Egg Harbor City Public Schools

Mathematics Curriculum

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New Jersey Core Curriculum Content Standards
for
Mathematics
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Introduction:

The purpose of the Egg Harbor City School District Math Curriculum Guide is to provide parents, staff members and community members with information that describes the Math instructional program in our school district. This curriculum guide was developed to assist students achieve success with the New Jersey Standards and to prepare them with the knowledge of Math that can be applied to their everyday life as well as using this knowledge to make informed decisions about careers in Math and related fields of endeavor. The foregoing curriculum serves as a true curriculum resource guide to assist Math teachers with implementing the Standards and District goals.

The Math Curriculum will be an ever-evolving curriculum, keeping up-to-date with the latest content knowledge, utilizing the best instructional practices, incorporating effective multiple assessments, and discarding materials and practices that are ineffective or detrimental to student achievement. An evolving curriculum allows for flexibility to adapt to students' academic needs and interests, while maintaining focus on student achievement of the Standards and District goals.

Acknowledgement:

The development of the District Math Curriculum Guide was an arduous task that required dedicated professionals with a sincere interest in their craft. Many hours of preparation, discussion, articulation and refinement went into this curriculum guide. The Egg Harbor City School District gratefully acknowledges the thoughtful contributions and outstanding efforts of the members of the Math Curriculum Development Team.

Instructional Practices:

Essentially, the aim of our instructional practice is to maximize each student's growth by meeting each student where he or she is and helping the student to progress. In practice, it involves offering several different learning experiences in response to students' varied needs. Learning activities and materials may be varied by difficulty to challenge students at different readiness levels, by topic in response to students' interests, and by students' preferred ways of learning or expressing themselves. Through well-developed unit plans instructional staff has the opportunity to remain consistent in the implementation of the curriculum. In addition, formatted lesson plans that coincide with the unit plans will afford the instructional staff a template that can be easily completed and address the necessary components of the unit plan.

Our teachers use numerous strategies and tools to differentiate instruction. There are several key characteristics or elements that form the foundation of our instructional practices:

- Teachers and students accept and respect one another's similarities and differences.
- All students participate in respectful work -- work that is challenging, meaningful, interesting, and engaging.
- The teacher is primarily a coordinator of time, space, and activities rather than a provider of information. The aim is to help students become self-reliant learners.

- Students and teachers collaborate in setting class and individual goals.
- Students work in a variety of group configurations, as well as independently. Flexible grouping is evident.
- Time is used flexibly in the sense that pacing is varied based on student needs.
- Students often have choices about topics they wish to study, ways they want to work, and how they want to demonstrate their learning.

Curriculum Design:

Addressing Grade Level Expectations –

- Highlighted within the Lesson (Unit) Plan

→ Select Standards

→ State the Rationale (Goal)

→ Describe the Context (Objective)

→ Address a Timeframe

→ Identify Instructional Strategies

→ Present an Overview

→ Devise Essential and Guiding Questions

→ Determine Exit Outcomes and Indicators

→ Devise Learning Opportunities

→ Develop Assessment Opportunities

→ Use Data to Drive Instruction

→ Provide appropriate Accommodations/Modifications

→ Address Cross-Curricular Connections

→ Integrate Technology and Career Readiness Skills

→ Reflect on Teaching Practices

Accommodations/Modifications:

Overview –

- Accommodations Versus Modifications

→ Accommodations indicate changes to how the content is:

1) Taught
2) Made Accessible
3) Assessed

→ Accommodations do not change what the student is expected to master.

→ The objectives of the course remain intact.

- Modifications
  → Indicates the what (content) being taught is modified.

→ The student is expected to learn something different than the general education standard

Special Education Students (IEP –Individualized Education Program) –

- Implemented by Special Education Self-Contained Teachers
- Implemented by Special Education In-Class Resource Teachers
- Implemented by General Education Teachers (Supplemental Instruction)
- Implemented by Special Area Teacher (as per discipline area)
- Accommodation and Modification Options Chart

Visual Reinforcement	Use Manipulatives	Multi-Sensory Approach
Repeat Instructions	Review Directions	Visual Reminders
Modified Tests	Oral Testing	Scribe
On Computer	Preferential Seating	Study Carrel
Avoid placing student under pressure of time or completion	Post Assignments	Assignment Pad
Limited Multiple Choice	Prior Notice of Test	Test Setting: Administer tests in small group and/or in a separate room
Check Work in Progress	Immediate Feedback	Have Student Restate Information
Support Auditory Presentations with Visuals	Repeat Directions Quietly	Provide Extra Assignment Time
Highlight Key Words	Have the student repeat and explain directions	Modified Homework
Clean Work Area	Test Scheduling: Adding time as needed, providing frequent breaks	Test Study Guides
Concrete Examples	Extra Response Time	Extra Time Tests
Provide Models	Extra Drill/Practice	Monitor Assignments
Recognize and Give Credit for Oral Participation	No Handwriting Penalty	Post Routines
Extra Time - Written Work	Positive Reinforcement	Mindfulness Activities

504 Plan Students –

- Implemented by General Education Teachers
- Implemented by Special Area Teacher (as per discipline area)
- Accommodation and Modification Options Chart

Visual Reinforcement	Use Manipulatives	Multi-Sensory Approach
Repeat Instructions	Review Directions	Visual Reminders
Modified Tests	Oral Testing	Scribe
On Computer	Preferential Seating	Study Carrel
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English Language Learners –

- Implemented by ESL Teacher
- Implemented by General Education Teachers
- Implemented by Special Area Teacher (as per discipline area)
- Accommodation and Modification Options Chart

Visual Reinforcement	Use Manipulatives	Multi-Sensory Approach
Repeat Instructions	Review Directions	Visual Reminders
Modified Tests	Oral Testing	Scribe
On Computer	Preferential Seating	Study Carrel
Avoid placing student under pressure of time or completion	Post Assignments	Assignment Pad
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Basic Skills Instruction Students or Students at Risk of School Failure (IPP –Individualized Program Plan) –

- Implemented by Special Education In-Class Resource Teachers
- Implemented by General Education Teachers
- Implemented by Special Area Teacher (as per discipline area)
- Accommodation and Modification Options Chart

Visual Reinforcement	Use Manipulatives	Multi-Sensory Approach
Repeat Instructions	Review Directions	Visual Reminders
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Gifted and Talented Students –

- Implemented by General Education Teachers
- Implemented by Special Education In-Class Resource Teachers
- Implemented by Special Area Teacher (as per discipline area)
- Accommodation and Modification Options Chart

Encourage students to explore concepts in depth and encourage independent studies or investigations.	Use thematic instruction to connect learning across the curriculum.	Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment.
Expand students' time for free reading.	Invite students to explore different points of view on a topic of study and compare the two.	Provide learning centers where students are in charge of their learning.
Brainstorm with gifted children on what types of projects they would like to explore to extend what they're learning in the classroom.	Determine where students' interests lie and capitalize on their inquisitiveness.	Refrain from having them complete more work in the same manner.
Employ differentiated curriculum to keep interest high.	Avoid drill and practice activities.	Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning.
If possible, compact curriculum to allow gifted students to move more quickly through the material	Encourage students to make transformations- use a common task or item in a different way.	Allow for choice.

Assessments:

Formative – (Refer to **Tools for Formative Assessment** on the Google Team Drive in the Staff Resources Folder under the Formative Assessment Folder for list of techniques to check for understanding and how to utilize each.)

- Analyzing Student Work (Homework, Classwork, Tests, Quizzes, Stations)
- Observation
- Smart Responders
- Round Robin Charts
- Strategic Questioning
- Think-Pair-Share
- Classroom Polls
- Exit Slips
- Admit Slips
- One Minute Papers
- Thumbs Up and Thumbs Down
- Extended Projects
- Self-Assessment
- Peer-Assessment
- Portfolio Check
- Choral Response
- Quizlet
- LinkIt Standards-Based Assessments

- Data Conferencing

Summative –
- STEM activities
- End of Unit Assessment
- End of Chapter Test
- Mid-Term Exam
- Final Exam
- LinkIt Benchmark Assessments
- LinkIt PMI Assessments
- New Jersey Student Learning Assessment Math

Benchmark –
- Grades K-8 / Alg 1 LinkIt Fall Benchmark
- Grades K-8 / Alg 1 LinkIt Winter Benchmark
- Grades K-8 / Alg 1 LinkIt Spring Benchmark

Alternative Assessmets-
- Projects
- Contests
- Student Centered Assessments
- Presentaions
- Mini Quizzes
- Performace Tasks
- Google Forms

Instructional Materials:

Mathematics		
Grade K-8	Core Text	Publisher
	NA	
	Supplemental text or materials	Publisher
	Progressive Math Initiative	NJ Center for Teaching and Learning
Algebra I (*full year course or equivalent*)	Core Text	Publisher
	NA	
	Supplemental text or materials	Publisher
	Progressive Math Initiative	NJ Center for Teaching and Learning

Supplemental Materials:
- Edmark
- Online Resources

Pacing Guide:

- Refer to Matrix (where identified)
- Refer to Unit Plan Time Frames
- Identified on Lesson Plan

Interdisciplinary Connections:
Identified on Lesson Plan –

Interdisciplinary learning develops real-world, multi-faceted knowledge. Integration identifies logical connections between and among the content and learning experiences in all areas of the curriculum. Integrating and connecting various content areas improves learning outcomes and provides more authentic and relevant experiences for students. Interdisciplinary connections both enrich and extend learning. Interdisciplinary connections are studies that cross the boundaries of two or more district disciplines such as mathematics and art or literature and science. By purposefully looking for "essential concepts" and "big ideas," we purposefully design deliberate integration of the various content areas whenever appropriate. This includes, but is not limited to, examining how curriculum themes, project based learning, understanding by design essential questions, inquiry approaches, curriculum mapping, and the standards merge, while always keeping student best interests at the heart of this work.

The following areas are integrated into all areas of the instructional program:

Reading

<u>Key Ideas and Details</u>:

<u>CCSS.ELA-LITERACY.CCRA.R.1</u> - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

Word Problems, STEM activities

<u>CCSS.ELA-LITERACY.CCRA.R.3</u> - Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

Word Problems, STEM activities

<u>Craft and Structure</u>:

<u>CCSS.ELA-LITERACY.CCRA.R.4</u> - Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

Word Problems, Math-specific vocabulary

<u>CCSS.ELA-LITERACY.CCRA.R.6</u> - Assess how point of view or purpose shapes the content and style of a text.

______*Word Problems, STEM activities*

<u>Integration of Knowledge and Ideas</u>:

CCSS.ELA-LITERACY.CCRA.R.7 - Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

STEM activities, Data analysis (qualitative and quantitative)

CCSS.ELA-LITERACY.CCRA.R.8 - Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

Word problems, Constructed responses / Explaining and defending responses, classroom discourse

CCSS.ELA-LITERACY.CCRA.R.9 - Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Multiple approaches to solving problems, Differentiated instruction

Range of Reading and Level of Text Complexity:

CCSS.ELA-LITERACY.CCRA.R.10 - Read and comprehend complex literary and informational texts independently and proficiently.

Word Problems, Math Read-Alouds, Real-World connections, Mathematical career readiness, STEM activities

Writing

Text Types and Purposes:

CCSS.ELA-LITERACY.CCRA.W.1 - Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

Math reasoning Word problems, Constructed responses, Identifying errors in mathematical logic, STEM activities

CCSS.ELA-LITERACY.CCRA.W.2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

Constructed response, Open-ended questions, Peer instruction, Multiple explanations to solving problems, STEM activities

CCSS.ELA-LITERACY.CCRA.W.3 - Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details and well-structured event sequences.

Creation of word problems, Student-led instruction, STEM activities

Production and Distribution of Writing:

CCSS.ELA-LITERACY.CCRA.W.4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Constructed responses, STEM activities

CCSS.ELA-LITERACY.CCRA.W.5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

Constructed responses, Multi-step problems, STEM activities

CCSS.ELA-LITERACY.CCRA.W.6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Performance-based assessments, Constructed responses, STEM activities, Word processing, Data conferencing

Research to Build and Present Knowledge:

CCSS.ELA-LITERACY.CCRA.W.7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

STEM activities, Data analysis, Math career readiness, Problem solving

CCSS.ELA-LITERACY.CCRA.W.8 - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

STEM activities, Data analysis, Problem solving, Research projects

CCSS.ELA-LITERACY.CCRA.W.9 - Draw evidence from literary or informational texts to support analysis, reflection, and research.

STEM activities, Data analysis, Math career readiness

Speaking and Listening:

Comprehension and Collaboration:

CCSS.ELA-LITERACY.CCRA.SL.1 - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Constructed responses, Peer instruction, Differentiated instruction, Math stations, STEM activities, Problem solving

CCSS.ELA-LITERACY.CCRA.SL.2 - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

Constructed responses, Peer instruction, Differentiated instruction, Math stations, STEM activities, Problem solving

CCSS.ELA-LITERACY.CCRA.SL.3 - Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Word problems, Peer instruction, STEM activities, Problem solving / analysis

Presentation of Knowledge and Ideas:

CCSS.ELA-LITERACY.CCRA.SL.4 - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

Constructed responses, Peer instruction, Differentiated instruction, STEM activities

CCSS.ELA-LITERACY.CCRA.SL.5 - Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

Data analysis, Differentiated instruction, STEM activities, Online spreadsheet tools, Problem-based learning

CCSS.ELA-LITERACY.CCRA.SL.6 - Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

Math-specific vocabulary, Peer instruction, Math stations, Constructed responses, STEM activities

Language:

Conventions of Standard English:

CCSS.ELA-LITERACY.CCRA.L.1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

Constructed responses, Word problems, STEM activities

CCSS.ELA-LITERACY.CCRA.L.2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Constructed responses, Word problems, STEM activities

Knowledge of Language:

CCSS.ELA-LITERACY.CCRA.L.3 - Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Constructed responses, Word problems, STEM activities

Vocabulary Acquisition and Use:

CCSS.ELA-LITERACY.CCRA.L.4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

Constructed responses, Word problems, STEM activities, Math-specific vocabulary, Data analysis

CCSS.ELA-LITERACY.CCRA.L.5 - Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

Math-specific vocabulary within word problems (ex. how much larger, no less than, etc)

CCSS.ELA-LITERACY.CCRA.L.6 - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

Math-specific vocabulary within word problems (ex. how much larger, no less than, etc), *Math career readiness*

Science:

PS1 - Matter and Its Interactions- structures and properties of matter, chemical reactions, nuclear processes

Mathematical computation, balancing equations, variables, measurements, STEM activities

PS2 - Motion and Stability: Forces and Interactions- forces and motion, types of interactions, stability and instability in physical systems

Mathematical computation, formulas and literal equations, vectors, conservation principles, data analysis, metric system, STEM activities

PS3 - Energy- definitions of energy, conservation of energy and energy transfers, relationship between energy and forces, energy in chemical processes, and everyday life

Mathematical computation, formulas and literal equations, vectors, conservation principles, data analysis, metric system, STEM activities

PS4 - Waves and their Applications in Technologies for Information Transfer- wave properties, electromagnetic radiation, information technologies and instrumentation

Mathematical computation, formulas and literal equations, measurement, data analysis, metric system, STEM activities

LS1 - From Molecules to Organisms: Structures and Processes- structure and function, growth and development of organisms, organization for matter and energy flow in organisms, information processing

Mathematical computation, charts and tables, measurement, patterns, STEM activities

LS2 - Ecosystems: Interactions, Energy, and Dynamics- interdependent relationships in ecosystems, cycles of matter and energy transfers in ecosystems, ecosystem dynamics,functioning and resilience, social interactions and group behavior

Mathematical computation, charts and tables, measurement, patterns, STEM activities

LS3 - Heredity: Inheritance and Variation of Traits- inheritance of traits, variation of traits

Mathematical computation, charts and tables, measurement, patterns, statistical analysis, data analysis, STEM activities

LS4 - Biological Evolution: Unity and Diversity- evidence of common ancestry and diversity, natural selection, adaptation, biodiversity and humans

Mathematical computation, charts and tables, measurement, patterns, statistical analysis, data analysis, STEM activities

ESS1 - Earth's Place in the Universe- universe and its stars, Earth and the solar system, history of planet Earth

Mathematical computation, charts and tables, measurement, patterns, data analysis, conversions, metric system, STEM activities

ESS2 - Earth's Systems- Earth material and systems, plate tectonics and large-scale system interactions, the role of water in the Earth's surface properties, weather and climate, biogeology

Mathematical computation, charts and tables, measurement, patterns, data analysis, conversions, metric system, STEM activities

ESS3 - Earth and Human Activity- natural resources, natural hazards, human impacts on Earth's systems, global climate change

Mathematical computation, charts and tables, measurement, patterns, data analysis, conversions, metric system, STEM activities

ETS1 - Engineering Design- engineering design, defining and delimiting an engineering problem, developing possible solutions, optimizing the design solution

Mathematical computation, charts and tables, measurement, data analysis, STEM activities

Cross-Curricular Science and Engineering Practices

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating and communicating information
-

Computer Science & Design Thinking:

New approaches necessary for solving the critical challenges that we face as a society will require harnessing the power of technology and computing. Rapidly changing technologies and the proliferation of digital information have permeated and radically transformed learning, working, and everyday life. To be well-educated, global-minded individuals in a computing-intensive world, students must have a clear understanding of the concepts and practices of computer science. As education systems adapt to a vision of students who are not just computer users but also computationally literate creators who are proficient in the concepts and practices of computer science and design thinking, engaging students in computational thinking and human-centered approaches to design through the study of computer science and technology serves to prepare students to ethically produce and critically consume technology.

Computing Systems:
People interact with a wide variety of computing devices that collect, store, analyze, and act upon information in ways that can affect human capabilities both positively and negatively. The physical components (hardware) and instructions (software) that make up a computing system communicate and process information in digital form.

Networks and the Internet:

Computing devices typically do not operate in isolation. Networks connect computing devices to share information and resources and are an increasingly integral part of computing. Networks and communication systems provide greater connectivity in the computing world.

Data & Analysis:
Computing systems exist to process data. The amount of digital data generated in the world is rapidly expanding, so the need to process data effectively is increasingly important. Data is collected and stored so that it can be analyzed to better understand the world and make more accurate predictions.

Algorithms & Programming:
An algorithm is a sequence of steps designed to accomplish a specific task. Algorithms are translated into programs, or code, to provide instructions for computing devices. Algorithms and programming control all computing systems, empowering people to communicate with the world in new ways and solve compelling problems.

Engineering Design:
People design for enjoyment and to solve problems, extend human capabilities, satisfy needs and wants, and improve the human condition. Engineering Design, a systematic approach to creating solutions to technological problems and finding ways to meet people's needs and desires, allows for the effective and efficient development of products and systems.

Interaction of Technology and Humans:
Societies influence technological development. Societies are characterized by common elements such as shared values, differentiated roles, and cultural norms, as well as by entities such as community institutions, organizations, and businesses. Interaction of Technology and Humans concerns the ways society drives the improvement and creation of new technologies, and how technologies both serve and change society.

Nature of Technology:
Human population, patterns and movement focus on the size, composition, distribution, and movement of human populations and how they are fundamental and active features on Earth's surface. This includes understanding that the expansion and redistribution of the human population affects patterns of settlement, environmental changes, and resource use. Patterns and movements of population also relate to physical phenomena including climate variability, landforms, and locations of various natural hazards and their effects on population size, composition, and distribution.

Effects of Technology on the Natural World:
Many of engineering and technology's impacts on society and the environment are widely regarded as desirable. However, other impacts are regarded as less desirable. Effects of Technology on the Natural World concerns the positive and negative ways that technologies affect the natural world.

Ethics & Culture:
Ethics and Culture concerns the profound effects that technologies have on people, how those effects can widen or narrow disparities, and the responsibility that people have for the societal consequences of their technological decisions.

Social Studies:

Social Studies Standard 6.3 - Active Citizenship in the 21st Century: All students will acquire the skills needed to be active, informed citizens who value diversity and promote cultural understanding by working collaboratively to address the challenges that are inherent in living in an interconnected world.
Word problems, STEM activities, graphical and statistical analysis, financial literacy, career-readiness

Technology:

Technology Standard 8.1: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

Word processing, online spreadsheet tools, STEM activities, math career readiness

Technology Standard 8.2: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

Word processing, online spreadsheet tools, STEM activities, math career readiness

Visual and Performing Arts:

The NJ Visual & Performing Arts Standards emphasize the process-oriented nature of the arts and arts learning by:

- Defining artistic literacy through a set of overarching philosophical foundations and lifelong goals that clarify long-term expectations for arts learning;
- Placing artistic processes and anchor standards at the forefront of the work;
- Identifying creative artistic practices as the bridge for the application of the artistic processes and anchor standards across all learning; and
- Specifying enduring understandings and essential questions that provide conceptual through lines and articulate value and meaning within and across the arts discipline.

The development of artistic literacy is dependent on creating an environment in which students are encouraged to independently and collaboratively imagine, investigate, construct, and reflect. These steps are much the same as those taken in the math classroom. The artistic processes: *creating, performing/presenting/producing, responding, and connecting*, are the foundation for developing artistic literacy and fluency in the arts and, subsequently, the sciences.

Patterns, transformations, student-led instruction / presentation

Health and Physical Education:

The NJ Comprehensive Health & Physical Education Standards highlight the expectation that all students participate in a high-quality, K–12 sequential health and physical education program that emphasizes 21st Century skills and interdisciplinary connections to empower students to live a healthy active lifestyle. The primary focus of the standards consists of the development of concepts and skills that promote and influence healthy behaviors. These concepts can be supported through math instruction can help students gain a deeper understanding of the material.

- Standard 2.1 - Personal & Mental Health
- Standard 2.2 - Physical Wellness
- Standard 2.3 - Safety

Mathematical computation, measurement, project-based learning, STEM activities

Integration of 21st Century Skills through NJSLS 9:

New Jersey's Standard 9 is composed of the Career Readiness, Life Literacies, and Key Skills

- Mission- Career readiness, life literacies, and key skills education provides students with the necessary skills to make informed career and financial decisions, engage as responsible community members in a digital society, and to successfully meet the challenges and opportunities in an interconnected global economy.

- This standard will be addressed via researching and presenting information, working collaboratively with partners or small groups, using technology like Google Suite on a regular basis, grounding reading, writing, and speaking in evidence from text, both literary and informational, building knowledge through content rich non-fiction, inferencing, identifying main idea and theme, sequence of events, cause and effect, vocabulary, problem and solution, point of view, and by evaluating various forms of media and formats.

- **Vision- An education in career readiness, life literacies, and key skills fosters a population that:**
  Continually self-reflects and seeks to improve the essential life and career practices that lead to success;
  Uses effective communication and collaboration skills and resources to interact with a global society; Possesses financial literacy and responsibility at home and in the broader community; Plans, executes, and alters career goals in response to changing societal and economic conditions; and seeks to attain skill and content mastery to achieve success in a chosen career path.

9.1 Financial Literacy Themes

- Civic Financial Responsibility
- Financial Institutions
- Financial Psychology
- Planning and Budgeting

- Risk Management
- Economic and Government Influences
- Credit Profile

9.2 Career Awareness, Exploration, Preparation and Training Themes
- Career Awareness and Planning

9.4 Life Literacies and Key Skills Themes
- Creativity and Innovation
- Critical Thinking and Problem Solving
- Digital Citizenship
- Global and Cultural Awareness
- Information and Media Literacy
- Technology Literacy
- Career Readiness, Life Literacy, and Key Skills Practices

NJSLS Standard 9 is integrated across the K-8 curriculum in various subject areas, where appropriate. Lessons could include:
- working collaboratively to solve problems
- comparing and contrasting
- classroom debates and negotiations
- speaking and listening skills
- networking
- customizing resumes and references
- questioning techniques
- communicating clearly and effectively, with reason
- employ valid and reliable research strategies
- accept and integrating criticism and feedback
- utilize critical thinking to make sense of problems and persevere in solving them
- use technology to enhance productivity
- In addition, a yearly career fair will be conducted.

The integration of 21st century skills will be identified on lesson plans.

Career Readiness, Life Literacies, and Key Skills
- Act as a responsible and contributing community members and employee.
- Attend to financial well-being
- Consider the environmental, social and economic impacts of decisions
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity, increase collaboration and communicate effectively.

- Work productively in teams while using cultural/global competence.

Standards in Action: Climate Change

- The NJSLS-CLKS includes the skills, knowledge and practices necessary for success in an increasingly complex world and changing natural environment. Climate change is included in these standards. Collaborating to solve a problem, approaching a solution with innovation, and determining the validity of a source of information are all essential skills required in the standards and necessary for students to maintain awareness of and successfully address climate change. Climate change can be integrated into the teaching of these standards in a few ways. For example, middle school students could develop a plan for implementing an environmentally focused project in the local community such as protecting a wetland or developing an urban greenway along a stream. The plan would include goals, priorities and necessary resources. In a career and technical education program, as a part of a green building design integrated project, students could explore various sustainable and reclaimed products used for construction. After researching several sources, students would create a collage of information, share with their classmates and take notes on new products and ideas.

New Jersey's Standard 9.1 Financial Literacy

- This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance.
- Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.
- This standard would be addressed via read alouds, STEAM and problem solving activities, by having a classroom economy, the use of school-wide currency, higher order thinking and questioning strategies, and by hosting a career fair each year.
- Resources-My Classroom Economy link
    - Free Experiential learning / Financial Literacy
    - <u>My Classroom Economy Resource</u>

New Jersey's Standard 9.2 Career Awareness, Exploration, and Preparation

- This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.
- This standard would be addressed via researching and presenting information, working collaboratively with partners or small groups, using technology like Google Suite on a regular basis, grounding reading, writing, and speaking in evidence from text, both literary and informational, building knowledge through content rich non-fiction,

inferencing, identifying main idea and theme, sequence of events, cause and effect, vocabulary, problem and solution, point of view, and by evaluating various forms of media and formats.

New Jersey's Technology Standard 9.3 Career and Technical Education

- All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

  Standard 9.3 is broken into the following strands:

    - Strand A: Career Awareness (met by Grade 4)
    - Strand B: Career Exploration (met by Grade 8)

- This standard would be addressed via researching and presenting information, working collaboratively with partners or small groups, using technology like Google Suite on a regular basis, grounding reading, writing, and speaking in evidence from text, both literary and informational, building knowledge through content rich non-fiction, inferencing, identifying main idea and theme, sequence of events, cause and effect, vocabulary, problem and solution, point of view, and by evaluating various forms of media and formats.

Standard 9.4 Life Literacies and Key Skills.

- This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.

Personal Financial Literacy:

- New Jersey's Standard 9.1 Personal Financial Literacy
    - This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance.
    - Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

Theme 1: Civic Financial Responsibility

- This idea will be addressed via read alouds, researching various civic duties and responsibilities, delineating classroom jobs, project based learning activities on volunteering and giving back to the community

Theme 2: Financial Institutions

- This standard will be addressed via read alouds, researching the American banking and credit system, STEAM and problem solving activities, analysis of informational text (primary and secondary)

Theme 3: Financial Psychology

- This standard will be addressed via STEAM and problem solving activities, having a classroom token economy, personal reflections on spending habits and emotional well-being

Theme 4: Planning and Budgeting

- This standard will be addressed via STEAM and problem solving activities, by having a classroom economy, the use of school-wide currency, analysis of informational texts regarding savings accounts

Theme 5: Risk Management

- This standard will be addressed via the use of read alouds regarding insurance, higher order thinking and questioning techniques regarding when insurance is needed

Theme 6: Economic and Government Influences (Grades 5- 8)

- This standard will be addressed via read alouds, research and debates on taxation, research on the history of taxation, defining trade practices throughout American history, determining state and federal financial laws.

Theme 7: Credit Profile (Grades 5th- 8th)

- This standard will be addressed via read alouds, analysis of informational texts, compare and contrasting product prices, classroom discussions on credit score

Career Awareness, Exploration and Preparation

New Jersey's Standard 9.2 Career Awareness, Exploration, and Preparation

- This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.
- This standard would be addressed via researching and presenting information, working collaboratively with partners or small groups, using technology like Google Suite on a regular basis, grounding reading, writing, and speaking in evidence from text, both literary and informational, building knowledge through content rich non-fiction, inferencing, identifying main idea and theme, sequence of events, cause and effect, vocabulary, problem and solution, point of view, and by evaluating various forms of media and formats.

Theme 1: Career Awareness and Planning

- This standard will be addressed via the use of read alouds regarding occupations, defining individual skills, training, and knowledge required for various occupations and higher education, determining incomes associated with various careers, compare and contrast of public, private and entrepreneurial occupations

Career Readiness, Life Literacies, and Key Skills

Standard 9.4 Life Literacies and Key Skills.

- This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.

Theme 1: Creativity and Innovation

- This standard will be addressed via read alouds, project based learning assignments, think-a-louds, classroom collaboration activities, perspective- taking assignments, and problem solving assignments as they relate to career readiness

Theme 2: Critical thinking and problem solving

- This standard will be addressed via read alouds, project based learning assignments, research assignments, compare and contrast activities, multi-solution project based learning assignments, local, national, and global research projects based on current events

Theme 3: Digital Citizenship

- This standard will be addressed via read alouds, project based learning assignments, research assignments, primary and secondary resource analysis, citation assignments, online safety and research assignments, student presentations, collaborative activities, outcome based assignments regarding technology safety

Theme 4: Global and Cultural Awareness

- This standard will be addressed via read alouds, project based learning assignments, research assignments, classroom discussions, cultural awareness activities,

Theme 5: Information and Media Literacy

- This standard will be addressed via read alouds, project based learning assignments, research assignments, classroom discussions, Google Scholar assignments, Google Suite activities, analysis of media bias assignments

Theme 6: Technology Literacy

- This standard will be addressed via read alouds, project based learning assignments, research assignments, classroom discussions, use of Google Docs and Microsoft Word assignments, Google Suite Slides and Microsoft Powerpoint assignments, Google Sheets and Microsoft Excel assignments, current events assignments

Career Ready Practices:

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of
Study.

Integration and Focus -

- Our career programs are focused on STEAM based practices, meaning all lessons are hands-on and introduce students to high interest, STEM-based careers.
- With our career programs, students learn how the concepts and topics they learn in school are related to the real world. And, all lessons are experiential and use simple supplies, no text book or handout is used.
- The career programs will utilize videos, magazines, presenters, internet search engines, hands on projects, and experiments that focus on topics that link student learning to various career options.

Technology through NJSLS and Career Education:

Identified on Lesson Plan –

Mission:

Readiness in this century demands that students actively engage in critical thinking, communication, collaboration, and creativity. Technology empowers students with real-world data, tools, experts and global outreach to actively engage in solving meaningful problems in all areas of their lives. The power of technology discretely supports all curricular areas and multiple levels of mastery for all students.

Vision:

The design process builds in our students the recognition that success is not merely identifying a problem but working through a process and that failure is not an end but rather a point for reevaluation. Whether applied as a skill in product development, in the learning environment, in daily life, in a local or more global arena, the design process supports students in their paths to becoming responsible, effective citizens in college, careers and life. Computational thinking provides an organizational means of approaching life and its tasks. It develops an understanding of technologies and their operations and provides students with the abilities to build and create knowledge and new technologies.

Standards:

Technology Standard 8.1: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

Use of non-fiction media, science-specific vocabulary, data analysis, lab reports, research-based assignments, word processing, online spreadsheet tools, STEM activities, problem-based learning

Technology Standard 8.2: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
______*Problem-based learning, STEM activities, use of non-fiction media, solving real-world science-based issues (ex. global warming, filtration, alternate fuels, etc), engineering activities (particularly civil engineering), projects with constraints*

Implementation During Instruction:

→ Webquests
→ Demos Activities
→ Classroom Responders
→ Chromebooks
→ Online Progress Monitoring Tools
→ Online Assessments
→ Online Word Processing
→ Let's Go Learn
→ LinkIt

Additional Content-Specific Information/Resources –

1. National / International Technology Student Standards
    1. 8.1 Educational Technology
        1. International Society for Technology in Education (ISTE) Standards for Student
        2. American Association of School Librarians (AASL) Student Standards for the 21st-Century Learner
        3. Common Sense Student Standards Alignment in the K-12 Digital Citizenship Curriculum
    2. 8.2 Technology Education, Engineering, Design and Computational Thinking - Programming
        1. K12 Computer Science Student Framework Statements by Grade Band
        2. International Technology and Engineering Educators Association Standards for Technological Literacy

Career Education:

Identified on Lesson Plan –

- Integrated into 21st Century Skills (NJSLS 9) and (NJSLS 8)
- Annual Career Fair

Integration and Focus -

- Our career programs are focused on STEM based practices, meaning all lessons are hands-on and introduce students to high interest, STEM-based careers.
- With our career programs, students learn how the concepts and topics they learn in school are related to the real world. And, all lessons are experiential and use simple supplies, no text book or handout is used.
- The career programs will utilize videos, magazines, presenters, internet search engines, hands on projects, and experiments that focus on topics that link student learning to various career options.

Amistad Law: N.J.S.A. 18A 52:16A-88 Every board of education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.

Holocaust Law: N.J.S.A. 18A:35-28 Every board of education shall include instruction on the Holocaust and genocides in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

Integration of LGBT+ Individuals with Disabilities:

In each curricular area, the district will adopt inclusive instructional materials that portray the cultural and economic diversity of society including the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people.Specifically in Math students will be examining influential mathematicians who have made contributions that may include people who are a part of the LGBTQ+ community or individuals with disabilities.

Diversity, Equity, and Inclusion:

All students deserve equitable access (N.J.A.C. 6A:7) to a high-quality education that is inclusive and reflective of the rich diversity of our state. This can be achieved through consideration of diverse histories, experiences and perspectives that promote the dignity and respect of all individuals.Throughout the course of this Math curriculum, it is our intent to present materials and activities that are respectful and inclusive of diversity, gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, and culture. Students will be exposed to a multitude of different cultures including Asian American & Pacific Islanders and discussions about the Holocaust and Amistad when appropriate,

Asian American & Pacific Islander Contributions:

Ensures that the contributions, history, and heritage of Asian Americans and Pacific Islanders (AAPI) are included in the New Jersey Student Learning Standards (NJSLS) for Social Studies in kindergarten through Grade 12 (P.L.2021, c.416);

Unit Plans:

- District Unit Plans with Timeline for Instruction
- Highlights Integration of Essential Curricular Components
- Includes Curriculum Development Resources

<table>
<tr><th colspan="2">Egg Harbor City School District
Mathematics Curriculum
Unit Plan #1</th></tr>
<tr><td colspan="2">Title: Daily Routines</td></tr>
<tr><td>Grade Level: Kindergarten</td><td>Length of Time: 2 weeks</td></tr>
<tr><td colspan="2">Unit Summary: The students will become familiar with simple math routines through daily calendar time. They will explore the calendar, numbers, counting, weather, patterns and colors.</td></tr>
<tr><td colspan="2" align="center">Learning Targets</td></tr>
<tr><td colspan="2">Daily Routine Skills:</td></tr>
<tr><td colspan="2">Number of the Day
Counting by 1
Calendar (Days of the week, Months of the Year, Date, Year)
Weather (Temperature, Seasons, Visible Weather)
Patterns (Shapes, AB)
Colors</td></tr>
<tr><td>Unit Essential Questions:
● How do we use numbers every day?
● What are the days of the week, months of the year, and seasons of the year?
● What is a calendar and why do we need it?
● What is the weather and how does it affect our lives?
● How do we reproduce a pattern?
● What colors do we see around us?</td><td>Unit Enduring Understandings:
● Numbers are used in many ways.
● The weather impacts our daily lives and changes throughout the year.
● We use a calendar to track day to day activity.
● A pattern is a repeated design or reoccurring sequence.
● Different colors are all around us.</td></tr>
<tr><td colspan="2">Unit Objectives (unpacking Clusters where needed):
s will become familiar with the daily math routines.</td></tr>
<tr><td colspan="2" align="center">Evidence of Learning</td></tr>
<tr><td colspan="2">Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.</td></tr>
<tr><td colspan="2">Summative Assessments:
Common Assessment: Readiness Checklist</td></tr>
<tr><td colspan="2" align="center">Lesson Plans</td></tr>
<tr><td align="center">Lessons</td><td align="center">Timeframe</td></tr>
<tr><td align="center">Lesson #1Title: Daily Math Routines</td><td align="center">10 Days = 2 weeks</td></tr>
</table>

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.home.earthlinks.net
- www.apples4theteacher.com
- Thinkcentral.com

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan #2**	
Title: Where are the Shapes?	
Grade Level: Kindergarten	**Length of Time:** 3 weeks
Unit Summary: Children will learn about shapes around them and be able to identify them.	
Learning Targets	
Domain: Geometry	
Standard(s): Identify shapes and describe shapes (square, circles, triangles, rectangles, hexagons, cubes, cone, cylinders and spheres.	
K.G.1	Describe objects in the environment using names of shapes and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.
K.G.2	Correctly names shapes regardless of their orientation or overall size.
K.G.3	Identify shapes as two-dimensional (lying in a plane flat) or three-dimensional (solid). (assessed in unit 8)
K.G.5	Model shapes in the world by building shapes from components and drawing shapes.
Unit Essential Questions: ● **How do you know the difference between a 2-D or 3-D shape?** ● **How would you describe the location of an object?** ● **What shapes do you see around you everyday?**	**Unit Enduring Understandings:** ● **Shapes are seen all around us in the world.** ● **Shapes can be flat (2-D) or solid (3-D).**
Unit Objectives (unpacking Clusters where needed): ● *Students will describe objects in the environment using shape names and describe the position of the objects (i.e. above, below, etc.).* ● *Students will identify two-dimensional shapes using the correct name.* ● *Students will distinguish between two-dimensional and three-dimensional shapes.* ● *Students will model and draw two-dimensional shapes.*	
Evidence of Learning	
Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.	
Summative Assessments: (one-on-one) ● Common Assessment #1: K.G.1 (Describe objects relative to position), K.G.2 (Name shapes) ● Common Assessment #2: K.G.5 (Model shapes)	
Lesson Plans	

Lessons	Timeframe
Lesson #1Title: Names of Shapes/2-D vs. 3-D/Modeling	10 days = 2 weeks
Lesson #2 Title : Positional Words	5 days = 1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*
- www.primarygames.com
- www.learningplanet.com
- Thinkcentral.com

Egg Harbor City School District Mathematics Curriculum Unit Plan # 3	
Title: Numbers and Counting to 10	
Grade Level: Kindergarten	**Length of Time:** 4 weeks
Unit Summary: Students will write, count, and compare numbers 1 to 10.	
Learning Targets	
Domain: Counting and Cardinality	
Standard(s): umber names and the count sequence. o tell the number of objects. re numbers.	
K.CC.1	Count to 100 by ones and by tens. **(assessed to 10)**
K.CC.2	Count forward beginning from a given number within the known sequence (instead of having to begin at 1).
K.CC.3	Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).
K.CC.4	Understand the relationship between numbers and quantities; connect counting to cardinality.
K.CC.5	Count to answer "how many?" questions about as many as 20 things arranged in a line, rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1-20, count out that many objects.
K.CC.6	Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group.
K.CC.7	Compare two numbers between 1 and 10 presented as written numerals.
Unit Essential Questions: ● How will I know if I have more or less? ● Why do we need to be able to count objects? ● How can I record what I count?	Unit Enduring Understandings: ● Objects can be counted and represented with a number. ● Counting can begin at any given number. ● Counting is a strategy for finding the answer to how many. ● Groups of objects can be smaller or larger than another.
Unit Objectives (unpacking Clusters where needed): ● *Students will count to ten.* ● *Students will write numbers one to ten.* ● *Students will count given objects and represent with a number.*	

● *Students will compare two numbers between 1 and 10.* ● *Students will identify if one group of numbers is greater, less, or equal to another group.*
Evidence of Learning
Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.
Summative Assessments: ● Common Assessment #1: K.CC.1 (Count to 10 by ones), K.CC.2 (Count forward beginning from a given number to 10), K.CC.3 (Write numbers to ten) K.CC.4 (Understand relationship between numbers and quantities), K.CC.5 (Count to answer "How many?") K.CC.6 (Identify if one group is greater, less, or equal to another), K.CC.7 (Compare two numbers between 1 and 10)
Lesson Plans

Lessons	**Timeframe**
Lesson #1 Title: Count, write, compare numbers to 5	10 days = 2 weeks
Lesson #2 Title: Count, write, compare numbers 5 to 10	10 days = 2 weeks

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.primarygames.com
- www.kidport.com
- Thinkcentral.com

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan # 4**	
Title: Sorting	
Grade Level: Kindergarten	**Length of Time:** 3 weeks
Unit Summary: Students will learn to sort objects (up to 10) into given categories	
Learning Targets	
Domain: Measurement and Data	
Standard(s): Classify objects and count the number of objects in each category	
Cluster #:	**Cluster(s):**
K.MD.3	Classify objects into given categories; count the numbers of objects in each category and sort the categories by count (Limit category counts to be less than or equal to 10)
Unit Essential Questions: ● **What makes objects different?**	**Unit Enduring Understandings:** ● **Objects can be sorted by color, shape and size.**
Unit Objectives (unpacking Clusters where needed): ● *Students will sort objects into given categories.*	
Evidence of Learning	
Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.	
Summative Assessments: Common Assessment: K.MD.3 (sorting objects)	
Lesson Plans	
Lessons	**Timeframe**
Lesson #1 Title: Sort by Color	5 days = 1 week
Lesson #2 Title: Sort by Shape	5 days = 1 week
Lesson #3 Title : Sort by Size	5 days = 1 week
Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):* ● www.kidport.com ● www.harcourtschool.com ● www.scholastic.com/clifford/play/sortitout/sortitout.him ● www.meddybemps.com/deepblue/sortingfish.html ● Thinkcentral.com	

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan # 4**	
Title: Sorting	
Grade Level: Kindergarten	**Length of Time:** 3 weeks
Unit Summary: Students will learn to sort objects (up to 10) into given categories	
Learning Targets	
Domain: Measurement and Data	
Standard(s): Classify objects and count the number of objects in each category	
Cluster #:	**Cluster(s):**
K.MD.3	Classify objects into given categories; count the numbers of objects in each category and sort the categories by count (Limit category counts to be less than or equal to 10)
Unit Essential Questions: ● **What makes objects different?**	**Unit Enduring Understandings:** ● **Objects can be sorted by color, shape and size.**
Unit Objectives (unpacking Clusters where needed): ● *Students will sort objects into given categories.*	
Evidence of Learning	
Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.	
Summative Assessments: Common Assessment: K.MD.3 (sorting objects)	
Lesson Plans	
Lessons	**Timeframe**
Lesson #1 Title: Sort by Color	5 days = 1 week
Lesson #2 Title: Sort by Shape	5 days = 1 week
Lesson #3 Title : Sort by Size	5 days = 1 week
Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):* ● www.kidport.com ● www.harcourtschool.com ● www.scholastic.com/clifford/play/sortitout/sortitout.him ● www.meddybemps.com/deepblue/sortingfish.html ● Thinkcentral.com	

Egg Harbor City School District
Mathematics Curriculum
Unit Plan # 6

Title: Measuring

Grade Level: Kindergarten	**Length of Time:** 3 weeks

Unit Summary: To describe attributes and compare objects in terms of length and weight.

Learning Targets

Domain: Measurement and Data

Standard(s): Describe and compare measurable attributes.

Cluster #:	Cluster(s):
K.MD1	Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
K.MD.2	Directly compare two objects with a measurable attribute in common, to see which object has "more of/less of" the attribute, and describe the difference.

Unit Essential Questions:

- **How can I compare objects?**
- **Which items are heavier or lighter than others?**

Unit Enduring Understandings:

- **Objects have distinct attributes that can be measured and compared.**

Unit Objectives (unpacking Clusters where needed):

- *Students will describe objects in terms of length and weight.*
- *Students will compare objects using length and weight.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

n Assessment #1: K.MD.1 (describe attributes), K.MD.2 (compare objects by their attributes)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Measuring in Length	5 days = 1 week
Lesson #2 Title: Measuring Weight	5 days = 1 week
Lesson #3Title: Compare two objects by their attributes	5 days = 1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.kidport.com
- www.funbrain.com
- Thinkcentral.com

Egg Harbor City School District Mathematics Curriculum Unit Plan # 7	
Title: Numbers 20 to 100	
Grade Level: Kindergarten	**Length of Time:** 3 weeks
Unit Summary: Students will recognize, write, and count numbers beyond 20.	
Learning Targets	
Domain: Counting and Cardinality	
Standard(s): umber names and the count sequence. o tell the number of objects.	
K.CC.1	Count to 100 by ones and by tens.
K.CC.2	Count forward beginning from a given number within the known sequence (instead of having to begin at 1).
K.CC.4	Understand the relationship between numbers and quantities; connect counting to cardinality.
Domain: Numbers & Operations in Base Ten	
Standard(s): Work with numbers 11-19 to gain foundations for place value.	
K.NBT.1	Compose and decompose numbers from 11 to 19 into tens and ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equations; understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

Unit Essential Questions:	Unit Enduring Understandings:
● **What do written numerals represent?** ● **Given two sets of objects, how can you determine which set has more or less?**	● **When numbers increase the quantity also increases.** ● **There are different strategies to use when counting.**

Unit Objectives (unpacking Clusters where needed):

- *Students will count to 120.*
- *Students will count given objects and represent with a written numeral.*
- *Students will identify if one group of numbers is greater, less, or equal to another group.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment #1: K.CC.1 (Count to 100 by ones), K.CC.2 (Count forward beginning from a given number to 100)

- Common Assessment #2: K.CC.4 (Understand relationship between numbers and quantities),
- Common Assessment #3: K.NBT.1 (Place Value)

Lesson Plans	
Lessons	**Timeframe**
Lesson #1Title: Count, write, compare numbers to 100	10 days = 2 weeks
Lesson #2 Title: place value and number relationship	10 days = 2 weeks

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.kidport.com
- www.primarygames.com
- Thinkcentral.com

Egg Harbor City School District Mathematics Curriculum Unit Plan # 8	
Title: Addition	
Grade Level: Kindergarten	**Length of Time:** 4 weeks
Unit Summary: The students learn the meaning of addition using concrete objects. They will also work through number stories to gain a real world understanding. The students will use many fact strategies (making 10 and decomposing). By the end of the unit, they will be fluent with facts to five.	
Learning Targets	
Domain: Operations & Algebraic Thinking	
Standard(s): Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.	
Cluster #:	**Cluster(s):**
K.OA.1	Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
K.OA.2	Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.
K.OA.3	Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).
K.OA.4	For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.
K.OA.5	Fluently add and subtract within 5.
Unit Essential Questions: ● **How can you combine 2 sets to make 1 larger set?** ● **How many do you add to make 10?** ● **How do we represent addition with objects, fingers, etc.?**	**Unit Enduring Understandings:** ● **Quantities can be represented in a variety of ways.** ● **Computation involves taking apart and combining numbers using a variety of approaches.** ● **Proficiency of basic facts aids computation of larger and smaller numbers.**
Unit Objectives (unpacking Clusters where needed): ● *Students will use objects, fingers, images, skits, verbal explanations, expressions and equations to represent addition within 10.* ● *Students will decompose numbers within 10.* ● *Students will make groups of ten using objects and drawings.*	
Evidence of Learning	
Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.	
Summative Assessments:	

- Common Assessment #1: K.OA.1 (using concrete objects to represent addition) , K.OA.2, (number stories with drawings)
- Common Assessment #2: K.OA.3, (decompose to show addition), K.OA.4 (making 10)
- Common Assessment #3: K.OA. 5 (fluency to 5)

Lesson Plans	
Lessons	**Timeframe**
Lesson #1Title: Adding with Concrete Objects	5 days = 1 week
Lesson #2 Title: Word Problems	5 days = 1 week
Lesson #3Title: Decompose, Making 10 & Fluency	10 days = 2 week

Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):*

- www.apple4teachers.com
- www.elemedu.ccs.k12.nc.us/**Resources/.../Problem/Problem**
- **www.kidport.com**
- Thinkcentral.com

Egg Harbor City School District
Mathematics Curriculum
Unit Plan #1

Title: Numbers to 120

Grade Level: 1	**Length of Time:** 3 Weeks

Unit Summary: Students will study the structure of the whole number system. They will write, read (numeral and words,) order and compare numbers to 120. They will identify patterns in skip counting, distinguish between odd and even and become fluent with a number line and number grid.

Learning Targets

Domain: Number and Operations in Base Ten (NBT)

Standard(s):
Extend the counting sequence.
Understand place value.
Use place value understanding and properties of operations to add and subtract.

Cluster #:	**Cluster(s):**
1.NBT.1	Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.
1.NBT.3	Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.
1.NBT.5	Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. **(Not assessed until unit 5)**

Unit Essential Questions:
- **What patterns exist in number names that can be used to understand and represent larger numbers?**
- **How can words and symbols be used to illustrate the comparison of numbers?**
- **What does less than, greater than and equal to mean?**
- **How do we use ordinal numbers in everyday life?**

Unit Enduring Understandings:
- **Numbers can be used to count, label, order, identify, measure and describe things and experiences.**
- **Quantities can be compared using number words or numerals.**

Unit Objectives (unpacking Clusters where needed):
- *Students will be able to compare two given numbers between 0-100.*
- *Students will be able to count to 120.*
- *Students will be able to mentally find 10 more or less than a given number.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.
ggestions are listed below: Number Recognition to 120 Worksheet & Counting to 120 Worksheet

Summative Assessments:
n Assessment: 1.NBT.1 (Count to 120, read & write numbers to 120), 1.NBT.3 (Compare 2 numbers)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Reading and Writing Numbers	4 days
Lesson #2Title: Exploring the Number Line and Number Grid	2 days
Lesson #3 Title: More Than, Less Than	3 days
Lesson #4 Title: Skip Counting	3 days
Lesson #5 Title: Odd & Even	1 day
Lesson #6 Title: Review/Unit Assessment	2 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- http://njctl.org/courses/math/1st-grade/
- Thinkcentral.com

<table>
<tr><th colspan="2">Egg Harbor City School District
Mathematics Curriculum
Unit Plan #2</th></tr>
<tr><td colspan="2">Title: Addition to 20</td></tr>
<tr><td>Grade Level: 1</td><td>Length of Time: 4 Weeks</td></tr>
<tr><td colspan="2">Unit Summary: Students will gain an understanding of addition facts to 20. They will use counters, connecting cubes, the number line and the number grid to help them initially. They will also discover patterns in addition such as plus 1, plus 0, plus 10, and doubles. They will then use all of this knowledge to find a missing addend.</td></tr>
<tr><th colspan="2">Learning Targets</th></tr>
<tr><td colspan="2">Domain: Operations and Algebraic Thinking (OA)</td></tr>
<tr><td colspan="2">Standard(s):
Represent and solve problems involving addition and subtraction
Understand and apply properties of operations and the relationship between addition and subtraction</td></tr>
<tr><td>1.OA.1</td><td>Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.</td></tr>
<tr><td>1.OA.2</td><td>Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.</td></tr>
<tr><td>1.OA.3</td><td>Apply properties of operations as strategies to add and subtract.[2] Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)</td></tr>
<tr><td>1.OA.5</td><td>Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).</td></tr>
<tr><td>1.OA.6</td><td>Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).</td></tr>
<tr><td>1.OA.7</td><td>Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. For example, which of the following equations are true and which are false? 6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2.</td></tr>
<tr><td>1.OA.8</td><td>Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = _ – 3, 6 + 6 = _.</td></tr>
<tr><td colspan="2">Domain: Numbers and Operations in Base Ten</td></tr>
<tr><td colspan="2">Standard(s):
Use place value understanding and properties of operations to add and subtract.</td></tr>
<tr><td>Cluster #:</td><td>Cluster(s):</td></tr>
<tr><td>1.NBT.5</td><td>Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. (Not assessed until unit 5)</td></tr>
<tr><td>Unit Essential Questions:
How do pictures and objects help us solve addition problems?
Why can you add addends in any order?</td><td>Unit Enduring Understandings:
We make generalizations and use symbols to represent mathematical ideas.</td></tr>
</table>

● **Why is counting on helpful when solving an addition sentence?** ● **What does the equation sign mean?** ● **How do you solve a missing addend problem?**	● **Proficiency with basic facts aids estimation and computation of larger and smaller numbers.** ● **We must apply and adapt a variety of strategies to solve problems.** ● **Numbers are related and manipulated for real world problem solving**

Unit Objectives (unpacking Clusters where needed):

- *Students will solve addition problems using objects, drawings, a number line, and a number grid.*
- *Students will explore the commutative and associative properties of addition.*
- *Students will relate addition to combining two groups of objects.*
- *Students will understand that the equal sign is used to show two even groups.*

Evidence of Learning

Formative Assessments:

s should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment # 1 : 1.OA.1 (solve word problem s +/- within 20), 1.OA.2 (solve word problem + of 3 whole numbers within 20), 1.OA.5 (relate counting to +/-), 1.OA.7 (understand meaning of =, determine true/false)
- Common Assessment # 2 : 1.OA.3(commutative/associative), 1.OA.6 (+/- with fluency within 10), 1.OA.8 (determine the unknown number)

Lesson Plans

Lessons	Timeframe
Lesson #1: Tools to help us add	**6 Days**
Lesson #2: Addition patterns	**5 Days**
Lesson #3: Turn Around Facts	**2 Days**
Lesson #4: Making 10	**2 Days**
Lesson #5: Missing Addends	**2 Days**
Lesson #6: 3 Addends	**1 Day**
Lesson #7: Review/Unit Assessment	**2 Days**

Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):*

- http://njctl.org/courses/math/1st-grade/
- Thinkcentral.com

Egg Harbor City School District Mathematics Curriculum Unit Plan # 3	
Title: Subtraction to 20	
Grade Level: 1	**Length of Time:** 4 Weeks
Unit Summary: Students will gain an understanding of subtraction facts to 20. They will use counters, connecting cubes, the number line and the number grid to help them initially. They will also discover patterns in subtraction such as minus 1, minus 0, minus 10, and doubles. They will then use all of this knowledge to find missing numbers.	
Learning Targets	
Domain: Operations and Algebraic Thinking (OA)	
Standard(s): Represent and solve problems involving addition and subtraction Understand and apply properties of operations and the relationship between addition and subtraction Add and subtract within 20 Work with addition and subtraction equations	
1.OA.1	Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.
1.OA.4	Understand subtraction as an unknown-addend problem. *For example, subtract 10 – 8 by finding the number that makes 10 when added to 8. Add and subtract within 20.*
1.OA.5	Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).
1.OA.6	Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).
1.OA.7	Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. For example, which of the following equations are true and which are false? 6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2.
1.OA.8	Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = _ – 3, 6 + 6 = _.*
Domain: Number and Operations in Base Ten (NBT)	
Standard(s): Use place value understanding and properties of operations to add and subtract.	
Cluster #:	**Cluster(s):**
1.NBT.5	Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. **(Not assessed until unit 5)**
1.NBT.6	Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.
Unit Essential Questions: ● **How do you solve a subtraction sentence using objects and drawings?**	**Unit Enduring Understandings:** ● **We make generalizations and use symbols to represent mathematical ideas.**

● **Why is counting back helpful when solving a subtraction sentence?** ● **How do operations relate to each other?** ● **How do I find differences by using related addition facts?**	● **Proficiency with basic facts aids estimation and computation of larger and smaller numbers.** ● **We must apply and adapt a variety of strategies to solve problems.** ● **Numbers are related and manipulated for real world problem solving**

Unit Objectives (unpacking Clusters where needed):

- *Students will solve subtraction problems using objects, drawings, a number line, and a number grid.*
- *Students will use patterns to help solve subtraction sentences and decompose a number leading to 10.*
- *Students will learn fact families to help them find missing numbers.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment # 1: 1.OA.1 (word problems +/- within 20), 1.OA.5 (relate counting with +), 1.OA.7 (determine T/F using =)
- Common Assessment # 2: 1.OA.4 (unknown addend to solve subtraction), 1.OA.6 (+/- within 20, fluently within 10), 1.OA.8 (determine unknown in 3 digit + within 20), 1.NBT.6 (- tens from multiples of 10 within 90)

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Tools to help us subtract	6 Days
Lesson #2 Title: Subtraction patterns	4 Days
Lesson #3Title: Fact Families	3 days
Lesson #4 Title: Get to the 10	3 days
Lesson #5 Title: Missing Number	2 days
Lesson #6 Title: Review/Unit Assessment	2 Days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- http://njctl.org/courses/math/1st-grade/
- Thinkcentral.com

Egg Harbor City School District Mathematics Curriculum Unit Plan #4	
Title: Time	
Grade Level: 1	**Length of Time:** 3 Weeks
Unit Summary: Students will gain an understanding of time to the half hour and hour. They will demonstrate time in both digital and analog format.	
Learning Targets	
Domain: Measurement and Data	
Standard(s): Tell and write time.	
Cluster #:	**Cluster(s):**
1.MD.3	Tell and write time in hours and half-hours using analog and digital clocks.
Unit Essential Questions: ● **How do we use clocks to tell time?** ● **Why is time important?**	**Unit Enduring Understandings:** ● **Telling time is an essential life skill** ● **Understand the connection between analog and digital time**
Unit Objectives (unpacking Clusters where needed): ● *Students will understand the difference between the hands on a clock.* ● *Students will tell time to the half hour and hour.* ● *Students will show time in digital and analog format.*	
Evidence of Learning	
Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.	
Summative Assessments: n Assessment: 1.MD.3 (tell time to hour and ½ hour)	
Lesson Plans	
Lessons	**Timeframe**
Lesson #1Title: Hands of a Clock	2 days
Lesson #2 Title: Time to the Hour	2 days
Lesson #3Title: Time to the Half Hour	3 days
Lesson #4Title: Digital Clock	3 days
Lesson #5Title: Digital & Analog	3 days
Lesson #6Title: Review/Assessment	2 days
Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):* ● http://njctl.org/courses/math/1st-grade/ ● Thinkcentral.com	

Egg Harbor City School District
Mathematics Curriculum
Unit Plan # 5

Title: Place Value

Grade Level: 1	**Length of Time:** 3 Weeks

Unit Summary: The students will gain an understanding of the ones and tens place value. They will use this information to help compare two digit numbers.

Learning Targets

Domain: Numbers and Operations in Base Ten

Standard(s):
Understand place value.
Use place value understanding and properties of operations to add and subtract.

Cluster #:	Cluster(s):
1.NBT.2	Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases: - 10 can be thought of as a bundle of ten ones — called a "ten." - The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. - The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).
1.NBT.3	Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.
1.NBT.5	Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

Unit Essential Questions:	Unit Enduring Understandings:
● **How does the position of a digit in a number affect its value?** ● **How are place value patterns repeated in numbers?**	● **In two digit numbers each digit represents a value in the tens and/or ones place.**

Unit Objectives (unpacking Clusters where needed):
- *Students will distinguish between the tens and ones place value.*
- *Students will compare two digit numbers according to their value.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:
- Common Assessment # 1: 1.NBT.2 (tens and ones), 1.NBT.3(compare 2-digit numbers)
- Common Assessment # 2: 1.NBT.5 (mentally 10 more/less)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Digits	2 days
Lesson #2 Title: Base Ten Blocks	2 days
Lesson #3Title: Ones & Tens	7 days
Lesson #4 Title: Comparing	2 days
Lesson #5 Title: Review/Assessment	2 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*
- http://njctl.org/courses/math/1st-grade/
- Thinkcentral.com

Mathematics Curriculum Unit Plan #6	
Title: Length	
Grade Level: 1	**Length of Time:** 3 Weeks
Unit Summary: The students will gain an understanding of nonstandard and standard length measurement.	
Learning Targets	
Domain: Measurement and Data	
Standard(s): Measure lengths indirectly and by iterating length units	

Cluster #:	**Cluster(s):**
1.MD.1	Order three objects by length; compare the lengths of two objects indirectly by using a third object.
1.MD.2	Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*

Unit Essential Questions:	**Unit Enduring Understandings:**
• **What are the tools of measurement and how are they used?** • **Why do we measure?** • **Why do we have different tools to measure?**	• **Objects have distinct attributes that can be measured** • **Measurement is a way to describe and compare objects** • **A specific process is used to measure objects** • **Measurement helps us understand and describe our world**

Unit Objectives (unpacking Clusters where needed):

- *Students will use blocks and other objects to measure items by placing them end to end.*
- *Students will compare the length of two and three objects.*
- *Students will use rulers to measure to the nearest inch and centimeter.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

n Assessment # 1: 1.MD.1 (order 3 objects by length), 1.MD.2 (measure with same size objects (units)

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Comparing Objects	2 days
Lesson #2 Title: Measuring with Blocks	2 days
Lesson #3Title: Measuring with Nonstandard Objects	2 days
Lesson #4 Title: Using our Body to Measure	3 days
Lesson #5Title: Inches	2 days
Lesson #6 Title: Centimeters	2 days
Lesson #7 Title: Review/Assessment	2 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- http://njctl.org/courses/math/1st-grade/
- Thinkcentral.com

Mathematics Curriculum Unit Plan #7	
Title: Two Digit Addition	
Grade Level: 1	**Length of Time:** 3 Weeks
Unit Summary: Students will gain an understanding of two digit addition.	

Learning Targets

Domain: Number and Operations in Base Ten

Standard(s): Use place value understanding and properties of operations to add and subtract.

Cluster #:	Cluster(s):
1.NBT.4	Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.
1.NBT.5	Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

Unit Essential Questions:	Unit Enduring Understandings:
• **How do operations affect numbers?** • **What makes a computational strategy both effective and efficient?** • **How can I use what I know about tens and ones to add two-digit numbers?**	• **To add two digit numbers, first add the ones and then add the tens.** • **If the sum of the ones place is greater than 9, regroup to the tens.**

Unit Objectives (unpacking Clusters where needed):

- *Students will add with tens mentally and by computing with two digit numbers.*
- *Students will add two digit numbers with and without regrouping.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 1.NBT.4 (+ within 100), 1.NBT.5 (mentally 10 more/less)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Adding with tens	6 days
Lesson #2Title: Two digit plus one digit without regrouping	3 days
Lesson #3Title: Two digit plus one digit with regrouping	3 days
Lesson #4Title: Review/Assessment	3 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- http://njctl.org/courses/math/1st-grade/
- Thinkcentral.com

Unit Plan # 8		
Title: Two Digit Subtraction		
Grade Level: 1	**Length of Time:** 3 Weeks	
Unit Summary: Students will gain an understanding of subtracting 10 from a two digit number. They will use the number grid along with place value concepts to help aid their understandings.		
Learning Targets		
Domain: Number and Operations in Base Ten		
Standard(s): Use place value understanding and properties of operations to add and subtract.		
Cluster #:	**Cluster(s):**	
1.NBT.5	Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.	
1.NBT.6	Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	

Unit Essential Questions: ● **How can I use what I know about tens and ones to subtract two-digit numbers?** ● **How can using number relationships help me solve subtraction problems for two digit numbers?**	**Unit Enduring Understandings:** ● **When subtracting 10, the tens place goes down one and the ones place stays the same.**

Unit Objectives (unpacking Clusters where needed):
- *Students will subtract ten from multiples of 10.*
- *Students will mentally subtract 10 from two digit numbers.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

n Assessment: 1.NBT.5 (+ within 100), 1.NBT.6 (- multiples of 10 within 90)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Subtracting with 10	8 days
Lesson #2 Title: Subtraction without Borrowing	3 days
Lesson #3 Title: Addition and Subtraction Relationship	2 days
Lesson #4 Title: Review/Assessment	2 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*
- http://njctl.org/courses/math/1st-grade/
- **Thinkcentral.com**

Unit Plan # 9	
Title: Geometry	
Grade Level: 1	**Length of Time:** 4 Weeks
Unit Summary: Students will gain an understanding of two-dimensional and three-dimensional shapes and the relationships between them. Students will observe, describe, compare, classify, represent, and build 2-D & 3-D shapes. They will learn to use geometric language to describe and identify important features of shapes. In addition, the students will divide shapes into equal parts and label the parts as ½ and ¼.	
Learning Targets	
Domain: Geometry	
Standard(s): Reason with shapes and their attributes.	

Cluster #:	**Cluster(s):**
1.G.1	Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.
1.G.2	Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.
1.G.3	Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

Unit Essential Questions:	**Unit Enduring Understandings:**
• **How do we show an equal part of something?** • **How are numbers used to show fractions?** • **How can I identify and describe solid figures by describing the faces, edges, and sides?** • **What are the attributes of shapes?**	• **Objects can be described and compared using their geometric attributes.** • **Parts of a whole can be represented as fractions.**

Unit Objectives (unpacking Clusters where needed):

- *Students will describe 2D & 3D shapes by their attributes.*
- *Students will compose 2D & 3D shapes.*
- *Students will divide shapes into equal shares.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment # 1: 1.G.1 (defining attributes vs. non-defining attributes), 1.G.2 (compose 2 and 3 digit shapes)
- Common Assessment # 2: 1.G.3 (partition circles and rectangles)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: 2D Shapes	2 days
Lesson #2 Title: Attributes	4 days
Lesson #3Title: 3D Shapes	5 days
Lesson #4Title: Half & Quarter Fractions	7 days
Lesson #5 Title: Review/Assessment	2 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- http://njctl.org/courses/math/1st-grade/
- **Thinkcentral.com**

Unit Plan #10		
Title: Data		
Grade Level: 1	**Length of Time:** 3 Weeks	
Unit Summary: Students will gain an understanding of bar graphs, picture graphs, and Venn diagrams. They will pose questions and collect and sort information about data. Students will also compare information represented on the graphs or diagram.		

Learning Targets	
Domain: Measurement and Data	
Standard(s): Represent and interpret data	
Cluster #:	**Cluster(s):**
1.MD.4	Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

Unit Essential Questions:

- **How does a graph give information without many words?**
- **When do we use graphs?**
- **Why do we use graphs?**
- **What are some ways to gather, record, and use data on a graph?**

Unit Enduring Understandings:

- **Graphs help us understand information**
- **Graphs convey data in a concise way**

Unit Objectives (unpacking Clusters where needed):

- *Students will draw and interpret picture graphs.*
- *Students will draw and interpret bar graphs.*
- *Students will accurately read and write tally marks.*
- *Students will use Venn diagrams to compare two or more objects.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

n Assessment: 1.MD.4 (organize, represent and interpret data)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Tally Marks	2 days
Lesson #2 Title: Picture Graphs	3 days
Lesson #3Title: Bar Graphs	2 days
Lesson #4 Title: How many More/How Many Less	3 days
Lesson #5 Title: Venn Diagrams	3 days
Lesson #6 Title: Review/Assessment	2 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- http://njctl.org/courses/math/1st-grade/
- **Thinkcentral.com**

Unit Plan # 1

Title: Place Value

Grade Level: 2	**Length of Time:** 30 days

Unit Summary: Place value provides the conceptual foundation for all aspects for whole-number for computation. The ordering of numbers and computational flexibility will help students address real world situations

Learning Targets

Domain: Number and Operation in Base Ten 2.NBT

Standard: Understand Place Value

Domain: Operations in Algebraic Thinking 2.OA

Standard: Work with equal groups of objects to gain foundation for multiplication

Cluster# (s):	Cluster(s):
2.NBT.1	Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones.
2.NBT.2	Count within 1000; skip-count by 5s, 10s, and 100s.
2.NBT.3	Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.
2.NBT.4	Compare two three-digit numbers based on meanings of the hundreds, ten, and ones digits, using >, =, and < symbols to record the results of comparisons.
2.OA.3	Determine whether a group of objects (up to 20) has an odd or even number of members.

Unit Essential Questions:

- **How can you show the value of a number in different ways?**
- **How are odd and even numbers different?**
- **How do you compare and order #'s within 1,000?**
- **What strategies can be used to count within 1,000 (e.g. skip count 5s, 10s, 100s); skip counting is effective strategy**

Unit Enduring Understandings:

- **There are a variety of ways to group and represent numbers.**
- **Even numbers can be divided into two equal groups; odd numbers cannot.**
- **Focus on the position of a digit in a number to determine its value and compare numbers.**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to determine if a group of objects has odd or even # of members.*
- *Students will understand that the 3 digit number represents amounts of hundreds, tens, and ones.*
- *Students will be able to count within 1000 and skip count by 5s, 10s, and 100s.*
- *Students will be able to read and write numbers to 1000 using base ten numerals, number names, and expanded form.*
- *Students will be able to compare 2 and 3 digit numbers using <.>. and = symbols.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment # 1:- 2.OA.3 (odd/even), 2.NBT.1 (hundreds, tens, ones), 2.NBT.2 (skip count by fives, tens, hundreds) , 2.NBT.4 (compare numbers)
- Common Assessment # 2: 2.NBT.3 (read/write numbers to 1,000)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Understand the place value of a number	10 days
Lesson #2 Title: Expanded forms	5 days
Lesson #3 Title: Odd or Even numbers	4 days
Lesson #4 Title: Compare and Order Numbers	5 days
Lesson #5 Title: Count by 5's, 10's 100's	6 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.softschools.com under Math Games Heading

Title: Facts	
Grade Level: 2	**Length of Time:** 5 weeks = 25 days
Unit Summary: This unit will support an understanding of addition to develop quick recall of basic addition facts and related subtraction facts. Fact strategies, understanding place value, and properties of operations will assist to increase students' math fact fluency.	
Learning Targets	
Domain: Number and Operation in Base Ten 2.NBT	
Standard: Use place value understanding and properties of operation to add and subtract	
Cluster #:	**Cluster:**
2.NBT.9	Explain why addition and subtraction strategies work, using place value and properties of operations.
Domain: Operations in Algebraic Thinking 2.OA	
Standard: Add and subtract within 20.	
Cluster #:	**Cluster:**
2.OA.2	Fluently add and subtract within 20 using mental strategies (See Standard 1.OA.6 for list of strategies). By end of 2nd grade, know from memory all sums of two one-digit numbers.
Unit Essential Question: ● **How do the addition and subtraction strategies support fact fluency?**	**Unit Enduring Understanding:** ● **Fact strategies will support my understanding of math facts.** ● **Use drawings and objects to demonstrate how addition and subtraction strategies work.**
Unit Objectives (unpacking Clusters where needed): ● *Students will be able to add fluently within 20.* ● *Students will be able to subtract fluently within 20.* ● *Students will be able to use strategies to solve addition and subtraction problems. (See 1.OA.6 for list of mental strategies).*	
Evidence of Learning	
Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans. **Summative Assessment:** Common Assessment : 2.OA.2 (add/subtract within 20) 2.NBT.9(explain why +/- strategies work)(Standard 2.OA.2 will have continued assessment beyond this unit to achieve fluency.)	
Lesson Plans	
Lessons	**Timeframe**
Lesson #1Title: Addition Strategies	15 days = 3 weeks
Lesson #2 Title: Subtraction Strategies	10 days = 2 weeks
Curriculum Development Resources: Incorporate a fact based program to increase math fact fluency (ie rocket math or spaceship math)	

Title: +/- within 1,000	
Grade Level: 2	**Length of Time:** 6 weeks
Unit Summary: This unit will support an understanding of the relationship between numbers and how numbers influence decisions in everyday life.	
Learning Targets	
Domain: Number and Operation in Base Ten 2.NBT	
Standard: Use place value understanding and properties of operation to add and subtract.	
Cluster #(s):	**Cluster(s):**
2.NBT.5	Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.
2.NBT.6	Add up to four two-digit numbers using strategies based on place value and properties of operations.
2.NBT.7	Add and subtract within 1000 using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method.
2.NBT.8	Mentally add 10 or 100 to a given number 100-900, and mentally subtract 10 or 100 from a given number, 100-900.
Domain: Operations in Algebraic Thinking 2.OA	
Standard: Represent and solve problems involving addition and subtractions.	
Cluster #:	**Cluster(s):**
2.OA.1	Use addition and subtraction within 100 to solve one and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions.
Unit Essential Question: ● **How do addition and subtraction affect numbers?** ● **How do addition and subtractions strategies (place value, properties of operations, and fact families) help you to solve a variety of problems.**	**Unit Enduring Understanding:** ● **A decrease in value is representative of subtraction.** ● **An increase in value is representative of addition.** ● **Concrete models and drawings facilitate addition and subtraction.** ● **Place value assists addition and subtraction.** ● **Word problems can be multi-steps and involve more than one operation.**
Unit Objectives (unpacking Clusters where needed): ● *Students will be able to add within 100 using a variety of strategies.* ● *Students will be able to subtract within 100 using a variety of strategies.* ● *Students will be able to add up to 4 two-digit numbers.* ● *Students will be able to add and subtract within 1000 using concrete model or drawings.* ● *Students will be able to mentally add and subtract 10 or 100 to a number 100 to 900.* ● *Students will be able to complete one-and-two-step addition and subtraction word problems with missing variables beginning, middle, and end.*	
Evidence of Learning	
Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans. **Summative Assessment:** ● Common Assessment # 1: 2.NBT.5 (Fluently +/- within 100), 2.NBT.6 (+ up to 4 2-digti numbers), 2.NBT.7 (+/- within 1,000), 2.NBT.8(mentally +/- 10 or 100) ● Common Assessment # 2: 2.OA.1(solve +/- word problems within 100) (Use rubric to determine mastery)	

Lesson Plans	
Lessons	**Timeframe**
Lesson #1Title: Use concrete models or drawings, strategies based on place value, and properties of operations to add within 1,000.	2 days
Lesson # 2 Title: Mentally add 10 or 100 to a given number 100-900	2 days
Lesson #3Title: Multi-digit addition (within 1,000) with and without regrouping	8 days
Lesson #4 Title: One- and two-step addition word problems with missing variables beginning, middle, and end.	3 days
Lesson #5 Title: Use concrete models or drawings, strategies based on place value, and properties of operations to subtract within 1,000.	2 days
Lesson # 6 Title: Mentally subtract 10 or 100 to a given number 100-900	2 days
Lesson #7 Title: Multi-digit subtraction (within 1,000) with and without regrouping.	8 days
Lesson #8 Title: One- and two-step subtraction word problems with missing variables beginning, middle, and end.	3 days
Curriculum Development Resources: *(Click the links below to access additional resources used to design this unit):* www.superteacherworksheets.com	

Egg Harbor City School District Mathematics Curriculum Unit Plan # 4
Title: Time & Money

Grade Level: 2	**Length of Time:** 4 weeks
Unit Summary: Time and money helps describe our world using numbers. An understanding of both is critical for application to real-world situations.	
Learning Targets	
Domain: Measurement and Data 2.MD	
Standard: Work with time and money	

Cluster# (s):	**Cluster(s):**
2.MD.7	Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.
2.MD.8	Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately.

Unit Essential Question:	**Unit Enduring Understanding:**
• **How does knowledge of time support your daily life?** • **How does an understanding of the value of money solve problems?**	• **Time is essential to making daily decisions.** • **Knowing the value of coins and dollars will help in real world situations.**

Unit Objectives (unpacking Clusters where needed):

- *Tell and write time to the nearest 5 min. interval (i.e. am/pm, digital, and analog)*
- *Identify coins and the dollar and their value. (i.e. $ and ¢)*
- *Solve word problems using coins and dollar bills.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessment:

- Common Assessment # 1: 2.MD.7 (Time to 5 minutes, am/pm)
- Common Assessment # 2: 2.MD.8 (Solve problem with money, $/¢)

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Tell and write time to nearest 5 min.	8 days
Lesson #2 Title: Identify coins and dollar bills and their value	8 days
Lesson#3 Title: Solve word problems using money	4 days

Curriculum Development Resources: *(Click the links below to access additional resources used to design this unit):*

www.superteacherworksheets.com

www.thatquiz.com

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan # 5**
Title: Length

Grade Level: 2	**Length of Time:** 6 weeks

Unit Summary: Measurement helps describe our world using numbers. An understanding of common measurement units and tools is critical for application to real-world situations.

Learning Targets

Domain: Measurement and Data

Standard: Measure and estimate lengths in standard units.

Cluster# (s):	Cluster(s):
2.MD.1	Measure the length of an object by selecting and using appropriate tools such as rulers, yard sticks, meter sticks, and measuring tapes.
2.MD.2	Measure the length of an object twice using measurements; describe how the two measurements relate to the size of the unit chosen.
2.MD.3	Estimate length using units of inches, feet, centimeters, and meters.
2.MD.4	Measure to determine how much longer one object is than another, expressing the length difference in terms of standard length unit.

Domain: Measurement and Data

Standard: Relate addition and subtraction to length

Cluster# (s):	Cluster(s):
2.MD.5	Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units.
2.MD.6	Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0,1,2,…, and represent whole-numbers sums and difference within 100 on a number line diagram.

Domain: Measurement and Data

Standard: Represent and interpret data

Cluster#:	Cluster(s):
2.MD.9	Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.

Unit Essential Question:

- **How can measurements be used to solve problems?**

Unit Enduring Understanding:

- **The tool used to measure length depends upon what is being measured.**
- **Measurements can be used to describe, estimate, and compare objects.**

Unit Objectives (unpacking Clusters where needed):

- *Select and use appropriate tool to measure the length of an object (i.e. ruler, yardstick, meter stick, and measuring tape).*
- *Measure an object using 2 different units of length and describe how they relate.*
- *Estimate the length of objects (i.e. inches, feet, centimeters, and meters).*
- *Measure to compare one object to another.*
- *Solve word problems using length within 100.*
- *Use a number line to show addition and subtraction of lengths.*
- *Represent the length of objects on a line plot.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessment:

- Common Assessment # 1: 2.MD.6 (whole numbers as lengths on a number line) and 2.MD.9 (line plot lengths)
- Common Assessment # 2: 2.MD.1 (measure length), 2.MD.2 (measure length twice with 2 units), 2.MD.3 (estimate length), and 2.MD4 (measure and compare lengths)
- Common Assessment # 3: 2.MD.5 (word problems w/ length)

Lesson Plans	
Lessons	**Timeframe**
Lesson #1Title: Measure length of objects	7 days
Lesson #2 Title: Compare two measurements of the same object	4 days
Lesson #3 Title: Estimate length	3 days
Lesson #4 Title: Compare two objects	3 days
Lesson #5 Title: Use a number line to represent length	5 days
Lesson #6 Title: Use a line plot to represent length	5 days
Lesson #7Title: Solve word problems using length	3 days
Curriculum Development Resources: *(Click the links below to access additional resources used to design this unit):* www.superteacherworksheets.com	

Egg Harbor City School District Mathematics Curriculum Unit Plan # 6	
Title: Data	
Grade Level: 2	**Length of Time:** 3 weeks

Unit Summary: All students will develop an understanding of the concepts and techniques of data analysis by modeling a variety of real world situations, drawing appropriate inferences, making informed decisions, and justifying those decisions.
Learning Targets
Domain: Measurement and Data
Standard: Represent and Interpret data

Cluster #:	**Cluster(s):**
2.MD.10	Draw a picture graph and a bar graph (with single unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

Unit Essential Question:	**Unit Enduring Understanding:**
● **How can the collection, organization, interpretation, and display of data be used to answer questions?**	● **The results of data collection can be used to support an argument.**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to draw a picture graph to represent data with up to four categories.*
- *Students will be able to draw a bar graph to represent data with up to four categories.*
- *Students will be able to solve problems using bar graphs.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessment:

Common Assessment: 2.MD.10 (Create a picture and bar graph from given data. Only bar graph will used to solve given problems.)

Lesson Plans

Lessons	**Timeframe**
Lesson #1 Title: Collect, organize, and interpret data for a pictograph. (single unit scale)	6 days
Lesson #2 Title: Collect, organize, and interpret data for a bar graph. (single unit scale)	6 days
Lesson #3 Title: Solve simple put-together, take-apart, and compare problems using information in a bar graph.	3 days

Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):*

www.superteacherworksheets.com

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan # 7**
Title: Geometry

Grade Level: 2	**Length of Time:** 4 weeks

Unit Summary: All students will develop spatial sense and the ability to use geometric properties and relationships to solve problems and make sense of the world around them.	
Learning Targets	
Domain: Geometry 2.G	
Standard: Reason with shapes and their attributes.	
Cluster #(s):	**Cluster(s):**
2.G.1	Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.
2.G.2	Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.
2.G.3	Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, and a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize the equal shares of identical wholes need not have the same shape.
Domain: Operations and Algebraic Thinking 2.OA	
Standard: Work with equal groups of objects to gain foundations for multiplication.	
Cluster #:	**Cluster(s):**
2.OA.4	Use addition to find the total number of objects arranged in rectangular arrays with up to five rows and up to five columns; write an equation to express the total as a sum of equal addends.

Unit Essential Question:	**Unit Enduring Understanding:**
• **How are geometric properties used to solve problems in everyday life?** • **What is the relationship between addition and multiplication?**	• **Objects can be described and compared using their geometric attributes.** • **Repeated addition is a foundation for multiplication.**

Unit Objectives (unpacking Clusters where needed):

- *Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.*
- *Recognize and draw shapes based on number of angles or faces.*
- *Divide a rectangle into rows and columns. (i.e. area)*
- *Divide circles and rectangles into two, three, and four equal shares. (i.e. fractions)*
- *Use rectangular arrays to express addition sums. (within 25)*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessment:

- Common Assessment # 1: 2.G.2 (area)and 2.0A.4 (arrays, repeated addition)
- Common Assessments #2: 2.G.1(recognize and draw shapes) and 2.G.3 (partition circle/rectangles into halves, thirds, and fourths)

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Identify shapes based on attributes	2 days
Lesson #2 Title: Draw shapes based on angles and faces	4 days
Lesson#3Title: Divide a rectangle into rows and columns; find total	5 days
Lesson #4 Title: Divide circles and rectangles into halves, thirds, and fourths.	4 days
Lesson #5 Title: Use addition to find the sums of objects in rectangular arrays.	5 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

www.superteacherworksheets.com

www.thatquiz.com

<table>
<tr><th colspan="2">Egg Harbor City School District
Mathematics Curriculum
Unit Plan # 1</th></tr>
<tr><td colspan="2">Title: Place Value, Addition , and Subtraction</td></tr>
<tr><td>Grade Level: 3</td><td>Length of Time: 4 weeks = 20 days</td></tr>
<tr><td colspan="2">Unit Summary: Place value provides the concepts and the foundation for all aspects and use of whole-number understanding and computation. Understanding the value and ordering of numbers along with computational flexibility will help students address real world situations.</td></tr>
<tr><th colspan="2">Learning Targets</th></tr>
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Domain: Number and Operation in Base Ten 3.NBT

Standard(s): Understand Place Value and properties of operations to perform multi digit arithmetic

Cluster # (s):	Cluster (s):
3.NBT.1	Use place value understanding to round whole numbers to the nearest 10 or 100
3.NBT.2	Fluently add and subtract within 1,000 using strategies and algorithms based on place value, properties of operations, and or the relationship between addition and subtraction.

Domain: Operations in Algebraic Thinking 3.OA

Standard(S): Solve problems involving the four operations, and identify and explain patterns in arithmetic

Cluster# (s):	Cluster(s):
3.OA.8	Solve two step word problems using the four operations. Represent these problems using equations with the letter standing for the unknown quantity. Assess the reasonableness of answers using mental computations and estimation strategies including rounding.
3.OA.9	Identify arithmetic patterns and (including patterns in the addition table and multiplication table), and explain them using properties of operations.

Unit Essential Questions:

- **How does estimation and rounding help you work with large numbers?**
- **What strategies and algorithms can you use to help you add and subtract large numbers?**
- **How would you use an equation to solve a word problem?**
- **How do number patterns and skip counting help you to solve number problems?**

Unit Enduring Understandings:

- **Estimation and Rounding are two ways you can use to understand the value of a number.**
- **Strategies and algorithms are used when adding and subtracting numbers.**
- **When solving word problems in math, equations help organize your information.**
- **It's important to look for and find patterns in numbers.**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to determine the place value of digits in a number within the 1,000's place.*
- *Students will be able to read, write, compare and order numbers within the 1,000's place.*
- *Students will be able to add and subtract within the 1,000's place.*
- *Students will be able to solve two step word problems using the four operations.*
- *Students will be able to write and solve simple number sentences.*
- *Student will be able to estimate and round numbers (using mental math when appropriate) within the 1,000's place.*
- *Students will be able to identify and apply patterns within numbers to solve number problems.*

Evidence of Learning

Formative Assessments:

s should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment #1: 3.NBT.1 and 3.NBT.2 (using place value to identify, round and add number within 1,000)
- Common Assessment #2: 3.OA.8 (solve word problems) and 3.OA.9 (identify/solve arithmetic patterns)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Understand the place value of a number within the 1,000's place.	3 days
Lesson #2 Title: Read, write and compare numbers within the 1,000's place.	4 days

Lesson #3 Title: Adding and subtracting numbers within the 1,000's place.	4 days
Lesson #4 Title: Estimating and Rounding numbers within the 1,000's place.	4 days
Lesson #5 Title: Solve and write two step word problems using all four operations with estimating and rounding, mental math.	5days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.mathisfun.com
- www.smartygames.com
- www.thinkcentral.com

Egg Harbor City School District Mathematics Curriculum Unit Plan # 2	
Title: Represent and Interpret Data	
Grade Level: 3	**Length of Time:** 4 weeks = 20 days
Unit Summary: In this unit students will interpret data using graphs, solve one and two step problems and create graphs using a data set. They will measure lengths using a ruler and estimate the measurement of various objects and distances.	
Learning Targets	
Domain: Measurement and Data 3.MD	

Standard(s): Represent and interpret data	
Cluster# (s):	**Cluster(s):**
3.MD.3	Draw a scaled pictograph and scaled bar graph to represent a data set with several categories. Solve one-and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs.
3.MD.4	Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by marking a line plot with a horizontal scale is marked off in appropriate units-whole numbers halves and quart.

Unit Essential Question: ● **What are some ways you can represent data?** ● **How do you read a tally table and frequency chart?** ● **What are the steps in reading and making a bar graph?** ● **What are the steps in reading and making a pictograph?** ● **What are the steps in reading and making a line plot?**	**Unit Enduring Understanding:** ● **Data can be represented in a bar graph, pictograph and line plot.** ● **Tally table and frequency tables are useful when collecting and organized data.** ● **Bar graphs, pictographs and line plots are used to show data in a more functional way.**

Evidence of Learning

Unit Objectives (unpacking Clusters where needed):

- *Students will collect and record data in tally tables and frequency tables.*
- *Solve problems by using the strategy make a table.*
- *Read and interpret data in a pictograph.*
- *Make a pictograph to show data in a table.*
- *Read and interpret data on a bar graph.*
- *Make a bar graph to show data in a table or pictograph.*
- *Use data represented in bar graph and pictographs to solve problems.*
- *Read and interpret data in a line plot.*

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment #1: 3.MD.3 (Data in pictographs and bar graphs)
- Common Assessment #2: 3.MD.4 (Line plots)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Collect and record data in tally table and frequency tables.	2 days
Lesson#2 Title: Solve problems by using the strategy make a table.	2 days
Lesson#3 Title: Read and interpret data in a pictograph	2 days
Lesson# 4 Title: Make a pictograph to show data in a table.	2 days
Lesson #5 Title: Read and interpret data in a bar graph.	2 days
Lesson #6 Title: Make a bar graph to show data in a table or pictograph	2 days

Lesson #7 Title: Use data represented in bar graph and pictographs to solve problems.	2 days
Lesson #8 Title: Read and interpret data in a line plot.	2 days
Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*	

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan # 3**	
Title: Multiplication	
Grade Level: 3	**Length of Time:** 6 weeks = 30 days
Unit Summary: Multiplication involves using arrays, picture models, groupings, and memorization of fact table and fact families up to 10. Students will solve word problems using the strategies listed above. Students will become fluent in all their multiplication facts up to 10.	
Learning Targets	
Domain: Operations and Algebraic Thinking 3.OA	
Standard(s): Represent and solve problems involving multiplication and division.	

Cluster# (s):	Cluster(s):
3.OA.1	Interpret products of whole numbers, e.g., interpret 5 times 7 as the total number of objects in five groups of seven objects each.
3.OA.3	Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays and measurement quantities, e.g. by using drawings and equations with a symbol for the unknown number to represent the problem.
3.OA.4	Determine the unknown whole number in a multiplication and division equation relating three whole numbers.
3.OA.5	Apply properties of operations as strategies to multiply and divide.
3.OA.7	Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division.

Domain: Numbers and Operations in Base Ten 3.NBT

Standard: Use place value understanding and properties of operations to perform multi-digit arithmetic

Cluster# :	Cluster:
3.NBT.3	Multiply one digit whole numbers by multiples of 10 in the range 10-90 using strategies based on place value and properties of operations.

Unit Essential Questions:	Unit Enduring Understandings:
● **How does skip counting and number patterns relate to multiplication?** ● **How can arrays, grouping numbers and picture models help to understand multiplication problems?** ● **How can a multiplication fact table help you to learn and memorize multiplication facts to 10?** ● **What are some strategies you can use to help solve multi-step multiplication word problems?**	● **Skip counting and number patterns help you to understand and memorize multiplication facts.** ● **Arrays, grouping numbers and picture models are a visual tool in understanding properties of multiplication/division.** ● **Fluency with your multiplication facts will help you to solve problems with accuracy and speed.**

jectives (unpacking Clusters where needed):

- *Students will be able to use arrays, number groupings and picture models to understand multiplication properties.*
- *Students will be able to solve and write simple multiplication stories using equal groups.*
- *Students will be able to use a multiplication fact table and fact families to learn and memorize multiplication facts to 10.*
- *Students will be able to write and solve simple number sentences and word problems involving multiplication.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Assessment #1: 3.OA.1 (Multiplication of whole numbers), 3.OA.3 (Use drawing and equations), 3.OA.4 (Unknown whole number in multiplication problem), 3.OA.5 (multiplicative identity and zero property)

Assessment #2: 3.OA.7 (Fluently multiply 2-5 fact families-use a 30 problem mixed factors multiplication test)

Assessment #3: 3.OA.7and 3.NBT.3 (Fluently multiply 6-10 fact families-use a 40 problem mixed factors multiplication test)

Assessment #4: 3.OA.1 thru 3.OA.5(Solve simple number sentences and word problems involving multiplication using the strategies in the clusters)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Introduce arrays and picture models to demonstrate multiplication properties	3 days

Lesson #2 Title: Properties of Multiplication: Property of One (Multiplicative Identity) and Property of Zero when multiplying numbers	1 days
Lesson #3 Title: Introduce and practice for fluency Multiplication Fact Families 2-5	7 days
Lesson #4 Title: Introduce and practice for fluency Multiplication Fact Families 6-10	7 days
Lesson #4 Title: Write and Draw multiplication number sentences to solve multiplication problems	3 days
Lesson #5 Title: Solve and write multiplication word problems	4 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.multiplication.com
- www.smartygames.com
- www.thinkcentral.com

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan # 4**	
Title: Division	
Grade Level: 3	**Length of Time:** 6 weeks = 30 days
Unit Summary: Division involves breaking apart arrays, picture models, groupings, and recall and usage of fact table and fact families up to 9. Students will solve word problems using the strategies listed above. Students will become fluent at dividing when using divisors up to and including 9.	
Learning Targets	
Domain: Operations and Algebraic Thinking 3.OA	
Standard: Represent and solve problems involving multiplication and division	
Cluster# (s):	**Cluster(s):**

3.OA.2	Interpret whole number quotients
3.OA.3	Use Multiplication and Division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g. by using drawings and equations with a symbol of the unknown number to represent the problem
3.OA.4	Determine the unknown whole number in a multiplication or division equations relating three whole numbers
Standard:	Understand properties of multiplication and the relationship between multiplication and division
Cluster# (s):	Cluster(s):
3.OA.5	Apply properties of operations as strategies to multiply and divide
3.OA.6	Understand division as an unknown-factor problem
Standard:	Multiply and divide within 100
Cluster#:	**Cluster#:**
3.OA.7	Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations.

Unit Essential Question:	**Unit Enduring Understandings:**
• **How can breaking apart arrays, grouping objects and picture models help to understand and solve division problems?** • **How can a multiplication fact table help you to learn and memorize division facts up to and including 9?** • **What are some strategies you can use to help solve multi-step division word problems?**	• **Arrays, grouping numbers and picture models are a visual tool in understanding properties of multiplication/division.** • **Fluency with your multiplication and division facts will help you to solve problems division problems with accuracy and speed.**

Evidence of Learning

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to use arrays, number groupings and picture models to understand division properties.*
- *Students will be able to solve and write simple division stories using equal groups.*
- *Students will be able to use a multiplication fact table and fact families to learn and memorize multiplication and division facts up to and including 9 as a factor/divisor.*
- *Students will be able to write and solve simple word problems and write number sentences that involve multiplication and division.*

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment #1: 3.OA.2 (Division), 3.OA.4 (fluently multiply/divide), 3.OA.7 (mult./div. strategies)
- Common Assessment #2: 3.OA.3 (division/multiplication word problems), 3.OA.5 (multiplication/division properties) 3.OA.6 (division unknown factors)

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Use arrays and picture models to demonstrate division properties	3 days
Lesson #2 Title: Write and Draw division number sentences using multiplication to help solve the problem	3days
Lesson #3 Title: Review multiplication fact families up to 9	2 days
Lesson #4 Title: Practice and memorize division facts up to 9	14 days

Lesson #5 Title: Solve and write division word problems	3 days
Curriculum Development Resources: www.superteacherworksheets.com www.multiplication.com	

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan # 5**	
Title: Fractions	
Grade Level: 3	**Length of Time:** 5 weeks = 25 days
Unit Summary: This unit will develop the use of fractions and fraction notation, and help children develop the understanding of equivalent fractions. Fractions are a part of a whole and are used in measurement. In this unit number line diagrams will be introduced and used to show and demonstrate the value of a fraction.	
Learning Targets	
Domain: Number and Operations-Fractions 3.NF	
Standard: Develop understanding of fractions as numbers	
Cluster# (s):	**Cluster(s):**

3.NF.1	Understand a fraction *1 / b* as the quantity formed by one part when a whole is portioned into b equal parts: understand a fraction *a / b* as the quantity formed by parts of size *1/b*.
3.NF.2	Understand a fraction as a number on the number line; represent fractions on a number line diagram a. Represent a fractions *1/ b* on a number line diagram by defining the interval from zero to one as the whole and portioning it into b equal parts. Recognize that each part has size *1/b* and that the end point of the part based at zero locates the number *1/ b* on the number line. b. Represent a fraction *a/b* on a number line diagram by marking off lengths *1/b* from zero recognize that the resulting interval has size *a/b* and that its endpoint locates the number *a/b* on the number line.
3.NF.3	Explain equivalents of fractions in special cases, and compare fractions by reasoning about their size. a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on the number line. b. Recognize and generate simple equivalent fractions. Explain why the fractions are equivalent. c. Express whole numbers fractions, and recognize fractions that are equivalent to whole numbers. d. Compare two fractions with the same numerators or the same denominators by reasoning about their size. Recognize that comparisons are valid on when the two fractions refer to the same whole. Record the results of the comparisons with the symbols < > = and justify the conclusions.

Domain: Geometry 3.G

Unit Essential Question:	**Unit Enduring Understanding:**
• **What are equal parts of a whole?** • **Why do you need to know how to make equal shares?** • **What do the top and bottom numbers of a fraction tell you?** • **How can you tell if a fraction is equal to another fraction?** • **What strategies can you use to compare two fractions using < > = symbols?**	• **Recognize that fractions are a part of a whole.** • **Equal parts of a whole are used when writing/drawing a fraction.** • **Using multiplication and division fractions can be equivalent quantities of the same whole group.** • **You can use a number line diagram to locate and compare fractions.**

Evidence of Learning

Unit Objectives (unpacking Clusters where needed):

- *Students will explore and identify equal parts of a whole*
- *Students will divide models to make equal shares*
- *Students will use a fraction to name one part of a whole that is divided into equal parts*
- *Students will model read and write fractional parts of a group*
- *Students will find fractional parts of a group*
- *Student will use a number line diagram to locate and compare fractions*

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment #1: 3.NF.1 (fraction is part of a whole, numerator/denominator)
- Common Assessment #2: 3.NF.2 (represent fractions/number line diagram)
- Common Assessment #3: 3.NF.3 (explain and compare equivalent fractions)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Equal parts of a whole/Equal Shares	2 days
Lesson #2 Title: Unit Fractions of a whole/Fractions of a whole	3 days
Lesson #3 Title: Fractions greater than 1	2 days
Lesson # 4 Title: Find a part of a group	2 days
Lesson #5 Title: Compare fractions using benchmarks	3 days
Lesson #6 Title: Compare fractions with the same and different numerators	5 days
Lesson #7 Title: Order Fractions using a number line	4 days
Lesson #8 Title: Model equivalent fractions and recognize equivalent fractions	4 days
Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):* www.smartygames.com www.thinkcentral.com www.mathsisfun.com/shape	

Egg Harbor City School District Mathematics Curriculum Unit Plan # 6	
Title: Measurement in Time, Length, Volume, and Mass	
Grade Level: 3	**Length of Time:** 5 weeks = 25 days
Unit Summary: In this unit students will measure and estimate liquid volumes and masses of objects using standard units of measurement (kilograms, liters, grams). They will measure lengths using a ruler and estimate the measurement of various objects and distances. This unit will develop telling time to the minute using a digital and analog clock.	
Learning Targets	
Domain: Measurement and Data 3.MD	
Standard(s): Represent and interpret data	
Solve problems using measurement and estimation of intervals of time, liquid volumes, and masses of objects.	
Cluster# (s):	**Cluster(s):**

<table>
<tr><td>3.MD.1</td><td colspan="2">Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes.</td></tr>
<tr><td>3.MD.2</td><td colspan="2">Measure and estimate liquid volumes and masses of objects using standard units of grams, kilograms and liters. Add, subtract, multiply, or divide to solve one step word problems involving masses or volumes that are given in the same units.</td></tr>
<tr><td colspan="3">Standard(s): Solve problems using measurement and estimation of intervals of time, liquid volumes, and masses of objects.</td></tr>
<tr><td>Cluster# (s):</td><td colspan="2">Cluster(s):</td></tr>
<tr><td>3.MD.4</td><td colspan="2">Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by marking a line plot with a horizontal scale is marked off in appropriate units-whole numbers halves and quart.</td></tr>
<tr><td colspan="2">Unit Essential Question:
How do you read a ruler?
How can an analog clock help you to determine the time, estimate time and find elapsed time?
What are the different units of measurement you can use to classify the capacity, weight and mass of an object?
What tools can you use to measure the capacity, weight and mass of an object?</td><td>Unit Enduring Understanding:
Measuring with a ruler is an important life skill
A strong understanding of fractions is helpful when a using a ruler.
Students will understand that analog and digital clocks help them to determine what time it is and how much time has passed and how to estimate time.
Students will understand that there are different units of measurement for the volume and mass of objects.
Students will understand that objects have different capacity, weight and mass.</td></tr>
<tr><td colspan="3" align="center">Evidence of Learning</td></tr>
<tr><td colspan="3">Unit Objectives (unpacking Clusters where needed):
Read, write, and tell time on analog and digital clocks to the nearest hour, half hour and quarter hour. Students will divide models to make equal shares
Read write and tell time on analog and digit clocks to the nearest 5 minute and nearest minute.
Decide when to use A.M. and P.M. with time.
Use a number line or an analog clock to find elapsed time.
Measure length to the nearest half inch, quarter inch.
Estimate and measure capacity in customary units.
Change measure of capacity in customary units from larger to smaller units or from smaller units to larger mixed units.
Estimate and measure weight in ounces and pounds.
Change measures of weight in customary units from larger to smaller units or from smaller units to larger mixed units.</td></tr>
<tr><td colspan="3">Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.
Summative Assessments:
Common Assessment #1: 3.MD.1 (Time to the hour, minute and find elapsed time)
Common Assessment #2: 3.MD.2 (Liquid capacity and volume in customary/metric units)
Common Assessment #3: 3.MD.4 (Measurement with ruler)</td></tr>
<tr><td colspan="3" align="center">Lesson Plans</td></tr>
<tr><td colspan="2" align="center">Lessons</td><td align="center">Timeframe</td></tr>
</table>

Lesson #1 Title: Review the parts of an analog clock and tell time to the nearest hour and half hour.	2 days
Lesson #2 Title: Tell time to the nearest quarter hour, nearest five minutes and nearest minute.	3 days
Lesson #3 Title: Elapsed time using a number line and an analog clock.	2 days
Lesson #4 Title: Measure a line to the nearest half inch and quarter inch.	3 days
Lesson #5 Title: Estimate and measure capacity in customary units.	2 days
Lesson #6 Title: Change measure of capacity from larger units to smaller units; smaller units to larger mixed units.	2 days
Lesson #7 Title: Estimate and measure weight in ounces and pounds.	2 days
Lesson #8 Title: Change measures of weight in customary units from larger units to smaller units; smaller units to larger mixed units.	5 days
Lesson #9 Title: Measure capacity and mass using metric units.	4 days
Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*	

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan # 7**	
Title: Perimeter, Area, and Shapes	
Grade Level: 3	**Length of Time:** 4 weeks = 20 days
Unit Summary: Shapes and their attributes are important to learn. In this unit students will work with different shapes finding their area and perimeter. They will find common attributes and be able to name, draw and compare the different 2-D and 3-D figures. Students will use multiplication and division properties to find area and perimeter. In this unit students will categorize, identify and compare shapes by their size, shape and measurements.	
Learning Targets	
Domain: Geometry 3.G	
Standard: Reason with shapes and their attributes.	
Cluster# (s):	**Cluster (s):**

3.G.1	Understand that shapes in different categories (e.g. rhombuses, rectangles (and others) may share attributes and that the shared attributes can define a larger category. Recognize rhombuses and rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.
3.G.2	Partition shapes into parts with equal areas. Express the area of each parts as a unit fraction of the whole.

Domain: Measurement and Data 3.MD

Standard: Geometric measurement understand concepts of area and relate area to multiplication and to addition.

Cluster# (s):	Cluster(s):
3.MD.5	Recognize area as an attribute of plane figures and understand concepts of area and measurements a. A square with side length one unit, called a unit square is set to have one square unit of area, and can be used to measure area. A plane figure which can be covered without gaps and overlaps by ***n*** unit squares is said to have an area of ***n*** square units.
3.MD.6	Measure areas by counting unit squares (square centimeters, square meters, square inches, square feet and improvised units).
3.MD.7	Relate area to the operations of multiplication and division. a. Find the area of a rectangle with whole number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. b. Multiply side lengths to find areas of rectangle with whole number side lengths in the context of solving real world and mathematical problems, and represent whole number products as rectangular areas in mathematical reasoning. c. Use tiling to show in a concrete case that he area of a rectangle with whole number side lengths *a* and *b + c* is the sum of *a x b* and *b x c*. Use area models to represent the distributive property in mathematical reasoning. d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non overlapping rectangles and adding the areas of the non overlapping parts, applying this technique to solve real world problems.
3.MD.8	Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding and unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

Unit Essential Questions:	Unit Enduring Understandings:
● **Why is it important to be able to identify and describe different shapes?** ● **What are the steps in finding the perimeter of a polygon?** ● **What are the steps in finding the area of a polygon?** ● **How do you find the area of a polygon when you are given the length of the sides?** ● **How do you find the length of a side when you are given the area or perimeter?**	● **Polygons are everywhere and we need to be able to recognize them.** ● **Knowing how to find the perimeter and area of a polygon helps solve real world problems.** ● **Measuring with a ruler is a skill you need when working with polygons.**

Unit Objectives (unpacking Clusters where needed):

- *Identify and describe basic two dimensional shapes.*
- *Identify and name polygons by the number of sides they have.*
- *Describe and classify and compare quadrilaterals based on sides and angles.*
- *Combine and separate plane shapes to make new shapes.*
- *Explore perimeter by counting units on grid paper.*
- *Estimate and measure perimeter using inch/centimeter rulers.*
- *Estimate or find the area of plane shapes.*

- *Compare rectangles based on perimeter and area.*
- *Find the unknown length of a side when you know its perimeter and area.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment #1: 3.G.1 (recognizing shapes/polygons); 3.G.2 (dividing polygons equally-naming part)
- Common Assessment #2: 3.MD.6 (measuring area of a shape), 3.MD.5 (recognize area), 3.MD.7 (use multiplication and division to find area) and 3.MD.8 (finding perimeter)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Identify and describe basic 2 dimensional shapes	2 days
Lesson #2 Title Identify and name polygons by the number of side they have	2 days
Lesson #3Title: Identify 3-D shapes by name and their amount of edges, faces and vertices.	3 days
Lesson #4 Title: Describe, classify and compare quadrilaterals based on sides and angles	3 days
Lesson #5Title: Combine and separate plane shapes to make new shapes	3 days
Lesson #6 Title: Explore perimeter by counting units on grid paper	2 days
Lesson #7Title: Estimate and measure perimeter using inch and centimeter rulers.	2 days
Lesson #8Title: Estimate and find the area of plane shapes	2 days
Lesson #9Title: Compare rectangles based on perimeter and area.	2 days
Lesson #10 Title: Find the unknown length of a side when you know its perimeter and area.	2 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

www.smartygames.com
www.thinkcentral.com
www.mathsisfun.com/shape

Egg Harbor City School District Mathematics Curriculum Unit Plan # 1	
Title: Number Sense, Addition and Subtraction	
Grade Level: 4	**Length of Time:** 4 weeks
Unit Summary: This unit will give students an intuitive feel for numbers. It includes the important concept of place value and how it relates to comparison and rounding of numbers. This unit will also allow students to select and apply various computational methods, such as mental math, paper and pencil techniques, and the use of calculators in the areas of addition and subtraction.	
Learning Targets	
Domain: 4.OA	
Standard: Use the four operations with whole numbers to solve problems.	
Cluster#:	**Cluster:**
4.OA.3	Solve multistep work problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

Domain: 4.NBT	
Standard: Generalize place value understandings for multi-digit whole numbers.	
Cluster# (s):	**Cluster(s):**
4.NBT.1	Recognize that a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right.
4.NBT.2	Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based in meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
4.NBT.3	Use place value understanding to round multi-digit whole numbers to any place.
4.NBT.4	Fluently add and subtract multi-digit whole numbers using standard algorithm.

Unit Essential Questions:	**Unit Enduring Understandings:**
● **How do we compare and contrast numbers?** ● **What makes a computational strategy both effective and efficient?** ● **How do operations affect numbers?**	● **A quantity can be represented numerically in various ways.** ● **Computational fluency includes understanding not only the meaning, but also the appropriate use of numerical operations.** ● **Understand and use the inverse relationships between addition and subtraction.**

Unit Objectives (unpacking Clusters where needed):

- *Students will read and write multi-digit numbers in numerical, word, and expanded forms.*
- *Students will round multi-digit whole numbers.*
- *Students will fluently add and subtract multi-digit whole numbers using the standard algorithms.*
- *Students will solve multi-step word problems involving addition and subtraction of whole numbers.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment # 1: 4.NBT.1 (recognize that a place value is 10xs the number to the right)
- Common Assessment #2: 4.NBT.2 (numbers, number, names, and expanded form; comparing), 4.NBT.3 (rounding)
- Common Assessment # 3: 4.NBT.4 (fluently +/- multi-digit numbers)
- Common Assessment # 4: 4.OA.3 (multistep word problems with all four operations)

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Read and represent multi-digit numbers	1 week
Lesson #2 Title: Compare numbers	1 week
Lesson #3 Title: Round Numbers	1 week
Lesson #4 Title: Multi-digit addition with and without regrouping	1 week
Lesson #5: Multi-digit subtraction with and without regrouping	1 week
Lesson #6: Subtraction across zeros	1 week
Lesson #7: Inverse operations of addition and subtraction	1 week
*All including multi-step word problems	(inclusive)

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

Egg Harbor City School District Mathematics Curriculum Unit Plan #2		
Title: Multiplication		
Grade Level: 4	**Length of Time:** 5 weeks	
Unit Summary: This unit will allow students to select and apply various computational methods, such as mental math, paper and pencil techniques, and the use of calculators in the area of multiplication.		
Learning Targets		
Domain: 4.OA		
Standard: Use the four operations with whole numbers to solve problems.		
Cluster# (s):	**Cluster(s):**	
4.OA.1	Interpret a multiplication equation as a comparison. Represent verbal statements of multiplicative comparisons as multiplication equations.	
4.OA.2	Multiply or divide to solve work problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison for additive comparison.	
4.OA.3	Solve multi step work problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent	

	these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
Domain: 4.NBT	
Standard: Use place value understanding and properties of operations to perform multi-digit arithmetic.	
Cluster#:	**Cluster:**
4.NBT.5	Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Unit Essential Questions:	**Unit Enduring Understandings:**
• **Is my result of my computation reasonable?** • **What makes a computational strategy reasonable?** • **How do operations affect numbers?** • **How is algorithmic thinking being used to solve problems?**	• **Continue to develop proficiency with basic multiplication facts.** • **Computational fluency includes understanding not only the meaning, but also the appropriate use of numerical operations.** • **Context is critical when using estimation.**

Unit Objectives (unpacking Clusters where needed):

- *Students will fluently multiply whole numbers using the standard algorithms.*
- *Students will solve multi-step word problems involving multiplication and division of whole numbers.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment # 1: 4.OA.1 (multiplication as a comparison), 4.OA.2 (word problems, multiplicative vs. additive comparisons in multiplication), 4.OA.3 (multistep word problems with all 4 operations)
- Common Assessment # 2: 4.NBT.5 (multiply 4 digit by 1, and 2 digit by 2)

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Multiplication comparisons.	2 days
Lesson #2 Title: Multiply tens, hundreds, thousands.	1 week
Lesson #3 Title: Use rounding to estimate products.	1 week
Lesson #4 Title: Multiply using expanded form and partial products.	3 days
Lesson #5 Title: Multiply 2-digit numbers with regrouping.	3 days
Lesson #6 Title: Multiply 3-digit and 4digit numbers with regrouping.	1 week
Lesson #7 Title: Multiply by tens.	2 days
*All including multi-step word problems	(inclusive)

Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):*

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan #3**	
Title: Division	
Grade Level: 4	**Length of Time:** 4 weeks
Unit Summary: This unit will allow students to select and apply various computational methods, such as mental math, paper and pencil techniques, and the use of calculators in the area of division.	
Learning Targets	
Domain: 4.NBT	
Standard: Use place value understanding and standard properties of operations to perform multi-digit arithmetic.	
Cluster# (s):	**Cluster(s):**
4.NBT.6	Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies base on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
Domain: 4.OA	
Standard: Use the four operations with whole numbers to solve problems.	
Cluster# (s):	**Cluster(s):**
4.OA.3	Solve multi step work problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent

	these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

Unit Essential Questions:	**Unit Enduring Understandings:**
● **Is my result of my computation reasonable?** ● **What makes a computational strategy reasonable?** ● **How do operations affect numbers?** ● **How is algorithmic thinking being used to solve problems?**	● **Continue to develop proficiency with basic division facts.** ● **Computational fluency includes understanding not only the meaning, but also the appropriate use of numerical operations.** ● **Context is critical when using estimation.**

Unit Objectives (unpacking Clusters where needed):

- *Students will fluently multiply and divide whole numbers using the standard algorithms.*
- *Students will solve multi-step word problems involving division of whole numbers.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment # 1: 4.OA.3 (multistep word problems with all four operations)
- Common Assessment #2: 4.NBT.6 (up to 4 digit quotient by 1 digit divisor)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Division with remainders.	2 days
Lesson #2 Title: Divide multiples of 10, 100, and 1,000	2 days
Lesson #3 Title: Use rounding to estimate quotients	2 days
Lesson #4: Divide using partial quotients.	2 days
Lesson #5 Title: Find whole number quotients and remainders with up to four-digit dividends and one-digit divisors.	2 weeks
Lesson #6 Title: Quotients with zeros.	2 days
*All including multi-step word problems	(inclusive)

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

<table>
<tr><th colspan="3">Egg Harbor City School District
Mathematics Curriculum
Unit Plan #4</th></tr>
<tr><td colspan="3">Title: Factors, Multiples, and Patterns</td></tr>
<tr><td colspan="2">Grade Level: 4</td><td>Length of Time: 2 weeks</td></tr>
<tr><td colspan="3">Unit Summary: This unit will allow students to gain familiarity and understanding of factors and multiples, as well as patterns, and how these concepts are related to multiplication and division.</td></tr>
<tr><th colspan="3">Learning Targets</th></tr>
<tr><td colspan="3">Domain: 4.OA</td></tr>
<tr><td colspan="3">Standard: Use the four operations with whole numbers to solve problems.</td></tr>
<tr><td>Cluster# (s):</td><td colspan="2">Cluster(s):</td></tr>
<tr><td>4.OA.4</td><td colspan="2">Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one digit number. Determine whether a given whole in the range 1-100 is prime or composite.</td></tr>
<tr><td>4.0A.5</td><td colspan="2">Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.</td></tr>
<tr><td colspan="2">Unit Essential Questions:
● How do we compare and contrast numbers?
● How do you recognize and extend a pattern of shapes or numbers?
● How can you find factors and multiples?</td><td>Unit Enduring Understandings:
● A knowledge of factors, multiples, and patterns will develop a better understanding for proficiency in multiplication and division.</td></tr>
</table>

Unit Objectives (unpacking Clusters where needed): ● *Students will recognize and extend a number or shape pattern.*
Evidence of Learning
Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.
Summative Assessments: ● Common Assessment # 1: 4.OA.4 (factor pairs of whole numbers within 100) ● Common Assessment # 2: 4.OA.5 (number/shape patterns)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Factors	2 days
Lesson #2 Title: Multiples	2 days
Lesson #3 Title: Prime and composite numbers	4 days
Lesson #4 Title: Patterns	2 days

Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):*

Egg Harbor City School District
Mathematics Curriculum
Unit Plan #5

Title: Comparing Fractions, Adding and Subtracting Fractions	
Grade Level: 4	**Length of Time:** 5 weeks
Unit Summary: This unit will allow students to understand comparing fractions, as well as adding and subtracting fractions.	
Learning Targets	
Domain: 4.NF	
Standard: Extend understanding of fraction equivalence and ordering.	
Cluster# (s):	**Cluster(s):**
4.NF.1	Explain why a fraction a/b is equivalent to a fraction (n x a)/(n x b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
4.NF.2	Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fractions such as ½. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, <, and justify the conclusions, e.g., by using a visual fraction model.
Standard: Build fractions from unit fractions by applying and extending previous understanding of operations on whole numbers.	
4.NF.3	Understand a fraction a/b with a>1 as a sum of fractions 1/b.

	a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

Unit Essential Questions:	**Unit Enduring Understandings:**
● **How can we visually represent and verify fractional computation?** ● **How can we compare and contrast numbers?** ● **How do mathematical ideas interconnect and build on one another?**	● **One representation may sometimes be more helpful than another: and used together, multiple representations give a fuller understanding of a problem.** ● **A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways.**

Unit Objectives (unpacking Clusters where needed):

- *Students will identify, read, write, and model fractions and equivalent fractions.*
- *Students will compare and order fractions.*
- *Students will use models to represent mixed numbers and improper fractions.*
- *Students will correctly add and subtract fractions with like denominators.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment # 1: 4.NF.1 (equivalent fractions), 4.NF.2 (comparing fractions)
- Common Assessment # 2: 4.NF.3 (+/- fractions)

Lesson Plans

Lessons	Timeframe
Lesson #1Title:Explore equivalent fractions	1 week
Lesson #2 Title: Compare and order fractions	1 week
Lesson #3: Common denominators	1 week
Lesson #4: Adding and subtracting fractions	1 week
Lesson #5: Adding and subtracting mixed numbers	1 week

Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):*

<table>
<tr><th colspan="2">Egg Harbor City School District
Mathematics Curriculum
Unit Plan #6</th></tr>
<tr><td colspan="2">Title: Multiplying Fractions, Fraction/ Decimal Concepts</td></tr>
<tr><td>Grade Level: 4</td><td>Length of Time: 4 weeks</td></tr>
<tr><td colspan="2">Unit Summary: This unit will allow students to understand the relationship between fractions and decimals, as well as multiply fractions.</td></tr>
<tr><th colspan="2">Learning Targets</th></tr>
<tr><td colspan="2">Domain: 4.NF</td></tr>
<tr><td colspan="2">Standard: Understand decimal notation for fractions, and compare decimal fractions.</td></tr>
<tr><td>Cluster# (s):</td><td>Cluster(s):</td></tr>
<tr><td>4.NF.4</td><td>Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.
a. Understand a fraction a/b as a multiple of 1/b.
b. Understand the multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number.
c. Solve work problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem.</td></tr>
<tr><td>4.NF.5</td><td>Express a fraction with denominator of 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.</td></tr>
<tr><td>4.NF.6</td><td>Use decimal notation for fractions with denominators 10 or 100.</td></tr>
</table>

4.NF.7	Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of the comparisons with the symbols >, =, <, and justify the conclusions, e.g., by using a visual model.

Unit Essential Questions: ● **How can we compare and contrast numbers?** ● **How do mathematical ideas interconnect and build on one another?**	**Unit Enduring Understandings:** ● **One representation may sometimes be more helpful than another: and used together, multiple representations give a fuller understanding of a problem.** ● **A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways.**

Unit Objectives (unpacking Clusters where needed):

- *Students will compare and order both fractions and decimals.*
- *Students will identify the direct relationship between fractions and decimals.*
- *Students will correctly multiply fractions by whole numbers.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment # 1: 4.NF.4 (multiply a fraction by a whole number)
- Common Assessment # 2: 4.NF.5 (express and + fractions with denominators of 10 and 100), 4.NF.6 (decimal notation for fractions with denominators of 10 or 100), 4.NF.7 (compare decimals within hundredths)

Lesson Plans

Lessons	Timeframe
Lesson #1: Multiples of unit fractions and fractions	2 days
Lesson #2: Multiply fractions by whole numbers	3 days
Lesson #3: Multiply mixed numbers by whole numbers	1 week
Lesson #4: Find fraction and decimal equivalence	2 days
Lesson #5: Compare and order decimals with an understanding of place value, through the hundredths.	8 days

Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):*

Egg Harbor City School District Mathematics Curriculum Unit Plan #7	
Title: Geometry Figures, Lines, and Angles	
Grade Level: 4	**Length of Time:** 4 weeks
Unit Summary: This unit will allow students to identify, describe and measure standard geometric shapes, describing the properties of geometric objects and making conjectures concerning them. Also included is the concept of symmetry.	
Learning Targets	
Domain: 4.G	
Standard: Draw and identify lines and angles, and classify shapes by properties of their lines and angles.	
Cluster# (s):	**Cluster(s):**
4.G.1	Draw points, lines, line segments, rays, angles (right, acute, obtuse) and perpendicular and parallel lines. Identify these in two-dimensional figures.
4.G.2	Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.
4.G.3	Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.
Domain: 4.MD	
Standard: Geometric measurement: understand concepts of angle and measure angles.	
Cluster# (s):	**Cluster(s):**
4.MD.5	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:

	a. An angle is measured with reference to a circle with its center at the common endpoint of rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a “one-degree angle,” and can be used to measure angles. b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.
4.MD.6	Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
4.MD.7	Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

Unit Essential Questions:	**Unit Enduring Understandings:**
• **How can two-dimensional relationships be described by careful use of geometric language?** • **How can measurements be used to solve geometric problems?** • **What situations can be analyzed using symmetries?**	• **Identify, describe and classify two-dimensional figures, angles and objects.**

Unit Objectives (unpacking Clusters where needed):

- *Students will identify and describe parallel, perpendicular, and intersecting lines.*
- *Students will recognize and draw lines of symmetry.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment # 1: 4.G.1 (points, lines, angles), 4.G.2 (classify 2D shapes), 4.G.3 (symmetry)
- Common Assessment # 2: 4.MD.5 (recognize angles), 4.MD.6 (measure angles), 4.MD.7 (+ angle measures)

Lesson Plans

Lessons	**Timeframe**
Lesson #1 Title: Measure angles using a protractor.	1 week
Lesson #2 Title: Identify, describe and draw lines, line segments and rays.	1 week
Lesson #3 Title: Types of lines	1 week
Lesson #4Title: Lines of symmetry	1 week

Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):*

Egg Harbor City School District Mathematics Curriculum Unit Plan #8	
Title: Geometric Measurement	
Grade Level: 4	**Length of Time:** 5 weeks
Unit Summary: This unit will allow students to apply fraction concepts to create a line plot. They will also use various types of measurement to both perform conversion and solve related problems.	
Learning Targets	
Domain: 4.MD	
Standard(s): Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.	
Cluster#:	**Cluster:**
4.MD.1	Know relative sizes of measurement units within one system of units including km, m, cm; kg, oz.; l, ml, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit.
4.MD.2	Use the four operations to solve problems involving distances, intervals of time, liquid volumes, masses of objects, and money. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
4.MD.3	Apply the area and perimeter formulas for rectangles in real world and mathematical problems.
Standard(s): Represent and interpret data.	
4.MD.4	Make a line plot to display a data set of measurements in fractions of a unit (1/2, ¼, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots.
Unit Essential Questions:	**Unit Enduring Understandings:**

● **How can measurements be used to solve geometric problems?**	● **Measurement helps describe our world using numbers.** ● **A practical knowledge of measurement tools and techniques are critical for students' understanding of the world around them.** ● **Use area and perimeter formulas for rectangles to solve real world problems.**

Unit Objectives (unpacking Clusters where needed):
- *Students will convert measurements within a system.*
- *Students will use area and perimeter formulas for rectangles.*
- *Students will measure to collect data to make a fraction line plot.*
- *Students will solve problems involving various measurement situations.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:
- Common Assessment # 1: 4.MD.1 (relative measurement), 4.MD.2 (word problem with 4 operations)
- Common Assessment # 2: 4.MD.3 (area/perimeter formulas)
- Common Assessment # 3: 4.MD.4 (use line plot to +/- fractions)

Lesson Plans

Lessons	Timeframe
Lesson #4 Title: Use area and perimeter formulas for rectangles.	1 week
Lesson #2 Title: Make a line plot to display a data set of measurements in fractions of a unit.	1 week
Lesson #3 Title: Conversion of metric and standard measurements within one system.	1 week
Lesson #4 Title: Problem solving involving measurement concepts.	1 week
Lesson #5Title: Concepts of time	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

Egg Harbor City School District Mathematics Curriculum Unit Plan #1		
Title: Whole Number Operations		
Grade Level: 5		**Length of Time:** 4 weeks
Unit Summary: This unit will allow all students to apply and extend previous understandings of multiplication and division as it applies to whole numbers.		
Learning Targets		
Domain: Number and Operations in Base Ten		
Standards: Understand place value system Base ten # system		
Cluster# (s):	**Cluster(s):**	
5.NBT.1	Recognize that in a multi digit number, a digit in one place represents10 times as much as it represents to the place to its right and 1/10 of what it represents in the place to its left	
5.NBT.2	Explain patterns in the number of zeros of the products when multiplying a number by powers of ten, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of ten. Use whole number exponents to denote powers of ten.	
Standard: Perform operations with multi-digit whole numbers and decimals to hundredths ***(FOCUS-whole numbers. Decimals will be a focus and assessed in Unit #3)***		
5.NBT.5	Fluently multiply multi-digit whole numbers using the standard algorithm	
5.NBT.6	Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	
Unit Essential Questions:		**Unit Enduring Understandings:**

• **How do operations affect numbers?** • **What makes estimating when multiplying and dividing both effective & efficient?**	• **The magnitude of numbers affects the outcome of operations on them.** • **There are multiple algorithms for finding a mathematical solution.**

Unit Objectives (unpacking Clusters where needed):

- *Students will interpret patterns when multiplying and dividing by powers of ten.*
- *Students will represent powers of 10 as exponents.*
- ***Students will use estimation when multiplying large numbers.***
- ***Students will determine prime factorization and common factors/multiples of whole numbers.***
- *Student will multiply large numbers by one and two digit factors.*
- ***Students will use estimation when dividing.***
- *Students will divide whole numbers up to two digit divisors and up to four digit divisors.*

Evidence of Learning

n Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment #1: 5.NBT.1 (place value), 5.NBT.2 (exponents to the power of 10)
- Common Assessment #2: 5. NBT.5 (multiplication of whole numbers by one and two digit factors); 5. NBT.6 (division of whole number dividends up to 4 digits by 2 digit divisors)

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Patterns in Multiplication and Division by powers of ten	2 days
Lesson #2 Title: Place value of whole numbers and expanded notation to the power of 10	2 days
Lesson #3 Title: Compare and order large numbers using place value	2 days
Lesson #4 Title: Estimate and round large numbers	2 days
Lesson #5 Title: Multiplication of whole numbers by one and two digit factors	6 days
Lesson #6 Title: Division of whole numbers (up to 4 digit dividend and 2 digit divisor)	6 days

Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):*

www.thinkcentral.com
www.ixl.com
www.multiplication.com

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan #2**	
Title: Algebra and Expressions	
Grade Level: 5	**Length of Time:** 4 weeks
Unit Summary: This unit will allow students to write and interpret numerical expressions in addition to analyzing patterns and relationships.	
Learning Targets	
Domain: Operations and Algebraic Thinking	
Standard: Write and interpret numerical expressions	
Cluster# (s):	**Cluster(s):**
5.OA.1	Use parenthesis, brackets, or braces in numerical expressions, and evaluate expression with these symbols.
5.OA.2	Write simple expressions with numbers, and interpret numerical expressions without evaluating them.
Unit Essential Questions: ● **How can a situation be best represented as an algebraic expression?** ● **How can patterns be represented on the coordinate grid?**	**Unit Enduring Understandings:** ● **Algebra provides language through which we communicate the patterns in mathematics.** ● **The use of algebra requires the ability to represent data in graphs, expression and rules.**
Unit Objectives (unpacking Clusters where needed): ● *Students will be able to use parentheses, brackets, or braces in numerical expressions and evaluate.* ● *Students will write simple expressions & interpret numerical expressions.* ● *Students will use two numerical patterns using two given rules, "in & out".*	
Evidence of Learning	
Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.	
Summative Assessments: ● Assessment # 1: 5.OA.1 (Use parenthesis, brackets, or braces in numerical expressions, and evaluate expression with these symbols); 5.OA.2 (Write simple expressions with numbers, and interpret numerical expressions without evaluating them.)	
Lesson Plans	

Lessons	Timeframe
Lesson #1Title: Expressions with Parenthesis, Brackets and Braces	5 days
Lesson #2 Title: Write Algebraic expressions	5 days
Lesson #3 Title: Numerical patterns (input & output-linear equations)	5 days
Lesson #4 Title: Patterns and relationships with graphing on the coordinate plane	5 days
Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):* **www.thinkcentral.com**; **www.ixl.com**	

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan # 3**		
Title: Decimal Computation		
Grade Level: 5	**Length of Time:** 4 weeks	
Unit Summary: This unit will allow all students to apply and extend previous understandings of addition, subtraction and multiplication as it applies to decimals.		
Learning Targets		
Domain: Number and Operations in Base Ten		
Standard: Perform operations with multi-digit whole numbers and decimals to hundredths.		
5.NBT.3	Read, write and compare decimals to thousandths a. read and write decimals to thousandths using base ten numerals, number names, and expanded form. b. compare two decimals to thousandths based on meanings of the digits in each place value, using greater than, equal and less than symbols to record the results of comparisons.	
5.NBT.4	Use place value understanding to round decimals to any place	
5.NBT.7 (add, subtract, multiply only)	Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.	
Unit Essential Questions: • **How do operations affect numbers?** • **What strategies can you use to compare and order decimals?** • **How can concrete models or drawings help determine the value of a decimal?**	**Unit Enduring Understandings:** • **The magnitude of numbers affects the outcome of operations on them.** • **Decimals are part of a whole and are related to fractions.** • **Using concrete models and drawings will help with your understanding of decimals and fractions.**	
Unit Objectives (unpacking Clusters where needed): • *Students will add, subtract, and multiply decimals to hundredths using concrete models or drawings and strategies based on place value, properties of operation and/or the relationship between addition and subtraction.* • *Students will fluently multiply multi-digit numbers using the standard algorithm.*		
Evidence of Learning		

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment #1: 5.NBT.3 and 5.NBT.4 (read, write and compare decimals, use place value to round decimals)
- Common Assessment #2: 5.NBT.7 (add/subtract, multiply/divide decimals to the hundredths place)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Read, write, and compare decimals to the thousandths	3 days
Lesson #2: Use place value understanding to round decimals to any place	3 days
Lesson #3 Title: Add and Subtract decimals to the hundredths	3 days
Lesson #4 Title: Review multiplication/division of multi-digit whole numbers	3 days
Lesson #5 Title: Multiply decimals to the hundredths	4 days
Lesson #6 Title: Divide decimals to the thousandths	4 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

www.thinkcentral.com
www.ixl.com

<table>
<tr><th colspan="2">Egg Harbor City School District
Mathematics Curriculum
Unit Plan #4</th></tr>
<tr><td colspan="2">Title: Fraction Operations Part 1 Addition and Subtraction</td></tr>
<tr><td>Grade Level: 5</td><td>Length of Time: 5 weeks</td></tr>
<tr><td colspan="2">Unit Summary: This unit will allow students to further their understanding of fractions. Using equivalence they will add and subtract fractions with unlike denominators.</td></tr>
<tr><th colspan="2">Learning Targets</th></tr>
<tr><td colspan="2">Domain: Number and Operations – Fractions</td></tr>
<tr><td colspan="2">Standard: Use equivalent fractions as a strategy to add and subtract fractions.</td></tr>
<tr><td>Cluster# (s):</td><td>Cluster(s):</td></tr>
<tr><td>5.NF.1</td><td>Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.</td></tr>
<tr><td>5.NF.2</td><td>Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.</td></tr>
<tr><td colspan="2">Standard: Apply and extend previous understandings of multiplication and division to multiply and divide fractions.</td></tr>
<tr><td>Cluster#:</td><td>Cluster:</td></tr>
<tr><td>5.NF.3</td><td>Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem.</td></tr>
<tr><td>Unit Essential Questions:
● How do operations affect numbers?
● How are physical models used to clarify relationships?
● How can benchmark fractions help you estimate and order fractions?</td><td>Unit Enduring Understandings:
● A fraction is really a division problem.
● An understanding of equivalent fractions is needed to add and subtract fractions.
● The magnitude of numbers affects the outcome of operations on them.</td></tr>
<tr><td colspan="2">Unit Objectives (unpacking Clusters where needed):
● Students will understand that a fraction is another representation of a division problem.
● Students will add and subtract fractions with unlike denominators, including mixed numbers.</td></tr>
<tr><th colspan="2">Evidence of Learning</th></tr>
<tr><td colspan="2">Common Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.</td></tr>
<tr><td colspan="2">Summative Assessments:</td></tr>
</table>

Common Assessment #1: 5.NF.1, 5.NF.2 and 5.NF.3 (add/subtract fractions and mixed numbers with and without unlike denominators, include real life word problems on assessment)

Lesson Plans

Lessons	**Timeframe**
Lesson #1 Title: Fractions as a form of division	4 days
Lesson #2 Title: Addition of fractions	4 days
Lesson #3 Title: Addition of Mixed Numbers	4 days
Lesson #4 Title: Subtraction of Fractions	4 days
Lesson #5 Title: Subtraction of Mixed Numbers	4 days

Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):*

www.thinkcentral.com
www.ixl.com

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan #5**		
Title: Fraction Operations Part 2 Multiplication and Division		
Grade Level: 5		**Length of Time:** 4 weeks
Unit Summary: This unit will allow students to continue to further their understandings of fractions. They will understand the concepts of multiplication and division of fractions in real world situations.		
Learning Targets		
Domain: Number and Operations – Fractions		
Standard: Apply and extend previous understandings of multiplication and division to multiply and divide fractions.		
Cluster# (s):	**Cluster(s):**	
5.NF.4	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.	
5.NF.5	Interpret multiplication as scaling (resizing), by: a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.	
5.NF.6	Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.	
5.NF.7	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. b. Interpret division of a whole number by a unit fraction, and compute such quotients. c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem	
Unit Essential Questions: ● **How do operations affect numbers?**		**Unit Enduring Understandings:**

● **How are physical models used to clarify relationships?**	● **The magnitude of numbers affects the outcome of operations on them.**

Unit Objectives (unpacking Clusters where needed):

- *Students will develop an understanding for multiplication of whole numbers by fractions as well as fractions by fractions.*
- *Students will develop an understanding of division of a fraction by a unit fraction and a fraction by a unit fraction by using a concrete model.*

Evidence of Learning

ive Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment #1: 5.NF.4 (multiplication of fractions by whole numbers/fraction by fraction) and NF.5 (interpret multiplication by the size of factors)
- Common Assessment #2: 5.NF.6 (word problems)
- Common Assessment #3: 5.NF.7 (division of whole numbers and fractions)

Lesson Plans

Lessons	Timeframe
Lesson #1: Multiplication of a whole number by a fraction & a fraction by a whole number	5 days
Lesson #2: Multiplication of a fraction by a fraction	5 days
Lesson #3: Multiplication of mixed numbers	5 days
Lesson #4: Area of fractional side length rectangles	5 days
Lesson #5: Division of unit fractions by whole numbers and whole numbers by unit fractions.	5 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

www.thinkcentral.com
www.ixl.com

Egg Harbor City School District Mathematics Curriculum Unit Plan #6	
Title: Graphs and Data	
Grade Level: 5	**Length of Time:** 4 weeks
Unit Summary: This unit will allow students to interpret, analyze, and organize data. Students will use data to create bar and line graphs. They will also "plot" data on a line plot graph.	
Learning Targets	
Domain: Measurement and Data	
Standard: Represent and interpret data	
Cluster#:	**Cluster:**
5.MD.2	Make a line plot to display a data set of measurements in fractions of a unit (1/2 , 1/4, and 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots.
Domain: Geometry	
Standard: Graph points on the coordinate plane to solve real-world and mathematical problems.	
Cluster# (s):	**Cluster (s):**
5.G.1	Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).
5.G.2	Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.
Domain: Operations and Algebraic Thinking	
Standard: Analyze patterns and relationships	
Cluster# (s):	**Cluster# (s):**
5.OA.3	Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the coordinate pairs on the coordinate plane.
Unit Essential Questions: ● **How can graphs help us organize our data?** ● **What are the parts of a bar/line graph?** ● **How can a line plot help to organize your data?** ● **How can spatial relationships be described using geometric language?**	**Unit Enduring Understandings:** ● **Data can be collected and shared using different types of graphs.** ● **Interpreting data is an important skill.** ● **Geometric properties can be used to construct geometric figures.** ● **Coordinate geometry can be used to represent and verify geometric/algebraic relationships.**

● **How can geometric/ algebraic relationships best be represented and verified?**	

Unit Objectives (unpacking Clusters where needed):

- ***Students will use line plots to show and organize their data***
- ***Students will read and make a bar graphs to show and organize their data***
- ***Students will read and make line graphs to show and organize their data***
- ***Students will analyze and interpret data from all types of graphs***
- ***Students will graph points on the coordinate plane understanding that the first coordinate is the x value and the second coordinate is the second value.***
- ***Students will use the coordinate grid to visualize algebraic relationships.***

Evidence of Learning

Common Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment # 1: 5.OA.3 (Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the coordinate pairs on the coordinate plane.)
- Common Assessment #2: 5.MD.2 (Represent and interpret data)
- Common Assessment #3: 5.G.1 and 5.G.2 (Understand coordinate grid, interpret and plot points in the first quadrant)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Collect, interpret and analyze data from all types of graphs	8 days
Lesson #2 Title: Find median, mode, range and mean from a set of data.	3 days
Lesson #3 Title: Make and analyze bar graphs	3 days
Lesson #4 Title: Make and analyze line graphs	3 days
Lesson #5 Title: Make and analyze line plots	3 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*
www.thinkcentral.com
www.ixl.com

<table>
<tr><th colspan="2">Egg Harbor City School District
Mathematics Curriculum
Unit Plan #7</th></tr>
<tr><td colspan="2">Title: Measurement and Data</td></tr>
<tr><td>Grade Level: 5</td><td>Length of Time: 5 weeks</td></tr>
<tr><td colspan="2">Unit Summary: This unit will develop an understanding of the conversion among systems of measurements. The volume of rectangular prisms will be determined by layering unit cubes, leading to the formula.</td></tr>
<tr><th colspan="2">Learning Targets</th></tr>
<tr><td colspan="2">Domain: Measurement and Data</td></tr>
<tr><td colspan="2">Standard: Convert like measurement units within a given measurement system.</td></tr>
<tr><td>Cluster#:</td><td>Cluster:</td></tr>
<tr><td>5.MD.1</td><td>Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.</td></tr>
<tr><td colspan="2">Standard: Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.</td></tr>
<tr><td>Cluster# (s):</td><td>Cluster(s):</td></tr>
<tr><td>5.MD.3</td><td>Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.

b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.</td></tr>
<tr><td>5.MD.4</td><td>Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.</td></tr>
<tr><td>5.MD.5</td><td>Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.

b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.

c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.</td></tr>
<tr><td>Unit Essential Questions:
• How can measurement be used to solve problems?
• How can the collection and display of data be used to solve problems?</td><td>Unit Enduring Understandings:
• Measurements can be represented in various ways.
• The volume can be determined by using unit cubes.</td></tr>
<tr><td colspan="2">Unit Objectives (unpacking Clusters where needed):
• Students will convert measurements within a given system.
• Students will create line plots involving fractional units.</td></tr>
</table>

- *Students will develop an understanding of volume of solids through solving word problems.*

Evidence of Learning

ive Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment # 1: 5.MD.1 (conversion of standard measurement units)
- Common Assessment #2: 5.MD. 3, 5.MD.4, 5.MD.5 (recognize volume of solid figures, measure volume counting unit cubes, relate volume to the operations of multiplication/division)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Measurement conversions	6 days
Lesson #2 Title: Find the volume of a solid using multiplication	5 days
Lesson #3 Title: Find the volume of a solid using unit cubes	4 days
Lesson #4 Title: Volume problem solving	5 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

www.thinkcentral.com
www.ixl.com

Egg Harbor City School District Mathematics Curriculum Unit Plan #8	
Title: Geometry	
Grade Level: 5	**Length of Time:** 4 weeks
Unit Summary: This unit will allow students to develop spatial sense and make the connection between geometry and algebra.	

Learning Targets

Domain: Geometry

Standard: Classify two-dimensional figures into categories based on their properties.

Cluster# (s):	**Cluster(s):**
5.G.3	Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.
5.G.4	Classify two-dimensional figures in a hierarchy based on properties.

Unit Essential Questions:	**Unit Enduring Understandings:**
● **How can spatial relationships be described using geometric language?** ● **How can attributes of a shape help classify that shape?**	● **Geometric properties can be used to construct geometric figures.**

Unit Objectives (unpacking Clusters where needed):

- *Students will identify, categorize and classify geometric figures (2D).*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment #1: 5.G.3 and 5.G.4 (understand and classify 2D and 3D figures based on properties and or attributes)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Attributes of 2D figures and 3D figures	5 days
Lesson #2 Title: Properties of 2D figures and 3D figures	5 days
Lesson #3 Title: Identify parts of a circle, find diameter and radius.	5 days
Lesson #4 Title: Measuring angles with a protractor	5 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

www.thinkcentral.com
www.ixl.com

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan #1**	
Title: Expressions and Number Properties	
Grade Level: 6	**Length of Time:** 3 weeks
Unit Summary: All students will be able to evaluate algebraic expressions, write expressions, use the properties of addition and multiplication, use the distributive property, and use formulas to solve problems.	
Learning Targets	
Domain: 6. EE Expressions and Equations 6.NS The Number System	
Standard: Apply and extend previous understandings of arithmetic to algebraic expressions. Apply and extend previous understandings of numbers to the system of rational numbers.	
Cluster# (s):	**Cluster(s):**
6.EE.1	Write and evaluate numerical expressions involving whole-number exponents.
6.EE.2	Write, read, and evaluate expressions in which letters stand for numbers. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
6.EE.3	Apply the properties of operations to generate equivalent expressions.
6.EE.4	Identify when two expressions are equivalent.
6.EE.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
6.NS.4	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor.
2004/2008 Standards	• ***Squares and Cubes*** • ***Order of Operations*** • ***Patterns*** • ***Distributive Property*** • ***Prime and Composite Numbers*** • ***Prime Factorization***
Unit Essential Questions: • **How can you write and evaluate an expression that represents a real-life problem?** • **Which words correspond to the four operations of addition, subtraction, multiplication, and division?** • **Does the order in which you perform an operation matter?**	**Unit Enduring Understandings:** • **Evaluate algebraic expressions** • **Write expressions** • **Properties of Addition and Multiplication** • **Distributive Property** • **Use formulas to solve problems**

• **How do you multiply two 2-digit numbers using mental math?** • **How can you use formulas to find the area of an object with an unusual shape?**	

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to evaluate algebraic expressions.*
- *Students will be able to write expressions.*
- *Students will be able to use the properties of addition and multiplication.*
- *Students will be able to use the distributive property.*
- *Students will be able to use formulas to solve problems.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment : 6.EE.1 (evaluate numerical expressions), 6.EE.2 (write, read, and evaluate expressions), 6.EE.3 (properties of operations), 6.EE.4 (equivalent expressions), 6.EE.6 (real-world), 6.NS.4 (distributive property)**,** 2004/2008 standards (squares and cubes, order of operations, patterns, distributive property, prime and composite, prime factorization)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Expressions	1 week
Lesson #2 Title: Properties	1 week
Lesson #3 Title: Formulas	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.njpmi.org under Math Games Heading

Mathematics Curriculum **Unit Plan #2**	
Title: Multiplying and Dividing Fractions	
Grade Level: 6	**Length of Time:** 5 weeks
Unit Summary: All students will multiply and divide fractions and mixed numbers. All students will write fractions as decimals and decimals as fractions.	
Learning Targets	
Domain: 6.NS The Number System	
Standard: Apply and extend previous understandings of multiplication and division to divide fractions by fractions. Compute fluently with multi-digit numbers and find common factors and multiples.	
Cluster# (s):	**Cluster(s):**
6.NS.1	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions.
6.NS.2	Fluently divide multi-digit numbers using the standard algorithm.
2004/2008 Standards	• ***Add and subtract fractions***

Unit Essential Questions:	**Unit Enduring Understandings:**
• **How can you use estimation to check that your answer is reasonable?** • **What does it mean when a whole number is multiplied by a fraction? Will the product be *greater than* or *less than* the whole number?** • **What does it mean to multiply fractions?** • **How do you multiply a mixed number by a fraction?** • **How do you divide by a fraction?** • **How can you use division by a mixed number as part of a story?** • **When you write a terminating decimal as a fraction, what type of denominator do you get?** • **How can you tell from the denominator of a fraction if its decimal form is terminating or repeating?**	• **Fractions and estimation** • **Multiply fractions and whole numbers** • **Multiply fractions** • **Multiply mixed numbers** • **Divide fractions** • **Divide mixed numbers** • **Write decimals as fractions** • **Write fractions as decimals**

Unit Objectives (unpacking Clusters where needed):

1. *Students will be able to use estimation with fractions.*
2. *Students will be able to multiply fractions with whole numbers.*
3. *Students will be able to multiply fractions.*
4. *Students will be able to multiply mixed numbers.*
5. *Students will be able to divide fractions.*
6. *Students will be able to divide mixed numbers.*
7. *Students will be able to write decimals as fractions.*
8. *Students will be able to write fractions as decimals.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 6.NS.1 (division with fractions), 6.NS.2 (divide multi-digit numbers), 2004/2008 standards (add and subtract fractions)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Multiplying fractions	2 weeks
Lesson #2 Title: Dividing fractions	2 weeks
Lesson #3 Title: Fractions and decimals	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

<table>
<tr><th colspan="3">Unit Plan #3</th></tr>
<tr><td colspan="3">Title: Multiplying and Dividing Decimals</td></tr>
<tr><td colspan="2">Grade Level: 6</td><td>Length of Time: 3 weeks</td></tr>
<tr><td colspan="3">Unit Summary: Students will be able to multiply and divide decimals by decimals and whole numbers.</td></tr>
<tr><th colspan="3">Learning Targets</th></tr>
<tr><td colspan="3">Domain: 6.NS The Number System</td></tr>
<tr><td colspan="3">Standard(s): Compute fluently with multi-digit numbers and find common factors and multiples.</td></tr>
<tr><td>Cluster# (s):</td><td colspan="2">Cluster(s):</td></tr>
<tr><td>6.NS.2</td><td colspan="2">Fluently divide multi-digit numbers using the standard algorithm.</td></tr>
<tr><td>6.NS.3</td><td colspan="2">Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.</td></tr>
<tr><td>2004/2008 Standards</td><td colspan="2">● Compute with money</td></tr>
<tr><td colspan="2">Unit Essential Questions:
● How can you use estimation to check that your answer is reasonable?
● What happens to the decimal point when you multiply a whole number by a decimal?
● When multiplying decimals, how do you know where to place the decimal point in the product?
● How is dividing a decimal by a whole number similar to dividing a whole number by a whole number?
● How can you use base ten blocks to model decimal division?</td><td>Unit Enduring Understandings:
● Decimals and Estimation
● Multiply decimals by whole numbers
● Multiply decimals by decimals
● Divide decimals by whole numbers
● Divide decimals by decimals</td></tr>
<tr><td colspan="3">Unit Objectives (unpacking Clusters where needed):
1. Students will be able to estimate with decimals.
2. Students will be able to multiply decimals by whole numbers.
3. Students will be able to multiply decimals by decimals.
4. Students will be able to divide decimals by whole numbers.
5. Students will be able to divide decimals by decimals.</td></tr>
<tr><th colspan="3">Evidence of Learning</th></tr>
</table>

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.		
Summative Assessments: Common Assessment : 6.NS.2 (divide multi-digit numbers), 6.NS.3 (add, subtract, multiply, and divide multi-digit decimals), 2004/2008 standards (compute with money)		

Lesson Plans	
Lessons	**Timeframe**
Lesson #1 Title: Multiply decimals	1.5 week
Lesson #2 Title: Divide decimals	1.5 week
Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):* www.IXL.com	

Title: Fractions, Decimals, and Percents	
Grade Level: 6	**Length of Time:** 3 weeks
Unit Summary: Students will convert between fractions, decimals, and percents. Students will compare and order fractions, decimals, and percents. Students will find the percent of a number and estimate with percents.	
Learning Targets	
Domain: 6.RP Ratios and Proportional Relationships 6.NS The Number System	
Standard: Understand ratio concepts and use ratio reasoning to solve problems. Apply and extend previous understandings of numbers to the system of rational numbers.	

Cluster# (s):	**Cluster(s):**
6.RP.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
6.RP.3	Find a percent of a quantity as a rate per 100; solve problems involving finding the whole, given a part and the percent.
6.NS.7	Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. Write, interpret, and explain statements of order for rational numbers in real-world contexts.

Unit Essential Questions:	**Unit Enduring Understandings:**
• **How can you use a model to write a percent as a fraction or write a fraction as a percent?** • **How does the decimal point move when you rewrite a percent as a decimal and when you rewrite a decimal as a percent?** • **How can you order numbers that are written as fractions, decimals, and percents?** • **How can you use mental math to find the percent of a number?** • **How can you use mental math and estimation to help solve real-life problems?**	• **Percents and fractions** • **Percents and decimals** • **Compare and order fractions, decimals, and percents** • **Percent of a number** • **Estimate with percents**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to convert between fractions and percents.*
- *Students will be able to convert between decimals and percents.*
- *Students will be able to compare and order fractions, decimals, and percents.*
- *Students will be able to find the percent of a number.*
- *Students will be able to estimate with percents.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:
Common Assessment: 6.RP.1 (ratios), 6.RP.3 (solving real-world problems with ratios and rates), 6.NS.7 (ordering rational numbers)

Lesson Plans

Lessons	**Timeframe**
Lesson #1 Title: Fractions and Percents	0.5 week

Lesson #2 Title: Decimals and Percents	0.5 week
Lesson #3 Title: Compare and Order	1 week
Lesson #4Title: Percent of a Number	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.IXL.com

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan #5**	
Title: Ratios, Rates, and Data Analysis	
Grade Level: 6	**Length of Time:** 4 weeks

Unit Summary: Students will use rates, ratios, mean, median, mode, and range in real life situations. Students will also use tables and graphs to organize statistical data.	
Learning Targets	
Domain: 6.RP Ratios and Proportional Relationships 6. SP Statistics and Probability	
Standard: Understand ratio concepts and use ratio reasoning to solve problems. Develop understanding of statistical variability. Summarize and describe distributions.	
Cluster# (s):	**Cluster(s):**
6.RP.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
6.RP.2	Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.
6.RP.3	Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. Solve unit rate problems including those involving unit pricing and constant speed. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
6.SP.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
6.SP.2	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
6.SP.3	Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
6.SP.4	Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
6.SP.5	Summarize numerical data sets in relation to their context by reporting the number of observations. Summarize numerical data sets in relation to their context by describing the nature of the attribute under investigation, including how it was measured and its units of measurement. Summarize numerical data sets in relation to their context by giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. Summarize numerical data sets in relation to their context by relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.
2004/2008 Standards	• ***Independent/Dependent Events*** • ***Experimental Probability*** • ***Venn Diagrams*** • ***Fundamental Counting Principle*** • ***Lists/charts/trees*** • ***Vertex-Edge Graph***

Unit Essential Questions: • **How can you tell whether two recipes make the same mixture?** • **How can you use rates to describe changes in real-life problems?** • **How can you use rates to help show how a country can save valuable natural resources?** • **What is the meaning of the word "average?" How can you find the average of a collection of numbers?** • **Describe situations in real life where the mean is not a good representation of the average.**	**Unit Enduring Understandings:** • **Ratios** • **Rates** • **Solving Rate Problems** • **Mean** • **Median, Mode, and Range** • **Analyzing Data Sets**

● **How can you use tables and graphs to help organize data?**	

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to use ratios in real life problems.*
- *Students will be able to use rates in real life problems.*
- *Students will be able to define the word "average."*
- *Students will be able to use mean, median, mode, and range in real life problems.*
- *Students will be able to use graphs and tables to organize data.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 6.RP.1 (ratios), 6.RP.2 (rates and unit rates), 6.RP.3 (equivalent ratios). 6.SP.1 (statistical questions), 6.SP.2 (distribution of data), 6.SP.3 (measures of center), 6.SP.4 (displays of data), 6.SP.5 (summarize numerical data), 2004/2008 standards (independent/dependent events, experimental probability, Venn diagrams, fundamental counting principle, lists/charts/trees, vertex-edge graph)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Ratios	1 week
Lesson #2 Title: Rates	1 week
Lesson #3 Title: Mean	0.5 week
Lesson #4 Title: Graphs and Tables	1.5 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.IXL.com

Egg Harbor City School District
Mathematics Curriculum
Unit Plan #6

Title: Circles and Area

Grade Level: 6	**Length of Time:** 3 weeks

Unit Summary: Students will calculate area and perimeter of composite figures. Students will calculate area and circumference of circles.

Learning Targets	
Domain: 6.G Geometry 6.EE Expressions and Equations	
Standard: Solve real-world and mathematical problems involving area, surface area, and volume. Apply and extend previous understandings of arithmetic to algebraic expressions.	
Cluster# (s):	**Cluster(s):**
6.G.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
6.EE.2	Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
2004/2008 Standards	● ***Similar figures*** ● ***Symmetry*** ● ***Properties of 3D figures*** ● ***Angles in a triangle*** ● ***Lines, rays, segments*** ● ***Reflections/rotations***

Unit Essential Questions:	Unit Enduring Understandings:
● **How can you find the circumference of a circle?** ● **How can you find the perimeter of a composite figure?** ● **How can you find the area of a circle?** ● **How can you find the area of a composite figure?**	● **Circles and Circumference** ● **Perimeter of Composite Figures** ● **Area of Circles** ● **Area of Composite Figures**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to find the circumference of a circle.*
- *Students will be able to find the perimeter of a composite figure.*
- *Students will be able to find the area of a circle.*
- *Students will be able to find the area of a composite figure.*

Evidence of Learning

Common Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment : 6.G.1 (area, perimeter, and circumference), 6.EE.2 (Order of Operations), 2004/2008 standards (similar figures, symmetry, properties of 3D figures, angles in a triangle, lines, rays, segments, reflections, rotations)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Circles	1.5 weeks
Lesson #2 Title: Composite Figures	1.5 weeks

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.IXL.com

Egg Harbor City School District Mathematics Curriculum Unit Plan #7	
Title: Equations	
Grade Level: 6	**Length of Time:** 5 weeks
Unit Summary: Students will write expressions and equations. Students will solve equations using addition, subtraction, multiplication, and division. Students will solve two-step equations. Students will find dimensions of figures from area, perimeter, and volume formulas. Students will find volume and surface area using nets.	
Learning Targets	
Domain: 6.EE Expressions and Equations	

6.G Geometry

Standard: Reason about and solve one variable equations and inequalities.
Solve real-world and mathematical problems involving area, surface area, and volume.

Cluster# (s):	**Cluster(s):**
6.EE.2	Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entry.
6.EE.5	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
6.EE.7	Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.
6.G.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
6.G.2	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V=lwh$ and $V=bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
6.G.4	Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Unit Essential Questions:

- **How does rewriting a word problem help you solve the word problem?**
- **How can you use addition or subtraction to solve an equation?**
- **How can you use multiplication or division to solve an equation?**
- **What is a "two-step" equation? How can you solve a two-step equation?**
- **How can you use area and perimeter formulas to find missing dimensions of plane figures?**
- **How can you use a volume formula to find missing dimensions of prisms?**

Unit Enduring Understandings:

- **Write an equation with one variable**
- **Solve equations using addition, subtraction, multiplication, and division**
- **Solve two-step equations**
- **Find the dimensions of plane figures**
- **Find the dimensions of prisms**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to write an equation with one variable.*
- *Students will be able to solve equations using addition, subtraction, multiplication, and division.*
- *Students will be able to solve two-step equations.*
- *Students will be able to find the dimensions of plane figures using area and perimeter formulas.*
- *Students will be able to find the dimensions of prisms using volume formulas.*

Evidence of Learning
Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.
Summative Assessments: Common Assessment: 6.EE.2(writing expressions), 6.EE.5(solving equations), 6.EE.7(solving real-world equations), 6.G.1(area of composite figures), 6.G.2(volume of prisms), 6.G.4(surface area from nets)
Lesson Plans

Lessons	**Timeframe**
Lesson #1 Title: Writing Equations	1 week
Lesson #2 Title: Solving Equations	2 weeks
Lesson #3 Title: Find Dimensions	1 week
Lesson #4 Title: Volume and Surface Area	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.IXL.com

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan #8**	
Title: Inequalities	
Grade Level: 6	**Length of Time:** 3 weeks
Unit Summary: Students will write, graph, and solve inequalities and two-step inequalities.	
Learning Targets	
Domain: 6.EE Expressions and Equations	
Standard: Represent and analyze quantitative relationships between dependent and independent variables.	
Cluster:	**Cluster:**

6.EE.5	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
6.EE.8	Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

Unit Essential Questions: • **How can you use a number line to represent solutions of an inequality?** • **How can you use an inequality to describe a real-life situation?** • **How can you use multiplication or division to solve an inequality?** • **How can you use inequalities to classify different species of animals?**	**Unit Enduring Understandings:** • **Write and graph inequalities** • **Solve inequalities using addition, subtraction, multiplication, and division** • **Solve two-step inequalities**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to write and graph inequalities.*
- *Students will be able to solve inequalities using addition, subtraction, multiplication, and division.*
- *Students will be able to solve two-step inequalities.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:
Common Assessment: 6.EE.5 (write and graph inequalities), 6.EE.8 (solve inequalities)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Write and Graph Inequalities	1 week
Lesson #2 Title: Solve Inequalities	1.5 weeks
Lesson #3 Title: Solve Two-Step Inequalities	0.5 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.IXL.com

Egg Harbor City School District
Mathematics Curriculum
Unit Plan #9

Title: Tables, Graphs, and Functions

Grade Level: 6	**Length of Time:** 3 weeks

Unit Summary: Students will describe and represent a function with a mapping diagram, input-output table, graph, words, and equations.

Learning Targets

Domain: 6.EE Expressions and Equations

Standard: Represent and analyze quantitative relationships between dependent and independent variables.

Cluster:	**Cluster:**

6.EE.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

Unit Essential Questions:	**Unit Enduring Understandings:**
• **What is a mapping diagram? How can it be used to represent a function?** • **How can you describe a function with words? How can you describe a function with an equation?** • **How can you use a table to describe a function?** • **How can you use a graph to describe a function?** • **How can you analyze a function from its graph?**	• **Mapping Diagram** • **Functions as Words and Equations** • **Input-Output Tables** • **Graphs** • **Analyzing Graphs**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to use a mapping diagram to represent a function.*
- *Students will be able to describe a function with words and an equation.*
- *Students will be able to use an input-output table to describe a function.*
- *Students will be able to use a graph to describe a function.*
- *Students will be able to analyze a function from its graph.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:
Common Assessment: 6.EE.9 (dependent and independent variables in functions)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Functions	3 weeks

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.IXL.com

Egg Harbor City School District
Mathematics Curriculum
Unit Plan #10

Title: Integers

Grade Level: 6	**Length of Time:** 2 weeks

Unit Summary: Students will read and graph an integer. Students will compare, order, and find the absolute value of integers. Students will graph ordered pairs and polygons in the coordinate plane.

Learning Targets

Domain: 6.NS The Number System
6.G Geometry

Standard: Compute fluently with multi-digit numbers and find common factors and multiples.
Apply and extend previous understandings of numbers to the system of rational

	numbers. Solve real-world and mathematical problems involving area, surface area, and volume.
Cluster:	**Cluster:**
6.NS.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
6.NS.6	Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, and that 0 is its own opposite. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
6.NS.7	Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. Write, interpret, and explain statements of order for rational numbers in real-world contexts. Understand that the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. Distinguish comparisons of absolute value from statements about order.
6.NS.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
6.G.3	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

Unit Essential Questions: ● **How do you read and graph an integer?** ● **How do you compare rational numbers?** ● **How do you find the absolute value of a number?** ● **How do you plot in the coordinate plane?**	**Unit Enduring Understandings:** ● **The Number Line** ● **Comparing Numbers** ● **Absolute Value** ● **The Coordinate Plane**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to read and graph an integer on a number line.*
- *Students will be able to compare rational numbers using the less than or greater than symbol.*
- *Students will be able to order rational numbers.*
- *Students will be able to find the absolute value of a number.*
- *Students will be able to plot ordered pairs in the coordinate plane?*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 6.NS.5 (positive and negative numbers), 6.NS.6 (locate numbers on a number line), 6.NS.7 (absolute value), 6.NS.8 (coordinate plane), 6.G.3 (polygons in the coordinate plane)

Lesson Plans

Lessons	**Timeframe**
Lesson #1 Title: Integers	1 week
Lesson #2 Title: Coordinate Plane	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.IXL.com

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan #1**	
Title: Operations With Integers	
Grade Level: 7	**Length of Time:** 4 weeks
Unit Summary: Students will understand and solve real-life mathematical problems by absolute value, rational numbers, and graphing integers on a number line	
Learning Targets	
Domain: 7. NS The Number System 7.EE Expressions and Equations	
Standard: Apply and extend previous understandings, of operations with fractions to add, subtract, multiply, and divide rational numbers. Use properties of operations to generate equivalent expressions and solve real-life and mathematical problems using numerical and algebraic expressions and equations.	
Cluster #:	**Cluster:**

7.NS.1	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
7.NS.2	Apply and extend previous understanding of multiplication and division and of fractions to multiply and divide rational numbers.
7.NS.3	Solve real-life and mathematical problems involving the four operations with rational numbers.
7.EE.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
	2004/2008 Standards - Comparing/ordering fractions, decimals, and percents, exponents, coordinate grids, Venn diagrams, and order of operations will need to be taught with this cluster.

Unit Essential Questions:	Unit Enduring Understandings:
• **How are velocity and speed related?** • **Is the sum of two integers *positive, negative, or zero*? How can you tell?** • **How are adding integers and subtracting integers related?** • **Is the product of two integers *positive, negative, or zero*? How can you tell?** • **Is the quotient of two integers *positive, negative, or zero*? How can you tell?** • **How can you use ordered pairs to locate points in a coordinate plane?**	• **Integers and Absolute Value** • **Adding Integers** • **Subtracting Integers** • **Multiply Integers** • **Dividing Integers** • **Coordinate Plane**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to understand integers and absolute value.*
- *Students will be able to add, subtract, multiply and divide integers.*
- *Students will be able to identify and plot ordered pairs in a coordinate plane.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 7.NS.1 (adding and subtracting with rational numbers); 7.NS.2 (multiplying and dividing with rational numbers); 7.NS.3 (real-world problems with the four operations and rational numbers); 7.EE.3 (multi-step real-world problems using positive and negative rational numbers in any form ***2004/2008 Standards -***

Comparing/ordering fractions, decimals, and percents, exponents, coordinate grids, Venn diagrams, and order of operations	
Lesson Plans	
Lessons	**Timeframe**
Lesson #1Title: Add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.	1 week
Lesson #2 Title: Multiply and divide rational numbers.	1week
Lesson #3 Title: Real-world and mathematical problems involving adding, subtracting, multiplying and dividing.	1 week
Lesson #4 Title: Multi-step real-life and mathematical problems with positive and negative rational numbers in any form	1 week
Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):* ● www.IXL.com	

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan #2**	
Title: Rational Numbers and Equations	
Grade Level: 7	**Length of Time:** 4 weeks
Unit Summary: Students will understand, write, and solve real-life mathematical problems by adding, subtracting, multiplying, and dividing and rational numbers, and solving two-step equations.	
Learning Targets	
Domain: 7.NS The Number System 7.EE Expressions and Equations	
Standard: Apply and extend previous understandings, of operations with fractions to add, subtract, multiply, and divide rational numbers. Use properties of operations to generate equivalent expressions and solve real-life and mathematical problems using numerical and algebraic expressions and equations.	
Cluster# (s):	**Cluster(s):**
7.NS.1	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

7.NS.2	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
7.NS.3	Solve real-world and mathematical problems involving the four operations with rational numbers.
7.EE.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
7.EE.2	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.
7.EE.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
7.EE.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
	2004/2008 Standards – Comparing/ordering fraction, decimals, and percents, exponents, coordinate grids, Venn diagrams, and order of operations, growth situations (increase and decrease), graphing functions, functional relationships, and patterns will need to be taught with this cluster.

Unit Essential Questions:	**Unit Enduring Understandings:**
● **How can you use a number line to order rational numbers?** ● **How does adding and subtracting numbers compare with adding and subtracting integers?** ● **How can you use operations with rational numbers in a story?** ● **How can you use inverse operations to solve an equation?** ● **How can you use multiplication or division to solve an equation?** ● **In a two-step equation, which step should you do first?**	● **Solve real world and mathematical problems involving rational numbers.** ● **Adding and subtracting rational numbers.** ● **Multiplying dividing rational numbers.** ● **Solving equations using addition or subtracting** ● **Solving equations using multiplication or division** ● **Solving two-step equations**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to add, subtract, multiply and divide rations numbers.*
- *Students will understand properties of operations of rational numbers.*
- *Students will be able to write and solve one and two-step equations involving adding, subtracting, multiplying, and dividing*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 7.NS.1 (adding and subtracting with rational numbers*);* 7.NS.2 (multiplying and dividing rational numbers); 7NS.3 (solve real-world problems involving the four operations of rational numbers); 7.EE.1 (properties of multiplying and dividing equations); 7.EE.2 (writing equations for multiplying and dividing equations); 7.EE.3 (real life problems involving adding, subtracting, multiplying, and dividing rational numbers); 7.EE.4 (solving equations using adding, subtracting, multiplying, and dividing equations)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Adding and subtracting rational numbers	1 week
Lesson #2 Title: Multiplying and dividing rational numbers	1week
Lesson #3 Title: Solving addition and subtraction equations	1 week
Lesson #4 Title: Solving multiplication and division equations	1 week
Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):* ● www.IXL.com	

Egg Harbor City School District Mathematics Curriculum Unit Plan #3	
Title: Proportions and Variations	
Grade Level: 7	**Length of Time:** 5 weeks
Unit Summary: Students will analyze proportional relationships to solve ratios, proportions, and real-world math problems.	
Learning Targets	
Domain: 7.RP Ratios & Proportional Relationships	
Standard(s): Analyze proportional relationships and use them to solve real-world and mathematical problems.	
Cluster# (s):	**Cluster(s):**
7.RP.1	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.
7.RP.2	Recognize and represent proportional relationships between quantities.
7.RP.3	Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.
	***2004/2008 Standards - Percents and scientific notation will need to be taught with this cluster**

Unit Essential Questions:	**Unit Enduring Understandings:**
● **How do rates help you describe real-life problems?** ● **How can you compare two rates graphically?** ● **How can proportions help you decide when things are "fair"?** ● **How can you write a proportion that solves problems in real life?** ● **How can you use ratio tables and cross products to solve proportions in science?** ● **How can you compare lengths between the customary and metric systems?** ● **How can you use a graph to show the relationship between two variables that vary directly? How can you use an equation?** ● **How can you recognize when two variables are inversely proportional?**	● **Ratios and rates** ● **Slope** ● **Proportions** ● **Writing proportions** ● **Solving proportions** ● **Converting measures between systems** ● **Direct variation** ● **Inverse variation**

Unit Objectives (unpacking Clusters where needed):

- *Students will explore and use a variety of rates that describe common real-life situations.*
- *Students will explore maximum speed of various objects and use the information to explore what it means to "move at a constant speed".*
- *Students will explore ratios to reason if they are equivalent or not.*
- *Students will write and solve proportions using mental math.*
- *Students will solve proportions using ratio tables and cross proportions.*
- *Students will compare lengths between the customary and metric systems.*
- *Students will investigate what it means for two quantities to vary directly.*
- *Students will investigate what it means for two quantities to vary inversely, or to be inversely proportional.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 7.RP.1 (unit rates); 7.RP. 2 (recognize proportional relationships); 7.RP.3 (proportional relationships to solve ratio and percent problems); ***2004/2008 Standards - percents and scientific notation***

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Rates and Ratios	1week
Lesson #2 Title: Slope	1 week
Lesson #3 Title: Proportions	1 week
Lesson #4 Title: Converting Measures	1 week
Lesson #5 Title: Direct and Inverse Variations	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

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Egg Harbor City School District **Mathematics Curriculum** **Unit Plan #4**	
Title: Percents	
Grade Level: 7	**Length of Time:** 3 weeks
Unit Summary: Students will calculate percent equations, increase and decrease, discounts and markups, and simple interest	
Learning Targets	
Domain: 7.RP Ratios & Proportional Relationships 7.EE Expressions and Equations	
Standard(s): Analyze proportional relationships and use them to solve real-world and mathematical problems. Use properties of operations to generate equivalent expressions and solve real-life and mathematical problems using numerical and algebraic expressions and equations.	
Cluster# (s):	**Cluster(s):**
7.RP.3	Use proportional relationships to solve multistep ratio and percent problems.
7.EE.2	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.
7.EE.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between

	forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
	2004/2008 Standards - Comparing/ordering fractions, decimals, and percents, exponents, coordinate grids, Venn diagrams, and order of operations will need to be taught with this cluster.

Unit Essential Questions:	Unit Enduring Understandings:
• **How can you use models to estimate percent questions?** • **What is a percent of decrease? What is percent of increase?** • **How can you find discounts and markups efficiently?** • **How can you find the amount of simple interest earned on a savings account? How can you find the amount of interest owed on a loan?**	• **The percent equation** • **Percents of increase and decrease** • **Discounts and markups** • **Simple interest**

Unit Objectives (unpacking Clusters where needed):

- *Students will use the percent bar model to help solve three types of percent problems.*
- *Students will explore percent decrease and increase by working through real-life problems.*
- *Students will use a percent bar model to visualize discounts and markups.*
- *Students will use the simple interest formula to determine the amount of interest earned in a savings account.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 7.RP.3 (proportional relationships to solve ratio and percent problems);, 7.EE.2 (writing equations for multiplying and dividing equations); 7.EE.3 (real life problems involving adding, subtracting, multiplying, and dividing rational numbers)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Percents – Equations, Increase, and Decrease	1 week
Lesson #2 Title: Discounts and Markups	1 week
Lesson #3 Title: Simple Interest	1 week

Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):*

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Egg Harbor City School District Mathematics Curriculum Unit Plan #5		
Title: Similarity and Transformations		
Grade Level: 7		**Length of Time:** 4 weeks
Unit Summary: Students will understand and solve real-world mathematical problems by identifying similar figures, perimeter and area of figures, unknown measures, and understand scale drawings, translations, reflections and rotations.		
Learning Targets		
Domain: 7. G Geometry		
Standard(s): Draw, construct and describe geometrical figures and describe the relationships between them. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.		
Cluster# (s):	**Cluster(s):**	
7.G.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	
7.G.2	Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	
	2004/2008 Standards - Vertex-Edge graphs need to be taught with this cluster.	
Unit Essential Questions: ● **How can you use proportions to help make decisions in art, design, and magazine layouts?** ● **How do changes in dimensions of similar geometric figures affect the perimeters and areas of the figures?**		**Unit Enduring Understandings:** ● **Identifying similar figures** ● **Perimeter and area of similar figures** ● **Finding unknown measures in similar figures** ● **Scale drawings**

• **What information do you need to know to find the dimensions of a figure that is similar to another figure?** • **How can you use a scale drawing to estimate the cost off painting a room?** • **How can you use translations to make a tessellation?** • **How can you use reflections to classify a frieze pattern?** • **What are the three basic ways to move an object in a plane?**	• **Translations** • **Reflections** • **Rotations**

Unit Objectives (unpacking Clusters where needed):

- *Students will decide if two polygons are proportional or it they are distortions of the original polygon.*
- *Students will develop intuitive understanding about what happens to the perimeter and area of figure when it is enlarged (or reduced) proportionally.*
- *Students will construct similar rectangles in the coordinate plane to find a missing measure.*
- *Students will draw scale models of the walls of their classroom in order to decide how much paint is needed to apply two coats of paint.*
- *Students will explore translations, or slides, in visual patterns tracing paper and pattern blocks.*
- *Students will explore reflections in frieze patterns.*
- *Students will explore rotations in the coordinate plane by using tracing paper and cut-out polygons.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:
Common Assessment: 7.G.1 (solve problems using scale drawings); 7.G.2 (draw geometric shapes with given conditions)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Similar Figures	2 weeks
Lesson #2 Title: Scale Drawings	1week
Lesson #3 Title: Translations, Reflections, Rotations	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.IXL.com

Egg Harbor City School District Mathematics Curriculum Unit Plan #6	
Title: Surface Area of Solids	
Grade Level: 7	**Length of Time:** 4 weeks
Unit Summary: Students will understand and solve real-world mathematical problems by calculating area and circumference of a circle, and area, volume and surface area of two- and three- dimensional figures.	
Learning Targets	
Domain: 7. G Geometry	
Standard(s): Draw, construct, and describe geometrical figures and describe the relationships between them. Solve real-life and mathematical problems involving angle measure, area, surface area and volume	
Cluster# (s):	**Cluster(s):**
7.G3	Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.
7.G4	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
7.G6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
	2004 Standards* Properties of polygons will need to be taught with this cluster, area and perimeter of polygons and transformations will need to be taught with this cluster.
Unit Essential Questions: ● **How can you draw three-dimensional figures?** ● **How can you use a net to find the surface area of a prism?**	**Unit Enduring Understandings:** ● **Drawing 3-dimensional figures** ● **Surface area of prisms** ● **Surface area of cylinders**

● **How can you find the surface area of a cylinder?** ● **How can you find the surface area of a pyramid?**	● **Surface area of pyramids**

Unit Objectives (unpacking Clusters where needed):

- *Students will use cubes and isometric dot paper to investigate the surface area and volume of solids.*
- *Students will develop an intuition about how to find the surface area of a prism.*
- *Students will develop an intuition about how to find the surface area of a cylinder.*
- *Students will develop an intuition about how to find the surface area of a pyramid.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

mon Assessment #1: 7.G.4 and 7.G.6 (area and circumference of a circle, real-world problems involving area), 7.G.3 and 7.G.6 (creating two-dimensional figures from three-dimensional figures, real-world problems involving volume and surface area); ***2004/2008 Standards - properties of polygons, transformations, area and perimeter of polygons***

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Drawing 3 dimensional figures	1 week
Lesson #2 Title: Finding surface area of prisms	1week
Lesson #3 Title: Finding surface area of cylinders	1 week
Lesson # 4Title: Finding surface area of pyramids	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.IXL.com

Egg Harbor City School District Mathematics Curriculum Unit Plan #7		
Title: Volume of Solids		
Grade Level: 7		**Length of Time:** 4 weeks
Unit Summary: Students will draw, construct and describe geometrical figures and describe the relationships between them and solve real-life and mathematical problems involving angle measure, area, surface area, and volume.		
Learning Targets		
Domain: 7. G Geometry		
Standard(s): Draw, construct, and describe geometrical figures and describe the relationships between them. Solve real-life and mathematical problems involving angle measure, area, surface area and volume		
Cluster# (s):	**Cluster(s):**	
7.G4	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.	
7.G6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes,and right prisms.	
	2004/2008 Standards - Area and perimeter of polygons and transformations will need to be taught with this cluster.	
Unit Essential Questions: ● **How can you find the volume of a prism?** ● **How can you find the volume of a cylinder?** ● **How can you find the volume of a pyramid?** ● **How can you remember the formulas for surface area and volume?** ● **How can you estimate the volume of a composite solid?** ● **When the dimensions of a solid increase by a factor of *k*, how does the surface area change? How does the volume change?**		**Unit Enduring Understandings:** ● **Students will develop an intuitive understanding of how to measure the volume of a prism** ● **Students will develop an understanding of the volume of a cylinder** ● **Students will develop an intuition of how to find the volume of a pyramid.** ● **Students will develop a strategy to summarize volume and surface area and formulas.**

	• **Students will explore strategies for finding the volumes of composite figures.** • **Students will explore what happens to the surface areas and volumes of solids whose dimensions are increased by a factor of *k*.**

Unit Objectives (unpacking Clusters where needed):

- *Students will find the volume of a prism, cylinder, and pyramid of 3-dimensional figures.*
- *Students will describe the two-dimensional figures that result from slicing three-dimensional figures.*
- *Students will solve real-world problems that involve area, volume, and surface area of two- and three-dimensional figures.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

- Common Assessment #1: 7.G.4 and 7.G.6 (area and circumference of a circle, real-world problems involving area), and 7.G.6 (creating two-dimensional figures from three-dimensional figures, real-world problems involving volume and surface area); ***2004/2008 Standards - properties of polygons, transformations, area and perimeter of polygons***

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Finding the volume of prism, cylinder, and pyramid	1 week
Lesson #2 Title: Estimating the volume of composite figures	1week
Lesson #3 Title: Finding the surface area and volume of similar solids	2 weeks

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.IXL.com

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan #8**		
Title: Data Analysis and Samples		
Grade Level: 7		**Length of Time:** 3 weeks
Unit Summary: Students will understand and solve real-world mathematical problems by using random sampling to draw inferences about a population and drawing informal comparative inferences about two populations.		
Learning Targets		
Domain: 7. SP Statistics and Probability		
Standard(s): Use random sampling to draw inferences about a population, draw informal comparative inferences about two populations, investigate chance processes and develop, and use and evaluate probability models.		
Cluster# (s):	**Cluster(s):**	
7.SP.1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.	
7.SP.2	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.	
7.SP.3	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.	
7.SP.4	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.	
	***2004/2008 Standards- Graphs and measures of central tendency will need to be taught with this cluster.**	
Unit Essential Questions: ● **How can you use a stem-and-leaf plot to organize a set of numbers?** ● **How do histograms show the differences in distributions of data?** ● **How can you use a circle graph to show the results of a survey?**		**Unit Enduring Understandings:** ● **Students will explore the features of a stem-and-leaf plot.** ● **Students will develop an intuitive understanding how a histogram shows the distribution of data.**

● **How can you use a survey to make conclusions about the general population?**	● **Students will read the results of a survey displayed as a circle graph.** ● **Students will develop an understanding of surveys and how they are used to describe a general population.**

Unit Objectives (unpacking Clusters where needed):

- *Students will use statistics to gain information about populations.*
- *Students will use data from a random sample to draw inferences about population.*
- *Students will visualize overlap of two numerical data distributions.*
- *Students will use measure of center and measures of variability for numerical data from random samples.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 7.SP.1 (population and sample), 7.SP.2 (random sampling and inferences), 7.SP.3 (understanding distributions of variabilities), 7.SP.4 (measures of center and measures of variability); ***2004/2008 Standards - graphs and measures of central tendency***

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Explore stem-and-leaf plots	1 week
Lesson #2 Title: Understanding histograms and circle graphs	1week
Lesson #3Title: Samples, populations and surveys	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.IXL.com

Egg Harbor City School District Mathematics Curriculum Unit Plan #9	
Title: Conditional Probability and Rules of Probability	
Grade Level: 7	**Length of Time:** 3 weeks
Unit Summary: Students will understand the likelihood of an event occurring and how to determine where a probability lies; and solve real-world mathematical problems by investigating chance processes and evaluating probability models. Students will develop an understanding of the differences between experimental and theoretical probability. Students will understand and solve real-world mathematical problems by finding probabilities of compound events, using organized lists, tables, tree diagrams, and simulations.	
Learning Targets	
Domain: 7. SP Statistics and Probability	
Standard: Use random sampling to draw inferences about a population, draw informal comparative inferences about two populations, investigate chance processes and develop, and use and evaluate probability models.	
Cluster #:	**Cluster:**
7.SP.5	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
7.SP.6	Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.
7.SP.7	Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
7.SP.8	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

	2004/2008 Standards - Combinations, permutations, and fundamental counting principle will need to be taught with this cluster.

Unit Essential Questions:	**Unit Enduring Understandings:**
● **How you can you predict the results of spinning a sinner?** ● **How can you find a theoretical probability?** ● **What is meant by experimental probability?** ● **What is the difference between dependent and independent events?**	● **Determine where the probability of an event lies.** ● **Students will develop an understanding of theoretical probability.** ● **Students will develop an understanding of experimental probability.** ● **Students will explore the differences between dependent and independent events.**

Unit Objectives (unpacking Clusters where needed):

- *Students will determine where the probability of an event lies.*
- *Students will determine the likelihood of an event occurring.*
- *Students will understand theoretical and experimental probability.*
- *Students will explore differences in dependent and independent events.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 7.SP.5 (likelihood of an event occurring); 7.SP.6 (collecting data and finding probability (experimental probability)),;7.SP.7 (independent and dependent events/ probability model),;7.SP.8 (probabilities of compound events)***2004/2008 Standards – combinations, permutations, fundamental counting principle***

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Determine where the probability of an event lies	1 week
Lesson #2 Title: Find the likelihood of an event occurring	1week
Lesson #3 Title: Explore dependent and independent events	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.IXL.com

Egg Harbor City School District Mathematics Curriculum Unit Plan #10	
Title: Probability	
Grade Level: 7	**Length of Time:** 3 weeks
Unit Summary: Students will understand and solve real-world mathematical problems by investigating chance processes and evaluating probability models. Students will develop an understanding of the differences between experimental and theoretical probability. Students will understand and solve real-world mathematical problems by finding probabilities of compound events, using organized lists, tables, tree diagrams, and simulations.	
Learning Targets	
Domain: 7. SP Statistics and Probability	
Standard: Investigate chance processes and develop, use, and evaluate probability models	
Cluster# (s):	**Cluster(s):**
7.SP.6	Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.*
7.SP.7	Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.* Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*
7.SP.8	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.

	Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?*

Unit Essential Questions:	**Unit Enduring Understandings:**
• **How do you compare probabilities using probability models?** • **What is the difference between theoretical and experimental probability?** • **How do you represent sample spaces for compound events?**	• **Solve real world and mathematical problems involving probability of compound events.** • **Utilize probability models to compare probabilities** • **Understand the differences between theoretical and experimental probability** • **Solve compound events using simulations.** • **Evaluate probability models of compound events.**

Unit Objectives (unpacking Clusters where needed):

- *Students will compare probabilities using various probability models.*
- *Students will understand the differences between theoretical and experimental probability.*
- *Students will represent sample spaces for compound events.*
- *Students will find the probability of compound events.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objective listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 7.SP.6 (collecting data and finding probability (experimental probability)), 7.SP.7 (independent and dependent events/ probability model), 7.SP.8 (probabilities of compound events)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Develop a probability model to find probability	1 week
Lesson #2 Title: Utilize data to find probability (Experimental Probability)	1week
Lesson #3 Title: Probabilities of Compound Events	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.IXL.com

Egg Harbor City School District Mathematics Curriculum Unit Plan # 1		
Title: Solving Equations		
Grade Level: 8	**Length of Time:** 4 weeks	
Unit Summary: Students will be able to analyze and solve linear equations, rewrite equations and formulas, and convert units of measure.		
Learning Targets		
Domain: Expressions and Equations		
Standard: Solve linear equations in one variable, using the distributive property and collecting like terms; convert units of measure.		
Cluster #(s):	**Cluster(s):**	
8.EE.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.	
8.EE.7	Solve linear equations in one variable.	
Unit Essential Questions: ● **How can you use inductive reasoning to discover rules in mathematics?** ● **How can you solve a multi-step equation?** ● **How can you solve an equation that has variables on both sides?** ● **How can you use a formula for one measurement to write a formula for a different measurement?** ● **How can you convert from one measurement system to another?**	**Unit Enduring Understandings:** ● **Solve simple equations.** ● **Solve multi-step equations.** ● **Solve equations with variables on both sides.** ● **Rewrite equations and formulas.** ● **Convert units of measure.**	
Unit Objectives (unpacking Clusters where needed): ● *Students will be able to solve simple equations.* ● *Students will be able to solve multi-step equations.* ● *Students will be able to solve equations with variables on both sides.* ● *Students will be able to rewrite equations and formulas.* ● *Students will be able to convert units of measure.*		
Evidence of Learning		
Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.		

Summative Assessments: Common Assessment: 8.EE.5 (convert units of measure), 8.EE.7 (solve linear equations in one variable)	
Lesson Plans	
Lessons	**Timeframe**
Lesson #1 Title: Solving Simple Equations	3 days
Lesson #2 Title: Solving Multi-Step Equations	2 days
Lesson #3 Title: Solving Equations with Variables on Both Sides	3 days
Lesson #4 Title: Rewriting Equations and Formulas	3 days
Lesson #5 Title: Converting Units of Measure	3 days
Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):* www.ixl.com	

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan # 2**		
Title: Graphing Linear Equations and Linear Systems		
Grade Level: 8		**Length of Time:** 5 weeks
Unit Summary: Students will graph linear equations in slope-intercept form and in standard form, solve systems of equations, and solve equations by graphing.		
Learning Targets		
Domain: Expressions and Equations		
Standard: Graph proportional relationships, interpreting the unit rate as the slope of the graph; graph linear equations and systems of equations; solve systems by graphing.		
Cluster #(s):	**Cluster(s):**	
8.EE.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.	
8.EE.6	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y=mx$ for a line through the origin and the equation $y=mx+b$ for a line intercepting the vertical axis at b.	
8.EE.8	Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve real-world and mathematical problems leading to two linear equations in two variables.	
8.SP.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.	
Unit Essential Questions: ● **How do you graph linear equations?** ● **What is the slope of a line?** ● **How do you graph linear equations in slop-intercept form?** ● **How do you graph linear equations in standard form?** ● **What are systems of linear equations?** ● **What are special systems of linear equations?** ● **How do you solve equations by graphing?**		**Unit Enduring Understandings:** ● **Graph linear equations.** ● **Understand Slope of a Line** ● **Graph Linear Equations in Slope-Intercept Form** ● **Graph Linear Equations in Standard Form** ● **Solve Systems of Linear Equations** ● **Solve Special Systems of Linear Equations** ● **Solve Equations by Graphing**
Unit Objectives (unpacking Clusters where needed): ● *Students will be able to graph linear equations.* ● *Students will understand the slope of a line.* ● *Students will be able to graph linear equations in slope-intercept form.* ● *Students will be able to graph linear equations in standard form.*		

- *Students will be able to solve systems of equations.*
- *Students will be able to solve special systems of linear equations.*
- *Students will be able to solve systems by graphing.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 8.EE.5 (Slope of a Line), 8.EE.6 (Graphing Linear Equations), 8.EE.8 (Systems of Linear Equations), 8.SP.3 (Graphing Linear Equations)

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Graphing Linear Equations	2 days
Lesson #2 Title: Slope of a Line	4 days
Lesson #3 Title: Graphing Linear Equations in Slope-Intercept Form	2 days
Lesson #4 Title: Graphing Linear Equations in Standard Form	2 days
Lesson #5 Title: Systems of Linear Equations	3 days
Lesson #6 Title: Special Systems of Linear Equations	2 days
Lesson #7 Title: Solving Equations by Graphing	2 days

Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):*

w.ixl.com

Egg Harbor City School District Mathematics Curriculum Unit Plan # 3	
Title: Writing Linear Equations and Linear Systems	
Grade Level: 8	**Length of Time:** 4 Weeks
Unit Summary: Students will be able to write equations and systems of equations in slope-intercept form, using slope and a point and using two points. Students will be able to solve real-life problems.	
Learning Targets	
Domain: Expressions and Equations	
Standard(s): Derive the equation *y=mx* for a line through the origin and the equation *y=mx+b* for a line intercepting the vertical axis at *b;* analyze and solve pairs of simultaneous linear equations; construct a function to model a linear relationship between two quantities; determine the rate of change and initial value of the function from a description of a relationship or from two *(x,y)* values.	
Cluster #(s):	**Cluster(s):**
8.EE.6	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.
8.EE.8	Analyze and solve pairs of simultaneous linear equations. A. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. B. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. C. Solve real-world and mathematical problems leading to two linear equations in two variable.
8.F.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two *(x,y)* values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
Unit Essential Questions: ● **How can you write an equation of a line when you are given the slope and y-intercept of the line?** ● **How can you write an equation of a line when you are given the slope and a point on the line?** ● **How can you write an equation of a line when you are given two points on the line?** ● **How can you use a linear equation in two variables to model and solve a real-life problem?** ● **How can you use a system of linear equations to model and solve a real-life problem?**	**Unit Enduring Understandings:** ● **Write equations in slope-intercept form.** ● **Write equations using a slope and a point.** ● **Write equations using two points.** ● **Solve real-life problems.** ● **Write systems of linear equations.**

Unit Objectives (unpacking Clusters where needed): ● *Students will be able to write equations in slope-intercept form.* ● *Students will be able to write equations using a slope and a point.* ● *Students will be able to write equations using two points.* ● *Students will be able to solve real-life problems.* ● *Students will be able to write systems of linear equations.*
Evidence of Learning
Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.
Summative Assessments: Common Assessments: 8.EE.6 (Slope and Linear Equations)**,** 8.EE.8 (Pairs of Linear Equations)**,** 8.F.4 (Models of Linear Relationships)
Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Writing Equations in Slope-Intercept Form	2 days
Lesson #2 Title: Writing Equations Using a Slope and a Point	3 days
Lesson #3 Title: Writing Equations Using Two Points	2 days
Lesson #4 Title: Solving Real-Life Problems	3 days
Lesson #5 Title: Writing Systems of Linear Equations	2 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.ixl.com

Egg Harbor City School District **Mathematics Curriculum** **Unit Plan # 4**
Title: Functions
Grade Level: 8 — **Length of Time:** 3 weeks
Unit Summary: Students will define, evaluate, and compare functions, and use functions to model relationships between quantities.
Learning Targets
Domain: Functions
Standard(s): Define, evaluate, and compare functions; use functions to model relationships between quantities.

Cluster #(s):	**Cluster(s):**
8.EE.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
8.F.1	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
8.F.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
8.F.3	Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

8.F.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x,y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
8.F.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Unit Essential Questions:	Unit Enduring Understandings:
• **How can you find the domain and range of a function?** • **How can you decide whether the domain of a function is discrete or continuous?** • **How can you use a linear function to describe a linear pattern?** • **How can you recognize when a pattern in real life is linear of nonlinear?**	• **Describe the domain and range of a function.** • **Understand the difference between discrete and continuous domains.** • **Understand linear function patterns.** • **Compare linear and nonlinear functions.**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to describe the domain and range of a function.*
- *Students will understand the difference between discrete and continuous domains.*
- *Students will be able to use linear function patterns.*
- *Students will be able to compare linear and nonlinear functions.*

Evidence of Learning

Formative Assessments:

Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 8.EE.5 (Graph Proportional Relationships), 8.F.1 (Functions as a Rule), 8.F.2 (Compare Properties of Functions), 8.F.3 (Linear and Nonlinear Functions), 8.F.4 (Linear Modeling and Rate of Change), 8.F.5 (Functional Relationships)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Domain and Range of a Function	2 days
Lesson #2 Title: Discrete and Continuous Data	2 days
Lesson #3Title: Linear Function Patterns	2 days
Lesson #4 Title: Comparing Linear and Nonlinear Functions	3 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.ixl.com

<table>
<tr><th colspan="3">Egg Harbor City School District
Mathematics Curriculum
Unit Plan # 5</th></tr>
<tr><td colspan="3">Title: Angles, Similarity and Transformations (AT)</td></tr>
<tr><td colspan="2">Grade Level: 8</td><td>Length of Time: 4 weeks</td></tr>
<tr><td colspan="3">Unit Summary: Students will classify angles, and relate properties of angles with various polygons. Students will understand congruence and similarity using physical models. Students will explore transformations including rotations and dilations (additional topics).</td></tr>
<tr><th colspan="3">Learning Targets</th></tr>
<tr><td colspan="3">Domain: Geometry</td></tr>
<tr><td colspan="3">Standard: Understand congruence and similarity using physical models, transparencies, or geometry software.</td></tr>
<tr><td>Cluster #(s):</td><td colspan="2">Cluster(s):</td></tr>
<tr><td>8.G.1</td><td colspan="2">Verify experimentally the properties of rotations, reflections, and translations:
a. Lines are taken to lines, and line segments to line segments of the same length.
b. Angles are taken to angles of the same measure.
c. Parallel lines are taken to parallel lines.
*2004/2008 Standards - 4.2.8 A Geometric Properties will need to be taught with this cluster</td></tr>
<tr><td>8.G.2</td><td colspan="2">Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.</td></tr>
</table>

8.G.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
8.G.4	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.
8.G.5	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

Unit Essential Questions:

- **How can you classify two angles as complementary of supplementary?**
- **How can you classify triangles by their angles?**
- **How can you find the formula for the sum of the angle measures of any polygon?**
- **Which properties of triangles make them special among all other types of polygons?**
- **How can you use properties of parallel lines to solve real-life problems?**

Unit Enduring Understandings:

- **Classify angles.**
- **Understand the relationship between angles and sides of triangles.**
- **Understand angle relationships in polygons.**
- **Understand properties of similar triangles.**
- **Understand the properties of parallel lines and transversals.**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to classify triangles.*
- *Students will be able to use their understanding of angle relationships to find unknown angles.*
- *Students will be able to describe the sum of angle measures in any polygon.*
- *Students will understand and use the properties of similar triangles.*
- *Students will be able to solve problems using parallel lines and a transversal.*
- *Students will be able to describe a sequence of transformations and dilations that will result in similar figures.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 8.G.1 (Properties of Rotations, Reflections, Translations)**,** 8.G.2 (Congruence of Polygons)**,** 8.G.3 (Effects of Transformations)**,** 8.G.4 (Similar Polygons)**,** 8.G.5 (Parallel Lines and Angle Relationships)

2004/2008 Standards - 4.2.8 A Geometric Properties

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Classifying Angles	2 days
Lesson #2 Title: Angles and Sides of Triangles	2 days
Lesson #3Title: Angles of Polygons	3 days
Lesson #4 Title: Using Similar Triangles	2 days
Lesson #5 Title: Parallel Lines and Transversals	3 days
Lesson #6 Title: Transformations (AT)	2 days

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

- www.ixl.com

<table>
<tr><th colspan="3">Egg Harbor City School District
Mathematics Curriculum
Unit Plan # 6</th></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">Title: Square Roots, the Pythagorean Theorem and Volume</td></tr>
<tr><td colspan="2">Grade Level: 8</td><td>Length of Time: 4 weeks</td></tr>
<tr><td colspan="3">Unit Summary: Students will be able to find, approximate, and simplify square roots. Students will understand and apply the Pythagorean Theorem. Students will use the formulas for volumes of cylinders, cones, and spheres (additional topics).</td></tr>
<tr><th colspan="3">Learning Targets</th></tr>
<tr><td colspan="3">Domain: The Number System, Expressions and Equations, Geometry</td></tr>
<tr><td colspan="3">Standard(s): Know that there are numbers that are not rational, and approximate them. Work with radicals and integer exponents. Understand and apply the Pythagorean Theorem. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.</td></tr>
<tr><td>Cluster #(s):</td><td colspan="2">Cluster(s):</td></tr>
<tr><td>8.G.6</td><td colspan="2">Explain a proof of the Pythagorean Theorem and its converse.</td></tr>
<tr><td>8.G.7</td><td colspan="2">Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.</td></tr>
<tr><td>8.G.8</td><td colspan="2">Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.</td></tr>
<tr><td>8.G.9</td><td colspan="2">Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
*2004/2008 Standards - 4.2.8 E Measuring Geometric Objects will need to be taught with this cluster</td></tr>
</table>

8.EE.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2=p$ and $x^3=p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that the square root of two is irrational.
8.NS.1	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
8.NS.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions.

Unit Essential Questions:	**Unit Enduring Understandings:**
• **How can you find the side length of a square when you are given the area of the square?** • **How are the lengths of the sides of a right triangle related?** • **How can you find decimal approximations of square roots that are irrational?** • **How can you use a square root to describe the golden ratio?** • **How can you use the Pythagorean Theorem to solve real-life problems?** • **How do you find the volume of a cylinder, cone or sphere?**	• **Find square roots.** • **Understand and apply the Pythagorean Theorem.** • **Approximate square roots.** • **Simplify square roots.**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to find square roots.*
- *Students will be able to apply the Pythagorean Theorem to real-world problems.*
- *Students will be able to apply the volume formula of cones, cylinders, and spheres to real-world problems.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 8.G.6 (Pythagorean Theorem), 8.G.7 (Pythagorean Theorem in Real World Problems), 8.G.8 (Pythagorean Theorem and Graphing), 8.G.9 (Real World Volume Formulas), 8.EE.2 (Square root and cube root), 8.NS.1 (Irrational numbers), 8.NS.2 (Represent irrational numbers)

04/2008 Standards - 4.2.8 E Measuring Geometric Objects

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Pythagorean Theorem	2 weeks
Lesson #2 Title: Distance in Coordinate Plane	1 week
Lesson #3 Title: Volume	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

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Egg Harbor City School District Mathematics Curriculum Unit Plan # 7	
Title: Data Analysis and Displays	
Grade Level: 8	**Length of Time:** 3 weeks
Unit Summary: Students will be able to use measures of central tendency. Students will be able to create box-and-whisker plots and scatter plots. Students will be able to choose a data display.	
Learning Targets	
Domain: 8.SP Statistics and Probability	
Standard: Investigate patterns of association in bivariate data.	
Cluster #:	**Cluster:**
8.SP.1	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
8.SP.2	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
8.SP.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.
8.SP.4	Understand that patterns of association can only be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

	2004/2008 Standards - 4.4.8B Probability ; 4.4.8C Discrete Mathematic: Systematic Listing and Counting ; 4.4.8 D Discrete Mathematics: Vertex-Edge Graphs and Algorithms will need to be taught with this cluster

Unit Essential Questions:	**Unit Enduring Understandings:**
• **How can you use measures of central tendency to distribute an amount evenly among a group of people?** • **How can you use a box-and-whisker plot to describe a population?** • **How can you use data to predict an event?** • **How can you display data in a way that helps you make decisions?**	• **Measures of central tendency** • **Box-and-Whisker Plots** • **Scatter plots and lines of best fit** • **Choose a data display**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to use measures of central tendency in real world problems.*
- *Students will be able to use a box-and-whisker plot to describe a population.*
- *Students will be able to use data to predict an event.*
- *Students will be able to display data in a way that helps to make a decision.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:

Common Assessment: 8.SP.1 (Scatter Plots and Interpreting Data), 8.SP.2 (Straight lines are used to model a relationship), 8.SP.3 (Interpret slope and intercept), 8.SP.4 (Two-way tables)

004/2008 Standards – 4.4.8A Data Analysis; 4.4.8B Probability ; 4.4.8C Discrete Mathematic: Systematic Listing and Counting ; 4.4.8 D Discrete Mathematics: Vertex-Edge Graphs and Algorithms

Lesson Plans

Lessons	**Timeframe**
Lesson #1Title: Measures of Central Tendency	1 week
Lesson #2 Title: Box-and-Whisker Plots	1 week
Lesson #3 Title: Scatter Plots	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

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Egg Harbor City School District Mathematics Curriculum Unit Plan # 8		
Title: Linear Inequalities		
Grade Level: 8	**Length of Time:** 3 weeks	
Unit Summary: Students will be able to write and graph inequalities. Students will be able to solve inequalities and multi-step inequalities using addition, subtraction, multiplication, and division.		
Learning Targets		
Domain: 8.EE Expressions and Equations		
Standard: Work with radicals and integer exponents. Understand the connections between proportional relationships, lines, and linear equations. Analyze and solve linear equations and pairs of simultaneous linear equations.		
Cluster #(s):	**Cluster(s):**	
8.EE.7	Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x=a$, $a=a$, or $a=b$ results (where a and b are different numbers). Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	
Unit Essential Questions: • **How can you use an inequality to describe a real-life statement?** • **How can you use addition or subtraction to solve an inequality?** • **How can you use multiplication or division to solve an inequality?** • **How can you use an inequality to describe the area and perimeter of a composite figure?**	**Unit Enduring Understandings:** • **Writing and graphing inequalities** • **Solving inequalities using addition, subtraction, multiplication, or division** • **Solving multi-step inequalities**	
Unit Objectives (unpacking Clusters where needed):		

- *Students will be able to use an inequality in real-world situations.*
- *Students will be able to use addition, subtraction, multiplication, and division to solve inequalities.*
- *Students will be able to use inequalities to describe area and perimeter.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:
Common Assessment: 8.EE.7 (Inequalities)

Lesson Plans

Lessons	Timeframe
Lesson #1 Title: Write and Graph Inequalities	0.5 week
Lesson #2 Title: Solve Inequalities	1.5 weeks
Lesson #3 Title: Multi-Step Inequalities	1 week

Curriculum Development Resources *(Click the links below to access additional resources used to design this unit):*

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Egg Harbor City School District
Mathematics Curriculum
Unit Plan # 9

Title: Exponents and Scientific Notation

Grade Level: 8	**Length of Time:** 4 weeks

Unit Summary: Students will be able to use exponents to write numbers. Students will be able to multiply and divide two powers with the same base. Students will be able to read and write zero and negative exponents. Students will be able to read and write numbers in scientific notation.

Learning Targets

Domain: 8.EE Expressions and Equations

Standard: Work with radicals and integer exponents. Understand the connections between proportional relationships, lines, and linear equations. Analyze and solve linear equations and pairs of simultaneous linear equations.

Cluster #:	Cluster(s):
8.EE.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions.
8.EE.3	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.
8.EE.4	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology.

Unit Essential Questions:	Unit Enduring Understandings:
• **How can you use exponents to write numbers?** • **How can you multiply two powers that have the same base?**	• **Exponents** • **Product of powers property** • **Quotient of powers property** • **Zero and negative exponents**

● **How can you divide two powers that have the same base?** ● **How can you define zero and negative exponents?** ● **How can you read numbers that are written in scientific notation?** ● **How can you write a number in scientific notation?**	● **Reading scientific notation** ● **Writing scientific notation**

Unit Objectives (unpacking Clusters where needed):

- *Students will be able to use exponents to write numbers.*
- *Students will be able to multiply and divide two powers that have the same base.*
- *Students will be able to define zero and negative exponents.*
- *Students will be able to read and write numbers in scientific notation.*

Evidence of Learning

Formative Assessments: Students should be assessed on the Unit Objectives listed above. The amount of quizzes/teacher made assessments administered to the students will be determined by the teacher based on their class and their needs. These formative assessments should be woven into your weekly lesson plans.

Summative Assessments:
Common Assessment: 8.EE.1 (Exponents)**,** 8.EE.3 (Estimate very large and very small quantities)**,** 8.EE.4 (Perform operations with exponents)

Lesson Plans

Lessons	Timeframe
Lesson #1Title: Write numbers as exponents	0.5 week
Lesson #2Title: Multiply and Divide Powers	1.5 weeks
Lesson #3Title: Zero and Negative Exponents	1 week
Lesson #4 Title: Scientific Notation	1 week

Curriculum Development Resources ***(****Click the links below to access additional resources used to design this unit):*

●

Algebra 1

Description:
The focus of the course will be on the study of linear functions, quadratic functions, exponential functions, and data analysis. Students will be prepared to take any associated standardized test as well as continue the mathematics curriculum to Geometry and/or Algebra 2 in high school.

Goals and Objectives:

COURSE GOALS AND OBJECTIVES

A. Students will understand, interpret, and create relations and functions.
   At the conclusion of this unit, students will be able to:

   1. Match simple graphs with situations
   2. Graph a relationship
   3. Identify and distinguish between relations and functions
   4. Find the domain and range of relations and functions
   5. Identify independent and dependent variables
   6. Write an equation in function notation
   7. Evaluate a function for given input values
   8. Graph functions given a limited domain
   9. Graph functions given a domain of all real numbers

B. Students will write, graph, interpret, and analyze linear functions.
   At the conclusion of this unit, students will be able to:

   1. Recognize and extend an arithmetic sequence
   2. Find a given term of an arithmetic sequence
   3. Identify linear functions and linear equations
   4. Graph linear functions that represent real-world situations and give their domain and range
   5. Find *x*- and *y*-intercepts and interpret their meanings in real-world situations
   6. Use *x*- and *y*-intercepts to graph lines
   7. Find rates of change and slopes
   8. Relate constant rate of change to the slope of a line
   9. Find slope using the slope formula
   10. Identify, write, and graph direct variation
   11. Write a linear equation in slope-intercept form
   12. Graph a line using slope-intercept form
   13. Write a linear equation using point-slope form
   14. Graph a line using point-slope form
   15. Write a linear equation using two points
   16. Identify and graph parallel and perpendicular lines
   17. Write equations to describe lines parallel or perpendicular to a given line
   18. Describe how changing slope and *y*-intercept affect the graph of a linear function

C. Students will write, solve, and graph inequalities in one and two variables.
   At the conclusion of this unit, students will be able to:

   1. Identify solutions of inequalities in one variable
   2. Write and graph inequalities in one variable

3. Solve one-step inequalities in one variable using addition, subtraction, multiplication, or division
4. Solve two-step and multi-step inequalities in one variable
5. Solve inequalities with variables on both sides
6. Solve compound inequalities
7. Graph and solve linear inequalities in two variables

D. Students will determine the solution(s) that satisfy two linear equations or inequalities.
At the conclusion of this unit, students will be able to:

1. Identify solutions of systems of linear equations in two variables
2. Solve systems of linear equations in two variables by graphing
3. Solve systems of linear equations in two variables by substitution
4. Solve systems of linear equations in two variables by elimination
5. Compare and choose an appropriate method for solving systems of linear equations
6. Solve special systems of linear equations in two variables
7. Classify systems of linear equations and determine the number of solutions
8. Graph and solve systems of linear inequalities in two variables

E. Students will graph, solve, and interpret absolute value equations in one and two variables.
At the conclusion of this unit, students will be able to:

1. Solve absolute value equations in one variable
2. Solve absolute value inequalities in one variable
3. Graph absolute value functions

F. Students will graph exponential functions and apply them to real-world situations.
At the conclusion of this unit, students will be able to:

1. Recognize and extend geometric sequences
2. Find the *n*th term of a geometric sequence
3. Evaluate exponential functions
4. Identify and graph exponential functions
5. Solve problems involving exponential growth and decay

G. Students will use properties of exponents to add, subtract, and multiply monomial and polynomial expressions.
At the conclusion of this unit, students will be able to:

1. Evaluate expressions containing zero and integer exponents
2. Simplify expressions containing zero and integer exponents
3. Use multiplication properties of exponents to evaluate and simplify expressions
4. Use division properties of exponents to evaluate and simplify expressions
5. Classify polynomials and write polynomials in standard form
6. Evaluate polynomial expressions
7. Add and subtract polynomials
8. Multiply polynomials

H. Students will graph quadratic functions and use various methods to solve quadratic equations.
At the conclusion of this unit, students will be able to:

1. Identify quadratic functions
2. Graph a quadratic function
3. Identify important characteristics of a quadratic function, including domain and range, maximum or minimum values, vertex, axis of symmetry, and zeros
4. Solve quadratic equations by graphing
5. Factor polynomials using the greatest common factor
6. Factor quadratic trinomials
7. Solve quadratic equations by factoring
8. Solve quadratic equations using square roots
9. Solve simple quadratic equations by completing the square
10. Solve quadratic equations using the quadratic formula

I. Students will graph square root functions and solve radical equations.
At the conclusion of this unit, students will be able to:

1. Identify square-root functions
2. Graph square-root functions
3. Simplify radical expressions
4. Add, subtract, multiply, and divide radical expressions
5. Solve radical equations

J. Students will identify types of functions and analyze graph transformations.
At the conclusion of this unit, students will be able to:

1. Identify, write, and graph inverse variations
2. Identify linear, quadratic, absolute value, and exponential functions using a table, graph, equation, or situation
3. Relate graph transformations to changes in the corresponding equation

K. Students will solve problems using data analysis and probability.
At the end of this unit, students will be able to:

1. Choose a table or graph to display data
2. Create stem-and-leaf plots
3. Create frequency tables and histograms
4. Describe the central tendency of a data set
5. Create a box-and-whisker plot
6. Recognize misleading graphs
7. Recognize misleading statistics
8. Determine the experimental probability of an event
9. Use experimental probability to make predictions
10. Determine the theoretical probability of an event
11. Find the probability between independent and dependent events

12. Solve problems involving combinations and permutations

CROSS DISCIPLINARY REFERENCES

The following section contains suggestions for cross disciplinary connections between Algebra I and the areas of English Language Arts and Science.

Unit	**Subject**	**Connection**
Linear Functions	Language Arts	Students will read and interpret word problems based on real-life situations involving a constant rate of change. Students will express their solutions in written form and provide a justification for their process.
Systems of Linear Equations and Inequalities	Language Arts	Students will read and interpret word problems based on real-life situations involving constraints and linear programming. Students will express their solutions in written form and provide a justification for their process.
Exponential Functions	Biology	Students will explore population growth as it relates to exponential functions. Students will research actual population changes in the environment to analyze the validity of the exponential model.
Quadratic Functions	Language Arts	Students will read and interpret word problems based on real-life situations involving projectile motion. Students will express their solutions in written form and provide a justification for their process.
Data Analysis and Probability	Language Arts	Students will read and interpret word problems based on misleading statistics and graphs. Students will express their solutions in written form and provide a justification for their process.

Scope and Sequence/Pacing Guide:

Marking Period 1:
Goal A – Students will understand, interpret, and create relations and functions. (3-5 weeks)
Goal B – Students will write, graph, interpret, and analyze linear functions. (3-5 weeks)

Marking Period 2:
Goal C – Students will write, solve, and graph inequalities in one and two variables. (2-4 weeks)
Goal D – Students will determine the solution(s) that satisfy two linear equations or inequalities. (2-4 weeks)
Goal E – Students will graph, solve, and interpret absolute value equations in one and two variables. (2-4 weeks)

Marking Period 3:

Goal F – Students will graph exponential functions and apply them to real-world situations. (2-4 weeks)

Goal G – Students will use properties of exponents to add, subtract, and multiply monomial and polynomial expressions. (2-4 weeks)

Goal H – Students will graph quadratic functions and use various methods to solve quadratic equations. (2-4 weeks)

Marking Period 4:

Goal I – Students will graph square root functions and solve radical equations. (2-4 weeks)

Goal J – Students will identify types of functions and analyze graph transformations. (2-4 weeks)

Goal K – Students will solve problems using data analysis and probability. (2-4 weeks)

Standards: These are statements of the way in which you will know to what degree a student has achieved the goals and objectives of the course and to what degree the course has achieved its expected outcome.

A. **Student Evaluation Standards**

Pupil success and failure in the course will be evaluated based upon the professional judgment of the teacher according to the District grading policy and may consider the following:

1. Completion of written assignments prepared in the classroom or elsewhere
2. Oral contributions in class
3. Performance on oral and written tests and quizzes
4. Oral and written reports on materials read by the pupil
5. Laboratory or classroom projects
6. Authentic assessment
7. Other evidence of the pupil's constructive efforts and achievements in learning

B. **Course Evaluation Standards**

The goal is that all students pass the course. However, we recognize that student achievement is a result of a number of variables. We realize that some students may achieve more and some may fail. The following multiple measures will be considered in evaluating the effectiveness of the curriculum and the desired student achievement:

1. Program evaluation
2. Needs assessment (curriculum evaluation cycles)
3. Teacher observation
4. Teacher evaluation
5. Supervisor observation/evaluation
6. Grade distribution
7. State and national guidelines

Algebra Instruction Mapping:

Legend: I = Introduced D = Developed R = Reinforced

Goal and Objective	MP 1	MP 2	MP 3	MP 4
A. Relations & Functions				
1. Match simple graphs with situations	I,D	R	R	R
2. Graph a relationship	I,D	R	R	R
3. Identify and distinguish between relations and functions	I,D	R	R	R
4. Find the domain and range of relations and functions	I,D	R	R	R
5. Identify independent and dependent variables	I,D	R	R	R
6. Write an equation in function notation	I,D	R	R	R
7. Evaluate a function for given input values	I,D	R	R	R
8. Graph functions given a limited domain	I,D	R	R	R
9. Graph functions given a domain of all real numbers	I,D	R	R	R
B. Linear Functions				
1. Recognize and extend an arithmetic sequence	I,D	R	R	R
2. Find a given term of an arithmetic sequence	I,D	R	R	R
3. Identify linear functions and linear equations	I,D	R	R	R
4. Graph linear functions that represent real-world situations and give their domain and range	I,D	R	R	R
5. Find *x*- and *y*-intercepts and interpret their meanings in real-world situations	I,D	R	R	
6. Use *x*- and *y*-intercepts to graph lines	I,D	R	R	R
7. Find rates of change and slopes	I,D	R	R	R
8. Relate constant rate of change to the slope of a line	I,D	R	R	R
9. Find slope using the slope formula	I,D	R	R	R
10. Identify, write, and graph direct variation	I,D	R	R	R
11. Write a linear equation in slope-intercept form	I,D	R	R	R
12. Graph a line using slope-intercept form	I,D	R	R	R
13. Write a linear equation using point-slope form	I,D	R	R	R
14. Graph a line using point-slope form	I,D	R	R	R
15. Write a linear equation using two points	I,D	R	R	R
16. Identify and graph parallel and perpendicular lines	I,D	R	R	R
17. Write equations to describe lines parallel or perpendicular to a given line	I,D	R	R	R
18. Describe how changing slope and *y*-intercept affect the graph of a linear function	I,D	R	R	R
C. Inequalities				
1. Identify solutions of inequalities in one variable		I,D	R	R
2. Write and graph inequalities in one variable		I,D	R	R
3. Solve one-step inequalities in one variable using addition, subtraction, multiplication, or division		I,D	R	R
4. Solve two-step and multi-step inequalities in one variable		I,D	R	R
5. Solve inequalities with variables on both sides		I,D	R	R
6. Solve compound inequalities		I,D	R	R
7. Graph and solve linear inequalities in two variables		I,D	R	R
D. Systems of Linear Equations & Inequalities				

1. Identify solutions of systems of linear equations in two variables		I,D	R	R
2. Solve systems of linear equations in two variables by graphing		I,D	R	R
3. Solve systems of linear equations in two variables by substitution		I,D	R	R
4. Solve systems of linear equations in two variables by elimination		I,D	R	R
5. Compare and choose an appropriate method for solving systems of linear equations		I,D	R	R
6. Solve special systems of linear equations in two variables		I,D	R	R
7. Classify systems of linear equations and determine the number of solutions		I,D	R	R
8. Graph and solve systems of linear inequalities in two variables		I,D	R	R
E. Absolute Value				
1. Solve absolute value equations in one variable		I,D	R	R
2. Solve absolute value inequalities in one variable		I,D	R	R
3. Graph absolute value functions		I,D	R	R
F. Exponential Functions				
1. Recognize and extend geometric sequences			I,D	R
2. Find the *n*th term of a geometric sequence			I,D	R
3. Evaluate exponential functions			I,D	R
4. Identify and graph exponential functions			I,D	R
5. Solve problems involving exponential growth and decay			I,D	R
G. Polynomials				
1. Evaluate expressions containing zero and integer exponents			I,D	R
2. Simplify expressions containing zero and integer exponents			I,D	R
3. Use multiplication properties of exponents to evaluate and simplify expressions			I,D	R
4. Use division properties of exponents to evaluate and simplify expressions			I,D	R
5. Classify polynomials and write polynomials in standard form			I,D	R
6. Evaluate polynomial expressions			I,D	R
7. Add and subtract polynomials			I,D	R
8. Multiply polynomials			I,D	R
H. Quadratic Functions				
1. Identify quadratic functions			I,D	R
2. Graph a quadratic function			I,D	R
3. Identify important characteristics of a quadratic function, including domain and range, maximum or minimum values, vertex, axis of symmetry, and zeros			I,D	R
4. Solve quadratic equations by graphing			I,D	R

5. Factor polynomials using the greatest common factor			I,D	R
6. Factor quadratic trinomials			I,D	R
7. Solve quadratic equations by factoring			I,D	R
8. Solve quadratic equations using square roots			I,D	R
9. Solve simple quadratic equations by completing the square			I,D	R
10. Solve quadratic equations using the quadratic formula			I,D	R
I. Square Root Functions				
1. Identify square-root functions				I,D
2. Graph square-root functions				I,D
3. Simplify radical expressions				I,D
4. Add, subtract, multiply, and divide radical expressions				I,D
5. Solve radical equations				I,D
J. Graph Transformations				
1. Identify, write, and graph inverse variations				I,D
2. Identify linear, quadratic, absolute value, and exponential functions using a table, graph, equation, or situation				I,D
3. Relate graph transformations to changes in the corresponding equation				I,D
K. Data Analysis & Probability				
1. Choose a table or graph to display data				I,D
2. Create stem-and-leaf plots				I,D
3. Create frequency tables and histograms				I,D
4. Describe the central tendency of a data set				I,D
5. Create a box-and-whisker plot				I,D
6. Recognize misleading graphs				I,D
7. Recognize misleading statistics				I,D
8. Determine the experimental probability of an event				I,D
9. Use experimental probability to make predictions				I,D
10. Determine the theoretical probability of an event				I,D
11. Find the probability between independent and dependent events				I,D
12. Solve problems involving combinations and permutations				I,D

Resources:

NUMBER AND QUANTITY

<u>The Real Number System N-RN</u>

Extend the properties of exponents to rational exponents.

1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.*
2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Use properties of rational and irrational numbers.

3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

<u>Quantities★ N-Q</u>

Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
2. Define appropriate quantities for the purpose of descriptive modeling.
3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

<u>The Complex Number System N-CN</u>

Perform arithmetic operations with complex numbers.

1. Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.

2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
3. (+) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.

Represent complex numbers and their operations on the complex plane.

4. (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.
5. (+) Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. *For example,* $(-1 + \sqrt{3}\ i)^3 = 8$ *because* $(-1 + \sqrt{3}\ i)$ *has modulus* 2 *and argument* 120°.
6. (+) Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.

Use complex numbers in polynomial identities and equations.

7. Solve quadratic equations with real coefficients that have complex solutions.
8. (+) Extend polynomial identities to the complex numbers. *For example, rewrite* $x^2 + 4$ *as* $(x + 2i)(x - 2i)$.
9. (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

<u>Vector and Matrix Quantities N-VM</u>

Represent and model with vector quantities.

1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., $\boldsymbol{v}$, $|\boldsymbol{v}|$, $||\boldsymbol{v}||$, v).
2. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.
3. (+) Solve problems involving velocity and other quantities that can be represented by vectors.

Perform operations on vectors.

4. (+) Add and subtract vectors.
   a. Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes.
   b. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.
   c. Understand vector subtraction $\boldsymbol{v} - \boldsymbol{w}$ as $\boldsymbol{v} + (-\boldsymbol{w})$, where $-\boldsymbol{w}$ is the additive inverse of $\boldsymbol{w}$, with the same magnitude as $\boldsymbol{w}$ and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.
5. (+) Multiply a vector by a scalar.
   a. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(v\text{x}, v\text{y}) = (cv\text{x}, cv\text{y})$.
   b. Compute the magnitude of a scalar multiple $c\boldsymbol{v}$ using $||c\boldsymbol{v}|| = |c|v$. Compute the direction of $c\boldsymbol{v}$ knowing that when $|c|v \neq 0$, the direction of $c\boldsymbol{v}$ is either along $\boldsymbol{v}$ (for $c > 0$) or against $\boldsymbol{v}$ (for $c < 0$).

Perform operations on matrices and use matrices in applications.

6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.

7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.
8. (+) Add, subtract, and multiply matrices of appropriate dimensions.
9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.
10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.
11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.
12. (+) Work with 2×2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.

ALGEBRA

Seeing Structure in Expressions A-SSE

Interpret the structure of expressions

1. Interpret expressions that represent a quantity in terms of its context.★
   a. Interpret parts of an expression, such as terms, factors, and coefficients.
   b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)$n *as the product of P and a factor not depending on P.*
2. Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 – y^4$ *as* $(x^2)^2 – (y^2)^2$, *thus recognizing it as a difference of squares that can be factored as* $(x^2 – y^2)(x^2 + y^2)$.

Write expressions in equivalent forms to solve problems

3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★
   a. Factor a quadratic expression to reveal the zeros of the function it defines.
   b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
   c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression* 1.15t *can be rewritten as* (1.151/12)12*t* ≈ 1.01212t *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*
4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.*★

Arithmetic with Polynomials and Rational Expressions A-APR

Perform arithmetic operations on polynomials

1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

Understand the relationship between zeros and factors of polynomials

2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x – a$ is $p(a)$, so $p(a) = 0$ if and only if $(x – a)$ is a factor of $p(x)$.

3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Use polynomial identities to solve problems

4. Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ *can be used to generate Pythagorean triples.*
5. (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.[1]

[1]The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.

Rewrite rational expressions

6. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.
7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

<u>Creating Equations★ A-CED</u>

Create equations that describe numbers or relationships

1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*

<u>Reasoning with Equations and Inequalities A-REI</u>

Understand solving equations as a process of reasoning and explain the reasoning

1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Solve equations and inequalities in one variable

3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

4. Solve quadratic equations in one variable.
   a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x-p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
   b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.

Solve systems of equations

5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line* $y = -3x$ and the circle $x^2 + y^2 = 3$.
8. (+) Represent a system of linear equations as a single matrix equation in a vector variable.
9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3×3 or greater).

Represent and solve equations and inequalities graphically

10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★
12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

FUNCTIONS

<u>Interpreting Functions F-IF</u>

Understand the concept of a function and use function notation

1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by* $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ *for* $n \geq 1$.

Interpret functions that arise in applications in terms of the context

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*★
5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*★
6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★

Analyze functions using different representations

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★
   a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
   b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
   c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
   d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
   e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
   a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
   b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, *and classify them as representing exponential growth or decay.*
9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

Building Functions F-BF

Build a function that models a relationship between two quantities

1. Write a function that describes a relationship between two quantities.★
   a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
   b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*
   c. (+) Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.*

2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.★

Build new functions from existing functions

3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*
4. Find inverse functions.
   a. Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse. *For example,* $f(x) = x^3$ *or* $f(x) = (x+1)/(x–1)$ *for* $x \neq 1$.
   b. (+) Verify by composition that one function is the inverse of another.
   c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.
   d. (+) Produce an invertible function from a non-invertible function by restricting the domain.
5. (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

<u>Linear, Quadratic, and Exponential Models★ F-LE</u>

Construct and compare linear, quadratic, and exponential models and solve problems

1. Distinguish between situations that can be modeled with linear functions and with exponential functions.
   a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
   b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
   c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
4. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

Interpret expressions for functions in terms of the situation they model

5. Interpret the parameters in a linear or exponential function in terms of a context.

<u>Trigonometric Functions F-TF</u>

Extend the domain of trigonometric functions using the unit circle

1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi-x$, $\pi+x$, and $2\pi-x$ in terms of their values for x, where x is any real number.
4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

Model periodic phenomena with trigonometric functions

5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★
6. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.★

Prove and apply trigonometric identities

8. Prove the Pythagorean identity sin2(θ) + cos2(θ) = 1 and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle.
9. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

GEOMETRY

<u>Congruence G-CO</u>

Experiment with transformations in the plane

1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

Understand congruence in terms of rigid motions

6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Prove geometric theorems

9. Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.*
10. Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*
11. Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*

Make geometric constructions

12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.*
13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

<u>Similarity, Right Triangles, and Trigonometry G-SRT</u>

Understand similarity in terms of similarity transformations

1. Verify experimentally the properties of dilations given by a center and a scale factor:
   a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
   b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
2. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

Prove theorems involving similarity

4. Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.*
5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Define trigonometric ratios and solve problems involving right triangles

6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
7. Explain and use the relationship between the sine and cosine of complementary angles.
8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.★

Apply trigonometry to general triangles

9. (+) Derive the formula $A = 1/2\ ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.
11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

<u>Circles G-C</u>

Understand and apply theorems about circles

1. Prove that all circles are similar.
2. Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*
3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
4. (+) Construct a tangent line from a point outside a given circle to the circle.

Find arc lengths and areas of sectors of circles

5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

<u>Expressing Geometric Properties with Equations G-GPE</u>

Translate between the geometric description and the equation for a conic section

1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
2. Derive the equation of a parabola given a focus and directrix.
3. (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.

Use coordinates to prove simple geometric theorems algebraically

4. Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, $\sqrt{3}$) lies on the circle centered at the origin and containing the point (0, 2).*
5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.★

<u>Geometric Measurement and Dimension G-GMD</u>

Explain volume formulas and use them to solve problems

1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*
2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.
3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.★

Visualize relationships between two-dimensional and three-dimensional objects

4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

<u>Modeling with Geometry G-MG</u>

Apply geometric concepts in modeling situations

1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★
2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).★
3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★

STATISTICS AND PROBABILITY

<u>Interpreting Categorical and Quantitative Data S-ID</u>

Summarize, represent, and interpret data on a single count or measurement variable

1. Represent data with plots on the real number line (dot plots, histograms, and box plots).
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Summarize, represent, and interpret data on two categorical and quantitative variables

5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
   a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.*
   b. Informally assess the fit of a function by plotting and analyzing residuals.
   c. Fit a linear function for a scatter plot that suggests a linear association.

Interpret linear models

7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
8. Compute (using technology) and interpret the correlation coefficient of a linear fit.
9. Distinguish between correlation and causation.

<u>Making Inferences and Justifying Conclusions S-IC</u>

Understand and evaluate random processes underlying statistical experiments

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*

Make inferences and justify conclusions from sample surveys, experiments, and observational studies

3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
6. Evaluate reports based on data.

<u>Conditional Probability and the Rules of Probability S-CP</u>

Understand independence and conditional probability and use them to interpret data

1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
3. Understand the conditional probability of A given B as $P(A \text{ and } B)/P(B)$, and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.
4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.*
5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*

Use the rules of probability to compute probabilities of compound events in a uniform probability model

6. Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A,* and interpret the answer in terms of the model.
7. Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.
8. (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.
9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.

<u>Using Probability to Make Decisions S-MD</u>

Calculate expected values and use them to solve problems

1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.
2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. *For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.*
4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. *For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?*

Use probability to evaluate outcomes of decisions

5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.
    a. Find the expected payoff for a game of chance. *For example, find the expected winnings from a state lottery ticket or a game at a fastfood restaurant.*
    b. Evaluate and compare strategies on the basis of expected values. *For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.*
6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).
7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

Curriculum Correlation to NJ State Standards for Mathematics

This chart contains a reference to pertinent NJ State Standards for Mathematics. These standards and their associated domains can be identified by using an alpha numeric code. An example of the code would be A-REI 1. This refers to the conceptual category Algebra (A), the domain Reasoning with Equations and Inequalities (REI), standard 1. Additionally, course goals and objectives directly related to these standards are referenced in the right hand column using the following code: Letter# (i.e. A1) refers to Goal A and Objective 1 as written in Part III- Goals and Objectives of this document.

Legend:
Non-shaded box = concept or skill mastered during course of study
Light gray box = concept or skill introduced and developed throughout course of study
Dark gray box = concept or skill introduced

Standard	Brief Description	C
		Introduce d
N-RN	The Real Number System	
N-Q	Quantities	
N-CN	The Complex Number System	
N-VM	Vector and Matrix Quantities	
A-SSE	Seeing Structure in Expressions	
A-APR	Arithmetic with Polynomials and Rational Expressions	
A-CED	Creating Equations	
A-REI	Reasoning with Equations and Inequalities	
F-IF	Interpreting Functions	
F-BF	Building Functions	
F-LE	Linear, Quadratic, and Exponential Models	
F-TF	Trigonometric Functions	
G-CO	Congruence	
G-SRT	Similarity, Right Triangles, and Trigonometry	
G-C	Circles	
G-GPE	Expressing Geometric Properties with Equations	
G-GMD	Geometric Measurement and Dimension	
G-MG	Modeling with Geometry	
S-ID	Interpreting Categorical and Quantitative Data	
S-IC	Making Inferences and Justifying Conclusions	
S-CP	Conditional Probability and the Rules of Probability	
S-MD	Using Probability to Make Decisions	

Course Curriculum Map for Algebra 1

	Relations & Functions
Duration	**3 weeks**
Essential Questions	• How can a correlation between two variables be used to make predictions?
Content	• Relations • Functions • Domain and Range • Independent and Dependent Variables • Function Notation
Skills	• Match simple graphs with situations • Graph a relationship • Identify and distinguish between relations and functions • Find the domain and range of relations and functions • Identify independent and dependent variables • Write an equation in function notation • Evaluate a function for given input values • Graph functions given a limited domain • Graph functions given a domain of all real numbers
Assessments	• Quiz • Test • Graphing Calculator Activity • Homework • Classwork

21st Century Skills

x	Global Awareness	x	Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
	Creativity and Innovation	x	Critical Thinking and Problem Solving	x	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

Course Curriculum Map for Algebra 1

	Linear Functions
Duration	**6 weeks**
Essential Questions	• How can linear functions be used to represent real-world problems? • How do changes in slope and y-intercept affect the graph of a linear function?
Content	• Arithmetic Sequences • Domain and Range • x- and y-intercepts • Rate of Change • Slope • Direct Variation • Slope-Intercept Form • Point-Slope Form • Parallel Lines • Perpendicular Lines
Skills	• Recognize and extend an arithmetic sequence • Find a given term of an arithmetic sequence • Identify linear functions and linear equations • Graph linear functions that represent real-world situations and give their domain and range • Find x- and y-intercepts and interpret their meanings in real-world situations • Use x- and y-intercepts to graph lines • Find rates of change and slopes • Relate constant rate of change to the slope of a line • Find slope using the slope formula • Identify, write, and graph direct variation • Write a linear equation in slope-intercept form • Graph a line using slope-intercept form • Write a linear equation using point-slope form • Graph a line using point-slope form • Write a linear equation using two points • Identify and graph parallel and perpendicular lines • Write equations to describe lines parallel or perpendicular to a given line • Describe how changing slope and y-intercept affect the graph of a linear function
Assessments	• Quiz • Test • Graphing Calculator Activity • Homework • Classwork • Benchmark #1

21st Century Skills

x	Global Awareness	x	Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy	x	Health Literacy

	Creativity and Innovation	x	Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy	x	ICT Literacy	x	Life and Career Skills		

Course Curriculum Map for Algebra 1

	Inequalities
Duration	**3 weeks**
Essential Questions	• How can linear inequalities be useful in business applications? • How are the solutions to an inequality represented differently from the solutions of a linear equation?
Content	• Inequalities in One Variable • Compound Inequalities • Graphing Linear Inequalities
Skills	• Identify solutions of inequalities in one variable • Write and graph inequalities in one variable • Solve one-step inequalities in one variable using addition, subtraction, multiplication, or division • Solve two-step and multi-step inequalities in one variable • Solve inequalities with variables on both sides • Solve compound inequalities • Graph and solve linear inequalities in two variables
Assessments	• Quiz • Test • Homework • Classwork

21st Century Skills

	Global Awareness	x	Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
	Creativity and Innovation	x	Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy	x	ICT Literacy		Life and Career Skills		

Course Curriculum Map for Algebra 1

	Systems of Linear Equations & Inequalities
Duration	**3 weeks**
Essential Questions	• How can systems of linear equations and inequalities be useful tools in decision-making? • How can the number of solutions to a system of equations be determined using a graph? • How are the solutions to a system of inequalities represented differently than the solutions to a system of equations?
Content	• Solving Systems by Graphing • Solving Systems by Substitution • Solving Systems by Elimination • Inconsistent Systems • Consistent Dependent Systems • Graph Systems of Linear Inequalities
Skills	• Identify solutions of systems of linear equations in two variables • Solve systems of linear equations in two variables by graphing • Solve systems of linear equations in two variables by substitution • Solve systems of linear equations in two variables by elimination • Compare and choose an appropriate method for solving systems of linear equations • Solve special systems of linear equations in two variables • Classify systems of linear equations and determine the number of solutions • Graph and solve systems of linear inequalities in two variables
Assessments	• Quiz • Test • Graphing Calculator Activity • Homework • Classwork

21st Century Skills

x	Global Awareness	x	Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
	Creativity and Innovation	x	Critical Thinking and Problem Solving	x	Communication and Collaboration		Information Literacy
	Media Literacy	x	ICT Literacy		Life and Career Skills		

Course Curriculum Map for Algebra 1

	Absolute Value
Duration	**3 weeks**
Essential Questions	• How are absolute value equations, inequalities, and functions related to linear equations, inequalities, and functions? • How does the nature of an absolute value graph relate to its definition of distance from zero?
Content	• Absolute Value • Solving Equations • Solving Inequalities • Graphing Functions
Skills	• Solve absolute value equations in one variable • Solve absolute value inequalities in one variable • Graph absolute value functions
Assessments	• Quiz • Test • Homework • Classwork • Benchmark #2

21st Century Skills

	Global Awareness	x	Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
	Creativity and Innovation	x	Critical Thinking and Problem Solving	x	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

Course Curriculum Map for Algebra 1

	Exponential Functions
Duration	**3 weeks**
Essential Questions	• How can exponential functions be used to model wildlife population changes? • How does the size of a given exponent affect a function graphically?
Content	• Geometric Sequences • Exponential Functions • Exponential Growth and Decay
Skills	• Recognize and extend geometric sequences • Find the *n*th term of a geometric sequence • Evaluate exponential functions • Identify and graph exponential functions • Solve problems involving exponential growth and decay
Assessments	• Quiz • Test • Graphing Calculator Activity • Homework • Classwork

21st Century Skills

x	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
	Creativity and Innovation	x	Critical Thinking and Problem Solving	x	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

Course Curriculum Map for Algebra 1

	Polynomials
Duration	**3 weeks**
Essential Questions	• How can polynomials be useful in solving problems involving area? • How are the properties of exponents useful in simplifying polynomial expressions?
Content	• Integer Exponents • Properties of Exponents • Polynomial Classification • Adding, Subtracting, and Multiplying Polynomials
Skills	• Evaluate expressions containing zero and integer exponents • Simplify expressions containing zero and integer exponents • Use multiplication properties of exponents to evaluate and simplify expressions • Use division properties of exponents to evaluate and simplify expressions • Classify polynomials and write polynomials in standard form • Evaluate polynomial expressions • Add and subtract polynomials • Multiply polynomials
Assessments	• Quiz • Test • Homework • Classwork

21st Century Skills

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
x	Creativity and Innovation	x	Critical Thinking and Problem Solving	x	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

Course Curriculum Map for Algebra 1

	Quadratic Functions
Duration	**5 weeks**
Essential Questions	• How can quadratic functions be used to model the motion of falling objects and projectiles? • How can expressing quadratic functions in different forms provide information about important characteristics of the graph?
Content	• Quadratic Functions • Domain and range • Maximum and Minimum Values • Vertex • Axis of Symmetry • Zeros of a Function • Greatest Common Factor • Factoring Trinomials • Solving Quadratic Equations
Skills	• Identify quadratic functions • Graph quadratic functions • Identify important characteristics of a quadratic function, including domain and range, maximum or minimum values, vertex, axis of symmetry, and zeros • Solve quadratic equations by graphing • Factor polynomials using the greatest common factor • Factor quadratic trinomials • Solve quadratic equations by factoring • Solve quadratic equations using square roots • Solve simple quadratic equations by completing the square • Solve quadratic equations using the quadratic formula
Assessments	• Quiz • Test • Graphing Calculator Activity • Homework • Classwork

21st Century Skills

	Global Awareness	x	Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
	Creativity and Innovation	x	Critical Thinking and Problem Solving	x	Communication and Collaboration		Information Literacy
	Media Literacy	x	ICT Literacy	x	Life and Career Skills		

Course Curriculum Map for Algebra 1

	Square Root Functions
Duration	**2 weeks**
Essential Questions	• How are square root functions useful in solving problems in astronomy and geology? • How are operations with radical expressions related to combining like terms in a polynomial expression?
Content	• Square-root functions • Simplifying Radical Expressions • Adding, Subtracting, Multiplying, and Dividing Radical Expressions • Solving Radical Equations
Skills	• Identify square-root functions • Graph square-root functions • Simplify radical expressions • Add, subtract, multiply, and divide radical expressions • Solve radical equations
Assessments	• Quiz • Test • Graphing Calculator Activity • Homework • Classwork

21st Century Skills

x	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
	Creativity and Innovation	x	Critical Thinking and Problem Solving	x	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

Course Curriculum Map for Algebra 1

	Graph Transformations
Duration	**2 weeks**
Essential Questions	• How can changes in an equation be used to make predictions about the behavior of a graph?
Content	• Inverse Variation • Linear Functions • Quadratic Functions • Absolute Value Functions • Exponential Functions • Tables, Graphs, Equations, and Situations
Skills	• Identify, write, and graph inverse variations • Identify linear, quadratic, absolute value, and exponential functions using a table, graph, equation, or situation • Relate graph transformations to changes in the corresponding equation
Assessments	• Quiz • Test • Graphing Calculator Activity • Homework • Classwork

21st Century Skills

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
x	Creativity and Innovation	x	Critical Thinking and Problem Solving	x	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy	x	Life and Career Skills		

Course Curriculum Map for Algebra 1

	Data Analysis & Probability
Duration	**2 weeks**
Essential Questions	• How do researchers use data analysis and probability to gather information and make decisions?
Content	• Data Displays • Central Tendency • Misleading Graphs and Statistics • Experimental Probability • Theoretical Probability • Independent and Dependent Events • Combinations and Permutations
Skills	• Choose a table or graph to display data • Create stem-and-leaf plots • Create frequency tables and histograms • Describe the central tendency of a data set • Create a box-and-whisker plot • Recognize misleading graphs • Recognize misleading statistics • Determine the experimental probability of an event • Use experimental probability to make predictions • Determine the theoretical probability of an event • Find the probability between independent and dependent events • Solve problems involving combinations and permutations
Assessments	• Quiz • Test • Homework • Classwork

21st Century Skills

x	Global Awareness	x	Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
	Creativity and Innovation		Critical Thinking and Problem Solving	x	Communication and Collaboration	x	Information Literacy
x	Media Literacy		ICT Literacy	x	Life and Career Skills		

Guide to Best Practice Instructional Strategies

Marzano's Nine Instructional Categories Divided into Specific Behaviors

General Instructional Category	Specific Behaviors
1. Identifying similarities and differences	*assigning in-class and homework tasks that involve comparison and classification *assigning in-class and homework tasks that involve metaphors and analogies
2. Summarizing and note taking	*asking students to generate verbal summaries *asking students to generate written summaries *asking students to take notes *asking students to revise their notes, correcting errors and adding information
3. Reinforcing effort and providing recognition	*recognizing and celebrating progress toward learning goals throughout a unit *recognizing and reinforcing the importance of effort *recognizing and celebrating progress toward learning goals at the end of a unit
4. Homework and practice	*providing specific feedback on all assigned homework *assigning homework for the purpose of students practicing skills and procedures that have been the focus of instruction
5. Nonlinguistic representations	*asking students to generate mental images representing content *asking students to draw pictures or pictographs representing content *asking students to construct graphic organizers representing content *asking students to act out content *asking students to make physical models of content *asking students to make revisions in their mental images, pictures, pictographs, graphic organizers, and physical models
6. Cooperative Learning	*organizing students in cooperative groups when appropriate *organizing students in ability groups when appropriate
7. Setting objectives and providing feedback	*setting specific learning goals at the beginning of a unit *asking students to set their own learning goals at the beginning of a unit *providing feedback on learning goals throughout the unit *asking students to keep track of their progress on learning goals *providing summative feedback at the end of a unit *asking students to assess themselves at the end of a unit
8. Generating and testing hypotheses	*engaging students in projects that involve generating and testing hypotheses through problem solving tasks *engaging students in projects that involve generating and testing hypotheses through decision making tasks *engaging students in projects that involve generating and testing hypotheses through investigation tasks *engaging students in projects that involve generating and testing hypotheses through experimental inquiry tasks *engaging students in projects that involve generating and testing hypotheses through systems analysis tasks *engaging students in projects that involve generating and testing hypotheses through invention tasks
9. Questions, cues, and advance organizers	*prior to presenting new content, asking questions that help students recall what they might already know about the content *prior to presenting new content, providing students with direct links with what they have studied previously *prior to presenting new content, providing ways for students to organize or think about the content

BEST PRACTICE MATH

RECOMMENDATIONS ON TEACHING MATHEMATICS

Increase	*Decrease*
TEACHING PRACTICES	**TEACHING PRACTICES**
Use of manipulative materials	Rote practice
Cooperative group work	Rote memorization of rules and formulas
Discussion of mathematics	Teaching by telling
Questioning and making conjectures	Single answers and single methods to find answers
Justification of thinking	Stressing memorization instead of understanding
Writing about mathematics	Repetitive written practice
Problem-solving approach to instruction	Use of drill worksheets
Content integration	Teaching computation out of context
Use of calculators and computers	Reliance on paper and pencil calculations
Being a facilitator of learning	Being the dispenser of knowledge
Assessing learning as an integral part of instruction	Testing for grades only
PROBLEM SOLVING	**PROBLEM SOLVING**
Word problems with a variety of structures and solution paths	Use of cue words to determine operation to be used
Everyday problems and applications	
Problem-solving strategies (especially representational strategies)	Practicing problems categorized by type
Open-ended problems and extended problem-solving projects	Practicing routine, one-step problems
Investigating and formulating questions from problem situations	
CREATING REPRESENTATIONS	**CREATING REPRESENTATIONS**
Creating one's own representations that make sense	Copying conventional representations without understanding
Creating multiple representations of the same problem or situation	Reliance on a few representations
Translating between representations of the same problem or situation	
Representations using electronic technology	
Using representations to make the abstract ideas more concrete	Premature introduction of highly abstract representations
Using representations to build understanding of concepts through reflection	Forms of representations as an end product or goal
Sharing representations to communicate ideas	
COMMUNICATING MATH IDEAS	**COMMUNICATING MATH IDEAS**
Discussing mathematics	Doing fill-in-the-blank worksheets
Reading mathematics	Answering questions that need only yes or no responses
Writing mathematics	
Listening to mathematical ideas	Answering questions that need only numerical responses

Increase	*Decrease*
REASONING AND PROOF	**REASONING AND PROOF**
Drawing logical conclusions	Relying on authorities (teacher, answer key)
Justifying answers and solution processes	
Reasoning inductively and deductively	
MAKING CONNECTIONS	**MAKING CONNECTIONS**
Connecting mathematics to other subjects and to the real world	Learning isolated topics
Connecting topics within mathematics	Developing skills out of context
Applying mathematics	
NUMBERS/OPERATIONS/COMPUTATION	**NUMBERS/OPERATIONS/COMPUTATION**
Developing number and operation sense	Early use of symbolic notation
Understanding the meaning of key concepts such as place value, fractions, decimals, ratios, proportions, and percents	Memorizing rules and procedures without
Various estimation strategies	
Thinking strategies for basic facts	
Using calculators for complex calculations	Complex and tedious paper-and-pencil computations
GEOMETRY/MEASUREMENT	**GEOMETRY/MEASUREMENT**
Developing spatial sense	Memorizing facts and relationships
Actual measuring and exploring the concepts related to units of measure	Memorizing equivalencies between units or measure
Using geometry in problem solving	Memorizing geometric formulas
STATISTICS/PROBABILITY	**STATISTICS/PROBABILITY**
Collecting and organizing data	Memorizing formulas
Using statistical methods to describe, analyze, evaluate, and make decisions	
ALGEBRA	**ALGEBRA**
Recognizing and describing patterns	Manipulating symbols
Identifying and using functional relationships	Memorizing procedures
Developing and using tables, graphs, and rules to describe situations	
Using variables to express relationships	
ASSESSMENT	**ASSESSMENT**
Making assessment an integral part of teaching	Having assessment be simply counting correct answers on tests for the sole purpose of assigning Grades
Focusing on a broad range of mathematical skills	Focusing on a large number of specific and isolated
Tasks and taking a holistic view of mathematics	
Developing problem situations that require applications of a number of mathematical ideas	Using exercises or word problems requiring only one or two skills
Using multiple assessment techniques, including written, oral, and demonstration formats	Using only written tests

Benchmark Assessments

Benchmark 1

Directions
You may NOT use a calculator in this section. When you have finished this section, you may check over your work in this section only. All solutions are to be recorded in the answer document. Please do not write on the question pages.

1. What is the simplest form of the expression $4^3 \div 8 + 8$?

   A. 16
   B. 4
   C. 2
   D. $\frac{3}{4}$

2. What is the value of $6x^2 - 13$ for $x = 2$?

   A. –54
   B. 11
   C. 37
   D. 131

3. Which ordered pair is a solution to the equation $y = -9x$?

   A. (1,9)
   B. (–3,27)
   C. (–4,–36)
   D. (–2,18)

4. What is the solution of $-21 = n - 8$?

   A. $n = -168$
   B. $n = -29$
   C. $n = -13$
   D. $n = 168$

5. A map has a scale of 1 in : 25 mi. Two cities are 175 mi apart. How far apart are they on the map?

6. The equation $2w + 5j = 60$ is used to determine the number of water bottles w and the number of juice bottles j that can be bought for \$60. If you purchase 4 bottles of juice, how many bottles of water can you buy?

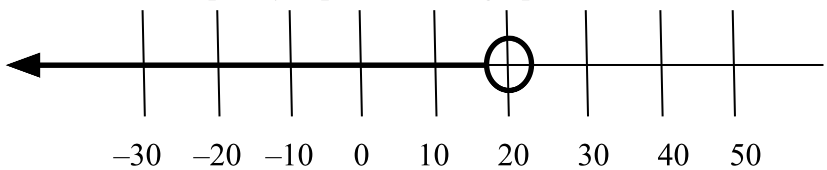
A. 10 C. 20
B. 15 D. 25

7. Solve the proportion $\frac{15t}{5} = \frac{2t+3}{6}$

A. 0.03
B. 0.1875
C. 0.0375
D. 0.15

8. **Leave this answer blank and move to the next question.**

9. Which inequality represents the graph below?



A. $x < 20$

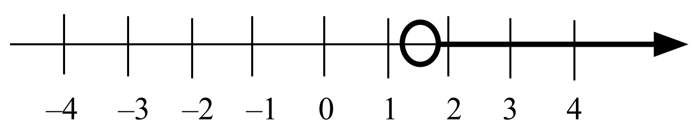
B. $x \leq 20$

C. $x > 20$

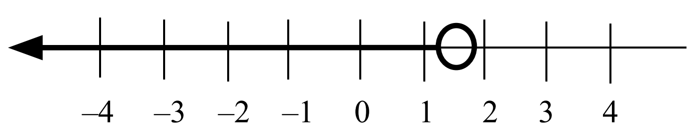
D. $x \geq 20$

10. Solve the inequality and graph its solution on a number line: $5x + 3 < 3(x + 2)$

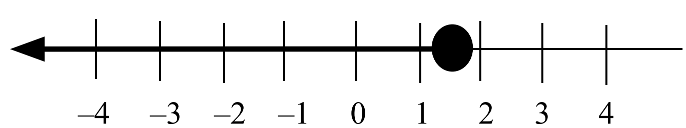
A. $x > \frac{3}{2}$

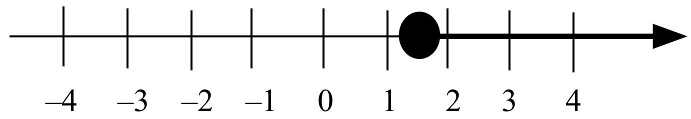


B. $x < \frac{3}{2}$



C. $x \leq \frac{3}{2}$



D. $x \geq \dfrac{3}{2}$ 

11. Solve the inequality and check your answer: $8 + 6n \geq 2$ or $-10n \geq 50$

12. What are the solutions of $|2x + 3| > 4$?

A. $x > -3\frac{1}{2}$ or $x > \frac{1}{2}$

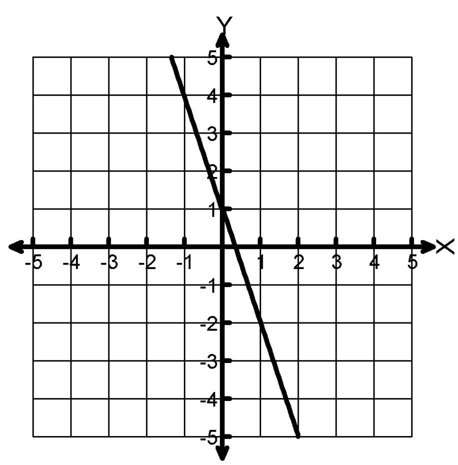
B. $x < -3\frac{1}{2}$ or $x > \frac{1}{2}$

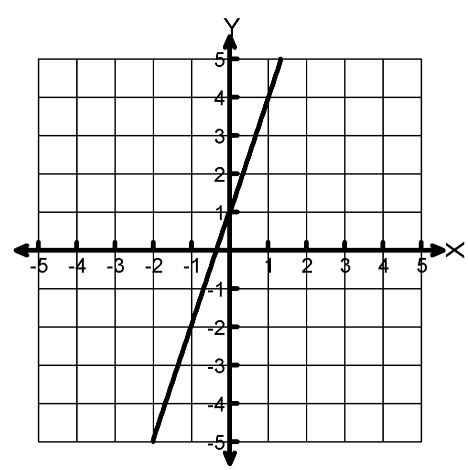
C. $x > -3\frac{1}{2}$ or $x < \frac{1}{2}$

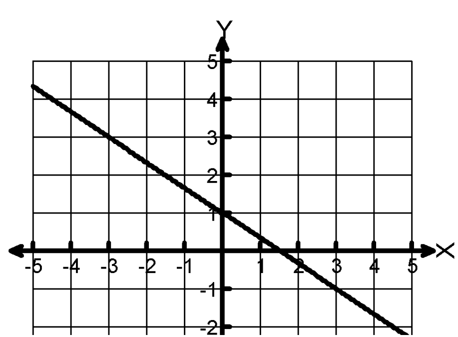
D. $x < -3\frac{1}{2}$ or $x > -3\frac{1}{2}$

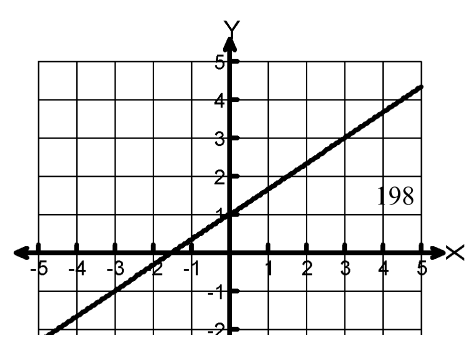
13. Which graph represents the table below?

x	–1	0	1
y	4	1	–2

A. 

B. 

C. 

D. 

Choose only <u>one</u> of the following two questions for your extended response:

14. A water tank that holds 60 L of water can be emptied in 24 minutes. How long will it take to empty a water tank that holds 280 L of water?

15. An internet café charges \$2.75 to use a computer and \$0.35 per minute while accessing the Internet. What is the cost of using the Internet for 28 minutes?

<u>Benchmark 2</u>

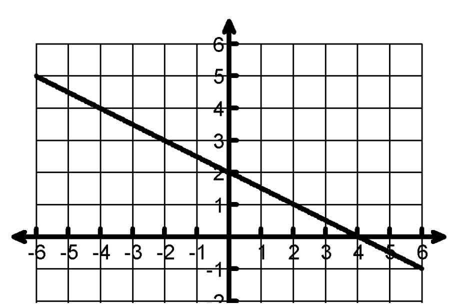
1. Which is a solution to $2x + 3y = 12$?

A. (0,–4)
B. (4,0)
C. (6,0)
D. (0,6)

2. Find the slope and the y-intercept for $y = \frac{1}{2}x + 4$.

A. slope = 0, y-intercept = $\frac{1}{2}$
B. slope = $\frac{1}{2}$, y-intercept = 4
C. slope = 4, y-intercept = $\frac{1}{2}$
D. slope = 2, y-intercept = 3

3. Which equation best matches the graph?



A. $y = 2x + 4$

B. $y = \frac{1}{2}x + 2$

C. $y = -\frac{1}{2}x + 2$

D. $y = -2x + 2$

4. Find the equation of the line with a slope of –2 and passes through (–3,1).

A. $y = -2x + 7$
B. $y = -2x - 3$
C. $y = -2x + 1$
D. $y = -2x + 5$

5. Find the slope and y-intercept of the line $3x - 7y = 28$.

A. $m = 3$, $b = -4$
B. $m = 3$, $b = 28$
C. $m = \frac{3}{7}$, $b = -4$
D. $m = \frac{7}{3}$, $b = -4$

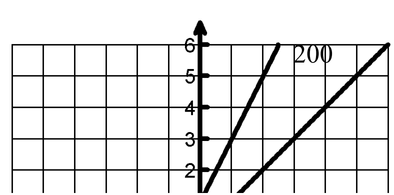
6. Which of the following describes the graph?

A. $y \geq -2x - 2$

B. $y \leq -3x - 2$

C. $y \geq 3x - 2$

D. $y \leq 3x - 2$



7. Which of the following describes the solution to the system?

A. (–1,–1)

B. (1,1)

C. (0,1)

D. (1,0)

8. Which shows the solution set of $\begin{cases} y \le x + 2 \\ y > 1 - x \end{cases}$

A.

B.

C.

D.

9. Write the range of the function {(–1,1), (0,0), (1,0), (2,6)}

A. {0,1,2,3,4,5,6}
B. {–1,0,1,2}
C. {(–1,1),(1,1)}
D. {0,1,6}

10. Given $f(x) = 4 - 8x$, evaluate $f(0)$:

A. 0
B. 2
C. 8
D. 4

11. The length of a rectangle is twice the width. The perimeter is 18 inches. Find the dimensions of the rectangle.

NJSLS for Math and Revised Standards Resource for Grades K-8

https://www.nj.gov/education/cccs/2016/math/crosswalk.pdf

https://www.nj.gov/education/cccs/2016/math/

Math Grades K-8 NJSLA

1 Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2 Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3 Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the

data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4 Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5 Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6 Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful

about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7 Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8 Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction.

The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word "understand" are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices.

In this respect, those content standards, which set an expectation of understanding, are potential "points of intersection" between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

Mathematics | Kindergarten

In Kindergarten, instructional time should focus on two critical areas: (1) representing and comparing whole numbers, initially with sets of objects; (2) describing shapes and space. More learning time in Kindergarten should be devoted to number than to other topics.

(1) Students use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets or numerals; and modeling simple joining and separating situations with sets of objects, or eventually with equations such as 5 + 2 = 7 and 7 – 2 = 5. (Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required.) Students choose, combine, and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects, counting and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away.

(2) Students describe their physical world using geometric ideas (e.g., shape, orientation, spatial relations) and vocabulary. They identify, name, and describe basic two-dimensional shapes, such as squares, triangles, circles, rectangles, and hexagons, presented in a variety of ways (e.g., with different sizes and orientations), as well as three-dimensional shapes such as cubes, cones, cylinders, and spheres. They use basic shapes and spatial reasoning to model objects in their environment and to construct more complex shapes.

Grade K Overview

Counting and Cardinality

- Know number names and the count sequence.
- Count to tell the number of objects.
- Compare numbers.

Operations and Algebraic Thinking

- Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

Number and Operations in Base Ten

- Work with numbers 11–19 to gain foundations for place value.

Measurement and Data

- Describe and compare measurable attributes.
- Classify objects and count the number of objects in categories.

Geometry

- Identify and describe shapes.
- Analyze, compare, create, and compose shapes.

Counting and Cardinality — K.CC

A. Know number names and the count sequence.

1. Count to 100 by ones and by tens.
2. Count forward beginning from a given number within the known sequence (instead of having to begin at 1).
3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).

B. Count to tell the number of objects.

4. Understand the relationship between numbers and quantities; connect counting to cardinality.

a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.

b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.

c. Understand that each successive number name refers to a quantity that is one larger.

5. Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.

C. Compare numbers.

6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.[1]

7. Compare two numbers between 1 and 10 presented as written numerals.

Operations and Algebraic Thinking K.OA

A. Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

1. Represent addition and subtraction up to 10 with objects, fingers, mental images, drawings[2], sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.

2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

3. Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).

4. For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.

5. Demonstrate fluency for addition and subtraction within 5.

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[1] Include groups with up to ten objects.

[2] Drawings need not show details, but should show the mathematics in the problem.

(This applies wherever drawings are mentioned in the Standards.)

Number and Operations in Base Ten K.NBT

A. Work with numbers 11–19 to gain foundations for place value.

1. Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (e.g., 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

Measurement and Data — K.MD

A. Describe and compare measurable attributes.

1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
2. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.*

B. Classify objects and count the number of objects in each category.

3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.[3]

Geometry — K.G

A. Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.
2. Correctly name shapes regardless of their orientations or overall size.
3. Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid").

B. Analyze, compare, create, and compose shapes.

4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length).
5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.
6. Compose simple shapes to form larger shapes. *For example, "Can you join these two triangles with full sides touching to make a rectangle?"*

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[3] Limit category counts to be less than or equal to 10.

Mathematics | Grade 1

In Grade 1, instructional time should focus on four critical areas: (1) developing understanding of addition, subtraction, and strategies for addition and subtraction within 20; (2) developing understanding of whole number relationships and place value, including grouping in tens and ones; (3) developing understanding of linear measurement and measuring lengths as iterating length units; and (4) reasoning about attributes of, and composing and decomposing geometric shapes.

(1) Students develop strategies for adding and subtracting whole numbers based on their prior work with small numbers. They use a variety of models, including discrete objects and length-based models (e.g., cubes connected to form lengths), to model add-to, take-from, put-together, take-apart, and compare situations to develop meaning for the operations of addition and subtraction, and to develop strategies to solve arithmetic problems with these operations. Students understand connections between counting and addition and subtraction (e.g., adding two is the same as counting on two). They use properties of addition to add whole numbers and to create and use increasingly sophisticated strategies based on these properties (e.g., "making tens") to solve addition and subtraction problems within 20. By comparing a variety of solution strategies, children build their understanding of the relationship between addition and subtraction.

(2) Students develop, discuss, and use efficient, accurate, and generalizable methods to add within 100 and subtract multiples of 10. They compare whole numbers (at least to 100) to develop understanding of and solve problems involving their relative sizes. They think of whole numbers between 10 and 100 in terms of tens and ones (especially recognizing the numbers 11 to 19 as composed of a ten and some ones). Through activities that build number sense, they understand the order of the counting numbers and their relative magnitudes.

(3) Students develop an understanding of the meaning and processes of measurement, including underlying concepts such as iterating (the mental activity of building up the length of an object with equal-sized units) and the transitivity principle for indirect measurement.[1]

(4) Students compose and decompose plane or solid figures (e.g., put two triangles together to make a quadrilateral) and build understanding of part-whole relationships as well as the properties of the original and composite shapes. As they combine shapes, they recognize them from different perspectives and orientations, describe their geometric attributes, and determine how they are alike and different, to develop the background for measurement and for initial understandings of properties such as congruence and symmetry.

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[1] **Students should apply the principle of transitivity of measurement to make indirect comparisons, but they need not use this technical term.**

Grade 1 Overview

Operations and Algebraic Thinking

- **Represent and solve problems involving addition and subtraction.**

- **Understand and apply properties of operations and the relationship between addition and subtraction.**
- **Add and subtract within 20.**
- **Work with addition and subtraction equations.**

Number and Operations in Base Ten

- **Extend the counting sequence.**
- **Understand place value.**
- **Use place value understanding and properties of operations to add and subtract.**

Measurement and Data

- **Measure lengths indirectly and by iterating length units.**
- **Tell and write time.**
- **Represent and interpret data.**

Geometry

- **Reason with shapes and their attributes.**

Operations and Algebraic Thinking 1.OA

A. Represent and solve problems involving addition and subtraction.

1. **Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.[2]**
2. **Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.**

B. Understand and apply properties of operations and the relationship between addition and subtraction.

3. **Apply properties of operations as strategies to add and subtract.[3]** ***Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)*** ***{Students need not use formal terms for these properties}***
4. **Understand subtraction as an unknown-addend problem.** ***For example, subtract 10 – 8 by finding the number that makes 10 when added to 8.***

C. Add and subtract within 20.

5. **Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).**
6. **Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).**

D. Work with addition and subtraction equations.

7. **Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false.** ***For example, which of the following equations are true and which are false? 6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2.***
8. **Determine the unknown whole number in an addition or subtraction equation relating to three whole numbers.** ***For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 =   – 3, 6 + 6 =   .***

Number and Operations in Base Ten 1.NBT

A. Extend the counting sequence.

1. **Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.**

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[2] See Glossary, Table 1.

[3] Students need not use formal terms for these properties.

B. Understand place value.

2. **Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:**

a. 10 can be thought of as a bundle of ten ones — called a "ten."

b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.

c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).

3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.

C. Use place value understanding and properties of operations to add and subtract.

4. Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models (e.g., base ten blocks) or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

5. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

6. Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Measurement and Data 1.MD

A. Measure lengths indirectly and by iterating length units.

1. Order three objects by length; compare the lengths of two objects indirectly by using a third object.

2. Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*

B. Tell and write time.

3. Tell and write time in hours and half-hours using analog and digital clocks.

C. Represent and interpret data.

4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

Geometry **1.G**

A. Reason with shapes and their attributes.

1. **Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.**
2. **Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.[4]**
3. **Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.**

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[4] Students do not need to learn formal names such as "right rectangular prism."

Mathematics | Grade 2

In Grade 2, instructional time should focus on four critical areas: (1) extending understanding of base-ten notation; (2) building fluency with addition and subtraction; (3) using standard units of measure; and (4) describing and analyzing shapes.

(1) Students extend their understanding of the base-ten system. This includes ideas of counting in fives, tens, and multiples of hundreds, tens, and ones, as well as number relationships involving these units, including comparing. Students understand multi-digit numbers (up to 1000) written in base-ten notation, recognizing that the digits in each place represent amounts of thousands, hundreds, tens, or ones (e.g., 853 is 8 hundreds + 5 tens + 3 ones).

(2) Students use their understanding of addition to develop fluency with addition and subtraction within 100. They solve problems within 1000 by applying their understanding of models for addition and subtraction, and they develop, discuss, and use efficient, accurate, and generalizable methods to compute sums and differences of whole numbers in base-ten notation, using their understanding of place value and the properties of operations. They select and accurately apply methods that are appropriate for the context and the numbers

involved to mentally calculate sums and differences for numbers with only tens or only hundreds.

(3) Students recognize the need for standard units of measure (centimeter and inch) and they use rulers and other measurement tools with the understanding that linear measure involves an iteration of units. They recognize that the smaller the unit, the more iterations they need to cover a given length.

(4) Students describe and analyze shapes by examining their sides and angles. Students investigate, describe, and reason about decomposing and combining shapes to make other shapes. Through building, drawing, and analyzing two- and three-dimensional shapes, students develop a foundation for understanding area, volume, congruence, similarity, and symmetry in later grades.

Grade 2 Overview

Operations and Algebraic Thinking

- Represent and solve problems involving addition and subtraction.
- Add and subtract within 20.
- Work with equal groups of objects to gain foundations for multiplication.

Number and Operations in Base Ten

- Understand place value.
- Use place value understanding and properties of operations to add and subtract.

Measurement and Data

- Measure and estimate lengths in standard units.
- Relate addition and subtraction to length.
- Work with time and money.
- Represent and interpret data.

Geometry

- Reason with shapes and their attributes.

Operations and Algebraic Thinking **2.OA**

A. Represent and solve problems involving addition and subtraction.

1. Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.[1]

B. Add and subtract within 20.

2. Fluently add and subtract within 20 using mental strategies.[2] By end of Grade 2, know from memory all sums of two one-digit numbers.

C. Work with equal groups of objects to gain foundations for multiplication.

3. Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.
4. Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

Number and Operations in Base Ten **2.NBT**

A. Understand place value.

1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:
   a. 100 can be thought of as a bundle of ten tens — called a "hundred."
   b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).
2. Count within 1000; skip-count by 5s, 10s, and 100s.
3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.
4. Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons.

B. Use place value understanding and properties of operations to add and subtract.

5. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.
6. Add up to four two-digit numbers using strategies based on place value and properties of operations.
7. Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit

numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.

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[1]See Glossary, Table 1.

[2]See standard 1.OA.6 for a list of mental strategies.

8. Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.
9. Explain why addition and subtraction strategies work, using place value and the properties of operations.[3]

Measurement and Data 2.MD

A. Measure and estimate lengths in standard units.

1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
2. Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.
3. Estimate lengths using units of inches, feet, centimeters, and meters.
4. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

B. Relate addition and subtraction to length.

5. Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.
6. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.

C. Work with time and money.

7. Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.
8. Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. *Example: If you have 2 dimes and 3 pennies, how many cents do you have?*

D. Represent and interpret data.

9. Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.

10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put together, take-apart, and compare problems[4] using information presented in a bar graph.

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[3]Explanations may be supported by drawings or objects.

[4]See Glossary, Table 1.

Geometry 2.G

A. Reason with shapes and their attributes.

1. Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces.[5] Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.
2. Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.
3. Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words *halves*, *thirds*, *half of*, *a third of*, etc., and desc`ibe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.

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[5]Sizes are compared directly or visually, not compared by measuring.

Mathematics | Grade 3

In Grade 3, instructional time should focus on four critical areas: (1) developing understanding of multiplication and division and strategies for multiplication and division within 100; (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area; and (4) describing and analyzing two-dimensional shapes.

(1) Students develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models; multiplication is finding an unknown product, and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size. Students use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on these properties to solve multiplication and division problems involving single-digit factors. By comparing a variety of solution strategies, students learn the relationship between multiplication and division.

(2) Students develop an understanding of fractions, beginning with unit fractions. Students view fractions in general as being built out of unit fractions, and they use fractions along with visual fraction models to represent parts of a whole. Students understand that the size of a fractional part is relative to the size of the whole. For example, 1/2 of the paint in a small bucket could be less paint than 1/3 of the paint in a larger bucket, but 1/3 of a ribbon is longer than 1/5 of the same ribbon because when the ribbon is divided into 3 equal parts, the parts are longer than when the ribbon is divided into 5 equal parts. Students are able to use fractions to represent numbers equal to, less than, and greater than one. They solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators or denominators.

(3) Students recognize area as an attribute of two-dimensional regions. They measure the area of a shape by finding the total number of same size units of area required to cover the shape without gaps or overlaps, a square with sides of unit length being the standard unit for measuring area. Students understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication, and justify using multiplication to determine the area of a rectangle.

(4) Students describe, analyze, and compare properties of two-dimensional shapes. They compare and classify shapes by their sides and angles, and connect these with definitions of shapes. Students also relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole.

Grade 3 Overview

Operations and Algebraic Thinking

- **Represent and solve problems involving multiplication and division.**
- **Understand properties of multiplication and the relationship between multiplication and division.**
- **Multiply and divide within 100.**
- **Solve problems involving the four operations, and identify and explain patterns in arithmetic.**

Number and Operations in Base Ten

- **Use place value understanding and properties of operations to perform multi-digit arithmetic.**

Number and Operations—Fractions

- **Develop understanding of fractions as numbers.**

Measurement and Data

- **Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.**
- **Represent and interpret data.**
- **Geometric measurement: understand concepts of area and relate area to multiplication and to addition.**
- **Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.**

Geometry

- **Reason with shapes and their attributes.**

Operations and Algebraic Thinking 3.OA

A. Represent and solve problems involving multiplication and division.

1. **Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each.** ***For example, describe and/or represent a context in which a total number of objects can be expressed as 5 × 7.***
2. **Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.** ***For example, describe and/or represent a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.***
3. **Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.[1]**
4. **Determine the unknown whole number in a multiplication or division equation relating three whole numbers.** ***For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = ÷ 3, 6 × 6 = ?.***

B. Understand properties of multiplication and the relationship between multiplication and division.

5. **Apply properties of operations as strategies to multiply and divide.**[2] ***Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)***
6. **Understand division as an unknown-factor problem.** ***For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.***

C. Multiply and divide within 100.

7. **Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.**

D. Solve problems involving the four operations, and identify and explain patterns in arithmetic.

8. **Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.**[3]
9. **Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations.** ***For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.***

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[1]**See Glossary, Table 2.**

[2]**Students need not use formal terms for these properties.**

[3]**This standard is limited to problems posed with whole numbers and having whole number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order (Order of Operations).**

Number and Operations in Base Ten — 3.NBT

A. Use place value understanding and properties of operations to perform multi-digit arithmetic.[4]

1. **Use place value understanding to round whole numbers to the nearest 10 or 100.**
2. **Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.**
3. **Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.**

Number and Operations—Fractions[5] — 3.NF

A. Develop understanding of fractions as numbers.

1. **Understand a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a*/*b* as the quantity formed by *a* parts of size 1/*b*.**

2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.

a. Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line.

b. Represent a fraction *a*/*b* on a number line diagram by marking off *a* lengths 1/*b* from 0. Recognize that the resulting interval has size *a*/*b* and that its endpoint locates the number *a*/*b* on the number line.

3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.

b. Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent, e.g., by using a visual fraction model.

c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.*

d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

Measurement and Data 3.MD

A. Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

1. Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

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[4] A range of algorithms may be used.

[5] Grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6, and 8.

2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).[6] Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.[7]

B. Represent and interpret data.

3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using

information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

4. **Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.**

C. Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

5. **Recognize area as an attribute of plane figures and understand concepts of area measurement.**
   a. **A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area.**
   b. **A plane figure which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units.**
6. **Measure areas by counting unit squares (square cm, square m, square in, square ft, and non-standard units).**
7. **Relate area to the operations of multiplication and addition.**
   a. **Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.**
   b. **Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.**
   c. **Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.**
   d. **Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.**

D. Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

8. **Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.**

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[6] **Excludes compound units such as cm^3 and finding the geometric volume of a container.**

[7] **Excludes multiplicative comparison problems (problems involving notions of "times as much"; see Glossary, Table 2).**

Geometry 3.G

A. Reason with shapes and their attributes.

1. **Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.**
2. **Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole.** ***For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.***

Mathematics | Grade 4

In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

(1) Students generalize their understanding of place value to 1,000,000, understanding the relative sizes of numbers in each place. They apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value, and properties of operations, in particular the distributive property, as they develop, discuss, and use efficient, accurate, and generalizable methods to compute products of multi-digit whole numbers. Depending on the numbers and the context, they select and accurately apply appropriate methods to estimate or mentally calculate products. They develop fluency with efficient procedures for multiplying whole numbers; understand and explain why the procedures work based on place value and properties of operations; and use them to solve problems. Students apply their understanding of models for division, place value, properties of operations, and the relationship of division to multiplication as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends. They select and accurately apply appropriate methods to estimate and mentally calculate quotients, and interpret remainders based upon the context.

(2) Students develop understanding of fraction equivalence and operations with fractions. They recognize that two different fractions can be equal (e.g., 15/9 = 5/3), and they develop methods for generating and recognizing equivalent fractions. Students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number.

(3) Students describe, analyze, compare, and classify two-dimensional shapes. Through building, drawing, and analyzing two-dimensional shapes, students deepen their understanding of properties of two-dimensional objects and the use of them to solve problems involving symmetry.

Grade 4 Overview

Operations and Algebraic Thinking

- **Use the four operations with whole numbers to solve problems.**
- **Gain familiarity with factors and multiples.**
- **Generate and analyze patterns.**

Number and Operations in Base Ten

- **Generalize place value understanding for multi-digit whole numbers.**
- **Use place value understanding and properties of operations to perform multi-digit arithmetic.**

Number and Operations—Fractions

- **Extend understanding of fraction equivalence and ordering.**
- **Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.**
- **Understand decimal notation for fractions, and compare decimal fractions.**

Measurement and Data

- **Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.**
- **Represent and interpret data.**
- **Geometric measurement: understand concepts of angle and measure angles.**

Geometry

- **Draw and identify lines and angles, and classify shapes by properties of their lines and angles.**

Operations and Algebraic Thinking 4.OA

A. Use the four operations with whole numbers to solve problems.

1. **Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.**
2. **Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.[1]**
3. **Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.**

B. Gain familiarity with factors and multiples.

4. **Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.**

C. Generate and analyze patterns.

5. **Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.***

Number and Operations in Base Ten[2] 4.NBT

A. Generalize place value understanding for multi-digit whole numbers.

1. **Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.***
2. **Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.**
3. **Use place value understanding to round multi-digit whole numbers to any place.**

B. Use place value understanding and properties of operations to perform multi-digit arithmetic.

4. **Fluently add and subtract multi-digit whole numbers using the standard algorithm.**

5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

[1] See Glossary, Table 2.

[2] Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.

6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Number and Operations—Fractions[3] 4.NF

A. Extend understanding of fraction equivalence and ordering.

1. Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

B. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

3. Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$.
   a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
   b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.*
   c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
   d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.
4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.
   a. Understand a fraction a/b as a multiple of $1/b$. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).*

b. Understand a multiple of *a*/*b* as a multiple of 1/*b*, and use this understanding to multiply a fraction by a whole number. ***For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)***

c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. ***For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?***

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[3] Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.

C. Understand decimal notation for fractions, and compare decimal fractions.

5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.[4] ***For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.***

6. Use decimal notation for fractions with denominators 10 or 100. ***For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.***

7. Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

Measurement and Data 4.MD

A. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

1. Know relative sizes of measurement units within one system of units including km, m, cm. mm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table. ***For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...***

2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

3. Apply the area and perimeter formulas for rectangles in real world and mathematical problems. ***For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.***

B. Represent and interpret data.

4. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in

line plots. ***For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.***

C. Geometric measurement: understand concepts of angle and measure angles.

5. **Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:**
   a. **An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.**
   b. **An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.**

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[4]Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.

6. **Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.**
7. **Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.**

Geometry 4.G

A. Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

1. **Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.**
2. **Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.**
3. **Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.**

Mathematics | Grade 5

In Grade 5, instructional time should focus on three critical areas: (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of

fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of volume.

(1) Students apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators as equivalent calculations with like denominators. They develop fluency in calculating sums and differences of fractions, and make reasonable estimates of them. Students also use the meaning of fractions, of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for multiplying and dividing fractions make sense. (Note: this is limited to the case of dividing unit fractions by whole numbers and whole numbers by unit fractions.)

(2) Students develop understanding of why division procedures work based on the meaning of base-ten numerals and properties of operations. They finalize fluency with multi-digit addition, subtraction, multiplication, and division. They apply their understandings of models for decimals, decimal notation, and properties of operations to add and subtract decimals to hundredths. They develop fluency in these computations, and make reasonable estimates of their results. Students use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain why the procedures for multiplying and dividing finite decimals make sense. They compute products and quotients of decimals to hundredths efficiently and accurately.

(3) Students recognize volume as an attribute of three-dimensional space. They understand that volume can be measured by finding the total number of same-size units of volume required to fill the space without gaps or overlaps. They understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. They select appropriate units, strategies, and tools for solving problems that involve estimating and measuring volume. They decompose three-dimensional shapes and find volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes. They measure necessary attributes of shapes in order to determine volumes to solve real world and mathematical problems.

Grade 5 Overview

Operations and Algebraic Thinking

- **Write and interpret numerical expressions.**
- **Analyze patterns and relationships.**

Number and Operations in Base Ten

- **Understand the place value system.**
- **Perform operations with multi-digit whole numbers and with decimals to hundredths.**

Number and Operations—Fractions

- **Use equivalent fractions as a strategy to add and subtract fractions.**
- **Apply and extend previous understandings of multiplication and division to multiply and divide fractions.**

Measurement and Data

- **Convert like measurement units within a given measurement system.**
- **Represent and interpret data.**
- **Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**

Geometry

- **Graph points on the coordinate plane to solve real-world and mathematical problems.**
- **Classify two-dimensional figures into categories based on their properties.**

Operations and Algebraic Thinking — 5.OA

A. Write and interpret numerical expressions.

1. **Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.**
2. **Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.** ***For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.***

B. Analyze patterns and relationships.

3. **Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.** ***For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.***

Number and Operations in Base Ten 5.NBT

A. Understand the place value system.

1. Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

3. Read, write, and compare decimals to thousandths.

a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000).

b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

4. Use place value understanding to round decimals to any place.

B. Perform operations with multi-digit whole numbers and with decimals to hundredths.

5. Fluently multiply multi-digit whole numbers using the standard algorithm.

6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

7. Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Number and Operations—Fractions 5.NF

A. Use equivalent fractions as a strategy to add and subtract fractions.

1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. ***For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)***

2. Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. ***For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.***

B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

3. Interpret a fraction as division of the numerator by the denominator (*a/b* = *a* ÷ *b*). Solve word problems involving division of whole numbers leading to answers in the form of fractions or

mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*

4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
   a. Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. *For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)*
   b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.
5. Interpret multiplication as scaling (resizing), by:
   a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.
   b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.
6. Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.[1]
   a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.*
   b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.*
   c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?*

Measurement and Data 5.MD

A. Convert like measurement units within a given measurement system.

1. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

B. Represent and interpret data.

2. **Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots.** ***For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.***

C. Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

3. **Recognize volume as an attribute of solid figures and understand concepts of volume measurement.**
   a. **A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume.**
   b. **A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.**
4. **Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and non-standard units.**
5. **Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.**
   a. **Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.**

[1]Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.

   b. **Apply the formulas $V = l \times w \times h$ and $V = B \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems.**
   c. **Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.**

Geometry 5.G

A. Graph points on the coordinate plane to solve real-world and mathematical problems.

1. **Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis,**

with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).

2. **Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.**

B. Classify two-dimensional figures into categories based on their properties.

3. **Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.** ***For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.***
4. **Classify two-dimensional figures in a hierarchy based on properties.**

Mathematics | Grade 6

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

(1) Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.

(2) Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

(3) Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are

in equivalent ratios, and they use equations (such as 3*x* = *y*) to describe relationships between quantities.

(4) Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability. Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

Students in Grade 6 also build on their work with area in elementary school by reasoning about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging or removing pieces, and relating the shapes to rectangles. Using these methods, students discuss, develop, and justify formulas for areas of triangles and parallelograms. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths. They prepare for work on scale drawings and constructions in Grade 7 by drawing polygons in the coordinate plane.

Grade 6 Overview

Ratios and Proportional Relationships

- **Understand ratio concepts and use ratio reasoning to solve problems.**

The Number System

- **Apply and extend previous understandings of multiplication and division to divide fractions by fractions.**
- **Compute fluently with multi-digit numbers and find common factors and multiples.**
- **Apply and extend previous understandings of numbers to the system of rational numbers.**

Expressions and Equations

- **Apply and extend previous understandings of arithmetic to algebraic expressions.**
- **Reason about and solve one-variable equations and inequalities.**

- **Represent and analyze quantitative relationships between dependent and independent variables.**

Geometry

- **Solve real-world and mathematical problems involving area, surface area, and volume.**

Statistics and Probability

- **Develop understanding of statistical variability.**

- **Summarize and describe distributions**

Ratios and Proportional Relationships 6.RP

A. Understand ratio concepts and use ratio reasoning to solve problems.

1. **Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.** ***For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."***
2. **Understand the concept of a unit rate *a/b* associated with a ratio *a:b* with *b* ≠0, and use rate language in the context of a ratio relationship.** ***For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."***[1]
3. **Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.**
   a. **Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.**
   b. **Solve unit rate problems including those involving unit pricing and constant speed.** ***For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?***
   c. **Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.**
   d. **Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.**

The Number System 6.NS

A. Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

1. **Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the**

problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc). How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*

B. Compute fluently with multi-digit numbers and find common factors and multiples.

2. Fluently divide multi-digit numbers using the standard algorithm.

3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. ***For example, express 36 + 8 as 4 (9 + 2).***

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[1]Expectations for unit rates in this grade are limited to non-complex fractions.

C. Apply and extend previous understandings of numbers to the system of rational numbers.

5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite.

b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.

c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

7. Understand ordering and absolute value of rational numbers.

a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. ***For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.***

b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. ***For example, write –3 °C > –7 °C to express the fact that –3 °C is warmer than –7 °C.***

c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. ***For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.***

d. **Distinguish comparisons of absolute value from statements about order.** ***For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.***

8. **Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.**

Expressions and Equations 6.EE

A. Apply and extend previous understandings of arithmetic to algebraic expressions.

1. **Write and evaluate numerical expressions involving whole-number exponents.**
2. **Write, read, and evaluate expressions in which letters stand for numbers.**

   a. **Write expressions that record operations with numbers and with letters standing for numbers.** ***For example, express the calculation "Subtract y from 5" as 5 – y.***

   b. **Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.** ***For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.***

   c. **Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).** ***For example, use the formulas*** $V = s^3$ ***and*** $A = 6s^2$ ***to find the volume and surface area of a cube with sides of length s = 1/2.***

3. **Apply the properties of operations to generate equivalent expressions.** ***For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.***
4. **Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).** ***For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.***

B. Reason about and solve one-variable equations and inequalities.

5. **Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.**
6. **Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.**
7. **Solve real-world and mathematical problems by writing and solving equations of the form** $x + p = q$ **and** $px = q$ **for cases in which** p, q **and** x **are all nonnegative rational numbers.**
8. **Write an inequality of the form** $x > c$ **or** $x < c$ **to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form** $x > c$ **or** $x < c$ **have infinitely many solutions; represent solutions of such inequalities on number line diagrams.**

C. Represent and analyze quantitative relationships between dependent and independent variables.

9. **Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.** ***For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.***

Geometry 6.G

A. Solve real-world and mathematical problems involving area, surface area, and volume.

1. **Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.**
2. **Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\ w\ h$ and $V = B\ h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.**
3. **Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.**
4. **Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.**

Statistics and Probability 6.SP

A. Develop understanding of statistical variability.

1. **Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.** ***For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.***
2. **Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.**
3. **Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.**

B. Summarize and describe distributions.

4. **Display numerical data in plots on a number line, including dot plots, histograms, and box plots.**
5. **Summarize numerical data sets in relation to their context, such as by:**
   a. **Reporting the number of observations.**

b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Mathematics | Grade 7

In Grade 7, instructional time should focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

(1) Students extend their understanding of ratios and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope. They distinguish proportional relationships from other relationships.

(2) Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.

(3) Students continue their work with area from Grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in Grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.

(4) Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.

Grade 7 Overview

Ratios and Proportional Relationships

- **Analyze proportional relationships and use them to solve real-world and mathematical problems.**

The Number System

- **Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.**

Expressions and Equations

- **Use properties of operations to generate equivalent expressions.**
- **Solve real-life and mathematical problems using numerical and algebraic expressions and equations.**

Geometry

- **Draw, construct and describe geometrical figures and describe the relationships between them.**
- **Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.**

Statistics and Probability

- **Use random sampling to draw inferences about a population.**
- **Draw informal comparative inferences about two populations.**

• Investigate chance processes and develop, use, and evaluate probability models.

Ratios and Proportional Relationships 7.RP

A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

1. **Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.** ***For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour.***
2. **Recognize and represent proportional relationships between quantities.**
   - **a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.**
   - **b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.**
   - **c. Represent proportional relationships by equations.** ***For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn*****.**
   - **d. Explain what a point *(x, y)* on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r)* where *r* is the unit rate.**
3. **Use proportional relationships to solve multistep ratio and percent problems.** ***Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.***

The Number System 7.NS

A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

1. **Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.**
   - **a. Describe situations in which opposite quantities combine to make 0.** ***For example, in the first round of a game, Maria scored 20 points. In the second round of the same game, she lost 20 points. What is her score at the end of the second round?***
   - **b. Understand *p* + *q* as the number located a distance |*q*| from *p*, in the positive or negative direction depending on whether *q* is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.**
   - **c. Understand subtraction of rational numbers as adding the additive inverse, *p* – *q* = *p* + (–*q*). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.**
   - **d. Apply properties of operations as strategies to add and subtract rational numbers.**
2. **Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.**

a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If *p* and *q* are integers, then –(*p*/*q*) = (–*p*)/*q* = *p*/(–*q*). Interpret quotients of rational numbers by describing real world contexts.

c. Apply properties of operations as strategies to multiply and divide rational numbers.

d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

3. Solve real-world and mathematical problems involving the four operations with rational numbers.[1]

Expressions and Equations 7.EE

A. Use properties of operations to generate equivalent expressions.

1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."*

B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.*

4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*

b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.*

Geometry 7.G

A. Draw, construct, and describe geometrical figures and describe the relationships between them.

1. **Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.**

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[1]**Computations with rational numbers extend the rules for manipulating fractions to complex fractions.**

2. **Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.**
3. **Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.**

B. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

4. **Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.**
5. **Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.**
6. **Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.**

Statistics and Probability 7.SP

A. Use random sampling to draw inferences about a population.

1. **Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.**
2. **Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.***

B. Draw informal comparative inferences about two populations.

3. **Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.***

4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*

C. Investigate chance processes and develop, use, and evaluate probability models.

5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.*
7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
   a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.*
   b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*
8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
   a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
   b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.
   c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?*

Mathematics | Grade 8

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using

functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

(1) Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions ($y/x = m$ or $y = mx$) as special linear equations ($y = mx + b$), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount $m \cdot A$. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation.

Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.

(2) Students grasp the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations.

(3) Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students understand the statement of the Pythagorean Theorem and its converse, and can explain why the Pythagorean Theorem holds, for example, by decomposing a square in two different ways. They apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

Grade 8 Overview

The Number System

- **Know that there are numbers that are not rational, and approximate them by rational numbers.**

Expressions and Equations

- **Work with radicals and integer exponents.**
  - **Understand the connections between proportional relationships, lines, and linear equations.**
  - **Analyze and solve linear equations and pairs of simultaneous linear equations.**

Functions

- **Define, evaluate, and compare functions.**
- **Use functions to model relationships between quantities.**

Geometry

  - **Understand congruence and similarity using physical models, transparencies, or geometry software.**
- **Understand and apply the Pythagorean Theorem.**
  - **Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.**

Statistics and Probability

- **Investigate patterns of association in bivariate data.**

The Number System 8.NS

A. Know that there are numbers that are not rational, and approximate them by rational numbers.

1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., p^2). ***For example, by truncating the decimal expansion of Ö2, show that Ö2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.***

Expressions and Equations 8.EE

A. Work with radicals and integer exponents.

1. **Know and apply the properties of integer exponents to generate equivalent numerical expressions.** ***For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.***

2. **Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that Ö2 is irrational.**

3. **Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.** ***For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.***

4. **Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.**

B. Understand the connections between proportional relationships, lines, and linear equations.

5. **Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.** ***For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.***

6. **Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.**

C. Analyze and solve linear equations and pairs of simultaneous linear equations.

7. **Solve linear equations in one variable.**
   a. **Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).**
   b. **Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.**

8. **Analyze and solve pairs of simultaneous linear equations.**
   a. **Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.**
   b. **Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.** ***For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.***
   c. **Solve real-world and mathematical problems leading to two linear equations in two variables.** ***For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.***

Functions 8.F

A. Define, evaluate, and compare functions.

1. **Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.[1]**
2. **Compare properties (e.g. rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.***
3. **Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.***

B. Use functions to model relationships between quantities.

4. **Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.**
5. **Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.**

Geometry 8.G

A. Understand congruence and similarity using physical models, transparencies, or geometry software.

1. **Verify experimentally the properties of rotations, reflections, and translations:**
   a. **Lines are transformed to lines, and line segments to line segments of the same length.**
   b. **Angles are transformed to angles of the same measure.**
   c. **Parallel lines are transformed to parallel lines.**

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[1] **Function notation is not required in Grade 8.**

2. **Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.**
3. **Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.**
4. **Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.**
5. **Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so***

that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

B. Understand and apply the Pythagorean Theorem.

6. Explain a proof of the Pythagorean Theorem and its converse.

7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

C. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Statistics and Probability 8.SP

A. Investigate patterns of association in bivariate data.

1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g. line of best fit) by judging the closeness of the data points to the line.

3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*

4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*

Mathematics | High School—Algebra (Use for Grade 8)

Expressions. An expression is a record of a computation with numbers, symbols that represent numbers, arithmetic operations, exponentiation, and, at more advanced levels, the operation of evaluating a function. Conventions about the use of parentheses and the order of operations assure that each expression is unambiguous. Creating an expression that describes a computation involving a general quantity requires the ability to express the computation in general terms, abstracting from specific instances.

Reading an expression with comprehension involves analysis of its underlying structure. This may suggest a different but equivalent way of writing the expression that exhibits some different aspect of its meaning. For example, $p + 0.05p$ can be interpreted as the addition of a 5% tax to a price p. Rewriting $p + 0.05p$ as $1.05p$ shows that adding a tax is the same as multiplying the price by a constant factor.

Algebraic manipulations are governed by the properties of operations and exponents, and the conventions of algebraic notation. At times, an expression is the result of applying operations to simpler expressions. For example, $p + 0.05p$ is the sum of the simpler expressions p and $0.05p$. Viewing an expression as the result of operation on simpler expressions can sometimes clarify its underlying structure.

A spreadsheet or a computer algebra system (CAS) can be used to experiment with algebraic expressions, perform complicated algebraic manipulations, and understand how algebraic manipulations behave.

Equations and inequalities. **An equation is a statement of equality between two expressions, often viewed as a question asking for which values of the variables the expressions on either side are in fact equal. These values are the solutions to the equation. An identity, in contrast, is true for all values of the variables; identities are often developed by rewriting an expression in an equivalent form.**

The solutions of an equation in one variable form a set of numbers; the solutions of an equation in two variables form a set of ordered pairs of numbers, which can be plotted in the coordinate plane. Two or more equations and/or inequalities form a system. A solution for such a system must satisfy every equation and inequality in the system.

An equation can often be solved by successively deducing from it one or more simpler equations. For example, one can add the same constant to both sides without changing the solutions, but squaring both sides might lead to extraneous solutions. Strategic competence in solving includes looking ahead for productive manipulations and anticipating the nature and number of solutions.

Some equations have no solutions in a given number system, but have a solution in a larger system. For example, the solution of $x + 1 = 0$ is an integer, not a whole number; the solution of $2x + 1 = 0$ is a rational number, not an integer; the solutions of $x^2 - 2 = 0$ are real numbers, not rational numbers; and the solutions of $x^2 + 2 = 0$ are complex numbers, not real numbers.

The same solution techniques used to solve equations can be used to rearrange formulas. For example, the formula for the area of a trapezoid, $A = ((b_1+b_2)/2)h$, can be solved for h using the same deductive process.

Inequalities can be solved by reasoning about the properties of inequality. Many, but not all, of the properties of equality continue to hold for inequalities and can be useful in solving them.

Connections to Functions and Modeling. Expressions can define functions, and equivalent expressions define the same function. Asking when two functions have the same value for the same input leads to an equation; graphing the two functions allows for finding approximate solutions of the equation. Converting a verbal description to an equation, inequality, or system of these is an essential skill in modeling.

Algebra Overview

Seeing Structure in Expressions

- Interpret the structure of expressions
- Write expressions in equivalent forms to solve problems

Arithmetic with Polynomials and Rational Functions

- Perform arithmetic operations on polynomials
- Understand the relationship between zeros and factors of polynomials
- Use polynomial identities to solve problems
- Rewrite rational expressions

Creating Equations

- Create equations that describe numbers or relationships

Reasoning with Equations and Inequalities

- Understand solving equations as a process of reasoning and explain the reasoning
- Solve equations and inequalities in one variable
- Solve systems of equations
- Represent and solve equations and inequalities graphically

Seeing Structure in Expressions A-SSE

A. Interpret the structure of expressions

1. **Interpret expressions that represent a quantity in terms of its context.★**
   a. **Interpret parts of an expression, such as terms, factors, and coefficients.**
   b. **Interpret complicated expressions by viewing one or more of their parts as a single entity.** ***For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P***

2. **Use the structure of an expression to identify ways to rewrite it.** ***For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.***

B. Write expressions in equivalent forms to solve problems

3. **Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★**
   a. **Factor a quadratic expression to reveal the zeros of the function it defines.**
   b. **Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.**
   c. **Use the properties of exponents to transform expressions for exponential functions.** ***For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.***
4. **Derive and/or explain the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.** ***For example, calculate mortgage payments.★***

Arithmetic with Polynomials and Rational Expressions A -APR

A. Perform arithmetic operations on polynomials

1. **Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.**

B. Understand the relationship between zeros and factors of polynomials

2. **Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.**
3. **Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.**

C. Use polynomial identities to solve problems

4. Prove polynomial identities and use them to describe numerical relationships. *For example, the difference of two squares; the sum and difference of two cubes; the polynomial identity $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.*
5. (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.[1]

[1] The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.

D. Rewrite rational expressions

6. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.
7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

Creating Equations ★ — A -CED

A. Create equations that describe numbers or relationships

1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*

Reasoning with Equations and Inequalities — A -REI

A. Understand solving equations as a process of reasoning and explain the reasoning

1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

B. Solve equations and inequalities in one variable

3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

4. Solve quadratic equations in one variable.

a. Use the method of completing the square to transform any quadratic equation in *x* into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers *a* and *b*.

C. Solve systems of equations

5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.*

8. (+) Represent a system of linear equations as a single matrix equation in a vector variable.

9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).

D. Represent and solve equations and inequalities graphically

10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

11. Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★

12. Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Glossary

Addition and subtraction within 5, 10, 20, 100, or 1000. Addition or subtraction of two whole numbers with whole number answers, and with sum or minuend in the range 0-5, 0-10, 0-20, or 0-100, respectively. Example: 8 + 2 = 10 is an addition within 10, 14 – 5 = 9 is a subtraction within 20, and 55 – 18 = 37 is a subtraction within 100.

Additive inverses. Two numbers whose sum is 0 are additive inverses of one another. Example: 3/4 and – 3/4 are additive inverses of one another because 3/4 + (– 3/4) = (– 3/4) + 3/4 = 0.

Associative property of addition. See Table 3 in this Glossary.

Associative property of multiplication. See Table 3 in this Glossary.

Bivariate data. Pairs of linked numerical observations. Example: a list of heights and weights for each player on a football team.

Box plot. A method of visually displaying a distribution of data values by using the median, quartiles, and extremes of the data set. A box shows the middle

50% of the data.[1]

Commutative property. See Table 3 in this Glossary.

Complex fraction. A fraction *A*/*B* where *A* and/or *B* are fractions (*B* nonzero).

Computation algorithm. A set of predefined steps applicable to a class of problems that gives the correct result in every case when the steps are carried out correctly. *See also:* computation strategy.

Computation strategy. Purposeful manipulations that may be chosen for specific problems, may not have a fixed order, and may be aimed at converting one problem into another. *See also:* computation algorithm.

Congruent. Two plane or solid figures are congruent if one can be obtained from the other by rigid motion (a sequence of rotations, reflections, and translations).

Counting on. A strategy for finding the number of objects in a group without having to count every member of the group. For example, if a stack of books is known to have 8 books and 3 more books are added to the top, it is not necessary to count the stack all over again. One can find the total by *counting on*—pointing to the top book and saying "eight," following this with "nine, ten, eleven. There are eleven books now."

Dot plot. *See:* line plot.

Dilation. A transformation that moves each point along the ray through the point emanating from a fixed center, and multiplies distances from the center by a common scale factor.

Expanded form. A multi-digit number is expressed in expanded form when it is written as a sum of single-digit multiples of powers of ten. For example, 643 = 600 + 40 + 3.

Expected value. For a random variable, the weighted average of its possible values, with weights given by their respective probabilities.

First quartile. For a data set with median *M*, the first quartile is the median of the data values less than *M*. Example: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the first quartile is 6.[2] *See also:* median, third quartile, interquartile range.

Fraction. A number expressible in the form *a*/*b* where *a* is a whole number and *b* is a positive whole number. (The word *fraction* in these standards always refers to a non-negative number.) *See also:* rational number.

Identity property of 0. See Table 3 in this Glossary.

Independently combined probability models. Two probability models are said to be combined independently if the probability of each ordered pair in the combined model equals the product of the original probabilities of the two individual outcomes in the ordered pair.

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[1] Adapted from Wisconsin Department of Public Instruction, http://dpi.wi.gov/standards/mathglos.html , accessed March 2, 2010.

[2] Many different methods for computing quartiles are in use. The method defined here is sometimes called the Moore and McCabe method. See Langford, E., "Quartiles in Elementary Statistics," *Journal of Statistics Education* Volume 14, Number 3 (2006).

Integer. A number expressible in the form *a* or –*a* for some whole number *a*.

Interquartile Range. A measure of variation in a set of numerical data, the interquartile range is the distance between the first and third quartiles of the data set. Example: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the interquartile range is 15 – 6 = 9. *See also:* first quartile, third quartile.

Line plot. A method of visually displaying a distribution of data values where each data value is shown as a dot or mark above a number line. Also known as a dot plot.[3]

Mean. A measure of center in a set of numerical data, computed by adding the values in a list and then dividing by the number of values in the list.[4] Example: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the mean is 21.

Mean absolute deviation. A measure of variation in a set of numerical data, computed by adding the distances between each data value and the mean, then dividing by the number of data values. Example: For the data set {2, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the mean absolute deviation is 20.

Median. A measure of center in a set of numerical data. The median of a list of values is the value appearing at the center of a sorted version of the list—or the mean of the two central values, if the list contains an even number of values. Example: For the data set {2, 3, 6, 7, 10, 12, 14, 15, 22, 90}, the median is 11.

Midline. In the graph of a trigonometric function, the horizontal line halfway between its maximum and minimum values.

Multiplication and division within 100. Multiplication or division of two whole numbers with whole number answers, and with product or dividend in the range 0-100. Example: 72 ÷ 8 = 9.

Multiplicative inverses. Two numbers whose product is 1 are multiplicative inverses of one another. Example: 3/4 and 4/3 are multiplicative inverses of one another because 3/4 × 4/3 = 4/3 × 3/4 = 1.

Number line diagram. A diagram of the number line used to represent numbers and support reasoning about them. In a number line diagram for measurement quantities, the interval from 0 to 1 on the diagram represents the unit of measure for the quantity.

Percent rate of change. A rate of change expressed as a percent. Example: if a population grows from 50 to 55 in a year, it grows by 5/50 = 10% per year.

Probability distribution. The set of possible values of a random variable with a probability assigned to each.

Properties of operations. See Table 3 in this Glossary.

Properties of equality. See Table 4 in this Glossary.

Properties of inequality. See Table 5 in this Glossary.

Properties of operations. See Table 3 in this Glossary.

Probability. A number between 0 and 1 used to quantify likelihood for processes that have uncertain outcomes (such as tossing a coin, selecting a person at random from a group of people, tossing a ball at a target, or testing for a medical condition).

Probability model. A probability model is used to assign probabilities to outcomes of a chance process by examining the nature of the process. The set of all outcomes is called the sample space, and their probabilities sum to 1. *See also:* uniform probability model.

Random variable. An assignment of a numerical value to each outcome in a sample space.

Rational expression. A quotient of two polynomials with a non-zero denominator.

Rational number. A number expressible in the form *a*/*b* or – *a*/*b* for some fraction *a*/*b*. The rational numbers include the integers.

Rectilinear figure. A polygon all angles of which are right angles.

Rigid motion. A transformation of points in space consisting of a sequence of one or more translations, reflections, and/or rotations. Rigid motions are here assumed to preserve distances and angle measures.

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[3] Adapted from Wisconsin Department of Public Instruction, *op. cit*.

[4] To be more precise, this defines the *arithmetic mean*.

Repeating decimal. The decimal form of a rational number. *See also:* terminating decimal.

Sample space. In a probability model for a random process, a list of the individual outcomes that are to be considered.

Scatter plot. A graph in the coordinate plane representing a set of bivariate data. For example, the heights and weights of a group of people could be displayed on a scatter plot.[5]

Similarity transformation. A rigid motion followed by a dilation

Tape diagram. A drawing that looks like a segment of tape, used to illustrate number relationships. Also known as a strip diagram, bar model, fraction strip, or length model.

Terminating decimal. A decimal is called terminating if its repeating digit is 0.

Third quartile. For a data set with median *M*, the third quartile is the median of the data values greater than *M*. Example: For the data set {2, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the third quartile is 15. *See also:* median, first quartile, interquartile range.

Transitivity principle for indirect measurement. If the length of object A is greater than the length of object B, and the length of object B is greater than the length of object C, then the length of object A is greater than the length of object C. This principle applies to measurement of other quantities as well.

Uniform probability model. A probability model which assigns equal probability to all outcomes. *See also:* probability model.

Vector. A quantity with magnitude and direction in the plane or in space, defined by an ordered pair or triple of real numbers.

Visual fraction model. A tape diagram, number line diagram, or area model.

Whole numbers. The numbers 0, 1, 2, 3, ….

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[5] Adapted from Wisconsin Department of Public Instruction, *op. cit*.

Table 1. Common addition and subtraction situations.[6]

	Result Unknown	Change Unknown	Start Unknown
Add to	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? 2 + 3 = ?	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? 2 + ? = 5	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? ? + 3 = 5
Take from	Five apples were on the table. I ate two apples. How many apples are on the table now? 5 – 2 = ?	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? 5 – ? = 3	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? ? – 2 = 3
	Total Unknown	**Addend Unknown**	**Both Addends Unknown[1]**

Put Together/ Take Apart[2]	Three red apples and two green apples are on the table. How many apples are on the table? 3 + 2 = ?	Five apples are on the table. Three are red and the rest are green. How many apples are green? 3 + ? = 5, 5 – 3 = ?	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? 5 = 0 + 5, 5 = 5 + 0 5 = 1 + 4, 5 = 4 + 1 5 = 2 + 3, 5 = 3 + 2
	Difference Unknown	**Bigger Unknown**	**Smaller Unknown**
Compare[3]	("How many more?" version): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy? ("How many fewer?" version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? 2 + ? = 5, 5 – 2 = ?	(Version with "more"): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? (Version with "fewer"): Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have? 2 + 3 = ?, 3 + 2 = ?	(Version with "more"): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have? (Version with "fewer"): Lucy has 3 fewer apples than Julie. Julie has five apples. How many apples does Lucy have? 5 – 3 = ?, ? + 3 = 5

[1]These take apart situations can be used to show all the decompositions of a given number. The associated equations, which have the total on the left of the equal sign, help children understand that the = sign does not always mean makes or results in but always does mean is the same number as.

[2]Either addend can be unknown, so there are three variations of these problem situations. Both Addends Unknown is a productive extension of this basic situation, especially for small numbers less than or equal to 10.

[3]For the Bigger Unknown or Smaller Unknown situations, one version directs the correct operation (the version using more for the bigger unknown and using less for the smaller unknown). The other versions are more difficult.

[6]Adapted from Box 2-4 of National Research Council (2009, op. cit., pp. 32, 33).

Table 2. Common multiplication and division situations.[7]

	Unknown Product	Group Size Unknown (“How many in each group?” Division)	Number of Groups Unknown (“How many groups?” Division)
	3 x 6 = ?	3 x ? = 18, and 18 ÷ 3 = ?	? x 6 = 18, and 18 ÷ 6 = ?
Equal Groups	There are 3 bags with 6 plums in each bag. How many plums are there in all? *Measurement example.* You need 3 lengths of string, each 6 inches long. How much string will you need altogether?	If 18 plums are shared equally into 3 bags, then how many plums will be in each bag? *Measurement example.* You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be?	If 18 plums are to be packed 6 to a bag, then how many bags are needed? *Measurement example*. You have 18 inches of string, which you will cut into pieces that are 6 inches long. How many pieces of string will you have?
Arrays,[4] Area[5]	There are 3 rows of apples with 6 apples in each row. How many apples are there? *Area example.* What is the area of a 3 cm by 6 cm rectangle?	If 18 apples are arranged into 3 equal rows, how many apples will be in each row? *Area example.* A rectangle has area 18 square centimeters. If one side is 3 cm long, how long is a side next to it?	If 18 apples are arranged into equal rows of 6 apples, how many rows will there be? *Area example.* A rectangle has area 18 square centimeters. If one side is 6 cm long, how long is a side next to it?
Compare	A blue hat costs $6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost? *Measurement example.* A rubber band is 6 cm long. How long will the rubber band be when it is stretched to be 3	A red hat costs $18 and that is 3 times as much as a blue hat costs. How much does a blue hat cost? *Measurement example.* A rubber band is stretched to be 18 cm long and that is 3 times as long as it was at first. How long was the rubber band at first?	A red hat costs $18 and a blue hat costs $6. How many times as much does the red hat cost as the blue hat? *Measurement example.* A rubber band was 6 cm long at first. Now it is stretched to be 18 cm long. How many times as long is the rubber band now as it was at first?

	times as long?		
General	a × b = ?	a × ? = p, and p ÷ a = ?	? × b = p, and p ÷ b = ?

[4]The language in the array examples shows the easiest form of array problems. A harder form is to use the terms rows and columns: The apples in the grocery window are in 3 rows and 6 columns. How many apples are in there? Both forms are valuable.

[5]Area involves arrays of squares that have been pushed together so that there are no gaps or overlaps, so array problems include these especially important measurement situations.

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[7]The first examples in each cell are examples of discrete things. These are easier for students and should be given

before the measurement examples.

Table 3. The properties of operations. Here *a*, *b* and *c* stand for arbitrary numbers in a given number system. The properties of operations apply to the rational number system, the real number system, and the complex number system.

Associative property of addition	$(a + b) + c = a + (b + c)$
Commutative property of addition	$a + b = b + a$
Additive identity property of 0	$a + 0 = 0 + a = a$
Existence of additive inverses	For every a there exists $-a$ so that $a + (-a) = (-a) + a = 0$.
Associative property of multiplication	$(a\ b)\ c = a\ (b\ c)$
Commutative property of multiplication	$a\ b = b\ a$
Multiplicative identity property of 1	$a\ 1 = 1\ a = a$
Existence of multiplicative inverses	For every $a \neq 0$ there exists $1/a$ so that $a\ 1/a = 1/a\ a = 1$.
Distributive property of multiplication over addition	$a\ (b + c) = a\ b + a\ c$

Table 4. The properties of equality. Here *a*, *b* and *c* stand for arbitrary numbers in the rational, real, or complex number systems.

Reflexive property of equality	***a = a***
Symmetric property of equality	**If *a = b*, then *b = a.***
Transitive property of equality	**If *a = b* and *b = c*, then *a = c.***
Addition property of equality	**If *a = b*, then *a + c = b + c.***
Subtraction property of equality	**If *a = b*, then *a – c = b – c.***
Multiplication property of equality	**If *a = b*, then *a x c = b x c.***
Division property of equality	**If *a = b* and *c* ≠, then *a ¸c = b ¸ c.***
Substitution property of equality	**If *a = b*, then *b* may be substituted for *a* in any expression containing *a*.**

Table 5. The properties of inequality. Here *a*, *b* and *c* stand for arbitrary numbers in the rational or real number systems.

Exactly one of the following is true: *a* < *b*, *a* = *b*, *a* > *b*.

If $a > b$ and $b > c$ then $a > c$.

If $a > b$, then $b < a$.

If $a > b$, then $-a < -b$.

If $a > b$, then $a \pm c > b \pm c$.

If $a > b$ and $c > 0$, then a x $c > b$ xc.

If $a > b$ and $c < 0$, then $a\ c < b$ xc.

If $a > b$ and $c > 0$, then a ¸$c > b$ ¸c.

If $a > b$ and $c < 0$, then a ¸$c < b$ ¸c.