# 6th, 7th and 8th GRADE MATH CURRICULUM

## Middle Township Public Schools
## 216 S. Main Street
## Cape May Court House, NJ 08210

Born On Date: September 2017

# Contents

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# Introduction

**Middle Township Middle School**

**6<sup>th</sup> Grade Math**

This document serves to meet all requirements for curriculum as per the Middle Township Board of Education and the New Jersey Department of Education and will serve as a guide for lesson planning.  Units within the curricular framework for mathematics are designed to be taught in order in which they are presented. There is a logical and developmentally-appropriate progression of standards, with strong consideration given to Major, Supporting, and Additional content standards presented since most concepts build upon each other. Within the units, the teachers have flexibility of what order to present the standards. Major, Supporting, and Additional clusters of mathematics content standards are based on the New Jersey Student Learning Standards.  Suggested New Jersey Student Learning Standards for Mathematics are listed in each unit to be imbedded regularly in daily mathematical instruction. This curriculum emphasizes a new leap forward in the continual process of improving learning for all of our students. These standards are based on a philosophy of teaching and learning mathematics that is consistent with the most current research and exemplary practices.

# Course Description

Middle School math in Middle Township Public School district focus is to make math relevant, rigorous, and possible for every student.  In meeting the demands of the New Jersey Student Learning Standards (NJSLS) Middle Township School District strives to instill a deep appreciation for math.  Focus, coherence, and rigor are the driving forces behind the transition to the NJSLS. These standards build upon the knowledge gained in previous lessons and grades, guides students through each concept with thoughtful progressions, while making connections so that each standard is a natural extension of what students have already learned.

Every lesson, activity, assessment, and resource is designed to build student mathematical understanding and connect to learning the Standards for Mathematical Practice. In doing so every student is ensured a deeper understanding of mathematical concepts and the ability to apply them in real-world situations.

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.

## Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

**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 $7 \times 8$ 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 $2 \times 7$ 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 $(x - 1)(x^3 + x2 + x + 1)$ 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.

## **Conclusion**

At Middle Township School District, the Math curriculum follows the standards for school mathematics. This district math curriculum describes the mathematical understanding, knowledge, and skills that students should acquire from prekindergarten through grade 12. Each Standard consists of two to four specific goals that apply across all the grades.

The five Content Standards each encompass specific expectations, organized by grade bands:

- [Number & Operations](#)
- [Algebra](#)
- [Geometry](#)
- [Measurement](#)
- [Data Analysis & Probability](#)

This approach reinforces the sequential progression of skills and concepts.  This supports developmentally appropriate teaching and assessments.  Each grade level has its own specific standards from each year to be used as stepping stones in the progression of learning and student achievement.

## Middle Township Middle School

## 6th Grade Math Pacing Guide

| UNIT TITLE | ENDURING UNDERSTANDINGS | NJSLS | TIMEFRAME |
|---|---|---|---|
| **1-Ratios and Proportional Relationships** | Students will understand that… <br> ● GCF and LCM can be used to compare ratios <br> ● Unit rates have a denominator of one <br> ● Ratios can be part to part or part to whole | **6.RP.A** | **14-20 days** |
| **2-The Number System** | Students will understand how to… <br> ● divide fraction by a fraction <br> ● multiply and divide multi-digit numbers <br> ● extend understanding of rational numbers | **6.NS.A** <br> **6.NS.B** <br> **6.NS.C** | **14-30 days** |

| | | | |
|---|---|---|---|
| | | | |
| **3-Expressions and Equations** | Students will understand that… <br> • Expressions can be evaluated when given the value of the variable. <br> • One variable equations can be solved using opposite operations <br> • Equations can be used to solve real life problems | **6.EE.A** <br> **6.EE.B** <br> **6.EE.C** | **14-30 days** |
| **4-Geometry** | Students will understand that… <br> • right triangles, other triangles, special quadrilaterals, and polygons are composed by triangles and can be decomposed into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. <br> • finding the volume of rectangular prism involves three dimensions. <br> • polygons can be drawn in the coordinate plane when given coordinates for vertices. <br> • three-dimensional shapes can be created from nets. | **6.G.A** | **14-20 days** |
| **5-Statistics and Probability** | Students will understand that… <br> • Mean, Median, and Mode are used to represent data. <br> • Measures of variation are used to describe distribution or spread of data. <br> • Appropriate measures of tendency need to be used. | **6.SP.A** <br> **6.SP.B** | **14-20 days** |
| | | | |

## Unit One-Ratios and Rate

| Content Area: | Mathematics | | Grade(s): 6th |
|---|---|---|---|
| Unit Plan Title: | Unit 1 Ratios and Rate Units | | |

**Overview/Rationale  (Describe and Justify)**

Students use multiple forms of ratio language and ratio notation, and formalize understanding of equivalent ratios.  Students apply reasoning when solving collections of ratio problems in real world contexts using various tools.  Students bridge their understanding of ratios to the value of a ratio, and then to a rate and unit rate, discovering that a percent of a quantity is a rate per 100.

**Standard(s)  Number and Description  (Established Goals)**

**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 ≠ 0, and use rate language in the context of a ratio relationship
**6.RP.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.

**Math Practice Standards  Number and Description  (MP1 through MP8)**

**MP1: Make sense of problems and persevere in solving them.** Students make sense of and solve real-world and mathematical ratio, rate, and percent problems using representations, such as tape diagrams, ratio tables, the coordinate plane, and double number line diagrams. They identify and explain the correspondences between the verbal descriptions and their representations and articulate how the representation depicts the relationship of the quantities in the problem. Problems include ratio problems involving the comparison of three quantities, multi-step changing ratio problems, using a given ratio to find associated ratios, and constant rate problems including two or more people or machines working together.
**MP.2 : Reason abstractly and quantitatively.** Students solve problems by analyzing and comparing ratios and unit rates given in tables, equations, and graphs. Students decontextualize a given constant speed situation, representing symbolically the quantities involved with the formula, distance = rate × time.

**MP.5: Use appropriate tools strategically.** Students become proficient using a variety of representations that are useful in reasoning with rate and ratio problems, such as tape diagrams, double line diagrams, ratio tables, a coordinate plane, and equations. They then use judgment in selecting appropriate tools as they solve ratio and rate problems.

**MP.6: Attend to precision.** Students define and distinguish between ratio, the value of a ratio, a unit rate, a rate unit, and a rate. Students use precise language and symbols to describe ratios and rates. Students learn and apply the precise definition of percent.

**MP.7:Look for and make use of structure.** Students recognize the structure of equivalent ratios in solving word problems using tape diagrams. Students identify the structure of a ratio table and use it to find missing values in the table. Students make use of the structure of division and ratios to model 5 miles/2 hours as a quantity 2.5 mph.

**MP. 8:Look for and express regularity in repeated reasoning.** Students determine reasonable answers to problems involving operations with decimals. Estimation skills and compatible numbers are used. For instance, when 24.385 is divided by 3.91, students determine that the answer is close to the quotient of $24 \div 4$, which equals 6. Students discover, relate, and apply strategies when problem solving, such as the use of the distributive property to solve a multiplication problem involving fractions and/or decimals (e.g., $350 \times 1.8 = 350(1 + 0.8) = 350 + 280 = 630$). When dividing fractions, students may use the following reasoning: Since $2\ 7 + 2\ 7 + 2\ 7 = 6\ 7$, then $6\ 7 \div 2\ 7 = 3$, so I can solve fraction division problems by first getting common denominators and then solving the division problem created by the numerators. Students understand the long division algorithm and the continual breakdown of the dividend into different place value units. Further, students use those repeated calculations and reasoning to determine the greatest common factor of two numbers using the Euclidean algorithm.

**Technology Standard(s)  Number and Description**

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

**Interdisciplinary Standard(s)  Number and Description**

MS-LS1-3 **Use argument supported by evidence for how the body is a system of interacting subsystems composed of a group of cells.**

**Enduring Understandings:**

*Students will understand that…*
- *GCF and LCM can be used to compare ratios*
- *Unit rates have a denominator of one*
- *Ratios can be part to part or part to whole*

**Essential Questions:**  (What provocative questions will foster inquiry, understanding, and transfer of learning?)

How can finding the GCF and LCM assist in solving mathematical problems?

Why is it important to be able to compare quantities using ratios?

When are unit rates beneficial in real world situations?

What is the relationship between ratio, rates, and fractions?

**21st Century Connections (P21 Framework – Partnership for 21st Century Learning):**

| *Check all that apply.* | *Indicate whether these skills are **E**-Encouraged, **T**-Taught, and/or **A**-Assessed in this unit by marking **E, T, A** in the box before the appropriate skill (Some boxes may have all 3, some 0).* |
|---|---|
| **21st Century Interdisciplinary Themes** | **21st Century Skills** |

| | | | | |
|---|---|---|---|---|
| X | Global Awareness | ETA | Critical Thinking and Problem Solving |
| | Environmental Literacy | | Creativity and Innovation |
| | Health Literacy | E | Communication and Collaboration |
| | Civic Literacy | | Flexibility and Adaptability |
| X | Financial, Economic , Business and Entrepreneurial Literacy | E | Initiative and Self-Direction |
| | | | Social and Cross-Cultural Skills |
| | | EA | Productivity and Accountability |
| | | E | Leadership and Responsibility |

| | | |
|---|---|---|
| ETA | Informational Literacy Skills | |
| | Media Literacy Skills | |
| E | Information, Communication, and Technology (ICT) Literacy | |

**Career Ready Practices:**

*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.*

| | |
|---|---|
| ET | CRP1.  Act as a responsible and contributing citizen and employee |
| ETA | CRP2.  Apply appropriate academic and technical skills |
| E | CRP3.  Attend to personal health and financial well-being |
| ETA | CRP4.  Communicate clearly and effectively with reason |
| E | CRP5.  Consider the environmental, social and economic impacts of decisions |
| E | CRP6.  Demonstrate creativity and innovation |
| | CRP7.  Employ valid and reliable research strategies |
| ETA | CRP8.  Utilize critical thinking to make sense of problems and persevere in solving them |
| E | CRP9.  Model integrity, ethical leadership, and effective management |
| E | CRP10.  Plan education and career paths aligned to personal goals |
| E | CRP11.  Use technology to enhance productivity |
| E | CRP12.  Work productively in teams while using cultural global competence |

**Student Learning Goals/Objectives:**  (What key knowledge and skills will students acquire as a result of this unit?  What should they eventually be able to do as a result of such knowledge and skill?)

| Students will know…. | Students will be able to (do)… |
|---|---|
| ● *GCF and LCM can be used to compare ratios* | ● *compare ratios using GCF and LCM* |

| | |
|---|---|
| ● *ratios and rate can be expressed in fraction form* | ● *express ratios as part to part or part to whole* |
| ● *unit rates have a denominator of one* | ● *find the unit rate* |

**Key Vocabulary and Terms:**

- *Ratio*
- *Rate*
- *Greatest common factor*
- *Least common multiple*
- *Unit Rate*
- *Equivalent ratio*

**Assessment Evidence:**

| *Performance Tasks:* | **Other Assessment Measures***: Through quizzes, tests, extended response* |
|---|---|
| Students will find the unit rate to find the best value of an item. | *test with rubric, academic prompts, observations, homework, journals, Star* |
| Students will use unit rate calculate the cost of trip. | *Renaissance, and benchmarks testing.  Students will demonstrate* |
| Students will calculate the exchange rate for the US dollar. | *achievements.  Students will reflect on errors and make corrections.* |
| Understanding will be judged using an extended- response rubric. | |

*Teaching and Learning Actions:  (What learning experiences and instruction will enable students to achieve the desired results?)*

| | | |
|---|---|---|
| *Instructional Strategies and Activities  (add rows as needed) *D* | **Consider how will the design will: *(WHERETO – Understanding By Design –Wiggins and McTighe)*** <br> **W** = Help the students know Where the unit is going and What is expected?  Help the teacher know Where the students are coming from (prior knowledge and interests)? <br> **H**= Hook all students and Hold their interest? <br> **E**= Equip students, help the Experience the key ideas and Explore the issue? <br> **R**=Provide opportunities to Rethink and Revise their understandings and work? <br> **E**=Allow students to Evaluate their work and its implications? <br> **T**=be Tailored (personalized to the different needs, interests and abilities of learners? <br> **O**=be Organized to maximize initial and sustained engagement as well as effective learning? | |
| **Title** | **Description with Modifications, number of days, etc.** | |
| 1.   Finding GCF and LCM | ● *W-Student learning map* <br> ● *H- Real World Link* <br> ● *E-Vocabulary activities* <br> ● *R- Redo-knows and corrections* <br> ● *E-students analyze progress throughout unit* <br> ● *T-Scaffold activities to meet individual student needs* <br> ● *O- encourage students to keep an organized binder* | |
| 2.   Rate and Ratio | ● *W-Student learning map* <br> ● *H- Real World Link* <br> ● *E-Vocabulary activities* <br> ● *R- Redo-knows and corrections* <br> ● *E-students analyze progress throughout unit* <br> ● *T-Scaffold activities to meet individual student needs* <br> ● *O- encourage students to keep an organized binder* | |
| 3.   Unit Rate | ● *W-Student learning map* <br> ● *H- Real World Link* <br> ● *E-Vocabulary activities* <br> ● *R- Redo-knows and corrections* <br> ● *E-students analyze progress throughout unit* <br> ● *T-Scaffold activities to meet individual student needs* <br> ● *O- encourage students to keep an organized binder* | |
| Resources:  (All textbooks, websites, and other major resources associated with the course) | | |

Glencoe Math Build to the Common Core- Course 1

Glencoe Math- Power Up

Glencoe Math Build to the Common Core Practice Masters

www.engageny.org

www.math.com

www.coolmath.com

www.interactivesites.weebly.com

| Suggested Time Frame (Days): | 25-30 days |
|---|---|

*D – Indicates differentiation at the Lesson Level (Identify Modifications for ELL, Gifted and Talented, Basic Skills, Special Education)

## Unit Two- The Number Sense

| Content Area: | Mathematics | Grade(s): 6th |
|---|---|---|
| Unit Plan Title: | Unit 2 The Number Sense | |

| Overview/Rationale (Describe and Justify) |
|---|
| Students will apply and extend previous understandings of multiplication and division to divide fractions by fractions. Multiply and divide multi-digit numbers and find common factors and multiples. |
| Standard(s) Number and Description (Established Goals) |

- **6.NS.A Apply and extend previous understandings of multiplication and division to divide fractions by fractions.**
    - **6.NS.A.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.**

        - **Divide whole numbers by unit fractions using models (6-L.1)**
        - **Reciprocals (6-L.2)**
        - **Divide whole numbers and unit fractions (6-L.3)**
        - **Divide fractions (6-L.5)**
        - **Estimate quotients when dividing mixed numbers (6-L.6)**
        - **Divide fractions and mixed numbers (6-L.7)**
        - **Divide fractions and mixed numbers: word problems (6-L.8)**
        - **Add, subtract, multiply, or divide two fractions (6-O.7)**
        - **Add, subtract, multiply, or divide two fractions: word problems (6-O.8)**

- **6.NS.B Compute fluently with multi-digit numbers and find common factors and multiples.**
    - **6.NS.B.2 Fluently divide multi-digit numbers using the standard algorithm.**

        - **Divisibility rules (6-C.1)**
        - **Division patterns with zeroes (6-C.2)**
        - **Divide numbers ending in zeroes: word problems (6-C.3)**
        - **Estimate quotients (6-C.4)**
        - **Divide whole numbers - 2-digit divisors (6-C.5)**
        - **Divide whole numbers - 3-digit divisors (6-C.6)**
        - **Add, subtract, multiply, or divide two whole numbers (6-O.1)**

■ **Add, subtract, multiply, or divide two whole numbers: word problems (6-O.2)**

○ **6.NS.B.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.**

■ **Add and subtract decimal numbers (6-G.1)**
■ **Add and subtract decimals: word problems (6-G.2)**
■ **Estimate sums and differences of decimals (6-G.3)**
■ **Maps with decimal distances (6-G.4)**
■ **Estimate products of decimal numbers (6-H.1)**
■ **Multiply decimals (6-H.2)**
■ **Inequalities with decimal multiplication (6-H.3)**
■ **Divide decimals by whole numbers (6-H.4)**
■ **Divide decimals by whole numbers: word problems (6-H.5)**
■ **Multiply and divide decimals by powers of ten (6-H.6)**
■ **Division with decimal quotients (6-H.7)**
■ **Inequalities with decimal division (6-H.8)**
■ **Add, subtract, multiply, or divide two decimals (6-O.4)**
■ **Add, subtract, multiply, or divide two decimals: word problems (6-O.5)**

○ **6.NS.B.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.**

- ■ **Identify factors (6-E.4)**
- ■ **Greatest common factor (6-E.7)**
- ■ **Least common multiple (6-E.8)**
- ■ **GCF and LCM: word problems (6-E.9)**

- **6.NS.C Apply and extend previous understandings of numbers to the system of rational numbers.**
    - ○ **6.NS.C.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.**

        - ■ **Understanding integers (6-M.1)**
        - ■ **Compare temperatures above and below zero (6-T.9)**

    - ○ **6.NS.C.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.**
        - ■ **6.NS.C.6a 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.

- ■ **Absolute value and opposite integers (6-M.2)**
- ■ **Integers on number lines (6-M.3)**

- ■ **6.NS.C.6b 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.**

- ■ **Objects on a coordinate plane (6-X.1)**
- ■ **Graph points on a coordinate plane (6-X.2)**
- ■ **Quadrants (6-X.3)**
- ■ **Reflections: graph the image (6-DD.4)**

- ■ **6.NS.C.6c 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.**

- **Decimal number lines (6-F.9)**
- **Integers on number lines (6-M.3)**
- **Graph integers on horizontal and vertical number lines (6-M.4)**
- **Rational numbers: find the sign (6-P.6)**
- **Objects on a coordinate plane (6-X.1)**
- **Graph points on a coordinate plane (6-X.2)**
- **Coordinate planes as maps (6-X.4)**
- **Translations: graph the image (6-DD.3)**

- **6.NS.C.7 Understand ordering and absolute value of rational numbers.**
  - **6.NS.C.7a Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.**

    - **Compare integers (6-M.5)**

  - **6.NS.C.7b Write, interpret, and explain statements of order for rational numbers in real-**

**world contexts.**

- ■ **Compare rational numbers (6-P.1)**
- ■ **Put rational numbers in order (6-P.2)**

- ■ **6.NS.C.7c 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.**

- ■ **Absolute value and opposite integers (6-M.2)**
- ■ **Absolute value of rational numbers (6-P.3)**

- ■ **6.NS.C.7d Distinguish comparisons of absolute value from statements about order.**

- ■ **Put rational numbers in order (6-P.2)**

■ **Absolute value of rational numbers (6-P.3)**

○ **6.NS.C.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.**

■ **Objects on a coordinate plane (6-X.1)**
■ **Graph points on a coordinate plane (6-X.2)**
■ **Coordinate planes as maps (6-X.4)**
■ **Distance between two points (6-X.5)**
■ **Follow directions on a coordinate plane (6-X.6)**

**Math Practice Standards  Number and Description  (MP1 through MP8)**

| | | | | | | | | |
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**Enduring Understandings:**

*Students will understand how to…*
- *divide fraction by a fraction*
- *multiply and divide multi-digit numbers*
- *extend understanding of rational numbers*

**Essential Questions:  (What provocative questions will foster inquiry, understanding, and transfer of learning?)**

**How can parts of a whole be divided by other parts of a whole?**

**Is there only one process for multiplying and dividing multi-digit numbers?**

**Why is it important to find the greatest common factor and least common multiple of numbers?**

**How do I distinguish between repeating and terminating decimals?**

**21st Century Connections (P21 Framework – Partnership for 21st Century Learning):**

| *Check all that apply.* | | *Indicate whether these skills are **E**-Encouraged, **T**-Taught, and/or **A**-Assessed in this unit by marking **E, T, A** in the box before the appropriate skill (Some boxes may have all 3, some 0).* | |
|---|---|---|---|
| **21st Century Interdisciplinary Themes** | | **21st Century Skills** | |
| x | **Global Awareness** | ETA | **Critical Thinking and Problem Solving** |
| | **Environmental Literacy** | | **Creativity and Innovation** |
| | **Health Literacy** | E | **Communication and Collaboration** |
| | **Civic Literacy** | | **Flexibility and Adaptability** |
| x | **Financial, Economic , Business and Entrepreneurial Literacy** | E | **Initiative and Self-Direction** |
| | | | **Social and Cross-Cultural Skills** |
| | | EA | **Productivity and Accountability** |

| | | |
|---|---|---|
| E | Leadership and Responsibility | |
| ETA | Informational Literacy Skills | |
| | Media Literacy Skills | |
| E | Information, Communication, and Technology (ICT) Literacy | |

**Career Ready Practices:**

*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.*

| | |
|---|---|
| ET | CRP1. Act as a responsible and contributing citizen and employee |
| ETA | CRP2. Apply appropriate academic and technical skills |
| E | CRP3. Attend to personal health and financial well-being |
| ETA | CRP4. Communicate clearly and effectively with reason |
| E | CRP5. Consider the environmental, social and economic impacts of decisions |
| E | CRP6. Demonstrate creativity and innovation |
| | CRP7. Employ valid and reliable research strategies |
| ETA | CRP8. Utilize critical thinking to make sense of problems and persevere in solving them |
| E | CRP9. Model integrity, ethical leadership, and effective management |
| E | CRP10. Plan education and career paths aligned to personal goals |
| E | CRP11. Use technology to enhance productivity |
| E | CRP12. Work productively in teams while using cultural global competence |

**Student Learning Goals/Objectives:** **(What key knowledge and skills will students acquire as a result of this unit? What should they eventually be able to do as a result of such knowledge and skill?)**

| Students will know…. | Students will be able to (do)… |
|---|---|
| how to divide fractions<br><br>how to multiply and divide multi-digit number<br><br>the value of positive and negative integers<br><br>that some fractions have repeating decimals and some fractions<br><br>have terminating decimals | ● *divide fractions by whole numbers, mixed numbers, and fractions*<br>● *multiply and divide numbers of various amounts*<br>● *add and subtract positive and negative integers*<br>● *find the repeating or terminating decimals as a result of fraction conversion* |

**Key Vocabulary and Terms:**

- *terminating decimal*
- *repeating decimal*
- *reciprocal*
- *absolute value*
- *bar notation*
- *integer*
- *opposites*
- *negative integer*
- *positive integer*

**Assessment Evidence:**

| Performance Tasks: | Other Assessment Measures: Through quizzes, tests, extended response |
|---|---|
| Students will find fractional amounts of money, food and land.<br><br>Students will multiply and divide large amounts.<br><br>Will see a pattern in fractions that turn into repeating decimals and<br><br>fractions that turn into terminating fractions.<br><br>Understanding will be judged using an extended- response rubric. | test and rubric, academic prompts, observations, homework, journals, Star Renaissance, and benchmarks testing students will demonstrate achievements. Students will reflect on errors and make corrections. |

*Teaching and Learning Actions: (What learning experiences and instruction will enable students to achieve the desired results?)*

| Instructional Strategies and Activities (add rows as needed) *D | Consider how will the design will: (WHERETO – Understanding By Design –Wiggins and McTighe)<br>**W** = Help the students know Where the unit is going and What is expected? Help the teacher know Where the students are coming from (prior knowledge and interests)?<br>**H**= Hook all students and Hold their interest?<br>**E**= Equip students, help the Experience the key ideas and Explore the issue?<br>**R**=Provide opportunities to Rethink and Revise their understandings and work?<br>**E**=Allow students to Evaluate their work and its implications?<br>**T**=be Tailored (personalized to the different needs, interests and abilities of learners?<br>**O**=be Organized to maximize initial and sustained engagement as well as effective learning? |
|---|---|
| **Title** | **Description with Modifications, number of days, etc.** |
| 1. *Dividing fractions by fractions* | ● *W-Student learning map*<br>● *H- Real World Link*<br>● *E-Vocabulary activities*<br>● *R- Redo-nows and corrections*<br>● *E-students analyze progress throughout unit*<br>● *T-Scaffold activities to meet individual student needs*<br>● *O- encourage students to keep an organized binder* |
| 2. *multiplying and dividing multi-digit numbers* | ● *W-Student learning map*<br>● *H- Real World Link*<br>● *E-Vocabulary activities*<br>● *R- Redo-nows and corrections*<br>● *E-students analyze progress throughout unit*<br>● *T-Scaffold activities to meet individual student needs*<br>● *O- encourage students to keep an organized binder* |
| 3. *rational numbers with terminating and repeating decimals* | ● *W-Student learning map*<br>● *H- Real World Link*<br>● *E-Vocabulary activities*<br>● *R- Redo-nows and corrections*<br>● *E-students analyze progress throughout unit*<br>● *T-Scaffold activities to meet individual student needs*<br>● *O- encourage students to keep an organized binder* |
| Resources: (All textbooks, websites, and other major resources associated with the course) | |

Glencoe Math Build to the Common Core- Course 1

Glencoe Math- Power Up

Glencoe Math Build to the Common Core- Common Core Practice Masters

www.engageny.org

www.math.com

www.coolmath.com

www.interactivesites.weebly.com

| Suggested Time Frame (Days): | 20-25 days |
|---|---|

*D – Indicates differentiation at the Lesson Level (Identify Modifications for ELL, Gifted and Talented, Basic Skills, Special Education)

## Unit Three-Expressions and Equations

| Content Area: | Mathematics | | Grade(s): 6th |
|---|---|---|---|
| Unit Plan Title: | Unit 3 Expression and Equations | | |
| **Overview/Rationale** (Describe and Justify) | | | |
| 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 to describe the relationships between quantities. | | | |
| **Standard(s)  Number and Description** (Established Goals) | | | |

**6.EE.A.1 Write and evaluate numerical expressions involving whole-number exponents.**

**6.EE.A2 Write, read, and evaluate expressions in which letters stand for numbers.**

**6.EE.A2.A Write expression that record operations with number and with letters standing for numbers.**

**6.EE.A2B Identify parts of an expression using mathematical terms; view one or more parts of an expression as a single entity.**

**6EE.A.2C 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.**

**6EE.A3 Apply the operations to generate equivalent expressions.**

**6.EE.A4 Identify when two expression are equivalent**

**6.EE.B5 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.B6 Use variables to represent numbers and write expressions when solving real world or mathematical problems; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.**

**6EE.B.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.EE.B8 Write an inequality of the form $x>c$ or $x<c$ to represent a constraint or condition in a real word mathematical problem. Recognize that inequalities of the form $x>c$ or $x<c$ have infinitely many solutions; represent solutions to such inequalities on number line diagrams.**

**6EE.C.9 Use variables to represent two quantities in a real world problem that change in relationship to one another ; write an equation to represent 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 to relate these to one equation.**

| |
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| |

**Technology Standard(s)  Number and Description**

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

**Interdisciplinary Standard(s)  Number and Description**

MS-LS1-3 **Use argument supported by evidence for how the body is a system of interacting subsystems composed of a group of cells.**

**Enduring Understandings:**

*Students will understand that…*
- *Expressions can be evaluated when given the value of the variable.*
- *One variable equations can be solved using opposite operations*
- *equations can be used to solve real life problems*

**Essential Questions:** **(What provocative questions will foster inquiry, understanding, and transfer of learning?)**

**Can all algebraic expressions be evaluated?**

**What is the difference between numeric expressions and equations and algebraic expressions and equations?**

**What is the difference between an equation and an inequality?**

**How can algebra be used to solve real word problems?**

**21st Century Connections (P21 Framework – Partnership for 21st Century Learning):**

| *Check all that apply.* | *Indicate whether these skills are E-Encouraged, T-Taught, and/or A-Assessed in this unit by marking E, T, A in the box before the appropriate skill (Some boxes may have all 3, some 0).* |
|---|---|
| **21st Century Interdisciplinary Themes** | **21st Century Skills** |

| | | | | |
|---|---|---|---|---|
| **x** | **Global Awareness** | **ETA** | **Critical Thinking and Problem Solving** |
| | **Environmental Literacy** | | **Creativity and Innovation** |
| | **Health Literacy** | **E** | **Communication and Collaboration** |
| | **Civic Literacy** | | **Flexibility and Adaptability** |
| **x** | **Financial, Economic , Business and Entrepreneurial** | **E** | **Initiative and Self-Direction** |
| | | | **Social and Cross-Cultural Skills** |

|  | Literacy |  |
|---|---|---|
| EA | Productivity and Accountability |
| E | Leadership and Responsibility |
| ETA | Informational Literacy Skills |
|  | Media Literacy Skills |
| E | Information, Communication, and Technology (ICT) Literacy |

**Career Ready Practices:**

*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.*

| | |
|---|---|
| ET | CRP1.  Act as a responsible and contributing citizen and employee |
| ETA | CRP2.  Apply appropriate academic and technical skills |
| E | CRP3.  Attend to personal health and financial well-being |
| ETA | CRP4.  Communicate clearly and effectively with reason |
| E | CRP5.  Consider the environmental, social and economic impacts of decisions |
| E | CRP6.  Demonstrate creativity and innovation |
|  | CRP7.  Employ valid and reliable research strategies |
| ETA | CRP8.  Utilize critical thinking to make sense of problems and persevere in solving them |
| E | CRP9.  Model integrity, ethical leadership, and effective management |
| E | CRP10.  Plan education and career paths aligned to personal goals |
| E | CRP11.  Use technology to enhance productivity |
| E | CRP12.  Work productively in teams while using cultural global competence |

**Student Learning Goals/Objectives:**  (What key knowledge and skills will students acquire as a result of this unit?  What should they eventually

**be able to do as a result of such knowledge and skill?)**

| *Students will know….* | *Students will be able to (do)…* |
|---|---|
| <ul><li>The difference between an expression and an equation.</li><li>The difference between an equation and an inequality.</li><li>How to use algebraic equations to solve real world problems.</li></ul> | <ul><li>identify expressions and equations.</li><li>identify equations and inequalities.</li><li>write and solve algebraic equations.</li></ul> |

**Key Vocabulary and Terms:**

- **Commutative property**
- **Distributive property**
- **Associative property**
- **Identity property**
- **Coefficient**
- **Variable**
- **Term**
- **Equation**
- **Expression**
- **Inverse operation**
- **Inequality**

**Assessment Evidence:**

| *Performance Tasks:* | **Other Assessment Measures***: Through quizzes, tests, extended response test with rubric, academic prompts, observations, homework, journals, Star Renaissance, and benchmarks testing students will demonstrate achievements. Students will reflect on errors and make corrections.* |
|---|---|
| Students will write and solve algebraic equations. Students will use various algebraic properties to solve real world problems. Students will write, solve and graph inequalities. | |

| | |
|---|---|
| | |

| Teaching and Learning Actions: (What learning experiences and instruction will enable students to achieve the desired results?) | |
|---|---|
| *Instructional Strategies and Activities (add rows as needed) *D* | **Consider how will the design will: (WHERETO – Understanding By Design –Wiggins and McTighe)**<br>**W** = Help the students know Where the unit is going and What is expected? Help the teacher know Where the students are coming from (prior knowledge and interests)?<br>**H**= Hook all students and Hold their interest?<br>**E**= Equip students, help the Experience the key ideas and Explore the issue?<br>**R**=Provide opportunities to Rethink and Revise their understandings and work?<br>**E**=Allow students to Evaluate their work and its implications?<br>**T**=be Tailored (personalized to the different needs, interests and abilities of learners?<br>**O**=be Organized to maximize initial and sustained engagement as well as effective learning? |
| **Title** | **Description with Modifications, number of days, etc.** |
| 1. Finding GCF and LCM | ● *W-Student learning map*<br>● *H- Real World Link*<br>● *E-Vocabulary activities*<br>● *R- Redo-knows and corrections*<br>● *E-students analyze progress throughout unit*<br>● *T-Scaffold activities to meet individual student needs*<br>● *O- encourage students to keep an organized binder* |
| 2. Rate and Ratio | ● *W-Student learning map*<br>● *H- Real World Link*<br>● *E-Vocabulary activities*<br>● *R- Redo-knows and corrections*<br>● *E-students analyze progress throughout unit*<br>● *T-Scaffold activities to meet individual student needs*<br>● *O- encourage students to keep an organized binder* |
| 3. Unit Rate | ● *W-Student learning map*<br>● *H- Real World Link*<br>● *E-Vocabulary activities*<br>● *R- Redo-knows and corrections*<br>● *E-students analyze progress throughout unit*<br>● *T-Scaffold activities to meet individual student needs* |

| | ● *O- encourage students to keep an organized binder* |
|---|---|

| Resources: (All textbooks, websites, and other major resources associated with the course) |
|---|
| Glencoe Math Build to the Common Core- Course 1<br>Glencoe Math- Power Up<br>Glencoe Math Build to the Common Core- Common Core Practice Masters<br>www.engageny.org<br><br>www.math.com<br><br>www.coolmath.com<br><br>www.interactivesites.weebly.com |

| Suggested Time Frame (Days): | 35-40 days |
|---|---|

*D* – Indicates differentiation at the Lesson Level (Identify Modifications for ELL, Gifted and Talented, Basic Skills, Special Education)

## Unit Four-Geometry

| Content Area: | Mathematics | Grade(s): 6th |
|---|---|---|
| Unit Plan Title: | Unit 4 Geometry | |

| Overview/Rationale (Describe and Justify) |
|---|
| **Students will find the area, volume, and surface area of two and three dimensional** |

| Standard(s) Number and Description (Established Goals) |
|---|
| 6.G Geometry<br><br>● **6.G.A Solve real-world and mathematical problems involving area, surface area, and volume.**<br>    ○ **6.G.A.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.

- **Area of rectangles and squares (6-FF.2)**
- **Area of triangles (6-FF.3)**
- **Area of parallelograms and trapezoids (6-FF.4)**
- **Area of quadrilaterals (6-FF.5)**
- **Area of compound figures (6-FF.6)**
- **Compare area and perimeter of two figures (6-FF.10)**

○ **6.G.A.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.**

- **Volume of cubes and rectangular prisms (6-FF.14)**

○ **6.G.A.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.**

- ■ **Objects on a coordinate plane (6-X.1)**
- ■ **Distance between two points (6-X.5)**
- ■ **Graph triangles and quadrilaterals (6-CC.6)**

○ **6.G.A.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.**

- ■ **Nets of three-dimensional figures (6-EE.3)**
- ■ **Surface area of cubes and rectangular prisms (6-FF.15)**
- ■ **Volume and surface area of triangular prisms (6-FF.16)**

| Math Practice Standards  Number and Description  (MP1 through MP8) |
|---|

MP1: Make sense of problems and persevere in solving them. Students make sense of and solve real-world and mathematical ratio, rate, and percent problems using representations, such as tape diagrams, ratio tables, the coordinate plane, and double number line diagrams. They identify and explain the correspondences between the verbal descriptions and their representations and articulate how the representation depicts the relationship of the quantities in the problem. Problems include ratio problems involving the comparison of three quantities, multi-step changing ratio problems, using a given ratio to find associated ratios, and constant rate problems including two or more people or

machines working together.

**MP.2: Reason abstractly and quantitatively. Students solve problems by analyzing and comparing ratios and unit rates given in tables, equations, and graphs. Students decontextualize a given constant speed situation, representing symbolically the quantities involved with the formula, distance = rate × time.**

**MP.5: Use appropriate tools strategically. Students become proficient using a variety of representations that are useful in reasoning with rate and ratio problems, such as tape diagrams, double line diagrams, ratio tables, a coordinate plane, and equations. They then use judgment in selecting appropriate tools as they solve ratio and rate problems.**

**MP.6: Attend to precision. Students define and distinguish between ratio, the value of a ratio, a unit rate, a rate unit, and a rate. Students use precise language and symbols to describe ratios and rates. Students learn and apply the precise definition of percent.**

**MP.7: Look for and make use of structure. Students recognize the structure of equivalent ratios in solving word problems using tape diagrams. Students identify the structure of a ratio table and use it to find missing values in the table. Students make use of the structure of division and ratios to model 5 miles/2 hours as a quantity 2.5 mph.**

**MP. 8: Look for and express regularity in repeated reasoning. Students determine reasonable answers to problems involving operations with decimals. Estimation skills and compatible numbers are used. For instance, when 24.385 is divided by 3.91, students determine that the answer is close to the quotient of 24 ÷ 4, which equals 6. Students discover, relate, and apply strategies when problem solving, such as the use of the distributive property to solve a multiplication problem involving fractions and/or decimals (e.g., 350 × 1.8 = 350(1 + 0.8) = 350 + 280 = 630). When dividing fractions, students may use the following reasoning: Since 2 7 + 2 7 + 2 7 = 6 7 , then 6 7 ÷ 2 7 = 3, so I can solve fraction division problems by first getting common denominators and then solving the division problem created by the numerators. Students understand the long division algorithm and the continual breakdown of the dividend into different place value units. Further, students use those repeated calculations and reasoning to determine the greatest common factor of two numbers using the Euclidean algorithm.**

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**Technology Standard(s)  Number and Description**

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

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**Interdisciplinary Standard(s)  Number and Description**

MS-LS1-3 **Use argument supported by evidence for how the body is a system of interacting subsystems composed of a group of cells.**

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**Enduring Understandings:**

*Students will understand that…*

- *right triangles, other triangles, special quadrilaterals, and polygons are composed by triangles and can be decomposed into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.*
- *finding the volume of rectangular prism involves three dimensions.*
- *polygons can be drawn in the coordinate plane when given coordinates for vertices.*
- *three-dimensional shapes can be created from nets.*

**Essential Questions:** **(What provocative questions will foster inquiry, understanding, and transfer of learning?)**

**How can finding the area of polygons be used in real world situations?**

**How is surface area and volume of three-dimensional shapes related to area?**

**Why is it important to create nets from three-dimensional figures?**

**21st Century Connections (P21 Framework – Partnership for 21st Century Learning):**

| Check all that apply. | | Indicate whether these skills are **E**-Encouraged, **T**-Taught, and/or **A**-Assessed in this unit by marking **E, T, A** in the box before the appropriate skill *(Some boxes may have all 3, some 0).* | |
|---|---|---|---|
| **21st Century Interdisciplinary Themes** | | **21st Century Skills** | |
| X | **Global Awareness** | ETA | **Critical Thinking and Problem Solving** |
| | **Environmental Literacy** | | **Creativity and Innovation** |
| | **Health Literacy** | E | **Communication and Collaboration** |
| | **Civic Literacy** | | **Flexibility and Adaptability** |
| X | **Financial, Economic , Business and Entrepreneurial** | E | **Initiative and Self-Direction** |
| | | | **Social and Cross-Cultural Skills** |

| | Literacy | | EA | Productivity and Accountability |
|---|---|---|---|---|
| | | | E | Leadership and Responsibility |
| | | | ETA | Informational Literacy Skills |
| | | | | Media Literacy Skills |
| | | | E | Information, Communication, and Technology (ICT) Literacy |

**Career Ready Practices:**

*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.*

| | |
|---|---|
| ET | CRP1.  Act as a responsible and contributing citizen and employee |
| ETA | CRP2.  Apply appropriate academic and technical skills |
| E | CRP3.  Attend to personal health and financial well-being |
| ETA | CRP4.  Communicate clearly and effectively with reason |
| E | CRP5.  Consider the environmental, social and economic impacts of decisions |
| E | CRP6.  Demonstrate creativity and innovation |
| | CRP7.  Employ valid and reliable research strategies |
| ETA | CRP8.  Utilize critical thinking to make sense of problems and persevere in solving them |
| E | CRP9.  Model integrity, ethical leadership, and effective management |
| E | CRP10.  Plan education and career paths aligned to personal goals |
| E | CRP11.  Use technology to enhance productivity |
| E | CRP12.  Work productively in teams while using cultural global competence |

**Student Learning Goals/Objectives:**  **(What key knowledge and skills will students acquire as a result of this unit?  What should they eventually**

| be able to do as a result of such knowledge and skill?) | |
|---|---|
| *Students will know….*<br><br>**area is measured in square units?**<br><br>**volume is measured in cubic units?**<br><br>**nets can be created from three-dimensional shapes?** | *Students will be able to (do)…*<br>● **calculate the area of two dimensional shapes**<br>● **calculate the volume of the three-dimensional shapes**<br>● **create nets from three-dimensional shapes** |

**Key Vocabulary and Terms:**

- *base*
- *composite figure*
- *congruent*
- *formula*
- *height*
- *parallelogram*
- *polygon*
- *rhombus*
- *prism*
- *cubic units*
- *surface area*
- *vertex*
- *volume*

**Assessment Evidence:**

| *Performance Tasks:*<br>*Students will find the area of two dimensional shapes.*<br>*Students will calculate the surface area of three-dimensional objects.*<br>*Students will create nets from three-dimensional objects.* | **Other Assessment Measures***:  Through quizzes, tests, extended response test with rubric, academic prompts, observations, homework, journals, Star Renaissance, and benchmarks testing students will demonstrate achievements.  Students will reflect on errors and make corrections.* |
|---|---|

| Teaching and Learning Actions: (What learning experiences and instruction will enable students to achieve the desired results?) | |
| --- | --- |
| *Instructional Strategies and Activities (add rows as needed) *D* | **Consider how will the design will: (WHERETO – Understanding By Design –Wiggins and McTighe)**<br>**W** = Help the students know Where the unit is going and What is expected?  Help the teacher know Where the students are coming from (prior knowledge and interests)?<br>**H**= Hook all students and Hold their interest?<br>**E**= Equip students, help the Experience the key ideas and Explore the issue?<br>**R**=Provide opportunities to Rethink and Revise their understandings and work?<br>**E**=Allow students to Evaluate their work and its implications?<br>**T**=be Tailored (personalized to the different needs, interests and abilities of learners?<br>**O**=be Organized to maximize initial and sustained engagement as well as effective learning? |
| **Title** | **Description with Modifications, number of days, etc.** |
| 1.  *area of polygons* | ● *W-Student learning map*<br>● *H- Real World Link*<br>● *E-Vocabulary activities*<br>● *R- Redo-knows and corrections*<br>● *E-students analyze progress throughout unit*<br>● *T-Scaffold activities to meet individual student needs*<br>● *O- encourage students to keep an organized binder* |
| 2.  *volume of rectangular prisms* | ● *W-Student learning map*<br>● *H- Real World Link*<br>● *E-Vocabulary activities*<br>● *R- Redo-knows and corrections*<br>● *E-students analyze progress throughout unit*<br>● *T-Scaffold activities to meet individual student needs*<br>● *O- encourage students to keep an organized binder* |
| 3.  *Nets of three-dimensional objects* | ● *W-Student learning map*<br>● *H- Real World Link*<br>● *E-Vocabulary activities*<br>● *R- Redo-knows and corrections*<br>● *E-students analyze progress throughout unit*<br>● *T-Scaffold activities to meet individual student needs*<br>● *O- encourage students to keep an organized binder* |

| Resources: (All textbooks, websites, and other major resources associated with the course) |
|---|
| Glencoe Math Build to the Common Core- Course 1 |
| Glencoe Math- Power Up |
| Glencoe Math Build to the Common Core- Common Core Practice Masters |
| www.engageny.org |
| www.math.com |
| www.coolmath.com |
| www.interactivesites.weebly.com |

| Suggested Time Frame (Days): | 20-25 days |
|---|---|

*D – Indicates differentiation at the Lesson Level (Identify Modifications for ELL, Gifted and Talented, Basic Skills, Special Education)

## Unit Five-Statistics and Probability

| Content Area: | Mathematics | Grade(s): 6th |
|---|---|---|
| Unit Plan Title: | Unit 5 Statistics and Probability | |

| Overview/Rationale (Describe and Justify) |
|---|
| Students build on and reinforce their understanding of numbers; students begin to develop the 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 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. |
| Standard(s) Number and Description (Established Goals) |

6. SP.A.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.

6SP.A.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.A3 Recognize that a measure of center for 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.

6SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

6SP.B.5A Summarize numerical data sets in relation to their context, such as by reporting the number of observations.

6SP.B5B Describing the nature of the attribute under investigation, including how it was measured and its units of measure

6SP.B.5C Giving quantitative measures of center and variability. as well as describing any overall pattern with reference to the context in which the data were gathered

6. SP.B5.D Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data was gathered.

Math Practice Standards  Number and Description  **(MP1 through MP8)**

MP1: Make sense of problems and persevere in solving them. Students make sense of and solve real-world and mathematical ratio, rate, and percent problems using representations, such as tape diagrams, ratio tables, the coordinate plane, and double number line diagrams. They identify and explain the correspondences between the verbal descriptions and their representations and articulate how the representation depicts the relationship of the quantities in the problem. Problems include ratio problems involving the comparison of three quantities, multi-step changing ratio problems, using a given ratio to find associated ratios, and constant rate problems including two or more people or machines working together.

MP.2: Reason abstractly and quantitatively. Students solve problems by analyzing and comparing ratios and unit rates given in tables, equations, and graphs. Students decontextualize a given constant speed situation, representing symbolically the quantities involved with the formula, distance = rate × time.

MP.5: Use appropriate tools strategically. Students become proficient using a variety of representations that are useful in reasoning with rate and ratio problems, such as tape diagrams, double line diagrams, ratio tables, a coordinate plane, and equations. They then use judgment in selecting appropriate tools as they solve ratio and rate problems.

MP.6: Attend to precision. Students define and distinguish between ratio, the value of a ratio, a unit rate, a rate unit, and a rate. Students use precise language and symbols to describe ratios and rates. Students learn and apply the precise definition of percent.

MP.7: Look for and make use of structure. Students recognize the structure of equivalent ratios in solving word problems using tape diagrams. Students identify the structure of a ratio table and use it to find missing values in the table. Students make use of the structure of division and ratios to model 5 miles/2 hours as a quantity 2.5 mph.

MP. 8: Look for and express regularity in repeated reasoning. Students determine reasonable answers to problems involving operations with decimals. Estimation skills and compatible numbers are used. For instance, when 24.385 is divided by 3.91, students determine that the answer

is close to the quotient of 24 ÷ 4, which equals 6. Students discover, relate, and apply strategies when problem solving, such as the use of the distributive property to solve a multiplication problem involving fractions and/or decimals (e.g., 350 × 1.8 = 350(1 + 0.8) = 350 + 280 = 630). When dividing fractions, students may use the following reasoning: Since 2 7 + 2 7 + 2 7 = 6 7 , then 6 7 ÷ 2 7 = 3, so I can solve fraction division problems by first getting common denominators and then solving the division problem created by the numerators. Students understand the long division algorithm and the continual breakdown of the dividend into different place value units. Further, students use those repeated calculations and reasoning to determine the greatest common factor of two numbers using the Euclidean algorithm.

**Technology Standard(s)  Number and Description**

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

**Interdisciplinary Standard(s)  Number and Description**

MS-LS1-3 **Use argument supported by evidence for how the body is a system of interacting subsystems composed of a group of cells.**

**Enduring Understandings:**

*Students will understand that…*

*Mean, Median, and Mode are used to represent data.*

*Measures of variation are used to describe distribution or spread of data.*

*Appropriate measures of tendency need to be used.*

**Essential Questions:  (What provocative questions will foster inquiry, understanding, and transfer of learning?)**

**What things in a data sample can make the mean, median or mode not a good measure of central tendency?**

**Why are the measures of variations important when looking at data?**

**Why isn't one measure of central tendency appropriate to use in every situation?**

**21st Century Connections (P21 Framework – Partnership for 21st Century Learning):**

| *Check all that apply.* | *Indicate whether these skills are E-Encouraged, T-Taught, and/or A-Assessed in this unit by marking E, T, A in the box before the appropriate skill (Some boxes may have all 3, some 0).* |
|---|---|
| **21st Century Interdisciplinary Themes** | **21st Century Skills** |

| | Theme | | Skill |
|---|---|---|---|
| x | Global Awareness | ETA | Critical Thinking and Problem Solving |
| | Environmental Literacy | | Creativity and Innovation |
| | Health Literacy | E | Communication and Collaboration |
| | Civic Literacy | | Flexibility and Adaptability |
| x | Financial, Economic , Business and Entrepreneurial Literacy | E | Initiative and Self-Direction |
| | | | Social and Cross-Cultural Skills |
| | | EA | Productivity and Accountability |
| | | E | Leadership and Responsibility |
| | | ETA | Informational Literacy Skills |
| | | | Media Literacy Skills |
| | | E | Information, Communication, and Technology (ICT) Literacy |

**Career Ready Practices:**

*Indicate whether these skills are E-Encouraged, T-Taught, or A-Assessed in this unit by marking E, T, A on the line before the appropriate skill.*

| | |
|---|---|
| ET | CRP1. Act as a responsible and contributing citizen and employee |
| ETA | CRP2. Apply appropriate academic and technical skills |

| | |
|---|---|
| E | CRP3. Attend to personal health and financial well-being |
| ETA | CRP4. Communicate clearly and effectively with reason |
| E | CRP5. Consider the environmental, social and economic impacts of decisions |
| E | CRP6. Demonstrate creativity and innovation |
| | CRP7. Employ valid and reliable research strategies |
| ETA | CRP8. Utilize critical thinking to make sense of problems and persevere in solving them |
| E | CRP9. Model integrity, ethical leadership, and effective management |
| E | CRP10. Plan education and career paths aligned to personal goals |
| E | CRP11. Use technology to enhance productivity |
| E | CRP12. Work productively in teams while using cultural global competence |

**Student Learning Goals/Objectives:** <span style="color:red">(What key knowledge and skills will students acquire as a result of this unit?  What should they eventually be able to do as a result of such knowledge and skill?)</span>

| Students will know…. | Students will be able to (do)… |
|---|---|
| <ul><li>*How to find the mean, median and mode*</li><li>*How to find the measure of variation.*</li><li>*How to choose an appropriate measure of central tendency.*</li></ul> | <ul><li>*Find the mean, median, and mode*</li><li>*Find the measure of variation*</li><li>*Choose appropriate measures*</li></ul> |

**Key Vocabulary and Terms:**

- *average*
- *mean*
- *median*
- *mode*
- *outliers*
- *range*

| Assessment Evidence: | |
|---|---|
| **Performance Tasks:**<br>Students will find the mean scores on class assignments<br>Students will use mean median , and mode to compare weather in different areas<br>Students will use mean deviation to compare the heights of water slides at two different water parks<br>Understanding will be judged using an extended- response rubric. | **Other Assessment Measures**: *Through quizzes, tests, extended response test with rubric, academic prompts, observations, homework, journals, Star Renaissance, and benchmarks testing students will demonstrate achievements.  Students will reflect on errors and make corrections.* |

| Teaching and Learning Actions:  (What learning experiences and instruction will enable students to achieve the desired results?) | |
|---|---|
| *Instructional Strategies and Activities  (add rows as needed) *D* | **Consider how will the design will: (WHERETO – Understanding By Design –Wiggins and McTighe)**<br>**W** = Help the students know Where the unit is going and What is expected?  Help the teacher know Where the students are coming from (prior knowledge and interests)?<br>**H**= Hook all students and Hold their interest?<br>**E**= Equip students, help the Experience the key ideas and Explore the issue?<br>**R**=Provide opportunities to Rethink and Revise their understandings and work?<br>**E**=Allow students to Evaluate their work and its implications?<br>**T**=be Tailored (personalized to the different needs, interests and abilities of learners?<br>**O**=be Organized to maximize initial and sustained engagement as well as effective learning? |
| **Title** | **Description with Modifications, number of days, etc.** |
| 1.   *Finding the mean, median, and mode* | ● *W-Student learning map*<br>● *H- Real World Link*<br>● *E-Vocabulary activities*<br>● *R- Redo-knows and corrections*<br>● *E-students analyze progress throughout unit*<br>● *T-Scaffold activities to meet individual student needs*<br>● *O- encourage students to keep an organized binder* |
| 2.   *Measures of variation* | ● *W-Student learning map*<br>● *H- Real World Link*<br>● *E-Vocabulary activities*<br>● *R- Redo-knows and corrections*<br>● *E-students analyze progress throughout unit* |

| | |
|---|---|
| | - *T-Scaffold activities to meet individual student needs*<br>- *O- encourage students to keep an organized binder* |
| *3. Appropriate measures* | - *W-Student learning map*<br>- *H- Real World Link*<br>- *E-Vocabulary activities*<br>- *R- Redo-knows and corrections*<br>- *E-students analyze progress throughout unit*<br>- *T-Scaffold activities to meet individual student needs*<br>- *O- encourage students to keep an organized binder* |

**Resources:** (All textbooks, websites, and other major resources associated with the course)

Glencoe Math Build to the Common Core- Course 1

Glencoe Math- Power Up

Glencoe Math Build to the Common Core- Common Core Practice Masters

www.engageny.org

www.math.com

www.coolmath.com

www.interactivesites.weebly.com

| Suggested Time Frame (Days): | 20-25 days |
|---|---|

*D – Indicates differentiation at the Lesson Level (Identify Modifications for ELL, Gifted and Talented, Basic Skills, Special Education)

# 6th Grade Math Standards Curriculum Map

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| **Unit 1**<br><br>**Operations and Reasoning about Ratios** | ■ 6.NS.A.1<br>◎ 6.NS.B.2<br>■ 6.RP.A.1<br>■ 6.RP.A.2<br>■ 6.RP.A.3*<br>◎ 6.NS.B.3<br>◎ 6.NS.B.4 | • Apply and extend previous understandings of multiplication and division to divide fractions by fractions<br>• Compute fluently with multi-digit numbers and find common factors and multiples<br>• Understand ratio concepts and use ratio reasoning to solve problems | |
| *Unit 1:*<br><br>*Suggested Open Educational Resources* | 6.NS.A.1 Traffic Jam<br><br>6.RP.A.1 Games at Recess<br><br>6.RP.A.2 Price per pound and pounds per dollar<br><br>6.RP.A.3 Voting for Three, Variation 1<br><br>6.RP.A.3c Shirt Sale<br><br>6.NS.B.3 Reasoning about Multiplication and Division and Place Value, Part 1<br><br>6.NS.B.4 Factors and Common Factors<br><br>6.NS.B.4 Multiples and Common Multiples | | MP.1 Make sense of problems and persevere in solving them.<br><br><br>MP.2 Reason abstractly and quantitatively.<br><br><br>MP.3 Construct viable arguments & critique the reasoning of others.<br><br><br>MP.4 Model with mathematics. |

| Overview | Standards for Mathematical Content | Unit Focus | | Standards for Mathematical Practice |
|---|---|---|---|---|
| **Unit 2**<br><br><br>**Expressions and 3-D Geometry** | ▪ 6.EE.A.1<br>▪ 6.EE.A.2<br>▪ 6.EE.A.3<br>▪ 6.EE.A.4<br>▪ 6.EE.B.6<br>☐ 6.G.A.2<br>☐ 6.G.A.4 | • Apply and extend previous understandings of arithmetic to algebraic expressions<br>• Reason about and solve one-variable equations and inequalities<br>• Solve real-world and mathematical problems involving area, surface area, and volume | | MP.5 Use appropriate tools strategically. |
| *Unit 2:*<br><br>*Suggested Open Educational Resources* | 6.EE.A.1 The Djinni's Offer<br><br>6.EE.A.2 Rectangle Perimeter 1<br><br>6.EE.A.4 Rectangle Perimeter 2<br><br>6.EE.A.4 Equivalent Expressions<br><br>6.G.A.2 Volumes with Fractional Edge Lengths<br><br>6.G.A.4 Nets for Pyramids and Prisms | | MP.6 Attend to precision.<br><br><br><br>MP.7 Look for and make use of structure.<br><br><br><br>MP.8 Look for and express regularity in repeated reasoning. | |

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| **Unit 3**<br><br>**Equations, The Rational Number System and**<br><br>**2-D Geometry** | ■ 6.EE.B.5<br>■ 6.EE.B.7<br>■ 6.NS.C.5<br>■ 6.NS.C.6<br>■ 6.NS.C.7<br>■ 6.EE.B.8<br>■ 6.NS.C.8*<br>☐ 6.G.A.3<br>☐ 6.G.A.1 | • Reason about and solve one-variable equations and inequalities<br>• Apply and extend previous understandings of numbers to the system of rational numbers<br>• Solve real-world and mathematical problems involving area, surface area, and volume | |
| *Unit 3:*<br><br>*Suggested Open Educational Resources* | 6.EE.B.5 Make Use of Structure<br><br>6.EE.B.7 Morning Walk<br><br>6.NS.C.5 Warmer in Miami<br><br>6.NS.C.6 Mile High<br><br>6.NS.C.7 Jumping Flea<br><br>6.NS.C.7a Fractions on the Number Line<br><br>6.NS.C.7b Comparing Temperatures<br><br>6.EE.B.8 Fishing Adventures 1<br><br>6.NS.C.8 Nome, Alaska<br><br>6.G.A.1, 6.G.A.3 Polygons in the Coordinate Plane | | MP.1 Make sense of problems and persevere in solving them.<br><br><br>MP.2 Reason abstractly and quantitatively.<br><br><br>MP.3 Construct viable arguments & critique the reasoning of others.<br><br><br>MP.4 Model with mathematics. |

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| [Unit 4](#) <br><br> Variability, Distributions, and Relationships between Quantities | ■ 6.EE.C.9 <br> ◎ 6.SP.A.1 <br> ◎ 6.SP.A.2 <br> ◎ 6.SP.A.3 <br> ◎ 6.SP.B.4 <br> ◎ 6.SP.B.5 <br> ■ 6.RP.A.3* <br> ■ 6.NS.C.8* | • Represent and analyze quantitative relationships between dependent and independent variables <br> • Develop understanding of statistical variability <br> • Summarize and describe distributions <br> • Understand ratio concepts and use ratio reasoning to solve problems <br> • Apply and extend previous understandings of numbers to the system of rational numbers | MP.5 Use appropriate tools strategically. <br><br><br> MP.6 Attend to precision. |
| *Unit 4:* <br><br> *Suggested Open Educational Resources* | 6.EE.C.9 Families of Triangles <br><br> 6.SP.A.1 Identifying Statistical Questions <br><br> 6.SP.A.2, 6.SP.B.4 Puppy Weights <br><br> 6.SP.A.3 Is It Center or Is It Variability? <br><br> 6.SP.B.5c Number of Siblings <br><br> 6.SP.B.5d Mean or Median? | | MP.7 Look for and make use of structure. <br><br><br> MP.8 Look for and express regularity in repeated reasoning. |

| Unit 1 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |

| Unit 1 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| ■ 6. NS.A.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?* | MP.4 Model with mathematics. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Divide a fraction by a fraction.<br>• Represent division of fractions using visual models.<br>• Interpret quotients of fractions in the context of the problem.<br>• Compute quotients of fractions in order to solve word problems.<br>• Write equations to solve word problems involving division of fraction by a fraction.<br>• Use the relationship between multiplication and division to explain division of fractions.<br><br>Learning Goal 1: Compute quotients of fractions.<br><br>Learning Goal 2: Construct visual fraction models to represent quotients of fractions and use the relationship between multiplication and division to explain division of fractions.<br><br>Learning Goal 3: Solve real-world problems involving quotients of fractions and interpret the solutions in the context given. |
| ◉ 6. NS.B.2. Fluently divide multi-digit numbers using the standard algorithm. | | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Use the standard algorithm to divide multi-digit numbers with speed and accuracy.<br><br>Learning Goal 4: Fluently divide multi-digit numbers using the standard algorithms. |

| Unit 1 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| 6. RP.A.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."* | MP.2 Reason abstractly and quantitatively. | Concept(s):<br><br>• A ratio shows relative sizes or values of two quantities.<br><br>Students are able to:<br><br>• Describe a ratio relationship between two quantities using ratio language.<br><br>Learning Goal 5: Explain the relationship of two quantities in given ratio using ratio language. |
| 6. RP.A.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."* | MP.2 Reason abstractly and quantitatively. | Concept(s):<br><br>• A rate is a ratio comparing two different types of quantities.<br>Students will be able to:<br><br>• Determine the unit rate given a ratio relationship.<br>• Describe a unit rate relationship between two quantities using rate language.<br><br>Learning Goal 6: Use rate language, in the context of the ratio relationship, to describe a unit rate. |
| 6. RP.A.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. *(benchmarked)<br>    6.RP.A.3a. Make tables of equivalent ratios relating quantities with whole number | MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Use ratio and rate reasoning to create tables of equivalent ratios relating quantities with *whole number* measurements, find missing values in tables and plot pairs of values.<br>• Compare ratios using tables of equivalent ratios.<br>• Solve real world and mathematical problems involving unit rate (including unit price and constant speed). |

| Unit 1 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.<br><br>6. RP.A.3b. Solve unit rate problems including those involving unit pricing and constant speed.<br><br>*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?*<br><br>6. RP.A.3c. 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.<br><br>6. RP.A.3d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. | MP.8 Look for and express regularity in repeated reasoning | • Calculate a percent of a quantity and solve problems by finding the whole when given the part and the percent.<br>• Convert measurement units using ratio reasoning.<br>• Transform units appropriately when multiplying and dividing quantities.<br><br>Learning Goal 7*:* Create and complete tables of equivalent ratios to sole real world and mathematical problems using ratio and rate reasoning that include making tables of equivalent ratios, solving unit rate problems, finding percent of a quantity as a rate per 100.<br><br>Learning Goal 8: Use ratio and rate reasoning to convert measurement units and to transform units appropriately when multiplying or dividing quantities. |

| Unit 1 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| ◎ 6. NS.B.3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. | | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Add and subtract multi-digit decimals with accuracy and efficiency.<br>• Multiply and divide multi-digit decimals with accuracy and efficiency.<br><br>Learning Goal 9:  Fluently add, subtract, multiply and divide multi-digit decimals. |
| ◎ 6. NS.B.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. | MP.7 Look for and make use of structure. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Create lists of factors for two whole numbers less than or equal to 100; find the largest factor common to both lists.<br>• Create lists of multiples for two whole numbers less than or equal to 12; find the smallest multiple common to both lists.<br><br>Learning Goal 10: Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two numbers less than or equal to 12. |

| Unit 1 Grade 6 What This May Look Like | |
|---|---|
| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
| *Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.* | *Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* |
| **Focus Mathematical Concepts** | |
| *Districts should consider listing prerequisites skills. Concepts that include a focus on relationships and representation might be listed as grade level appropriate.* | |

| Unit 1 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |

| Prerequisite skills:<br><br>Common Misconceptions: | |
|---|---|

| **District/School Tasks** | **District/School Primary and Supplementary Resources** |
|---|---|
| *Exemplar tasks or illustrative models could be provided.* | *District/school resources and supplementary resources that are texts as well as digital resources used to support the instruction.* |

| **Instructional Best Practices and Exemplars** |
|---|
| *This is a place to capture examples of standards integration and instructional best practices.* |

| Unit 2 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| ■ 6. EE.A.1. Write and evaluate numerical expressions involving whole-number exponents | MP.2 Reason abstractly and quantitatively.<br><br>MP.7 Look for and make use of structure. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Write numerical expressions (involving whole number exponents) from verbal descriptions.<br>• Evaluate numerical expressions involving whole number exponents.<br><br>Learning Goal 1:  Write and evaluate numerical expressions involving whole number exponents. |
| ■ 6. EE.A.2. Write, read, and evaluate expressions in which letters stand for | MP.2 Reason abstractly and | Concept(s): No new concept(s) introduced |

| Unit 2 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| numbers<br>    6. EE.A.2a. 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.*<br><br>6. EE.A.2b. 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*<br><br>6. EE.A.2c. 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 $V = s^3$* | quantitatively.<br><br>MP.7 Look for and make use of structure. | Students are able to:<br><br>• Write algebraic expressions from verbal descriptions.<br>• Use mathematical terms (sum, term, product, factor, quotient, coefficient) to identify the parts of an expression.<br>• Evaluate algebraic expressions and formulas, including those involving exponents.<br><br>Learning Goal 2:  Use mathematical language to identify parts of an expression.<br><br>Learning Goal 3: Write and evaluate algebraic expressions involving exponents (include evaluating formulas). |

| Unit 2 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| *and A = 6s² to find the volume and surface area of a cube with sides of length s = ½* | | |
| 🟩 6. EE.A.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* <br> 🟩 6. EE.A.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* | MP.2 Reason abstractly and quantitatively. <br><br> MP.7 Look for and make use of structure. | Concept(s): <br><br> • Properties of operations: distributive property, combining like terms <br> Students are able to: <br><br> • Combine like terms to generate an equivalent expression. <br> • Factor to generate an equivalent expression. <br> • Multiply (apply the distributive property) to generate an equivalent expression. <br><br> Learning Goal 4:  Apply properties of operations (factor, distribute, and combine like terms) to generate equivalent expressions and to identify when two expressions are equivalent. |
| 🟩 6. EE.B.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. | MP.2 Reason abstractly and quantitatively. <br><br> MP.6 Attend to precision. <br><br> MP.7 Look for and make use of structure. | Concept(s): <br><br> • A variable can represent an unknown number or any number in a set of numbers. <br> Students are able to: <br><br> • Write expressions for solving real-world problems. <br><br> Learning Goal 5:  Use variables to represent numbers and write expressions when solving |

| Unit 2 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| | | real world or mathematical problems. |
| ☐ 6. G.A.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. | MP. 2 Reason abstractly and quantitatively. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Pack a right rectangular prism with fractional edge lengths with unit fraction cubes.<br>• Show that the volume found by packing is the same as would be found by multiplying the edge lengths of the prism.<br>• Apply volume formulas, $V = l\,w\,h$ and $V = b\,h,$ to right rectangular prisms with fractional edge lengths.<br><br>Learning Goal 6: Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes and show that the volume is the same as it would be if found by multiplying the edge lengths; apply volume formulas to right rectangular prisms with fractional edge lengths. |
| ☐ 6. G.A.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. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Represent three dimensional objects with nets made up of rectangles and triangles.<br>• Find surface area of three-dimensional objects using nets.<br>• Solve real world and mathematical problems involving surface area using nets.<br><br>Learning Goal 7: Represent three dimensional figures objects with nets made of rectangles and triangles, and use the nets to find the surface area of the figures in order to solve real world and mathematical problems. |
| **Unit 2 Grade 6 What This May Look Like** | | |
| **District/School Formative Assessment Plan** | | **District/School Summative Assessment Plan** |

<table>
<tr><td colspan="2" align="center">**Unit 2 Grade 6**</td></tr>
</table>

| Content Standards | Suggested Standards for Mathematical Practice | Critical Knowledge & Skills |
|---|---|---|
| *Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.* | | *Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* |

<table><tr><td align="center">**Focus Mathematical Concepts**</td></tr></table>

*Districts should consider listing prerequisites skills. Concepts that include a focus on relationships and representation might be listed as grade level appropriate.*

Prerequisite skills:

Common Misconceptions:

| District/School Tasks | District/School Primary and Supplementary Resources |
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| *Exemplar tasks or illustrative models could be provided.* | *District/school resources and supplementary resources that are texts as well as digital resources used to support the instruction.* |

<table><tr><td align="center">**Instructional Best Practices and Exemplars**</td></tr></table>

*This is a place to capture examples of standards integration and instructional best practices.*

<table>
<tr><td colspan="3" align="center">**Unit 3 Grade 6**</td></tr>
</table>

| Content Standards | Suggested Standards for Mathematical Practice | Critical Knowledge & Skills |
|---|---|---|
| ■ 6. EE.B.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 | MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision. | Concept(s):<br><br>• Solving an equation or inequality is a process of answering the question: determine which values from a specified set, if any, make the equation or inequality true. |

| Unit 3 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| substitution to determine whether a given number in a specified set makes an equation or inequality true. | | Students are able to:<br><br>• Substitute a number into an equation to determine whether it makes an equation true.<br>• Substitute a number into an inequality to determine whether it makes the inequality true.<br><br>Learning Goal 1: Use substitution to determine whether a given number makes an equation or inequality true. |
| ■ 6. EE.B.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. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br><br>• An equation is defined by two expressions that are equivalent to one another.<br>Students will be able to:<br><br>• Solve real world problems by writing and solving equations of the form $x + p = q$ (p, q, and x are non-negative and rational).<br>• Solve real world problems by writing and solving equations of the form $px = q$ (p, q, and x are non-negative and rational).<br><br>Learning Goal 2: Solve real world problems by writing and solving equations of the form $x + p = q$ and $px = q$ (p, q, and x are non-negative rational numbers). |
| ■ 6. NS.C.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 | MP.2 Reason abstractly and quantitatively.<br><br>MP.5 Use appropriate tools strategically | Concept(s):<br><br>• Positive and negative numbers, used together, describe quantities having opposite directions or opposite values.<br>Students are able to:<br><br>• Represent quantities with positive and negative numbers in real-world contexts.<br>• Interpret positive and negative numbers in real-world contexts.<br>• Explain the meaning of zero, in context, in each real-world situation. |

| Unit 3 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| quantities in real-world contexts, explaining the meaning of 0 in each situation. | | Learning Goal 3: Use positive and negative numbers to represent quantities in real-world situations, explaining the meaning of zero in the context of the real-world situation. |
| ◼ 6. NS.C.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.<br><br>6.NS.C.6a. 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.<br><br>6. NS.C.6b. 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.<br><br>6. NS.C.6c. Find and position integers and other rational numbers | MP.5 Use appropriate tools strategically.<br><br>MP.8 Look for and express regularity in repeated reasoning. | Concept(s):<br><br>• Opposite signs of numbers indicate locations on opposite sides of 0 on the number line.<br>• The opposite of the opposite of a number is the number itself (e.g. the opposite of three is -3. The opposite of the opposite of three, -(-3), is equal to the original number, 3).<br>• Signs of numbers in ordered pairs indicate their locations in quadrants of the coordinate plane.<br>• When two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.<br>Students are able to:<br><br>• Position rational numbers on horizontal and vertical number lines.<br>• Position pairs of rational numbers on a coordinate plane.<br>• Explain the conditions for which pairs of points are reflections across an axes in the coordinate plane.<br>• Locate numbers and their opposites on the number line and explain their relation to 0.<br><br>Learning Goal 4: Locate rational numbers and their opposites on horizontal and vertical number line; explain their relation of the opposites to zero.<br><br>Learning Goal 5: Plot pairs of positive and negative rational numbers in the coordinate plane; describe two ordered pairs that differ only by signs as reflections across one or both axes. |

| Content Standards | Suggested Standards for Mathematical Practice | Critical Knowledge & Skills |
|---|---|---|
| on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. | | |
| ■ 6. NS.C.7. Understand ordering and absolute value of rational numbers.<br><br>6.NS.C.7a. 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.*<br><br>6. NS.C.7b. 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.*<br><br>6. NS.C.7c. 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,* | MP.2 Reason abstractly and quantitatively.<br><br>MP.3 Construct viable arguments and critique the reasoning of others.<br><br>MP.5 Use appropriate tools strategically | Concept(s):<br><br>• The absolute value of a rational number is its distance from 0 on the number line.<br>Students are able to:<br><br>• Given an inequality, determine the position of one rational number relative to another.<br>• Write a inequality and explain statements of order for rational numbers in real world situations.<br><br>Learning Goal 6: Use statements of inequality to determine relative positions of two rational numbers on a number line; write and explain statements of order for rational numbers in real-world contexts.<br><br>Learning Goal 7: Explain the meaning of absolute value of a rational number as distance from zero on the number line and as magnitude for a positive or negative quantity in a real-world situation. |

| Unit 3 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| *write |–30| = 30 to describe the size of the debt in dollars.*<br><br>6. NS.C.7d. Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represent a debt greater than 30 dollars.* | | |
| ◼ 6. EE.B.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 | MP.2 Reason abstractly and quantitatively.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br><br>• An inequality may represent a constraint (or a condition) in a real-world problem.<br>• Infinity ($x > c$ and $x < c$ have an infinite number of solutions).<br>Students are able to:<br><br>• Represent real-world constraint or condition by writing an inequality of the form $x > c$ or $x < c$.<br>• Graph inequalities of the form $x > c$ or $x < c$ on number lines.<br><br>Learning Goal 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 and represent them on a number line. |
| ◼ 6. NS.C.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. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Graph points in all four quadrants of the coordinate plane in order to solve real-world and mathematical problems.<br>• Draw polygons in the coordinate plane.<br>• Use absolute value to find distances between points with the same first coordinate |

| Unit 3 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| <span style="color:red">*(benchmarked)</span><br><br>☐ 6. G.A.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. | MP.5 Use appropriate tools strategically. | or the same second coordinate.<br>• Use coordinates to solve real-world distance, perimeter, and area problems.<br><br>Learning Goal 9: Solve real world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Use the absolute value of the differences of their coordinates to find distances between points with the same first coordinate or same second coordinate. |
| ☐ 6. G.A.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. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.7 Look for and make use of structure. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Compose rectangles in order to find the area of triangles, special quadrilaterals and polygons.<br>• Decompose triangles, special quadrilaterals, and polygons into triangles and other shapes in order to find their area.<br>• Compose rectangles and decompose into triangles in order to solve real-world problems.<br><br>Learning Goal 10: Find the area of right triangles, other triangles, special quadrilaterals and polygons by composing into rectangles or decomposing into triangles and other shapes to solve real world or mathematical problems. |

| Unit 3 Grade 6 What This May Look Like | |
|---|---|
| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
| *Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.* | *Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* |

| Unit 3 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| **Focus Mathematical Concepts** | | |
| *Districts should consider listing prerequisites skills. Concepts that include a focus on relationships and representation might be listed as grade level appropriate.*<br>Prerequisite skills:<br><br>Common Misconceptions: | | |
| **District/School Tasks** | | **District/School Primary and Supplementary Resources** |
| *Exemplar tasks or illustrative models could be provided.* | | *District/school resources and supplementary resources that are texts as well as digital resources used to support the instruction.* |
| **Instructional Best Practices and Exemplars** | | |
| *This is a place to capture examples of standards integration and instructional best practices.* | | |


| Unit 4 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| ■ 6. EE.C.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 | MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.6 Attend to precision. | Concept(s):<br><br>• Two quantities that change in relationship to one another may be represented with an equation in two variables, with a graph, and with a table of values.<br>Students are able to:<br><br>• Represent two quantities that related to one another, with variables.<br>• Write an equation in two variables.<br>• Distinguish the dependent variable from the independent variable.<br>• Analyze a given graph and table of values, and relate them to the equation. |

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| Unit 3 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| **Focus Mathematical Concepts** | | |
| *Districts should consider listing prerequisites skills. Concepts that include a focus on relationships and representation might be listed as grade level appropriate.*<br>Prerequisite skills:<br><br>Common Misconceptions: | | |
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| Unit 4 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| ■ 6. EE.C.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 | MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.6 Attend to precision. | Concept(s):<br><br>• Two quantities that change in relationship to one another may be represented with an equation in two variables, with a graph, and with a table of values.<br>Students are able to:<br><br>• Represent two quantities that related to one another, with variables.<br>• Write an equation in two variables.<br>• Distinguish the dependent variable from the independent variable.<br>• Analyze a given graph and table of values, and relate them to the equation. |

| Unit 4 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| the equation.<br>*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*. | | Learning Goal 1: Write an equation using two variables (independent and dependent) to represent two quantities that change in relationship to one another in a real world problem.<br><br>Learning Goal 2: Analyze the relationship between the dependent and independent variables and relate the equation to a given graph and to its table of values. |
| ◎ 6. SP.A.1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.<br>*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.* | MP.2 Reason abstractly and quantitatively.<br><br>MP.6 Attend to precision | Concept(s):<br><br>• Variability/Variation<br>• A statistical question is one that anticipates variability in the data that is related to the question.<br>Students are able to:<br><br>• Distinguish questions that are statistical (anticipate variability in data) from those that are not.<br><br>Learning Goal 3: Distinguish questions that are statistical (anticipate variability in data) from those that are not. |
| ◎ 6. SP.A.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.<br>◎ 6. SP.A.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 | MP.4 Model with mathematics. | Concept(s):<br><br>• A data set has a distribution which can be described by its center, spread, and overall shape.<br>• A measure of center summarizes, with a single number, the values of an entire data set.<br>• A measure of variation describes, with a single number, how the values of a data set vary. |

| Unit 4 Grade 6 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| vary with a single number.<br>⊙ 6. SP.B.4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots. | | Students are able to:<br><br>• Distinguish center from variation.<br>• Display numerical data in dot plots on a number line.<br>• Display numerical data in histograms on a number line.<br>• Display numerical data in box plots on a number line.<br><br>Learning Goal 4: Display numerical data in plots on the number line (including dot plots, histograms, and box plots) and summarize in relation to their context. |
| ⊙ 6. SP.B.5. Summarize numerical data sets in relation to their context, such as by:<br>6. SP.B.5a. Reporting the number of observations.<br><br>6. SP.B.5b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.<br><br>6.SP.B.5c. 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 | MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Determine the number of observations of a data set.<br>• Describe the data in context, including how it was measured and the units of measurement.<br>• Calculate measures of center, mean and median.<br>• Calculate measures of spread, interquartile range and mean absolute deviation.<br>• Describe the overall shape of a distribution (skewed left, skewed right, etc.).<br>• Identify striking deviations (outliers).<br>• Choose measures of center and variability appropriate to the shape of the distribution and context.<br><br>Learning Goal 5: Summarize numerical data in relation to their context by identifying the number of observations and describing how the data was measured.<br><br>Learning Goal 6: Calculate, and interpret measures of center (mean and median) and variability (interquartile range and mean absolute deviation); report |

| Unit 4 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| gathered. <br><br> 6. SP.B.5d. 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. | | measures of center and variability appropriate to the shape of the distribution and context. |
| ■ 6. RP.A.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. <br> *(benchmarked) <br><br> 6. RP.A.3a. 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. <br><br> 6. RP.A.3b. 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* | MP.2 Reason abstractly and quantitatively. <br><br> MP.4 Model with mathematics. <br><br> MP.5 Use appropriate tools strategically <br><br> MP.6 Attend to precision. <br><br> MP.7 Look for and make use of structure. <br><br> MP.8 Look for and express regularity in repeated reasoning | Concept(s): No new concept(s) introduced <br><br> Students are able to: <br><br> • Use ratio and rate reasoning to create tables of equivalent ratios relating quantities with *whole number* measurements, find missing values in tables and plot pairs of values. <br> • Compare ratios using tables of equivalent ratios. <br> • Solve real world and mathematical problems involving unit rate (including unit price and constant speed). <br> • Calculate a percent of a quantity and solve problems by finding the whole when given the part and the percent. <br> • Convert measurement units using ratio reasoning. <br> • Transform units appropriately when multiplying and dividing quantities. <br><br> Learning Goal 7*:* Create and complete tables of equivalent ratios to sole real world and mathematical problems using ratio and rate reasoning that include making tables of equivalent ratios, solving unit rate problems, finding percent of a quantity as a rate per 100. <br><br> Learning Goal 8: Use ratio and rate reasoning to convert measurement units and to transform units appropriately when multiplying or dividing quantities. |

| Unit 4 Grade 6 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| *could be mowed in 35 hours? At what rate were lawns being mowed?*<br><br>6. RP.A.3c. 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.<br><br>6. RP.A.3d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. | | |
| ■ 6. NS.C.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. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.5 Use appropriate tools strategically. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Graph points in all four quadrants of the coordinate plane in order to solve real-world and mathematical problems.<br>• Draw polygons in the coordinate plane.<br>• Use absolute value to find distances between points with the same first coordinate or the same second coordinate.<br>• Use coordinates to solve real-world distance, perimeter, and area problems.<br><br>Learning Goal 9: Solve real world and mathematical problems by graphing points in all |

| Unit 4 Grade 6 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| | | four quadrants of the coordinate plane; use the absolute value of the differences of their coordinates to find distances between points with the same first coordinate or same second coordinate. |

| Unit 4 Grade 6 What This May Look Like | |
|---|---|
| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
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| *Districts should consider listing prerequisites skills. Concepts that include a focus on relationships and representation might be listed as grade level appropriate.* <br> Prerequisite skills: <br><br> Common Misconceptions: |

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# 7th GRADE
# MATH
# CURRICULUM

## Middle Township Public Schools

## 216 S. Main Street
## Cape May Court House, NJ 08210

# Contents

# Acknowledgements

Dr. David Salvo-Superintendent
Dr. Toni Lehman-Director of Curriculum and Instruction

<u>Middle School Math Curriculum Committee</u>

Jessica Douglass  Kara Osmundsen  Donna Rubcich

# Introduction

**Middle Township Middle School**

**7th Grade Math**

This document serves to meet all requirements for curriculum as per the Middle Township Board of Education and the New Jersey Department of Education and will serve as a guide for lesson planning.  Units within the curricular framework for mathematics are designed to be taught in order in which they are presented. There is a logical and developmentally-appropriate progression of standards, with strong consideration given to Major, Supporting, and Additional content standards presented since most concepts build upon each other. Within the units, the teachers have flexibility of what order to present the standards. Major, Supporting, and Additional clusters of mathematics content standards are based on the New Jersey Student Learning Standards.  Suggested New Jersey Student Learning Standards for Mathematics are listed in each unit to be imbedded regularly in daily mathematical instruction. This curriculum emphasizes a new leap forward in the continual process of improving learning for all of our students. These standards are based on a philosophy of teaching and learning mathematics that is consistent with the most current research and exemplary practices.

**Mathematics Grade 7 Overview**

Grade 7 units were created and organized in line with the areas of focus as identified by the Common Core State Standards and the PARCC Model Content Frameworks. Each unit is comprised of standards that are considered major content along with standards that are supporting and/or additional content.  The fluency standards for grade 7 are presented in units one and two and will be assessed for student accuracy. However, the expectation is that students will have many opportunities to develop fluency, defined as speed and accuracy, with rational number arithmetic and solving multi-step problems (including those involving positive and negative rational numbers and word problems leading to one variable equation) throughout the school year.

Unit 1 builds on the students' understanding of rational numbers concepts presented in grade 6 to develop fluency with addition, subtraction, multiplication and division of rational numbers and to use these skills in a problem solving context.  Success with problem solving and developing fluency with rewriting linear expressions and solving linear equations presented in unit 2 will be dependent

upon the completion of the work with rational numbers in unit 1. The standards presented in unit 3 combine rational number arithmetic and linear expressions and equations concepts to build on the work from grade 6. These standards require the students to analyze proportional relationships and use them in problem solving. The geometry standards will provide opportunities for the students to use proportional reasoning in context. In unit 4 the students will continue to use ratios and proportional reasoning in multi-step ratio and percent problems. The standards from the Statistics and Probability domain will support the use of proportional reasoning in context. The fluency standards in unit 3 are repeated in unit 5 with the opportunity to extend the understandings to geometry concepts.

## Course Description

Middle School math in Middle Township Public School district focus is to make math relevant, rigorous, and possible for every student. In meeting the demands of the New Jersey Student Learning Standards (NJSLS) Middle Township School District strives to instill a deep appreciation for math. Focus, coherence, and rigor are the driving forces behind the transition to the NJSLS. These standards build upon the knowledge gained in previous lessons and grades, guides students through each concept with thoughtful progressions, while making connections so that each standard is a natural extension of what students have already learned. Every lesson, activity, assessment, and resource is designed to build student mathematical understanding and connect to learning the Standards for Mathematical Practice. In doing so every student is ensured a deeper understanding of mathematical concepts and the ability to apply them in real-world situations.

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.

# Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

**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 $7 \times 8$ 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 $2 \times 7$ 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 $(x - 1) (x^3 + x2 + x + 1)$ 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.

## Conclusion

At Middle Township School District, the Math curriculum follows the standards for school mathematics. This district math curriculum describes the mathematical understanding, knowledge, and skills that students should acquire from prekindergarten through grade 12. Each Standard consists of two to four specific goals that apply across all the grades.


The five Content Standards each encompass specific expectations, organized by grade bands:

- Number & Operations
- Algebra
- Geometry
- Measurement
- Data Analysis & Probability

This approach reinforces the sequential progression of skills and concepts.  This supports developmentally appropriate teaching and assessments.  Each grade level has its own specific standards from each year to be used as stepping stones in the progression of learning and student achievement.

## Middle Township Middle School

## 7th Grade Math Pacing Guide

| UNIT TITLE | ENDURING UNDERSTANDINGS | NJSLS | TIMEFRAME |
|---|---|---|---|
| **1-Ratios and Proportional Relationships** | Students will understand that… <br> • Proportional relationship can be used to solve percent problems. <br> • Negative integers can be used in everyday context that involve values below zero. <br> • Every quotient of integers (with non-zero divisor) is a rational number. | **7.RP.A** | **14-20 days** |
| **2-The Number Sense** | Students will understand that… <br> • Algebraic expressions can be used to represent real-world situations. <br> • An equation is a mathematical sentence stating that two expressions are equal. | **7.NS.A** | **20-30 days** |
| **3-Expressions and Equations** | Students will understand that… <br> • Proportional relationships can be used to solve real-world problems. <br> • Geometry helps describe real-world objects through drawing, constructing, and describing relationships between geometrical figures | **7.EE.A** <br> **7.EE.B** | **20-30 days** |
| **4-Geometry** | Students will understand that… <br> • Probability describes the likelihood of an event occurring. <br> • Statistics can be used to draw conclusions about a population | **7.G.A** <br> **7.G.B** | **20-30 days** |

| | Students will understand that… <br> • Geometric shapes can be drawn freehand, with a ruler and protractor, or using technology. <br> • *real-life problems involving area, surface area, and volume can be solved by using formulas* | | |
|---|---|---|---|
| **5-Statitics and Probability** | | **7.SP.A** <br> **7.SP.B** <br> **7.SP.C** | **14-20 days** |

# Unit Plans

## Unit One-The Number System

| Content Area: | Math | Grade(s) 7 |
|---|---|---|
| Unit Plan Title: | 1 - The Number System | |

| **Overview/Rationale** |
|---|
| Unit 1 builds on the students' understanding of rational numbers concepts presented in grade 6 to develop fluency with addition, subtraction, multiplication and division of rational numbers and to use these skills in a problem solving context.  Success with problem solving and developing fluency with rewriting linear expressions and solving linear equations presented in unit 2 will be dependent upon the completion of the work with rational numbers in unit 1. |

| **Standard(s)  Number and Description** |
|---|
| **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. <br> **7.RP.2** - Recognize and represent proportional relationships between quantities. <br> **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. <br> **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. <br> **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. <br> **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. <br> **7.NS.2** - Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. <br> **7.NS.3** - Solve real-world and mathematical problems involving the four operations with rational numbers. <br><br> **Student Learning Objectives and Corresponding CCSS** <br>　　　Student learning objectives for the unit, along with the corresponding Common Core State Standards. |

| **Math Practice Standards - Number and Description** |
|---|
| **MP 1 -** Make sense of problems and persevere in solving them. <br> **MP 2 -** Reason abstractly and quantitatively <br> **MP 3 -** Construct viable arguments and critique reasoning of others |

**MP 4 -** Model with mathematics
**MP 5 -** Use appropriate tools strategically
**MP 6 -** Attend to precision
**MP 7 -** Look for and make use of structure
**MP 8 -** Look for and express regularity and repeated reasoning

https://www.engageny.org/resource/grade-7-mathematics-module-2/file/113666
    Provides example problems using each Mathematical Practice Standard (pages 8-9).

https://www.engageny.org/resource/grade-7-mathematics-module-4/file/117471
    Provides example problems using each Mathematical Practice Standard (pages 7-9).

**Technology Standard(s)  Number and Description**

**8.1.8.A.3 -** Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

**Interdisciplinary Standard(s)  Number and Description**

**LA.7.W.7.1 -** Write arguments to support claims with clear reasons and relevant evidence.

**Science - MS - PS 3-4 -** Plan an investigation to determine the relationships among energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of a sample.

**SCI.7-8.5.3.8.C.1-** Model the effect of positive and negative changes in population size on a symbiotic pairing.

**Enduring Understandings:**

*Students will understand that…*
- *Proportional relationship can be used to solve percent problems.*
- *Negative integers can be used in everyday context that involve values below zero.*
- *Every quotient of integers (with non-zero divisor) is a rational number.*

**Unit Essential Questions :**
- How percent's help you understand situations involving money in real-world situations?
- How do you perform addition, subtraction, multiplication, and division of integers and determine the reasonableness of a solution?

- How do you perform addition, subtraction, multiplication, and division of fractions and determine the reasonableness of a solution?

**21st Century Connections**

| *Check all that apply.* | | *Indicate whether these skills are E-Encouraged, T-Taught, and/or A-Assessed in this unit by marking E, T, A in the box before the appropriate skill.* |
|---|---|---|
| **21st Century Interdisciplinary Themes** | | **21st Century Skills** |
| x | Global Awareness | ETA | Critical Thinking and Problem Solving |
| | Environmental Literacy | E | Creativity and Innovation |
| | Health Literacy | ET | Communication and Collaboration |
| | Civic Literacy | E | Flexibility and Adaptability |
| x | Financial, Economic , Business and Entrepreneurial Literacy | E | Initiative and Self-Direction |
| | | E | Social and Cross-Cultural Skills |
| | | E | Productivity and Accountability |
| | | E | Leadership and Responsibility |
| | | E | Informational Literacy Skills |
| | | E | Media Literacy Skills |
| | | ETA | Information, Communication, and Technology (ICT) Literacy |

**Career Ready Practices:**

*Indicate whether these skills are E-Encouraged, T-Taught, or A-Assessed in this unit by marking E, T, A on the line before the appropriate skill.*

| | |
|---|---|
| ETA | CRP1.  Act as a responsible and contributing citizen and employee |
| A | CRP2.  Apply appropriate academic and technical skills |

| | |
|---|---|
| TA | CRP3. Attend to personal health and financial well-being |
| ETA | CRP4. Communicate clearly and effectively with reason |
| TA | CRP5. Consider the environmental, social and economic impacts of decisions |
| E | CRP6. Demonstrate creativity and innovation |
| E | CRP7. Employ valid and reliable research strategies |
| A | CRP8. Utilize critical thinking to make sense of problems and persevere in solving them |
| E | CRP9. Model integrity, ethical leadership, and effective management |
| E | CRP10. Plan education and career paths aligned to personal goals |
| T | CRP11. Use technology to enhance productivity |
| ET | CRP12. Work productively in teams while using cultural global competence |

**Student Learning Goals/Objectives:**

| *Students will know….* | *Students will be able to (do)…* |
|---|---|
| <ul><li>*How to estimate and find the percent of a number.*</li><li>*The percent proportion and the percent equation to solve real world problems.*</li><li>*How to use percent's to calculate tip, tax, and discounts.*</li><li>*How to use a formula to determine simple interest.*</li><li>*The absolute value of a number is positive.*</li><li>*When adding, subtracting, multiplying, and dividing integers, whether the result will be positive, negative or zero by implementing the integer rules.*</li><li>*How to write fractions as decimals and compare fractions.*</li><li>*How to use simple rules for adding, subtracting, multiplying, and dividing fractions and mixed numbers with like and*</li></ul> | <ul><li>Find percent of increase and decrease and use percent's to solve problems involving sales tax, tips, markups, discounts, and simple interest.</li><li>Add, subtract, multiply, and divide integers.</li><li>Solve multi-step real life problems by performing operations on rational numbers.</li></ul> |

|  | unlike denominators.<br>● *How to use the dimensional analysis to convert between measurements.* |  |
|---|---|---|

| **Key Vocabulary and Terms:** |
|---|
| *discount, gratuity, markdown, markup, percent equation, percent error, percent of change, percent of decrease, percent of increase, percent proportion, principle, sales tax, selling price, simple interest, tip, absolute value, additive inverse, graph, integer, negative integer, opposites, positive integer, zero pair, bar notation, common denominator, least common denominator, like fractions, rational numbers, repeating decimal, terminating decimal, unlike fractions* |

| **Assessment Evidence:** | |
|---|---|
| ***Performance Tasks:***<br>***Suggested performance tasks, but not limited to:***<br>*Glencoe Math Course 2 - Common Core Performance Task text*<br>● *DVD Deals page 181 - complete Scoring Rubric can be found on page PT2*<br>● *Weather Report page 255 - complete Scoring Rubric with answers can be found on page PT3*<br>● *Managing Money page 339- complete Scoring Rubric with answers can be found on page PT4*<br><br>25% Sale Task<br>25% Sale Rubric<br>25% Sale Sample | **Other Assessment Measures**: *Through quizzes, tests, academic prompts, observations, homework, journals, Star Renaissance, and benchmarks testing students will demonstrate achievements. Students will reflect on errors and make corrections.*<br><br>**Performance Scales**<br>Learning goals and scales-Scales use an explicit set of criteria used for assessing progress toward a learning goal or target. |

| *Teaching and Learning Actions:  (What learning experiences and instruction will enable students to achieve the desired results?)* | |
|---|---|
| **Title** | **Description with Modifications, number of days, etc.** |
| 1. *Percent Proportion, Equation, Percent of Change, Percent of Number and Simple* | ● ***W-Student learning map***<br>● ***H- Real World Link***<br>● ***E-Vocabulary activities***<br>● ***R- attend to precision and corrections*** |

| | | |
|---|---|---|
| *Interest*<br><br><br><br><br>**Days** : 9-12 | • **E-students analyze progress throughout unit**<br>• **T-Scaffold activities to meet individual student needs**<br>• **O- encourage students to keep an organized ISN (Interactive Student Notebook)**<br><br>*D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* | |
| *2.  Operations with Integers*<br><br><br><br><br><br><br><br><br>**Days** : 9-12 | • **W-Student learning map**<br>• **H- Real World Link**<br>• **E-Vocabulary activities**<br>• **R- attend to precision and corrections**<br>• **E-students analyze progress throughout unit**<br>• **T-Scaffold activities to meet individual student needs**<br>• **O- encourage students to keep an organized ISN (Interactive Student Notebook)**<br><br>*D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* | |
| *3. Operations with Rational Numbers*<br><br><br><br><br><br><br><br>**Days** : 9-12 | • **W-Student learning map**<br>• **H- Real World Link**<br>• **E-Vocabulary activities**<br>• **R- attend to precision and corrections**<br>• **E-students analyze progress throughout unit**<br>• **T-Scaffold activities to meet individual student needs**<br>• **O- encourage students to keep an organized ISN (Interactive Student Notebook)**<br><br>*D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* | |
| Resources: | | |

Glencoe Math Course 2

Glencoe Math Course 2 - Power Up for the PARCC Assessment

Glencoe Math Course 2 - Common Core Performance Tasks

**Various websites**

- http://www.state.nj.us/education/modelcurriculum/math/7u1.shtml

  User Name: model  Password: curriculum

- https://www.insidmathematics.org/performance-assessment-tasks
- www.mathplayground.com
- www.teacherspayteachers.com
- www.kahnacademy.org
- www.xpmath.com
- www.illustrativemathematics.org
- www.mathbitsnotebook.com
- http://map.mathshell.org/
- https://parcc.pearson.com/practice-tests/math/
- https://www.engageny.org/resource/mathematics-fluency-support-grades-6-8/file/133021

  Provides fluency exercises along with recommended use

- https://www.engageny.org/resource/grade-7-mathematics-module-2

  Engage NY - Grade 7:  Rational Numbers
  - Teacher materials
  - Student materials
  - Copy ready materials
  - Module overview
  - Assessments

- https://www.engageny.org/resource/grade-7-mathematics-module-4

  Engage NY - Grade 7:  Percent and Proportional Relationships
  - Teacher materials
  - Student materials
  - Copy ready materials
  - Module overview
  - Assessments

**Additional General Modifications**

- "Chunking" new material
- Providing step by step prompts
- Repeated practice
- Sequence review
- Directed questioning and responses
- Sequence tasks from easy to difficult
- individual/small group/whole group
- Modeling - teacher demonstrates, students use model to problem solve
- Meaningful real-life connections

| Suggested Time Frame: | http://www.state.nj.us/education/modelcurriculum/timeline.pdf<br><br>30-35 days |
|---|---|

## Unit Two-Expressions and Equations

| Content Area: | Math | Grade(s) 7 |
|---|---|---|
| Unit Plan Title: | 2 - Expressions and Equations | |

| Overview/Rationale |
|---|
| In unit 2 students will learn how to simplify and evaluate algebraic expressions.  Students will solve one-two step equations and inequalities involving addition, subtraction, multiplication and division. |

| Standard(s)  Number and Description |
|---|
| **7.EE.1** - Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.<br> **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.<br> **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.<br> **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.

 **7.EE.4a** - 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.

 **7.EE.4b** - 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.

**7.NS.3** - Apply and extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers.

**Student Learning Objectives and Corresponding CCSS**

Student learning objectives for the unit, along with the corresponding Common Core State Standards.

| Math Practice Standards - Number and Description |
|---|

**MP 1 -** Make sense of problems and persevere in solving them
**MP 2 -** Reason abstractly and quantitatively
**MP 3 -** Construct viable arguments and critique reasoning of others
**MP 4 -** Model with mathematics
**MP 5 -** Use appropriate tools strategically
**MP 6 -** Attend to precision
**MP 7 -** Look for and make use of structure
**MP 8 -** Look for and express regularity or repeated reasoning

https://www.engageny.org/resource/grade-7-mathematics-module-3/file/113666

Provides example problems using each Mathematical Practice Standard (pages 8-9).

| Technology Standard(s)  Number and Description |
|---|

**8.1.8.A.3 -** Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

| Interdisciplinary Standard(s)  Number and Description |
|---|

**LA.7.W.7.1 -** Write arguments to support claims with clear reasons and relevant evidence.

**SCI.7-8.8.2.8.E.1**-Calculate the speed of an object given distance and time.

**Enduring Understandings:**

*Students will understand that…*

- *Algebraic expressions can be used to represent real-world situations.*
- *An equation is a mathematical sentence stating that two expressions are equal.*

**Unit Essential Questions:**

- How can you use numbers and symbols to represent mathematical ideas?
- How can you describe the relationship between equivalent quantities that are expressed algebraically in different forms in a problem context and explain their equivalence in light of the context of the problem?

**21st Century Connections**

| *Check all that apply.* | *Indicate whether these skills are **E**-Encouraged, **T**-Taught, and/or **A**-Assessed in this unit by marking **E, T, A** in the box before the appropriate skill.* |
|---|---|
| **21st Century Interdisciplinary Themes** | **21st Century Skills** |

| | | | | |
|---|---|---|---|---|
| **x** | Global Awareness | | ETA | Critical Thinking and Problem Solving |
| | Environmental Literacy | | E | Creativity and Innovation |
| | Health Literacy | | ET | Communication and Collaboration |
| | Civic Literacy | | E | Flexibility and Adaptability |
| **x** | Financial, Economic , Business and Entrepreneurial Literacy | | E | Initiative and Self-Direction |
| | | | E | Social and Cross-Cultural Skills |
| | | | E | Productivity and Accountability |
| | | | E | Leadership and Responsibility |
| | | | E | Informational Literacy Skills |
| | | | E | Media Literacy Skills |
| | | | ETA | Information, Communication, and Technology (ICT) Literacy |

**Career Ready Practices:**

*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.*

| | |
|---|---|
| ETA | **CRP1. Act as a responsible and contributing citizen and employee** |
| A | **CRP2. Apply appropriate academic and technical skills** |
| TA | **CRP3. Attend to personal health and financial well-being** |
| ETA | **CRP4. Communicate clearly and effectively with reason** |
| TA | **CRP5. Consider the environmental, social and economic impacts of decisions** |
| E | **CRP6. Demonstrate creativity and innovation** |
| E | **CRP7. Employ valid and reliable research strategies** |
| A | **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them** |
| E | **CRP9. Model integrity, ethical leadership, and effective management** |
| E | **CRP10. Plan education and career paths aligned to personal goals** |
| T | **CRP11. Use technology to enhance productivity** |
| ET | **CRP12. Work productively in teams while using cultural global competence** |

**Student Learning Goals/Objectives:**

| *Students will know….* | *Students will be able to (do)…* |
|---|---|
| <ul><li>*How to evaluate and simplify algebraic expressions.*</li><li>*How to describe the relationships and extend terms in arithmetic sequences.*</li><li>*How to explore patterns in sequences of geometric figures.*</li><li>*How to identify and use mathematical properties to simplify*</li></ul> | <ul><li>evaluate and simplify algebraic expressions</li><li>add, subtract, and factor linear expressions students</li><li>solve one and 2 step equations</li><li>solve one and 2 step inequalities</li></ul> |

- *algebraic expressions.*
- *How to apply the Distributive Property to rewrite algebraic expressions.*
- *How to add and subtract linear expressions.*
- *How to factor linear expressions using models.*
- *How to read and write integers and find the absolute value of an integer.*
- *How to write and solve addition, subtraction, multiplication, and division equations.*
- *How the process for solving multiplication and division one-step equations is like solving one-step addition and subtraction equations.*
- *Why it is important to perform identical operations on each side of the equals sign.*
- *How to write and solve inequalities and compare inequalities to each other.*

## Key Vocabulary and Terms:

*Additive Identity Property, algebra, algebraic expression, arithmetic sequence, Associative Property, coefficient, Commutative Property, constant, counterexample, define a variable, Distributive Property, equivalent expressions, factor, factored form, like terms, linear expressions, monomial, Multiplicative Identity Property, Multiplicative Property of Zero, property, sequence, simplest form, term, variable, Addition Property of Equality, Addition Property of Inequality, coefficient, Division Property of Equality, Division Property of Inequality, equation, equivalent equation, inequality, Multiplication Property of Equality, Multiplication of Inequality, solution, Subtraction Property of Equality, Subtraction Property of Inequality, two-step equation, two-step inequality*

## Assessment Evidence:

| Performance Tasks: | Other Assessment Measures: *Through quizzes, tests, academic prompts,* |
|---|---|
| ***Suggested performance tasks, but not limited to:*** | *observations, homework, journals, Star Renaissance, and benchmarks* |

| | |
|---|---|
| *Glencoe Math Course 2 - Common Core Performance Task text* <br> ● *Movie Time page 427-Complete Scoring Rubric with answers can be found on page PT1* <br> ● *Fall Reading page 525-Complete Scoring Rubric with answers can be found on page PT2* <br><br> *Meals Out Task* <br> *Meals Out Rubric* <br> *Meals Out Sample* <br><br> *T-Shirt Task and Rubric* | *testing students will demonstrate achievements.  Students will reflect on errors and make corrections.* <br><br> **Performance Scales** <br>    Learning goals and scales-Scales use an explicit set of criteria used for assessing progress toward a learning goal or target. |

| *Teaching and Learning Actions:  (What learning experiences and instruction will enable students to achieve the desired results?)* | |
|---|---|
| **Title** | **Description with Modifications, number of days, etc.** |
| 1.   Expressions <br><br><br><br><br><br><br><br><br><br><br><br><br> **Days** : 9-12 | ● *W-Student learning map* <br> ● *H- Real World Link* <br> ● *E-Vocabulary activities* <br> ● *R- attend to precision and corrections* <br> ● *E-students analyze progress throughout unit* <br> ● *T-Scaffold activities to meet individual student needs* <br> ● *O- encourage students to keep an organized ISN (Interactive Student Notebook)* <br><br> *\*D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* |
| 2.  Equations | ● *W-Student learning map* <br> ● *H- Real World Link* <br> ● *E-Vocabulary activities* <br> ● *R- attend to precision and corrections* |

| | |
|---|---|
| **Days** : 9-12 | ● *E-students analyze progress throughout unit*<br>● *T-Scaffold activities to meet individual student needs*<br>● *O- encourage students to keep an organized ISN (Interactive Student Notebook)*<br><br>*\*D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* |
| *3. Inequalities*<br><br><br><br><br><br><br><br><br><br><br>**Days** : 9-12 | ● *W-Student learning map*<br>● *H- Real World Link*<br>● *E-Vocabulary activities*<br>● *R- attend to precision and corrections*<br>● *E-students analyze progress throughout unit*<br>● *T-Scaffold activities to meet individual student needs*<br>● *O- encourage students to keep an organized ISN (Interactive Student Notebook)*<br><br>*\*D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* |
| **Resources:** ||

Glencoe Math Course 2

Glencoe Math Course 2 - Power Up for the PARCC Assessment

Glencoe Math Course 2 - Common Core Performance Tasks

**Various websites**
- http://www.state.nj.us/education/modelcurriculum/math/7u2.shtml
  - User Name: model  Password: curriculum
- https://www.insidmathematics.org/performance-assessment-tasks
- www.mathplayground.com
- www.teacherspayteachers.com

- www.kahnacademy.org
- www.xpmath.com
- www.illustrativemathematics.org
- www.mathbitsnotebook.com
- http://map.mathshell.org/
- https://parcc.pearson.com/practice-tests/math/
- https://www.engageny.org/resource/mathematics-fluency-support-grades-6-8/file/133021

   Provides fluency exercises along with recommended use
- https://www.engageny.org/resource/grade-7-mathematics-module-3

   Engage NY - Grade 7:  Expressions and Equations
   - Teacher materials
   - Student materials
   - Copy ready materials
   - Module overview
   - Assessments

**Additional General Modifications**
- "Chunking" new material
- Providing step by step prompts
- Repeated practice
- Sequence review
- Directed questioning and responses
- Sequence tasks from easy to difficult
- individual/small group/whole group
- Modeling - teacher demonstrates, students use model to problem solve
- Meaningful real-life connections

| Suggested Time Frame: | http://www.state.nj.us/education/modelcurriculum/timeline.pdf<br><br>30-35 days |
|---|---|

## Unit Three-Ratios and Proportions

| Content Area: | Math | Grade(s) 7 |
|---|---|---|
| **Unit Plan Title:** | **3 - Ratios and Proportions** | |

| **Overview/Rationale** |
|---|
| The standards presented in Unit 3 combine rational number arithmetic and linear expression and equations concepts to build on the work from grade 6. These standards require the students to analyze proportional relationships and use them in problem solving.  The geometry standards will provide opportunities for the students to use proportional reasoning in content. |

| **Standard(s)  Number and Description** |
|---|
| **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.<br> **7.RP.2** - Recognize and represent proportional relationships between quantities.<br> **7.RP.2a** - Decide whether two quantities are in a proportional relationship.<br> **7.RP.2b** - Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.<br> **7.RP.2c** - 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.<br> **7.RP.2d** - 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.<br> **7.RP.3** - Use proportional relationships to solve multistep ratio and percent problems.<br>**7.NS.3** - Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.<br>**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.<br> **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.<br><br>**Student Learning Objectives and Corresponding CCSS**<br>        Student learning objectives for the unit, along with the corresponding Common Core State Standards. |

| **Math Practice Standards  Number and Description** |
|---|

**MP 1 -** Make sense of problems and persevere in solving them.
**MP 2 -** Reason abstractly and quantitatively
**MP 3 -** Construct viable arguments and critique reasoning of others
**MP 4 -** Model with mathematics
**MP 5 -** Use appropriate tools strategically
**MP 6 -** Attend to precision
**MP 7 -** Look for and make use of structure
**MP 8 -** Look for and express regularity and repeated reasoning

https://www.engageny.org/resource/grade-7-mathematics-module-4/file/117471
        Provides example problems using each Mathematical Practice Standard (pages 7-9).

**Technology Standard(s)  Number and Description**

**8.1.8.A.3 -** Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

**Interdisciplinary Standard(s)  Number and Description**

**LA.7.W.7.1 -** Write arguments to support claims with clear reasons and relevant evidence.

**SCI.7-8.8.2.8.E.1-**Calculate the speed of an object given distance and time.

**SCI.7-8.5.4.8.A.c** Gravitation is a universal attractive force by which objects with mass attract one another.   The gravitational force between two objects is proportional to their masses and inversely proportional to the square of the distance between the object.

**Enduring Understandings:**

***Students will understand that…***
- *Proportional relationships can be used to solve real-world problems.*
- *Geometry helps describe real-world objects through drawing, constructing, and describing relationships between geometrical figures.*

**Unit Essential Questions :**

- How can you show that two objects are proportional and determine when it is appropriate to use a unit rate and understand its limitations?
- How do you solve problems involving scale drawings of geometric figures, including reproducing a scale drawing at a different scale?
- How can you represent angle relationships using equations to solve for unknown angles?

**21st Century Connections**

| *Check all that apply.*<br><br>**21st Century Interdisciplinary Themes** | | *Indicate whether these skills are **E**-Encouraged, **T**-Taught, and/or **A**-Assessed in this unit by marking **E, T, A** in the box before the appropriate skill.*<br>**21st Century Skills** | |
|---|---|---|---|
| x | Global Awareness | ETA | Critical Thinking and Problem Solving |
| x | Environmental Literacy | E | Creativity and Innovation |
|  | Health Literacy | ET | Communication and Collaboration |
|  | Civic Literacy | E | Flexibility and Adaptability |
| x | Financial, Economic , Business and Entrepreneurial Literacy | E | Initiative and Self-Direction |
|  |  | E | Social and Cross-Cultural Skills |
|  |  | E | Productivity and Accountability |
|  |  | E | Leadership and Responsibility |
|  |  | E | Informational Literacy Skills |
|  |  | E | Media Literacy Skills |
|  |  | ETA | Information, Communication, and Technology (ICT) Literacy |

**Career Ready Practices:**

| | |
|---|---|
| ETA | **CRP1. Act as a responsible and contributing citizen and employee** |
| A | **CRP2. Apply appropriate academic and technical skills** |
| TA | **CRP3. Attend to personal health and financial well-being** |
| ETA | **CRP4. Communicate clearly and effectively with reason** |
| TA | **CRP5. Consider the environmental, social and economic impacts of decisions** |
| E | **CRP6. Demonstrate creativity and innovation** |
| E | **CRP7. Employ valid and reliable research strategies** |
| A | **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them** |
| E | **CRP9. Model integrity, ethical leadership, and effective management** |
| E | **CRP10. Plan education and career paths aligned to personal goals** |
| T | **CRP11. Use technology to enhance productivity** |
| ET | **CRP12. Work productively in teams while using cultural global competence** |

**Student Learning Goals/Objectives:**

| *Students will know….* | *Students will be able to (do)…* |
|---|---|
| <ul><li>*Rate is a measure of one quantity per unit of another quantity.*</li><li>*What is a complex fraction?*</li><li>*What makes two quantities proportional?*</li><li>*How to graph a relationship to solve if it is proportional or non-proportional.*</li></ul> | <ul><li>find and convert unit rates.</li><li>solve complex fractions.</li><li>identify proportional and non-proportional relationships.</li><li>graph and solve proportional relationships.</li><li>calculate constant rate of change.</li><li>identify slope.</li></ul> |

| | |
|---|---|
| ● *How to solve a proportion.*<br>● *How rate of change is related to slope.*<br>● *How to determine if a linear function is a direct variation from an equation, table, and graph.*<br>● *Identify and classify triangles and find missing angle measures.*<br>● *Solve problems involving scale drawings.* | ● solve problems using direct variation.<br>● draw triangles from three measures of angles or sides.<br>● solve problems involving scale drawings of geometric figures. |

**Key Vocabulary and Terms:**

*complex fraction, constant of proportionality, constant rate of change, constant of variation, coordinate plane, cross products, dimensional analysis, direct variation, equivalent ratios, non-proportional, proportion, proportional, ordered pair, origin, quadrants, rate, rate of change, slope, unit rate, unit ratio, x-axis, x-coordinate, y-axis, y-coordinate, acute triangle, right triangle, obtuse triangle, scalene triangle, isosceles triangle, equivalent triangle, triangle, congruent segments, scale drawing, scale model, scale, scale factor*

**Assessment Evidence:**

| | |
|---|---|
| ***Performance Tasks:***<br>***Suggested performance tasks, but not limited to:***<br>*Glencoe Math Course 2 - Common Core Performance Task text*<br> ●  *p.93 Road Trip- Complete Scoring Rubric with answers can be found on PT1*<br><br>*Ice Cream Performance Task*<br>*Ice Cream Performance Task Rubric*<br>*Ice Cream Performance Task Student Sample* | **Other Assessment Measures***:  Through quizzes, tests, academic prompts, observations, homework, journals, Star Renaissance, and benchmarks testing students will demonstrate achievements.  Students will reflect on errors and make corrections.*<br><br>**Performance Scales**<br>   Learning goals and scales-Scales use an explicit set of criteria used for assessing progress toward a learning goal or target. |

| *Teaching and Learning Actions:  (What learning experiences and instruction will enable students to achieve the desired results?)* ||
|---|---|
| **Title** | **Description with Modifications, number of days, etc.** |

| | | |
|---|---|---|
| 1. Proportional and Non-proportional Relationships<br><br>**Days** : 9-12 | • *W-Student learning map*<br>• *H- Real World Link*<br>• *E-Vocabulary activities*<br>• *R- attend to precision and corrections*<br>• *E-students analyze progress throughout unit*<br>• *T-Scaffold activities to meet individual student needs*<br>• *O- encourage students to keep an organized ISN (Interactive Student Notebook)*<br><br>*\*D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* | |
| 2. Rate of change, slope and direct variation<br><br>**Days** : 9-12 | • *W-Student learning map*<br>• *H- Real World Link*<br>• *E-Vocabulary activities*<br>• *R- attend to precision and corrections*<br>• *E-students analyze progress throughout unit*<br>• *T-Scaffold activities to meet individual student needs*<br>• *O- encourage students to keep an organized ISN (Interactive Student Notebook)*<br><br>*\*D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* | |
| 3. Triangles and Scale Drawings | • *W-Student learning map*<br>• *H- Real World Link*<br>• *E-Vocabulary activities*<br>• *R- attend to precision and corrections*<br>• *E-students analyze progress throughout unit*<br>• *T-Scaffold activities to meet individual student needs*<br>• *O- encourage students to keep an organized ISN (Interactive Student Notebook)* | |

| | |
|---|---|
| **Days** : 9-12 | *D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* |

**Resources:**

Glencoe Math Course 2

Glencoe Math Course 2 - Power Up for the PARCC Assessment

Glencoe Math Course 2 - Common Core Performance Tasks

**Various websites**
- http://www.state.nj.us/education/modelcurriculum/math/7u3.shtml

  User Name: model  Password: curriculum
- https://www.insidmathematics.org/performance-assessment-tasks
- www.mathplayground.com
- www.teacherspayteachers.com
- www.kahnacademy.org
- www.xpmath.com
- www.illustrativemathematics.org
- www.mathbitsnotebook.com
- http://map.mathshell.org/
- https://parcc.pearson.com/practice-tests/math/
- https://www.engageny.org/resource/mathematics-fluency-support-grades-6-8/file/133021

  Provides fluency exercises along with recommended use
- https://www.engageny.org/resource/grade-7-mathematics-module-4

  Engage NY - Grade 7:  Percent and Proportional Relationships
  - Teacher materials
  - Student materials
  - Copy ready materials
  - Module overview
  - Assessments

| Suggested Time Frame: | 30-35 days |
|---|---|

## Unit Four- Statistics and Probability

| Content Area: | **Math** | | **Grade(s) 7** |
|---|---|---|---|
| **Unit Plan Title:** | **4 - Statistics and Probability** | | |

| **Overview/Rationale** |
|---|
| **Unit 4 students will continue to use ratios and proportional reasoning in multi-step ratio and percent problems.  Statistics and Probability of calculating simple and compound event along with use of random samples to make predictions and compare populations.** |

| **Standard(s)  Number and Description** |
|---|
| **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. <br> **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. <br> **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. <br> **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. <br> **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. <br> **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. <br> **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. <br> **7.SP.7a** - Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. <br> **7.SP.7b** - Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. <br> **7.SP.8** - Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. |

**7.SP.8a** - 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.

**7.SP.8b** - 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.

**7.SP.8c** - Design and use a simulation to generate frequencies for compound events.

**Student Learning Objectives and Corresponding CCSS**
Student learning objectives for the unit, along with the corresponding Common Core State Standards.

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**Math Practice Standards - Number and Description**

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**MP 1** - Make sense of problems and persevere in solving them.
**MP 2** - Reason abstractly and quantitatively
**MP 3** - Construct viable arguments and critique reasoning of others
**MP 4** - Model with mathematics
**MP 5** - Use appropriate tools strategically
**MP 6** - Attend to precision
**MP 7** - Look for and make use of structure
**MP 8** - Look for and express regularity and repeated reasoning

**https://www.engageny.org/resource/grade-7-mathematics-module-5/file/123101**
Provides example activities using Mathematical Practice Standards 2-6 (pages 6).

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**Technology Standard(s) - Number and Description**

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**8.1.8.A.3** - Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

---

**Interdisciplinary Standard(s) - Number and Description**

---

**LA.7.W.7.1** - Write arguments to support claims with clear reasons and relevant evidence.

**SCI.7-8.5.1.8.D.a**- Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work

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**Enduring Understandings:**

*Students will understand that…*
- *Probability describes the likelihood of an event occurring.*
- *Statistics can be used to draw conclusions about a population.*

**Unit Essential Questions :**

How can you predict the outcome of future events through designing and using simulations?

How can you generate multiple samples of the same size to gauge the variation in estimates or predictions?

How can you analyze whether a sample is representative of a population?

**21st Century Connections**

| *Check all that apply.* <br><br> **21st Century Interdisciplinary Themes** | *Indicate whether these skills are **E**-Encouraged, **T**-Taught, and/or **A**-Assessed in this unit by marking **E, T, A** in the box before the appropriate skill.* <br> **21st Century Skills** |
|---|---|
| **x**   Global Awareness | **ETA**   Critical Thinking and Problem Solving |
| Environmental Literacy | **E**   Creativity and Innovation |
| Health Literacy | **ET**   Communication and Collaboration |
| Civic Literacy | **E**   Flexibility and Adaptability |
| **x**   Financial, Economic , Business and Entrepreneurial Literacy | **E**   Initiative and Self-Direction |
| | **E**   Social and Cross-Cultural Skills |
| | **E**   Productivity and Accountability |
| | **E**   Leadership and Responsibility |
| | **E**   Informational Literacy Skills |
| | **E**   Media Literacy Skills |

| | ETA | Information, Communication, and Technology (ICT) Literacy |
|---|---|---|

**Career Ready Practices:**

*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.*

| | | |
|---|---|---|
| ETA | CRP1. | Act as a responsible and contributing citizen and employee |
| A | CRP2. | Apply appropriate academic and technical skills |
| TA | CRP3. | Attend to personal health and financial well-being |
| ETA | CRP4. | Communicate clearly and effectively with reason |
| TA | CRP5. | Consider the environmental, social and economic impacts of decisions |
| E | CRP6. | Demonstrate creativity and innovation |
| E | CRP7. | Employ valid and reliable research strategies |
| A | CRP8. | Utilize critical thinking to make sense of problems and persevere in solving them |
| E | CRP9. | Model integrity, ethical leadership, and effective management |
| E | CRP10. | Plan education and career paths aligned to personal goals |
| T | CRP11. | Use technology to enhance productivity |
| ET | CRP12. | Work productively in teams while using cultural global competence |

**Student Learning Goals/Objectives:**

| *Students will know….* | *Students will be able to (do)…* |
|---|---|
| <ul><li>*What the relationship is between the probability of an event and its complement.*</li><li>*How experimental probability and theoretical probability are*</li></ul> | <ul><li>Calculate probability of simple and compound events</li><li>Predict outcomes of an event by using theoretical and experimental probability, sample space, and simulation</li></ul> |

- *alike.*
- *How tree diagrams, tables, and lists help find the probability of a compound event.*
- *How using a simulation is related to experimental probability.*
- *How using the Fundamental Counting Principle compares to making a tree diagram.*
- *How to find the number of permutations of a set of objects.*
- *What the difference is between independent and dependent events.*
- *When statistics can be used to gain information about a population from a sample.*
- *How using a survey is one way to determine experimental probability.*
- *What ways the display of can influence conclusions?*
- *How to use data displays to compare two populations.*
- *What some of the factors is there that should be considered when selecting an appropriate display for a set of data.*

- Compare data from a double box plot by their centers and variations.

**Key Vocabulary and Terms:**

*complementary events, compound event, dependent event, experimental probability, fair, fundamental counting principle, independent events outcome, permutation, probability, random, relative frequency, sample space, simple event, simulation, theoretical probability, tree diagram, uniform probability model, unfair, biased sample, convenience sample, double box plot, double dot plot, population, sample, simple random sample, statistics, survey, systematic random sample, unbiased sample, voluntary response sample*

**Assessment Evidence:**

| **Performance Tasks:** **Suggested performance tasks, but not limited to:** | **Other Assessment Measures:** *Through quizzes, tests, academic prompts, observations, homework, journals, Star Renaissance, and benchmarks* |

| | |
|---|---|
| *Glencoe Math Course 2 - Common Core Performance Task text* <br> ● *p.787 Carnival Prizes- Complete Scoring Rubric with answers can be found on PT5* <br> ● *p.851 Class Evaluation- Complete Scoring Rubric with answers can be found on PT6* <br><br> *Spinner Bingo Task* <br> *Spinner Bingo Task Rubric* <br> *Spinner Bingo Task Student Sample* | *testing students will demonstrate achievements. Students will reflect on errors and make corrections.* <br><br> **Performance Scales** <br> Learning goals and scales-Scales use an explicit set of criteria used for assessing progress toward a learning goal or target. |

| Teaching and Learning Actions: (What learning experiences and instruction will enable students to achieve the desired results?) | |
|---|---|
| **Title** | **Description with Modifications, number of days, etc.** |
| 1. *Probability of Simple and Compound Events* <br><br><br> **Days** : 9-12 | ● *W-Student learning map* <br> ● *H- Real World Link* <br> ● *E-Vocabulary activities* <br> ● *R- attend to precision and corrections* <br> ● *E-students analyze progress throughout unit* <br> ● *T-Scaffold activities to meet individual student needs* <br> ● *O- encourage students to keep an organized ISN (Interactive Student Notebook)* <br><br> *\*D - The teacher will provide more guidance to struggling learners. The teacher will have higher-level learners generate their own comprehension questions. The teacher will provide modified levels of graphic organizers to use for various learners. The teacher will group students in the way they feel best suits the assigned discussion/task. See additional resources for additional general modifications.* |
| 2. *Make Predictions* <br><br><br> **Days** : 9-12 | ● *W-Student learning map* <br> ● *H- Real World Link* <br> ● *E-Vocabulary activities* <br> ● *R- attend to precision and corrections* <br> ● *E-students analyze progress throughout unit* <br> ● *T-Scaffold activities to meet individual student needs* <br> ● *O- encourage students to keep an organized ISN (Interactive Student Notebook)* |

| | | |
|---|---|---|
| | | *\*D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* |
| *3. Comparing Box Plots*<br><br>**Days** : 9-12 | | ● **W-Student learning map**<br>● **H- Real World Link**<br>● **E-Vocabulary activities**<br>● **R- attend to precision and corrections**<br>● **E-students analyze progress throughout unit**<br>● **T-Scaffold activities to meet individual student needs**<br>● **O- encourage students to keep an organized ISN (Interactive Student Notebook)**<br><br>*\*D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* |
| *4.  Measures of Central Tendency*<br><br>**Days** : 9-12 | | ● **W-Student learning map**<br>● **H- Real World Link**<br>● **E-Vocabulary activities**<br>● **R- attend to precision and corrections**<br>● **E-students analyze progress throughout unit**<br>● **T-Scaffold activities to meet individual student needs**<br>● **O- encourage students to keep an organized ISN (Interactive Student Notebook)**<br><br>*\*D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* |

Resources:

Glencoe Math Course 2

Glencoe Math Course 2 - Power Up for the PARCC Assessment

Glencoe Math Course 2 - Common Core Performance Tasks

**Various websites**

- http://www.state.nj.us/education/modelcurriculum/math/7u4.shtml
  - User Name: model   Password: curriculum
- https://www.insidmathematics.org/performance-assessment-tasks
- www.mathplayground.com
- www.teacherspayteachers.com
- www.kahnacademy.org
- www.xpmath.com
- www.illustrativemathematics.org
- www.mathbitsnotebook.com
- http://map.mathshell.org/
- https://parcc.pearson.com/practice-tests/math/
- https://www.engageny.org/resource/mathematics-fluency-support-grades-6-8/file/133021
  - Provides fluency exercises along with recommended use
- https://www.engageny.org/resource/grade-7-mathematics-module-5
  - Engage NY - Grade 7:  Statistics and Probability
    - Teacher materials
    - Student materials
    - Copy ready materials
    - Module overview
    - Assessments

**Additional General Modifications**
- "Chunking" new material
- Providing step by step prompts
- Repeated practice
- Sequence review
- Directed questioning and responses
- Sequence tasks from easy to difficult
- individual/small group/whole group
- Modeling - teacher demonstrates, students use model to problem solve
- Meaningful real-life connections

| Suggested Time Frame (Days): | http://www.state.nj.us/education/modelcurriculum/timeline.pdf |
|---|---|
| | 36 - 48 days |

## Unit Five-Geometry

| Content Area: | Math | | Grade(s) 7 |
|---|---|---|---|
| Unit Plan Title: | 5 - Geometry | | |

| Overview/Rationale |
|---|
| The fluency standards in Unit 3 are repeated in Unit 5 with the opportunity to extend the understandings to geometry concepts. Students will use facts about angles to write and solve simple equations for an unknown angle in a figure. Solve real world problems involving area and circumference of circles, area, volume and surface area of 2D and 3D shapes. |

| Standard(s)  Number and Description |
|---|
| **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. <br> **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. <br> **7.G.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. <br> **7.G.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. <br> **7.G.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. <br> **7.G.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. <br><br> **Student Learning Objectives and Corresponding CCSS** <br>       Student learning objectives for the unit, along with the corresponding Common Core State Standards. |

| Math Practice Standards - Number and Description |
|---|
| **MP 1 -** Make sense of problems and persevere in solving them. |

**MP 2 -** Reason abstractly and quantitatively
**MP 3 -** Construct viable arguments and critique reasoning of others
**MP 4 -** Model with mathematics
**MP 5 -** Use appropriate tools strategically
**MP 6 -** Attend to precision
**MP 7 -** Look for and make use of structure
**MP 8 -** Look for and express regularity and repeated reasoning

https://www.engageny.org/resource/grade-7-mathematics-module-6
       Provides example problems using each Mathematical Practice Standard (page 5 - 6).

**Technology Standard(s) - Number and Description**

**8.1.8.A.3 -** Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

**Interdisciplinary Standard(s) - Number and Description**

**LA.7.W.7.1 -** Write arguments to support claims with clear reasons and relevant evidence.

**Enduring Understandings:**

*Students will understand that…*
- *Geometric shapes can be drawn freehand, with a ruler and protractor, or using technology.*
- *Real-life problems involving area, surface area, and volume can be solved by using formulas.*

**Unit Essential Questions :**

How can you describe two-dimensional figures that result from slicing three-dimensional figures by a plane which may or may not be parallel or perpendicular to a base or face?

How can you produce a logical conclusion about the relationship between the circumference and area of a circle?

## 21st Century Connections

| Check all that apply. | Indicate whether these skills are **E**-Encouraged, **T**-Taught, and/or **A**-Assessed in this unit by marking **E, T, A** in the box before the appropriate skill. |
|---|---|
| **21st Century Interdisciplinary Themes** | **21st Century Skills** |

| | | | |
|---|---|---|---|
| x | Global Awareness | ETA | Critical Thinking and Problem Solving |
| x | Environmental Literacy | E | Creativity and Innovation |
| | Health Literacy | ET | Communication and Collaboration |
| | Civic Literacy | E | Flexibility and Adaptability |
| x | Financial, Economic , Business and Entrepreneurial Literacy | E | Initiative and Self-Direction |
| | | E | Social and Cross-Cultural Skills |
| | | E | Productivity and Accountability |
| | | E | Leadership and Responsibility |
| | | E | Informational Literacy Skills |
| | | E | Media Literacy Skills |
| | | ETA | Information, Communication, and Technology (ICT) Literacy |

## Career Ready Practices:

*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.*

| | |
|---|---|
| ETA | CRP1. Act as a responsible and contributing citizen and employee |
| A | CRP2. Apply appropriate academic and technical skills |

| | |
|---|---|
| TA | **CRP3. Attend to personal health and financial well-being** |
| ETA | **CRP4. Communicate clearly and effectively with reason** |
| TA | **CRP5. Consider the environmental, social and economic impacts of decisions** |
| E | **CRP6. Demonstrate creativity and innovation** |
| E | **CRP7. Employ valid and reliable research strategies** |
| A | **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them** |
| E | **CRP9. Model integrity, ethical leadership, and effective management** |
| E | **CRP10. Plan education and career paths aligned to personal goals** |
| T | **CRP11. Use technology to enhance productivity** |
| ET | **CRP12. Work productively in teams while using cultural global competence** |

**Student Learning Goals/Objectives:**

| *Students will know….* | *Students will be able to (do)…* |
|---|---|
| ● *What are the differences between vertical and adjacent angles?*<br>● *How vertical, adjacent, complementary, and supplementary angles are related.*<br>● *How triangles can be classified.*<br>● *How you can use a map to estimate the actual distance between two places.*<br>● *How drawing the different views of a three-dimensional figure help with a deeper understanding of the figure.*<br>● *How to name a three-dimensional figure using the shape of the base.*<br>● *What the relationship is between the circumference and the* | ● use facts about angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure<br>● identify nets of three-dimensional figures<br>● calculate area and circumference of circles<br>● calculate area of composite figures<br>● calculate volume and surface area of composite figures<br>● calculate volume of prisms and pyramids<br>● calculate surface area of prisms and pyramids |

- *diameter of a circle.*
- *How the circumference and area of a circle are alike and how they are different.*
- *How finding the volume of a rectangular prism and the volume of a triangular prism are alike and how they are different.*
- *Why the surface area of a three-dimensional figure is measured in square units instead of cubic units.*
- *How to justify the formula for the surface area of a pyramid.*
- *How to find the surface area and volume of a composite figure.*

## Key Vocabulary and Terms:

*acute angle, acute triangle, adjacent angles, base, complementary angles, cone, congruent, congruent segments, coplanar, cross section, cylinder, diagonal, edge, equilateral triangle, face, isosceles triangle, obtuse triangle, obtuse angle, plane, polyhedron, prism, pyramid ,right angle, right triangle, scale, scale drawing, scale factor, scale model, scalene triangle, skew line, straight line, straight angles, supplementary angles, triangles, vertex, vertical angles, center, circle, circumference, composite figure, diameter, lateral face, lateral surface area, pi, radius, regular pyramid, semicircle, slant height, surface area, volume*

## Assessment Evidence:

| | |
|---|---|
| ***Performance Tasks:*** <br> ***Suggested performance tasks, but not limited to:*** <br> *Glencoe Math Course 2 - Common Core Performance Task text* <br> • *p.605 Stacking Triangles- Complete Scoring Rubric with answers can be found on page PT3* <br> • *p. 701 Juice Box Packaging - Complete Scoring Rubric with answers can be found on page PT4* | **Other Assessment Measures***:  Through quizzes, tests, academic prompts, observations, homework, journals, Star Renaissance, and benchmarks testing students will demonstrate achievements.  Students will reflect on errors and make corrections.* <br><br> **Performance Scales** <br>   Learning goals and scales-Scales use an explicit set of criteria used for assessing progress toward a learning goal or target. |

| | |
|---|---|
| *Historic Bicycle Task* <br> *Historic Bicycle Task Rubric* <br> *Historic Bicycle Task Student Sample* | |

| Teaching and Learning Actions: (What learning experiences and instruction will enable students to achieve the desired results?) | |
|---|---|
| **Title** | **Description with Modifications, number of days, etc.** |
| 1. *Classify Angles* <br><br><br><br><br><br><br><br> **Days** : 9-12 | ● *W-Student learning map* <br> ● *H- Real World Link* <br> ● *E-Vocabulary activities* <br> ● *R- attend to precision and corrections* <br> ● *E-students analyze progress throughout unit* <br> ● *T-Scaffold activities to meet individual student needs* <br> ● *O- encourage students to keep an organized ISN (Interactive Student Notebook)* <br><br> *\*D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* |
| 2. *Area and Circumference of Circles* <br><br><br><br><br><br><br><br> **Days** : 9-12 | ● *W-Student learning map* <br> ● *H- Real World Link* <br> ● *E-Vocabulary activities* <br> ● *R- attend to precision and corrections* <br> ● *E-students analyze progress throughout unit* <br> ● *T-Scaffold activities to meet individual student needs* <br> ● *O- encourage students to keep an organized ISN (Interactive Student Notebook)* <br><br> *\*D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* |
| 3. *Volume and Surface Area of Prisms, Pyramids, Composite* | ● *W-Student learning map* <br> ● *H- Real World Link* <br> ● *E-Vocabulary activities* |

| | |
|---|---|
| *figures*<br><br>**Days** : 9-12 | ● **R- attend to precision and corrections**<br>● **E-students analyze progress throughout unit**<br>● **T-Scaffold activities to meet individual student needs**<br>● **O- encourage students to keep an organized ISN (Interactive Student Notebook)**<br><br>***D - The teacher will provide more guidance to struggling learners.  The teacher will have higher-level learners generate their own comprehension questions.  The teacher will provide modified levels of graphic organizers to use for various learners.  The teacher will group students in the way they feel best suits the assigned discussion/task.  See additional resources for additional general modifications.* |

**Resources:**

Glencoe Math Course 2

Glencoe Math Course 2 - Power Up for the PARCC Assessment

Glencoe Math Course 2 - Common Core Performance Tasks

**Various websites**
- http://www.nj.gov/education/modelcurriculum/math/7u5.shtml

  User Name: model  Password: curriculum
- https://www.insidmathematics.org/performance-assessment-tasks
- www.mathplayground.com
- www.teacherspayteachers.com
- www.kahnacademy.org
- www.xpmath.com
- www.illustrativemathematics.org
- www.mathbitsnotebook.com
- http://map.mathshell.org/
- https://parcc.pearson.com/practice-tests/math/
- https://www.engageny.org/resource/mathematics-fluency-support-grades-6-8/file/133021

  Provides fluency exercises along with recommended use
- https://www.engageny.org/resource/grade-7-mathematics-module-6

  Engage NY - Grade 7:  Geometry
    - Teacher materials
    - Student materials
    - Copy ready materials

| | |
|---|---|
| <ul><li>Module overview</li><li>Assessments</li></ul>**Additional General Modifications**<ul><li>"Chunking" new material</li><li>Providing step by step prompts</li><li>Repeated practice</li><li>Sequence review</li><li>Directed questioning and responses</li><li>Sequence tasks from easy to difficult</li><li>individual/small group/whole group</li><li>Modeling - teacher demonstrates, students use model to problem solve</li><li>Meaningful real-life connections</li></ul> | |
| Suggested Time Frame (Days): | http://www.state.nj.us/education/modelcurriculum/timeline.pdf<br><br>27 - 36 days |

*D* – Indicates differentiation at the Lesson Level

# 7th Grade Math Standards Curriculum Map

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| **Unit 1**<br><br>**Operations on Rational Numbers &** | ■ 7.NS.A.1<br>■ 7.NS.A.2<br>■ 7.NS.A.3<br>■ 7.EE.A.1<br>■ 7.EE.A.2 | • Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers<br>• Use properties of operations to generate equivalent expressions | |

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| **Expressions** | | | MP.1 Make sense of problems and persevere in solving them. |
| *Unit 1:*<br><br>*Suggested Open Educational Resources* | 7.NS.A.1 Comparing Freezing Points<br><br>7.NS.A.1b-c Differences of Integers<br><br>7.NS.A.2 Why is a Negative Times a Negative Always Positive<br><br>7.NS.A.2d Equivalent fractions approach to non-repeating decimals<br><br>7.NS.A.2d Repeating decimal as approximation<br><br>7.EE.A.1 Writing Expressions<br><br>7.EE.A.2 Ticket to Ride | | MP.2 Reason abstractly and quantitatively.<br><br>MP.3 Construct viable arguments & critique the reasoning of others.<br><br>MP.4 Model with mathematics. |
| **Unit 2**<br><br>**Equations and Ratio & Proportion** | 🟩 7.EE.B.3<br>🟩 7.EE.B.4*<br>🟩 7.RP.A.1<br>🟩 7.RP.A.2<br>🟩 7.RP.A.3*<br>🟡 7.G.A.1 | • Solve real-life and mathematical problems using numerical and algebraic expressions and equations<br>• Analyze proportional relationships and use them to solve real-world and mathematical problems<br>• Draw, construct, and describe geometrical figures and describe the relationships between them | MP.5 Use appropriate tools strategically. |

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| | | | MP.6 Attend to precision. |
| *Unit 2:*<br><br>*Suggested Open Educational Resources* | 7.EE.B.3 Discounted Books<br><br>7.EE.B.3 Shrinking<br><br>7.EE.B.4 Fishing Adventures 2<br><br>7.EE.B.4, 7.NS.A.1 Bookstore Account<br><br>7.EE.B.4b Sports Equipment Set<br><br>7.RP.A.1 Cooking with the Whole Cup<br><br>7.RP.A.2 Sore Throats, Variation 1<br><br>7.RP.A.2 Buying Coffee<br><br>7.RP.A.2c Gym Membership Plans<br><br>7.G.A.1 Floor Plan<br><br>7.G.A.1 Map distance | | MP.7 Look for and make use of structure.<br><br><br><br>MP.8 Look for and express regularity in repeated reasoning. |
| **Unit 3**<br><br>**Drawing Inferences** | ☐ 7.SP.A.1<br>☐ 7.SP.A.2<br>◉ 7.SP.B.3<br>◉ 7.SP.B.4<br>☐ 7.SP.C.5 | • Use random sampling to draw inferences about a population<br>• Draw informal comparative inferences about two populations<br>• Investigate chance processes and develop, use, and | |

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| **about Populations**<br><br>**& Probability Models** | ☐ 7.SP.C.6<br>☐ 7.SP.C.7<br>☐ 7.SP.C.8 | evaluate probability models | |
| *Unit 3:*<br><br>*Suggested Open Educational Resources* | 7.SP.A.1 Mr. Briggs Class Likes Math<br><br>7.SP.A.2 Valentine Marbles<br><br>7.SP.B.3,4 College Athletes<br><br>7.SP.B.3,4 Offensive Linemen<br><br>7.SP.C.6 Heads or Tails<br><br>7.SP.C.7, 6 Rolling Dice<br><br>7.SP.C.7a How Many Buttons<br><br>7.SP.C.8 Tetrahedral Dice<br><br>7.SP.C.8 Waiting Times | | MP.1 Make sense of problems and persevere in solving them.<br><br><br>MP.2 Reason abstractly and quantitatively.<br><br><br>MP.3 Construct viable arguments & critique the reasoning of others.<br><br><br>MP.4 Model with mathematics. |
| **Unit 4**<br><br><br>**Problem Solving with Geometry** | ⊙ 7.G.B.4<br>⊙ 7.G.B.5<br>⊙ 7.G.B.6<br>⊙ 7.G.A.2<br>⊙ 7.G.A.3<br>■ 7.EE.B.4*<br>■ 7.RP.A.3* | • Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.<br>• Draw, construct, and describe geometrical figures and describe the relationships between them.<br>• Solve real-life and mathematical problems using numerical and algebraic expressions and equations | MP.5 Use appropriate tools strategically. |

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| | | | MP.6 Attend to precision. |
| *Unit 4:*<br><br>*Sample Open Educational Resources* | 7.G.B.4 Wedges of a Circle<br><br>7.G.B.4 Eight Circles<br><br>7.G.B.6, 7.RP.A.3 Sand under the Swing Set<br><br>7.G.A.2 A task related to 7.G.A.2<br><br>7.G.A.3 Cube Ninjas!<br><br>7.RP, 7.EE, 7.NS Drill Rig<br><br>7.RP.A.3, 7.EE.B.3,4 Gotham City Taxis | | MP.7 Look for and make use of structure.<br><br>MP.8 Look for and express regularity in repeated reasoning. |

| Unit 1 Grade 7 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |

| Unit 1 Grade 7 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| ▪ 7.NS.A.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.<br><br>    7.NS.A.1a. 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?*<br><br>    7.NS.A.1b. 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. | MP.2 Reason abstractly and quantitatively.<br><br>MP.3 Construct viable arguments & critique the reasoning of others.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br><br>• Opposite quantities combine to make 0 (additive inverses).<br>• $p + q$ is the number located a distance $|q|$ from $p$, in the positive or negative direction depending on whether $q$ is positive or negative.<br>• Subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$<br>• The product of two whole numbers is the total number of objects in a number of equal groups.<br>Students are able to:<br><br>• Represent addition and subtraction on a horizontal number line.<br>• Represent addition and subtraction on a vertical number line.<br>• Interpret sums of rational numbers in real-world situations.<br>• Show that the distance between two rational numbers on the number line is the absolute value of their difference.<br><br>Learning Goal 1: Describe real-world situations in which (positive and negative) rational numbers are combined, emphasizing rational numbers that combine to make 0. Represent sums of rational numbers ($p + q$) on horizontal and vertical number lines, showing that the distance along the number line is $|q|$ and including situations in which $q$ is negative and positive.<br>Learning Goal 2: Add and subtract (positive and negative) rational numbers, showing that the distance between two points on a number line is the absolute value of their difference and representing subtraction using an additive inverse. |

| Unit 1 Grade 7 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| 7.NS.A.1c. 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.<br><br>7.NS.A.1d. Apply properties of operations as strategies to add and subtract rational numbers. | | |
| ■ 7.NS.A.2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.<br>    7.NS.A.2a. 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 | MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br><br>• Every quotient of integers (with non-zero divisor) is a rational number.<br>• Decimal form of a rational number terminates in 0s or eventually repeats.<br>• Integers can be divided, provided that the divisor is not zero.<br>• If $p$ and $q$ are integers, then $-(p/q) = (-p)/q = p/(-q)$.<br>Students are able to:<br><br>• Multiply and divide signed numbers.<br>• Use long division to convert a rational number to a decimal.<br><br>Learning Goal 3: Multiply and divide signed numbers, including rational numbers, and |

| Unit 1 Grade 7 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.<br><br>7.NS.A.2b. 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 $-(p/q) = (-p)/q = p/(-q)$. 2c. Interpret quotients of rational numbers by describing real world contexts.<br><br>7.NS.A.2d. 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. | | interpret the products and quotients using real-world contexts.<br><br>Learning Goal 4: Convert a rational number to a decimal using long division and explain why the decimal is either a terminating or repeating decimal. |
| ■ 7.NS.A.3. Solve real-world and mathematical problems involving the four operations with rational numbers.<br>■ 7.NS.A.2. Apply and extend previous understandings of | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively. | Concept(s):<br><br>• The process for multiplying and dividing fractions extends to multiplying and dividing rational numbers.<br>Students are able to: |

| Unit 1 Grade 7 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| multiplication and division and of fractions to multiply and divide rational numbers.<br><br>    7.NS.A.2c. Apply properties of operations as strategies to multiply and divide rational numbers. | MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision. | <ul><li>Add and subtract rational numbers.</li><li>Multiply and divide rational numbers using the properties of operations.</li><li>Apply the convention of order of operations to add, subtract, multiply and divide rational numbers.</li><li>Solve real world problems involving the four operations with rational numbers.</li></ul><br>Learning Goal 5:  Apply properties of operations as strategies to add, subtract, multiply, and divide rational numbers.<br>Learning Goal 6:  Solve mathematical and real-world problems involving addition, subtraction, multiplication, and division of signed rational numbers. |
| ■ 7.EE.A.1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.<br>■ 7.EE.A.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.".* | MP.2 Reason abstractly and quantitatively.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br><br><ul><li>Rewriting an expression in different forms in a problem context can shed light on the problem.</li></ul>Students are able to:<br><br><ul><li>Add and subtract linear expressions having rational coefficients, using properties of operations.</li><li>Factor and expand linear expressions having rational coefficients, using properties of operations.</li><li>Write expressions in equivalent forms to shed light on the problem and interpret the relationship between the quantities in the context of the problem.</li></ul><br>Learning Goal 7: Apply the properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.<br><br>Learning Goal 8: Rewrite algebraic expressions in equivalent forms to highlight how the quantities in it are related. |

| Unit 1 Grade 7 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| **Unit 1 Grade 7 What This May Look Like** | | |
| **District/School Formative Assessment Plan** | | **District/School Summative Assessment Plan** |
| *Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.* | | *Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* |
| **Focus Mathematical Concepts** | | |
| *Districts should consider listing prerequisites skills. Concepts that include a focus on relationships and representation might be listed as grade level appropriate.* Prerequisite skills: <br><br> Common Misconceptions: | | |
| **District/School Tasks** | | **District/School Primary and Supplementary Resources** |
| *Exemplar tasks or illustrative models could be provided.* | | *District/school resources and supplementary resources that are texts as well as digital resources used to support the instruction.* |
| **Instructional Best Practices and Exemplars** | | |
| *This is a place to capture examples of standards integration and instructional best practices.* | | |

| Unit 2 Grade 7 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| ■ 7.EE.B.3. Solve multi-step real-life and mathematical problems posed with positive and negative | MP.1 Make sense of problems and persevere in solving them. <br><br> MP.2 Reason abstractly and | Concept(s): <br><br> ● Rational numbers can take different forms. |

| Unit 2 Grade 7 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| 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.* | quantitatively.<br><br>MP.3 Construct viable arguments & critique the reasoning of others.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision. | Students are able to:<br><br>• solve multi-step real-life problems using rational numbers in any form.<br>• Solve multi-step mathematical problems using rational numbers in any form.<br>• Convert between decimals and fractions and apply properties of operations when calculating with rational numbers.<br>• Estimate to determine the reasonableness of answers.<br><br>Learning Goal 1: Solve multi-step real life and mathematical problems with rational numbers in any form (fractions, decimals) by applying properties of operations and converting rational numbers between forms as needed. Assess the reasonableness of answers using mental computation and estimation strategies. |
| ■ 7.EE.B.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.<br><br>    7.EE.B.4a. Solve word | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.3 Construct viable arguments & critique the reasoning of others. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Compare an arithmetic solution to a word problem to the algebraic solution of the word problem, identifying the sequence of operations in each solution.<br>• Write an equation of the form px + q = r or p(x + q)=r in order to solve a word problem. |

| Unit 2 Grade 7 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| 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?* <br><br> 7.EE.B.4b. 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. <br><br> *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* | MP.4 Model with mathematics. <br><br> MP.5 Use appropriate tools strategically. <br><br> MP.6 Attend to precision. <br><br> MP.7 Look for and make use of structure. | • Fluently solve equations of the form $px + q = r$ and $p(x + q) = r$. <br> • Write an inequality of the form $px + q > r$, $px + q < r$, $px + q \geq r$ or $px + q \leq r$ to solve a word problem. <br> • Graph the solution set of the inequality. <br> • Interpret the solution to an inequality in the context of the problem. <br><br> Learning Goal 2: Use variables to represent quantities in a real-world or mathematical problem by constructing simple equations and inequalities to represent problems. <br><br> Learning Goal 3: Fluently solve equations; solve inequalities, graph the solution set of the inequality and interpret the solutions in the context of the problem (*Equations of the form $px + q = r$ and $p(x + q) = r$ and inequalities of the form $px + q > r$, $px + q \geq r$, $px + q \leq r$, or $px + q < r$, where $p$, $q$, and $r$ are specific rational numbers*). |

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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| *number of sales you need to make, and describe the solutions.* *(benchmarked) | | |
| ■ 7.RP.A.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* $\frac{1/2}{1/4}$ *mph, equivalently 2 mph.* | MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.6 Attend to precision. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Compute unit rates with ratios of fractions.<br>• Compute unit rates with ratios of fractions representing measurement quantities. in both like and different units of measure.<br><br>Learning Goal 4:   Calculate and interpret unit rates of various quantities involving ratios of fractions that contain like and different units. |
| ■ 7.RP.A.2. Recognize and represent proportional relationships between quantities.<br><br>7.RP.A.2a. 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.<br><br>7.RP.A.2b. Identify the | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.3 Construct viable arguments & critique the reasoning of others.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of | Concept(s):<br>• Proportions represent equality between two ratios.<br>• Constant of proportionality<br>Students are able to:<br><br>• Use tables and graphs to determine if two quantities are in a proportional relationship.<br>• Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.<br>• Write equations representing proportional relationships.<br>• Interpret the origin and (1, r) on the graph of a proportional relationship in context.<br>• Interpret a point on the graph of a proportional relationship in context. |

| Unit 2 Grade 7 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. 7.RP.A.2c. Represent proportional relationships by equations.<br><br>*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.*<br><br>7.RP.A.2d. 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. | structure.<br>MP.8 Look for and express regularity in repeated reasoning. | Learning Goal 5: Determine if a proportional relationship exists between two quantities e.g. by testing for equivalent ratios in a table or graph on the coordinate plane and observing whether the graph is a straight line through the origin.<br>Learning Goal 6: Identify the constant of proportionality (unit rate) from tables, graphs, equations, diagrams, and verbal descriptions.<br>Learning Goal 7: Write equations to model proportional relationships in real world problems.<br>Learning Goal 8: Use the graph of a proportional relationship to interpret the meaning of any point (x, y) on the graph in terms of the situation - including the points (0, 0) and (1, r), recognizing that r is the unit rate. |
| 7.RP.A.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,* | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools | Concept(s):<br>• Recognize percent as a ratio indicating the quantity *per one hundred*.<br>Students are able to:<br><br>• use proportions to solve multistep percent problems including simple interest, tax, markups, discounts, gratuities, commissions, fees, percent increase, percent decrease, percent error. |

| Unit 2 Grade 7 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| *percent error.* *(benchmarked) | strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | • Use proportions to solve multistep ratio problems.<br><br>Learning Goal 9: Solve multi-step ratio and percent problems using proportional relationships (*simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error*) |
| ■ 7.RP.A.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.*<br><br>◎ 7.G.A.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. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br>• Scale and proportion<br>Students are able to:<br><br>• Use ratios and proportions to create scale drawings.<br>• Reproduce a scale drawing at a different scale.<br>• Computing actual lengths and areas from a scale drawing.<br>• Solve problems involving scale drawings using proportions.<br><br>Learning Goal 10: Use ratio and proportion to solve problems involving scale drawings of geometric figures. |

| Unit 2 Grade 7 What This May Look Like | |
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| **District/ School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
| *Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.* | *Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* |

| Unit 2 Grade 7 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
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| **Focus Mathematical Concepts** |
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| *Districts should consider listing prerequisites skills. Concepts that include a focus on relationships and representation might be listed as grade level appropriate.*<br>Prerequisite skills:<br><br>Common Misconceptions: |

| **District/School Tasks** | **District/School Primary and Supplementary Resources** |
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| *Exemplar tasks or illustrative models could be provided.* | *District/school resources and supplementary resources that are texts as well as digital resources used to support the instruction.* |

| **Instructional Best Practices and Exemplars** |
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| *This is a place to capture examples of standards integration and instructional best practices.* |

| Unit 3 Grade 7 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| ☐ 7.SP.A.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 | MP.3 Construct viable arguments & critique the reasoning of others.<br><br>MP.6 Attend to precision. | Concept(s)<br>• Statistics can be used to gain information about a population by examining a sample of the population.<br>• Generalizations about a population from a sample are valid only if the sample is representative of that population.<br>• Random sampling tends to produce representative samples.<br>Students are able to:<br>• Analyze and distinguish between representative and non-representative samples of a population. |

| Unit 3 Grade 7 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| samples and support valid inferences. | | Learning Goal 1: Distinguish between representative and non-representative samples of a population (*e.g. if the class had 50% girls and the sample had 10% girls, then that sample was not representative of the population*). |
| ☐ 7.SP.A.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.* | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.3 Construct viable arguments & critique the reasoning of others.<br>MP.4 Model with mathematics.<br><br>MP.6 Attend to precision. | Concept(s):<br>• Inferences can be drawn from random sampling.<br>Students are able to:<br><br>• Analyze data from a sample to draw inferences about the population.<br>• Generate multiple random samples of the same size.<br>• Analyze the variation in multiple random samples of the same size.<br><br>Learning Goal 2: Use random sampling to produce a representative sample.<br>Learning Goal 3: Develop inferences about a population using data from a random sample and assess the variation in estimates after generating multiple samples of the same size. |
| ◉ 7.SP.B.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.<br> *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* | MP.3 Construct viable arguments & critique the reasoning of others.<br>MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically. | Concept(s): No new concepts introduced<br><br>Students are able to:<br><br>• locate, approximately, the measure of center (mean or median) of a distribution<br>• Visually assess, given a distribution, the measure of spread (mean absolute deviation or inter-quartile range).<br>• Visually compare two numerical data distributions and describe the degree of overlap.<br>• Measure or approximate the difference between the measures centers and express it as a multiple of a measure of variability.<br><br>Learning Goal 4: Visually compare the means of two distributions that have similar |

| Unit 3 Grade 7 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| *distributions of heights is noticeable.* | MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | variability;  express the difference between the centers as a multiple of a measure of variability. |
| ◎ 7.SP.B.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.* | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.3 Construct viable arguments & critique the reasoning of others.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Using measures of center, draw informal inferences about two populations and compare the inferences.<br>• Using measures of variability, draw informal inferences about two populations and compare the inferences.<br><br><br>Learning Goal 5: Draw informal comparative inferences about two populations using their measures of center and measures of variability. |
| ☐ 7.SP.C.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. | MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br>• Probability of a chance event is a number between 0 and 1.<br>• Probability expresses the likelihood of the event occurring.<br>• Larger probability indicates greater likelihood.<br>Students are able to:<br>• Draw conclusions about the likelihood of events given their probability.<br><br>Learning Goal 6: Interpret and express the likelihood of a chance event as a number between 0 and 1, relating that the probability of an unlikely event happening is near 0, a likely event is near 1, and 1/2 is neither likely |

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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| | | nor unlikely. |
| ☐ 7.SP.C.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.* | MP.2 Reason abstractly and quantitatively.<br><br>MP.1 Make sense of problems and persevere in solving them.<br><br>MP.3 Construct viable arguments & critique the reasoning of others.<br><br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically. | Concept(s):<br>• Relative frequency<br>• Experimental probability<br>• Theoretical probability<br>Students are able to:<br>• Collect data on chance processes, noting the long-run relative frequency.<br>• Predict the approximate relative frequency given the theoretical probability.<br><br>Learning Goal 7: Approximate the probability of a chance event by collecting data and observing long-run relative frequency; predict the approximate relative frequency given the probability |
| ☐ 7.SP.C.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.<br>    7.SP.C.7a. 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* | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.6 Attend to precision. | Concept(s):<br>• Uniform (equally likely) and non-uniform probability models<br>*Students are able to:*<br>• Develop a uniform probability model.<br>• Use a uniform probability model to determine the probabilities of events.<br>• Develop (non-uniform) probability models by observing frequencies in data that has been generated from a chance process.<br><br>Learning Goal 8: Develop a uniform probability model by assigning equal probability to all outcomes; develop probability models by observing frequencies and use the models to determine probabilities of events; compare probabilities from a model to observed frequencies and explain sources of discrepancy when agreement is not good |

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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| *that Jane will be selected and the probability that a girl will be selected.*<br><br>7.SP.C.7b. . Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.<br>*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.C.8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.<br>    7.SP.C.8a. 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.<br><br>    7.SP.C.8b. Represent sample spaces for compound events using methods such as | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.7 Look for and make use of structure.<br>MP.8 Look for and express regularity | Concept(s):<br>    • Just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space.<br>Students are able to:<br>    • Use organized lists, tables, and tree diagrams to represent sample spaces.<br>    • Given a description of an event using everyday language, identify the outcomes in a sample space that make up the described event.<br>    • Design simulations.<br>    • Use designed simulations to generate frequencies for compound events.<br><br>Learning Goal 9: Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams, identifying the outcomes in the sample space which compose the event. Use the sample space to find the probability of a compound event. |

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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| 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. 7.SP.C.8c. 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?* | in repeated reasoning. | Learning Goal 10: Design and use a simulation to generate frequencies for compound events. |

| Unit 3 Grade 7 What This May Look Like | |
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| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
| *Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.* | *Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* |

| Focus Mathematical Concepts |
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| *Districts should consider listing prerequisites skills. Concepts that include a focus on relationships and representation might be listed as grade level appropriate.* Prerequisite skills: |

| Unit 3 Grade 7 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |

Common Misconceptions:

| **District/School Tasks** | **District/School Primary and Supplementary Resources** |
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| *Exemplar tasks or illustrative models could be provided.* | *District/school resources and supplementary resources that are texts as well as digital resources used to support the instruction.* |

| **Instructional Best Practices and Exemplars** |
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| *This is a place to capture examples of standards integration and instructional best practices.* |

| Unit 4 Grade 7 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| ⭕ 7.G.B.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. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.3 Construct viable arguments & critique the reasoning of others.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision. | Concept(s):<br>• Circumference<br>Students are able to:<br>• Solve problems by finding the area and circumference of circles.<br>• Show that the area of a circle can be derived from the circumference.<br><br>Learning Goal 1: 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. |

| Unit 4 Grade 7 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| | MP.7 Look for and make use of structure.<br>MP.8 Look for and express regularity in repeated reasoning. | |
| ⊙ 7.G.B.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.<br><br>■ 7.EE.B.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.<br>   7.EE.B.4a. 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. | MP.3 Construct viable arguments & critique the reasoning of others.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s): No new concept(s) introduced<br>Students are able to:<br>• Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations.<br>• Solve mathematical problems by writing and solving simple algebraic equations based on the relationships between and properties of angles (supplementary, complementary, vertical, and adjacent.<br>Learning Goal 2: Write and solve *simple* multi-step algebraic equations involving supplementary, complementary, vertical, and adjacent angles. |
| ⊙ 7.G.B.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, | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively. | Concept(s): No new concept(s) introduced<br>Students are able to:<br>• Solve real-world and mathematical problems involving area of two dimensional objects composed of triangles, quadrilaterals, and polygons.<br>• Solve real-world and mathematical problems involving volume of three dimensional objects composed of cubes and right prisms. |

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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| and right prisms. | MP.3 Construct viable arguments & critique the reasoning of others.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | • Solve real-world and mathematical problems involving surface area of three-dimensional objects composed of cubes and right prisms.<br><br>Learning Goal 3: 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. |
| ◎ 7.G.A.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 | MP.3 Construct viable arguments & critique the reasoning of others.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br>• Conditions for unique triangles, more than one triangle, and no triangle.<br>Students are able to:<br><br>• Draw geometric shapes with given conditions, including constructing triangles from three measures of angles or sides.<br>• Recognize conditions determining a unique triangle, more than one triangle, or no triangle.<br><br>Learning Goal 4: Use freehand, mechanical (i.e. ruler, protractor) and technological tools to draw geometric shapes with given conditions (e.g. scale factor), focusing on constructing triangles. |
| ◎ 7.G.A.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. | MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of | Concept(s):<br>• Cross-sections of three-dimensional objects<br>Students are able to:<br><br>• Analyze three dimensional shapes (right rectangular pyramids and prisms) by examining and describing all of the 2-dimensional figures that result from slicing |

| Unit 4 Grade 7 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| | structure. | it at various angles.<br><br>Learning Goal 5: Describe all of the 2-dimensional figures that result when 3-dimemsional figures are sliced from multiple angles. |
| ⬛ 7.EE.B.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.<br> 7.EE.B.4a. 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?*<br><br>*(benchmarked) | MP.2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Write an equation of the form $px + q = r$ or $p(x + q)=r$ in order to solve a word problem.<br>• Fluently solve equations of the form $px + q = r$ and $p(x + q)= r$.<br><br>Learning Goal 6: Fluently solve simple equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. |
| ⬛ 7.RP.A.3. Use proportional relationships to solve multistep ratio and percent problems. | MP.1 Make sense of problems and persevere in solving them. | Concept(s):<br>• Recognize percent as a ratio indicating the quantity *per one hundred*. |

| Unit 4 Grade 7 | | |
| --- | --- | --- |
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error*<br>*(benchmarked)* | MP.2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Students are able to:<br><br>• Use proportions to solve multistep percent problems including simple interest, tax, markups, discounts, gratuities, commissions, fees, percent increase, percent decrease, percent error.<br>• Use proportions to solve multistep ratio problems.<br><br>Learning Goal 7: Solve multi-step ratio and percent problems using proportional relationships (*simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error*). |

| Unit 4 Grade 7 What This May Look Like | |
| --- | --- |
| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
| *Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.* | *Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* |

| Focus Mathematical Concepts |
| --- |
| *Districts should consider listing prerequisites skills. Concepts that include a focus on relationships and representation might be listed as grade level appropriate.*<br>Prerequisite skills:<br><br>Common Misconceptions: |

| **District/School Tasks** | **District/School Primary and Supplementary Resources** |
| --- | --- |
| *Exemplar tasks or illustrative models could be provided.* | *District/school resources and supplementary resources that are texts as well as digital resources used to support the instruction.* |

| Instructional Best Practices and Exemplars |
| --- |
| *This is a place to capture examples of standards integration and instructional best practices.* |

| Unit 4 Grade 7 | | |
|---|---|---|
| Content Standards | Suggested Standards for Mathematical Practice | Critical Knowledge & Skills |
| | | |

# 8th GRADE
# MATH
# CURRICULUM

# Middle Township Public Schools

# 216 S. Main Street
# Cape May Court House, NJ 08210

# Contents

# Acknowledgements

# Introduction

This document serves to meet all requirements for curriculum as per the Middle Township Board of Education and the New Jersey Department of Education and will serve as a guide for lesson planning. Units within the curricular framework for mathematics are designed to be taught in order in which they are presented. There is a logical and developmentally-appropriate progression of standards, with strong consideration given to Major, Supporting, and Additional content standards presented since most concepts build upon each other. Within the units, the teachers have flexibility of what order to present the standards. Major, Supporting, and Additional clusters of mathematics content standards are based on the New Jersey Student Learning Standards. Suggested New Jersey Student Learning Standards for Mathematics are listed in each unit to be imbedded regularly in daily mathematical instruction. This curriculum emphasizes a new leap forward in the continual process of improving learning for all of our students. These standards are based on a philosophy of teaching and learning mathematics that is consistent with the most current research and exemplary practices.

# Course Description

Middle School math in Middle Township Public School district focus is to make math relevant, rigorous, and possible for every student. In meeting the demands of the New Jersey Student Learning Standards (NJSLS) Middle Township School District strives to instill a deep appreciation for math. Focus, coherence, and rigor are the driving forces behind the transition to the NJSLS. These standards build upon the knowledge gained in previous lessons and grades, guides students through each concept with thoughtful progressions, while making connections so that each standard is a natural extension of what students have already learned. Every lesson, activity, assessment, and resource is designed to build student mathematical understanding and connect to learning the Standards for Mathematical Practice. In doing so every student is ensured a deeper understanding of mathematical concepts and the ability to apply them in real-world situations.

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.

## Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

**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 $7 \times 8$ 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 $2 \times 7$ 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 $(x - 1) (x^3 + x2 + x + 1)$ 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.

## Conclusion

At Middle Township School District the Math curriculum follows the standards for school mathematics. This district math curriculum describes the mathematical understanding, knowledge, and skills that students should acquire from prekindergarten through grade 12. Each Standard consists of two to four specific goals that apply across all the grades.

The five Content Standards each encompass specific expectations, organized by grade bands:

- Number & Operations
- Algebra
- Geometry
- Measurement
- Data Analysis & Probability

This approach reinforces the sequential progression of skills and concepts.  This supports developmentally appropriate teaching and assessments.  Each grade level has its own specific standards from each year to be used as stepping stones in the progression of learning and student achievement.

## 8th Grade Math Pacing Guide

| UNIT TITLE | ENDURING UNDERSTANDINGS | CCCS | TIMEFRAME |
|---|---|---|---|
| **1-The Number System** | Students will understand that… <br>• Laws of exponents can be used to find powers of monomials. <br>• Scientific notation can be used to write large and small numbers. <br>• Mathematical expressions can be compared using real number properties. | **8.NS.A** | **14-20 DAYS** |
| **2-Expressions and Equations** | Students will understand that… <br>• there are connections between proportional relationships, lines and linear equations <br>• pairs of simultaneous linear equations can be analyzed and solved <br>• patterns and relationships can be represented graphically, numerically and symbolically <br>• reasoning can be generalized into algorithms for solving proportion problems <br><br>. | **8.EE.A** <br> **8.EE.B** <br> **8.EE.C** | **20-30 DAYS** |
| **3-Functions** | Students will understand that… <br>• Define, evaluate, and compare functions. <br>• Use functions to model relationships between quantities. | **8.F.A** <br> **8.F.B** | **14-20 DAYS** |

| | Students will understand that… | | |
|---|---|---|---|
| **4-Geometry** | • Understand congruence and similarity using physical models or geometry software<br>• Apply properties of congruence to lines and angles<br>• Understand and apply the Pythagorean Theorem<br>• Solve real world and mathematical problems involving cylinders, cones and spheres | **8.G.A**<br>**8.G.B**<br>**8.G.C** | **14-20 DAYS** |
| **5-Statistics and Probability** | Students will understand that<br>• Investigate patterns of association in bivariate data. | **8.SP.A** | **14-20 DAYS** |

# Unit One-The Number System

| Content Area: | Math | | Grade(s) 8 |
|---|---|---|---|
| Unit Plan Title: | The Number System - Chapter 1 | | |

### Overview/Rationale

It is essential that this curriculum unit build on the number sense that students bring with them to school. Problems and numbers which arise in the context of the students' world are more meaningful than traditional textbook exercises. Students will be encouraged to question and challenge strategies and techniques to problem solve solutions involving connections made with quantitative information encountered in their daily lives.

### Standard(s)  Number and Description

The Number System - 8.NS
CCSS.Math.Content.8.NS.A.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.
CCSS.Math.Content.8.NS.A.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., $\pi^2$). *For example, by truncating the decimal expansion of √2, show that √2 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 work with radicals and integer exponents. - 8.EE.1, 8.EE.2, 8.EE.3, 8.EE.4
CCSS.Math.Content.8.EE.A.1
Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.
CCSS.Math.Content.8.EE.A.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 √2 is irrational.
CCSS.Math.Content.8.EE.A.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 times $10^8$ and the population of the world as 7 times $10^9$, and determine that the world population is more than 20 times larger*.
CCSS.Math.Content.8.EE.A.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

**Math Practice Standards  Number and Description**

MP1 - Make sense of problems and persevere in solving them.
MP2 - Reason abstractly and quantitatively.
MP3 - Construct viable arguments and critique the reasoning of others.
MP4 - Model with mathematics.
MP5 - Use appropriate tools strategically.
MP6 - Attend to precision.
MP7 - Look for and make use of structure.
MP8 - Look for and express regularity in repeated reasoning.

**Technology Standard(s)  Number and Description**

TECH.8.2.8.C - The design process is a systematic approach to solving problems.

TECH.8.2.2.C.1 - Brainstorm ideas on how to solve a problem or build a product.

**Interdisciplinary Standard(s)  Number and Description**

LA.8.W.1 - Write arguments to support claims with clear reasons and relevant evidence.

SCI.MS-ESS1-3 - Analyze and interpret data to determine scale properties of objects in the solar system.

**Enduring Understandings:**

*Students will understand that…*
- laws of exponents can be used to find powers of monomials.
- scientific notation can be used to write large and small numbers.
- mathematical expressions can be compared using real number properties.

**Essential Questions :**

- Why is it helpful to write numbers in different ways?
- How can you determine when numbers are irrational and approximate them using rational numbers?

**21<sup>st</sup> Century Connections**

| *Check all that apply.*<br><br>**21<sup>st</sup> Century Interdisciplinary Themes** | | *Indicate whether these skills are **E**-Encouraged, **T**-Taught, and/or **A**-Assessed in this unit by marking **E, T, A** in the box before the appropriate skill.*<br>**21<sup>st</sup> Century Skills** | |
|---|---|---|---|
| X | **Global Awareness** | E,T,A | **Critical Thinking and Problem Solving** |
| X | **Environmental Literacy** | E,A | **Creativity and Innovation** |
| X | **Health Literacy** | E | **Communication and Collaboration** |
|  | **Civic Literacy** | E | **Flexibility and Adaptability** |
|  | **Financial, Economic , Business and Entrepreneurial Literacy** | E | **Initiative and Self-Direction** |
|  | | E | **Social and Cross-Cultural Skills** |
|  | | E,T,A | **Productivity and Accountability** |
|  | | E | **Leadership and Responsibility** |
|  | | E,T,A | **Informational Literacy Skills** |
|  | | E | **Media Literacy Skills** |
|  | | E | **Information, Communication, and Technology (ICT) Literacy** |

**Career Ready Practices:**

*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.*

| | | |
|---|---|---|
| E | **CRP1.** | **Act as a responsible and contributing citizen and employee** |
| E,T,A | **CRP2.** | **Apply appropriate academic and technical skills** |
| E | **CRP3.** | **Attend to personal health and financial well-being** |
| E,T,A | **CRP4.** | **Communicate clearly and effectively with reason** |
| E | **CRP5.** | **Consider the environmental, social and economic impacts of decisions** |
| E,T,A | **CRP6.** | **Demonstrate creativity and innovation** |
| E | **CRP7.** | **Employ valid and reliable research strategies** |
| E,T,A | **CRP8.** | **Utilize critical thinking to make sense of problems and persevere in solving them** |
| E,T | **CRP9.** | **Model integrity, ethical leadership, and effective management** |
| E | **CRP10.** | **Plan education and career paths aligned to personal goals** |
| E | **CRP11.** | **Use technology to enhance productivity** |
| E | **CRP12.** | **Work productively in teams while using cultural global competence** |

**Student Learning Goals/Objectives:**

*Students will know….*

- what steps to use in order to determine if a number is rational or irrational
- how to summarize the processes used to operate with roots
- the meaning of irrational numbers
- how to approximate irrational numbers
- how to apply properties of powers and exponents
- what steps to use when evaluating a problem using numbers that are written in scientific notation

*Students will be able to (do)…*

- Simplify real number expressions by multiplying and dividing monomials.
- Simplify expressions using negative exponents.
- Recognize numbers have square and cube roots.
- Estimate using square and cube roots.
- Convert fractions to decimals and vice versa.
- Write and evaluate expressions involving powers and exponents.

| | |
|---|---|

**Key Vocabulary and Terms:**

- base
- cube root
- exponent
- irrational number
- monomial
- perfect cube
- perfect square
- power
- radical sign
- rational number
- repeating decimal
- scientific notation
- square root
- terminating decimal

**Assessment Evidence:**

*Performance Tasks:*

- varied formative and summative concept assessments
  - for example but not limited to:
    - graphic organizers, exit slips, individual wipe boards, open ended questions, peer assessments
    - written end of unit tests, projects with rubrics, self-evaluation
- Rugs Project
- Glencoe Math - Power Up Performance Task - pg. 101

*Other Assessment Measures: *Include Benchmarks*

- GLENCOE Math - Built to the Common Core
  - pre/post assessment per unit
  - Pretest Chapter 1
  - Posttest Chapter 1
- STAR Assessment - benchmark
- Grade 8 Model Curriculum Assessment

| | |
|---|---|
| *Teaching and Learning Actions: (What learning experiences and instruction will enable students to achieve the desired results?)* | |
| *Instructional Strategies and Activities (add rows as needed) *D* <br><br> **Title** | ***Consider how well the design will:*** <br><br> **Description with Modifications, number of days, etc. - Modifications made as the need becomes apparent or as stated in IEPs, 504s and ELL documents.** <br> ● **List of modifications available in IEP Direct** |
| 1. concept map/graphic organizer | ● Promote use of graphic organizer <br> ● Allow graphic organizer to assist in means of test taking <br> ● Refer to graphic organizers, concept map, and/or mnemonic devices <br> ● Use of symbolic representations, such as pictures, to assist in making language connections |
| 2. concept instruction | ● Teacher models the desired learning strategy or task, and then teacher will gradually shift responsibility to the students. |
| 3. practice, and problem solving practice | ● Apply a variety of strategies to comprehend vocabulary and mathematical concepts <br> ● Monitor Student Understanding |
| 4. groups, individual, and partner activities | ● Assist those who require additional help <br> ● Allow extended time |

**Resources:**

- Glencoe Math - consumable text
- Glencoe Math - Power Up for PARCC
- various online resources
  - http://www.insidemathematics.org/performance-assessment-tasks
  - www.mathplayground.com

- o [www.teacherspayteachers.com](www.teacherspayteachers.com)
- o [www.kahnacademy.org](www.kahnacademy.org)
- o [www.xpmath.com](www.xpmath.com)
- o [www.illustrativemathematics.org](www.illustrativemathematics.org)
- o [www.mathbitsnotebook.com](www.mathbitsnotebook.com)
- o

| Suggested Time Frame: | 6 weeks (30 days) instruction - 1 week (5 days) assessment = 7 weeks (35 days) |
|---|---|

## Unit Two-Expressions and Equations

| Content Area: | Math | | Grade(s) 8 |
|---|---|---|---|
| Unit Plan Title: | Expressions & Equations - Chapter 2,3 | | |

| Overview/Rationale |
|---|
| It is essential that this curriculum unit build on the algebraic connections that students bring with them to school.  Students will demonstrate and effectively communicate their mathematical understanding of ratios and proportional relationships with a focus on expressions and equations.  Their strategies and executions should meet the content, thinking processes and qualitative demands as outlined by the standards. |

| Standard(s)  Number and Description |
|---|
| **Understand the connections between proportional relationships, lines, and linear equations.** |

CCSS.Math.Content.8.EE.B.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.
CCSS.Math.Content.8.EE.B.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 $b$.

**Analyze and solve linear equations and pairs of simultaneous linear equations.**

CCSS.Math.Content.8.EE.C.7
Solve linear equations in one variable.
CCSS.Math.Content.8.EE.C.7.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).
CCSS.Math.Content.8.EE.C.7.b
Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
CCSS.Math.Content.8.EE.C.8
Analyze and solve pairs of simultaneous linear equations.
CCSS.Math.Content.8.EE.C.8.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.
CCSS.Math.Content.8.EE.C.8.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.*
CCSS.Math.Content.8.EE.C.8.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*.

**Math Practice Standards  Number and Description**

MP1 - Make sense of problems and persevere in solving them.
MP2 - Reason abstractly and quantitatively.
MP3 - Construct viable arguments and critique the reasoning of others.
MP4 - Model with mathematics.
MP5 - Use appropriate tools strategically.
MP6 - Attend to precision.
MP7 - Look for and make use of structure.
MP8 - Look for and express regularity in repeated reasoning.

| | |
|---|---|
| **Technology Standard(s) Number and Description** | |
| TECH.8.2.8.C - The design process is a systematic approach to solving problems.<br><br>TECH.8.2.2.C.1 - Brainstorm ideas on how to solve a problem or build a product. | |
| **Interdisciplinary Standard(s) Number and Description** | |
| LA.8.W.1 - Write arguments to support claims with clear reasons and relevant evidence.<br><br>SCI.MS-PS2-1 - Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. (systems motion problems) | |

**Enduring Understandings:**

***Students will understand that…***
- there are connections between proportional relationships, lines and linear equations
- pairs of simultaneous linear equations can be analyzed and solved
- patterns and relationships can be represented graphically, numerically and symbolically
- reasoning can be generalized into algorithms for solving proportion problems

**Essential Questions :**
- What is equivalence?  How is equivalence demonstrated using expressions and equations?
- How can patterns, relations and graphs be used to explain real life relationships?

**21st Century Connections**

| *Check all that apply.*<br><br>**21st Century Interdisciplinary Themes** | *Indicate whether these skills are **E**-Encouraged, **T**-Taught, and/or **A**-Assessed in this unit by marking **E, T, A** in the box before the appropriate skill.*<br>**21st Century Skills** |
|---|---|

| | | | | | |
|---|---|---|---|---|---|
| X | Global Awareness | | E,T,A | Critical Thinking and Problem Solving |
| X | Environmental Literacy | | E,A | Creativity and Innovation |
| X | Health Literacy | | E | Communication and Collaboration |
| | Civic Literacy | | E | Flexibility and Adaptability |
| | Financial, Economic, Business and Entrepreneurial Literacy | | E | Initiative and Self-Direction |
| | | | E | Social and Cross-Cultural Skills |
| | | | E,T,A | Productivity and Accountability |
| | | | E | Leadership and Responsibility |
| | | | E,T,A | Informational Literacy Skills |
| | | | E | Media Literacy Skills |
| | | | E | Information, Communication, and Technology (ICT) Literacy |

**Career Ready Practices:**

*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.*

| | |
|---|---|
| E | CRP1. Act as a responsible and contributing citizen and employee |
| E,T,A | CRP2. Apply appropriate academic and technical skills |
| E | CRP3. Attend to personal health and financial well-being |
| E,T,A | CRP4. Communicate clearly and effectively with reason |
| E | CRP5. Consider the environmental, social and economic impacts of decisions |
| E,T,A | CRP6. Demonstrate creativity and innovation |
| E | CRP7. Employ valid and reliable research strategies |

| E,T,A | CRP8.  Utilize critical thinking to make sense of problems and persevere in solving them |
|---|---|
| E,T | CRP9.  Model integrity, ethical leadership, and effective management |
| E | CRP10.  Plan education and career paths aligned to personal goals |
| E | CRP11.  Use technology to enhance productivity |
| E | CRP12.  Work productively in teams while using cultural global competence |

## Student Learning Goals/Objectives:

*Students will know….*

- how the multiplicative inverse is used to solve an equation that has a rational coefficient
- that solving an equation with variables on both sides is similar to solving a two-step equation
- how to determine how many possible solutions there are there to a linear equation with one variable
- the relationship among the unit rate, slope, and constant rate of change or a proportional linear relationship
- how to use a graph to solve a system of equations
- how to determine the number of solutions for a system of linear equations

*Students will be able to (do)…*

- solve equations with rational coefficients
- write and solve two step equations
- solve equations with variables on both sides
- solve multi step equations
- identify proportional and no proportional linear relationships by finding a constant rate of change
- use tables and graphs to find the slope of a line
- use direct variation to solve problems
- graph linear equations using the slope and y-intercept
- graph an equation using x and y intercepts
- write an equation of a line
- solve systems of linear equations algebraically and graphically

## Key Vocabulary and Terms:

- coefficient
- multiplicative inverse
- identity property
- null set
- two step equations
- constant of proportionality

- constant of variation
- constant rate of change
- direct variation
- linear relationships
- point slope form
- rise/run
- slope
- slope intercept form
- standard form
- systems of equations
- x intercept
- y intercept
- ordered pairs

## Assessment Evidence:

| *Performance Tasks:* | *Other Assessment Measures:  *Include Benchmarks* |
|---|---|
| <ul><li>varied formative and summative concept assessments<ul><li>for example but not limited to:<ul><li>graphic organizers, exit slips, individual wipe boards, open ended questions, peer assessments</li><li>written end of unit tests, projects with rubrics, self-evaluation</li></ul></li></ul></li><li>Squares and Circles Project</li><li>Picking Apples Project</li><li>Glencoe Math - Power Up Performance Task - pg. 165, 257</li></ul> | <ul><li>GLENCOE Math - Built to the Common Core<ul><li>pre/post assessment per unit</li><li>Pretest Chapter 2</li><li>Pretest Chapter 3</li><li>Posttest Chapter 2</li><li>Posttest Chapter 3</li></ul></li><li>STAR Assessment - benchmark</li><li>Grade 8 Model Curriculum Assessment</li></ul> |

*Teaching and Learning Actions:  (What learning experiences and instruction will enable students to achieve the desired results?)*

| | *Instructional Strategies and Activities (add rows as needed) *D* <br><br>**Title** | ***Consider how will the design will:*** <br><br>**Description with Modifications, number of days, etc. -** Modifications made as the need becomes apparent or as stated in IEPs, 504s and ELL documents. <br>● **List of modifications available in IEP Direct** |
|---|---|---|
| | 1. concept map/graphic organizer | ● Promote use of graphic organizer <br>● Allow graphic organizer to assist in means of test taking <br>● Refer to graphic organizers, concept map, and/or mnemonic devices <br>● Use of symbolic representations, such as pictures, to assist in making language connections |
| | 2. concept instruction | ● Teacher models the desired learning strategy or task, and then teacher will gradually shift responsibility to the students. |
| | 3. practice, and problem solving practice | ● Apply a variety of strategies to comprehend vocabulary and mathematical concepts. <br>● Monitor Student Understanding |
| | 4. groups, individual, and partner activities | ● Assist those who require additional help <br>● Allow extended time |
| **Resources:** | | |
| | ● Glencoe Math - consumable text <br>● Glencoe Math - Power Up for PARCC <br>● various online resources <br>    ○ http://www.insidemathematics.org/performance-assessment-tasks <br>    ○ www.mathplayground.com <br>    ○ www.teacherspayteachers.com <br>    ○ www.kahnacademy.org <br>    ○ www.xpmath.com <br>    ○ www.illustrativemathematics.org | | |

- o [www.mathbitsnotebook.com](http://www.mathbitsnotebook.com)
- o

| Suggested Time Frame: | 10 weeks (50 days) instruction - 1 week (5 days) assessment = 11 weeks (55 days) |
|---|---|

## Unit Three-Functions

| Content Area: | Math | | Grade(s) 8 |
|---|---|---|---|
| Unit Plan Title: | Functions - Chapter 4 | | |

**Overview/Rationale**

It is essential that this curriculum unit build on the algebraic relations that students bring with them to school.  Students will learn the concept of a function and why functions are necessary for describing algebraic concepts in everyday life.  Students will consider functions of discrete and continuous rates and understand the difference between the two.

**Standard(s)  Number and Description**

**Define, evaluate, and compare functions.**

CCSS.Math.Content.8.F.A.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]

CCSS.Math.Content.8.F.A.2
Compare properties 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*.

CCSS.Math.Content.8.F.A.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*.

**Use functions to model relationships between quantities.**

CCSS.Math.Content.8.F.B.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.
CCSS.Math.Content.8.F.B.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.

**Math Practice Standards  Number and Description**

MP1 - Make sense of problems and persevere in solving them.
MP2 - Reason abstractly and quantitatively.
MP3 - Construct viable arguments and critique the reasoning of others.
MP4 - Model with mathematics.
MP5 - Use appropriate tools strategically.
MP6 - Attend to precision.
MP7 - Look for and make use of structure.
MP8 - Look for and express regularity in repeated reasoning.

**Technology Standard(s)  Number and Description**

TECH.8.2.8.C - The design process is a systematic approach to solving problems.

TECH.8.2.2.C.1 - Brainstorm ideas on how to solve a problem or build a product.

**Interdisciplinary Standard(s)  Number and Description**

LA.8.W.1 - Write arguments to support claims with clear reasons and relevant evidence.

SCI.MS-PS3-2 - Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential

energy are stored in the system.

**Enduring Understandings:**

*Students will understand that…*
- Define, evaluate, and compare functions.
- Use functions to model relationships between quantities.

**Essential Questions :**
- How do we use functions to model relationships between quantities?
- How doe define, evaluate and compare functions?

**21st Century Connections**

| *Check all that apply.* <br><br> **21st Century Interdisciplinary Themes** | | *Indicate whether these skills are E-Encouraged, T-Taught, and/or A-Assessed in this unit by marking E, T, A in the box before the appropriate skill.* <br> **21st Century Skills** | |
|---|---|---|---|
| X | **Global Awareness** | E,T,A | **Critical Thinking and Problem Solving** |
| X | **Environmental Literacy** | E,A | **Creativity and Innovation** |
| X | **Health Literacy** | E | **Communication and Collaboration** |
| | **Civic Literacy** | E | **Flexibility and Adaptability** |
| | **Financial, Economic , Business and Entrepreneurial Literacy** | E | **Initiative and Self-Direction** |
| | | E | **Social and Cross-Cultural Skills** |
| | | E,T,A | **Productivity and Accountability** |
| | | E | **Leadership and Responsibility** |

| | E,T,A | Informational Literacy Skills |
|---|---|---|
| | E | Media Literacy Skills |
| | E | Information, Communication, and Technology (ICT) Literacy |

**Career Ready Practices:**

*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.*

| | |
|---|---|
| E | CRP1. Act as a responsible and contributing citizen and employee |
| E,T,A | CRP2. Apply appropriate academic and technical skills |
| E | CRP3. Attend to personal health and financial well-being |
| E,T,A | CRP4. Communicate clearly and effectively with reason |
| E | CRP5. Consider the environmental, social and economic impacts of decisions |
| E,T,A | CRP6. Demonstrate creativity and innovation |
| E | CRP7. Employ valid and reliable research strategies |
| E,T,A | CRP8. Utilize critical thinking to make sense of problems and persevere in solving them |
| E,T | CRP9. Model integrity, ethical leadership, and effective management |
| E | CRP10. Plan education and career paths aligned to personal goals |
| E | CRP11. Use technology to enhance productivity |
| E | CRP12. Work productively in teams while using cultural global competence |

**Student Learning Goals/Objectives:**

| *Students will know….* | *Students will be able to (do)…* |
|---|---|
| ● how to write an equation from a graph<br>● how to use tables and graphs represent relations | ● translate tables and graphs into linear equations<br>● represent relations using tables and graphs |

- the effect the domain has on the range in a function
- how to use a table or graph to determine if a function is linear or nonlinear
- the characteristics of a quadratic function
- how to describe the similarities and differences between qualitative and quantitative graphs

- determine whether a relation is a function
- find function values and complete function tables
- represent linear functions using tables and graphs
- compare properties of functions represented I different ways
- determine whether a function is linear or nonlinear
- graph quadratic functions
- sketch and describe qualitative graphs

**Key Vocabulary and Terms:**

- continuous data
- dependent variable
- discrete data
- domain
- function
- independent variable
- linear equation
- linear function
- nonlinear function
- quadratic function
- qualitative graph
- range
- relation

**Assessment Evidence:**

*Performance Tasks:*

- varied formative and summative concept assessments
  - for example but not limited to:

*Other Assessment Measures: *Include Benchmarks*

- GLENCOE Math - Built to the Common Core
  - pre/post assessment per unit

| | | |
|---|---|---|
| | <ul><li>■ graphic organizers, exit slips, individual wipe boards, open ended questions, peer assessments</li><li>■ written end of unit tests, projects with rubrics, self-evaluation</li></ul><ul><li>Party Project</li><li>Vincent's Graphs Project</li><li>Glencoe Math - Power Up Performance Task - pg. 359</li></ul> | <ul><li>○ Pretest Chapter 4</li><li>○ Posttest Chapter 4</li></ul><ul><li>STAR Assessment - benchmark</li><li>Grade 8 Model Curriculum Assessment</li></ul> |

| *Teaching and Learning Actions:  (What learning experiences and instruction will enable students to achieve the desired results?)* |
|---|

| *Instructional Strategies and Activities  (add rows as needed) *D*<br><br>**Title** | **Consider how will the design will:**<br><br>**Description with Modifications, number of days, etc. -** Modifications made as the need becomes apparent or as stated in IEPs, 504s and ELL documents.<br><ul><li>**List of modifications available in IEP Direct**</li></ul> |
|---|---|
| 1. concept map/graphic organizer | <ul><li>Promote use of graphic organizer</li><li>Allow graphic organizer to assist in means of test taking</li><li>Refer to graphic organizers, concept map, and/or mnemonic devices</li><li>Use of symbolic representations, such as pictures, to assist in making language connections</li></ul> |
| 2. concept instruction | <ul><li>Teacher models the desired learning strategy or task, and then teacher will gradually shift responsibility to the students.</li></ul> |
| 3. practice, and problem solving practice | <ul><li>Apply a variety of strategies to comprehend vocabulary and mathematical concepts.</li><li>Monitor Student Understanding</li></ul> |

| | | |
|---|---|---|
| 4. groups, individual, and partner activities | • Assist those who require additional help<br>• Allow extended time | |

| Resources: |
|---|

- Glencoe Math - consumable text
- Glencoe Math - Power Up for PARCC
- various online resources
    - http://www.insidemathematics.org/performance-assessment-tasks
    - www.mathplayground.com
    - www.teacherspayteachers.com
    - www.kahnacademy.org
    - www.xpmath.com
    - www.illustrativemathematics.org
    - www.mathbitsnotebook.com
    -

| Suggested Time Frame: | 2 weeks (10 days) instruction - 1 week (5 days) assessment = 3 weeks (15 days) |
|---|---|

## Unit Four-Geometry

| Content Area: | Math | Grade(s) 8 |
|---|---|---|
| Unit Plan Title: | Geometry - Chapter 5, 6, 7, 8 | |

| Overview/Rationale |
|---|

It is essential that this curriculum unit build on the spatial relations that students bring with them to school.  Students will learn about transformations on the coordinate plane and apply their properties to determine congruence.  The ideas taught in geometry are foundational for future understanding of geometry concepts. They will learn to manipulate two- and three-dimensional shapes and angles. These concepts will be built on in later math classes and also in real-world problem-solving in the future.

| Standard(s)  Number and Description |
|---|

**Understand congruence and similarity using physical models, transparencies, or geometry software.**

CCSS.Math.Content.8.G.A.1
Verify experimentally the properties of rotations, reflections, and translations:
CCSS.Math.Content.8.G.A.1.a
Lines are taken to lines, and line segments to line segments of the same length.
CCSS.Math.Content.8.G.A.1.b
Angles are taken to angles of the same measure.
CCSS.Math.Content.8.G.A.1.c
Parallel lines are taken to parallel lines.
CCSS.Math.Content.8.G.A.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.
CCSS.Math.Content.8.G.A.3
Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
CCSS.Math.Content.8.G.A.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.
CCSS.Math.Content.8.G.A.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*.

**Understand and apply the Pythagorean Theorem.**

CCSS.Math.Content.8.G.B.6
Explain a proof of the Pythagorean Theorem and its converse.
CCSS.Math.Content.8.G.B.7
Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
CCSS.Math.Content.8.G.B.8
Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

**Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.**

CCSS.Math.Content.8.G.C.9
Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

**Math Practice Standards  Number and Description**

MP1 - Make sense of problems and persevere in solving them.
MP2 - Reason abstractly and quantitatively.
MP3 - Construct viable arguments and critique the reasoning of others.
MP4 - Model with mathematics.
MP5 - Use appropriate tools strategically.
MP6 - Attend to precision.
MP7 - Look for and make use of structure.
MP8 - Look for and express regularity in repeated reasoning.

**Technology Standard(s)  Number and Description**

TECH.8.2.8.C - The design process is a systematic approach to solving problems.

TECH.8.2.2.C.1 - Brainstorm ideas on how to solve a problem or build a product.

**Interdisciplinary Standard(s)  Number and Description**

LA.8.W.1 - Write arguments to support claims with clear reasons and relevant evidence.

SCI.MS-ETS1-1 - Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.  (surface area and volume)

**Enduring Understandings:**

*Students will understand that…*

- Understand congruence and similarity using physical models or geometry software
- Apply properties of congruence to lines and angles
- Understand and apply the Pythagorean Theorem
- Solve real world and mathematical problems involving cylinders, cones and spheres

**Essential Questions :**

- How can the Pythagorean Theorem be used to find distances on the coordinate grid?
- How would you describe the effect of transformations on geometric figures?
- What properties of transformations produce congruent and similar figures?
- How can you determine the surface area and volume of cones, cylinders and spheres?

**21st Century Connections**

| *Check all that apply.* | | *Indicate whether these skills are **E**-Encouraged, **T**-Taught, and/or **A**-Assessed in this unit by marking **E, T, A** in the box before the appropriate skill.* | |
|---|---|---|---|
| **21st Century Interdisciplinary Themes** | | **21st Century Skills** | |
| X | **Global Awareness** | E,T,A | **Critical Thinking and Problem Solving** |
| X | **Environmental Literacy** | E,A | **Creativity and Innovation** |
| X | **Health Literacy** | E | **Communication and Collaboration** |
|  | **Civic Literacy** | E | **Flexibility and Adaptability** |
|  | **Financial, Economic , Business and Entrepreneurial Literacy** | E | **Initiative and Self-Direction** |
|  | | E | **Social and Cross-Cultural Skills** |
|  | | E,T,A | **Productivity and Accountability** |
|  | | E | **Leadership and Responsibility** |

| | | |
|---|---|---|
| E,T,A | **Informational Literacy Skills** | |
| E | **Media Literacy Skills** | |
| E | **Information, Communication, and Technology (ICT) Literacy** | |

**Career Ready Practices:**

*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.*

| | |
|---|---|
| E | **CRP1.  Act as a responsible and contributing citizen and employee** |
| E,T,A | **CRP2.  Apply appropriate academic and technical skills** |
| E | **CRP3.  Attend to personal health and financial well-being** |
| E,T,A | **CRP4.  Communicate clearly and effectively with reason** |
| E | **CRP5.  Consider the environmental, social and economic impacts of decisions** |
| E,T,A | **CRP6.  Demonstrate creativity and innovation** |
| E | **CRP7.  Employ valid and reliable research strategies** |
| E,T,A | **CRP8.  Utilize critical thinking to make sense of problems and persevere in solving them** |
| E,T | **CRP9.  Model integrity, ethical leadership, and effective management** |
| E | **CRP10.  Plan education and career paths aligned to personal goals** |
| E | **CRP11.  Use technology to enhance productivity** |
| E | **CRP12.  Work productively in teams while using cultural global competence** |

**Student Learning Goals/Objectives:**

| *Students will know….* | *Students will be able to (do)…* |
|---|---|
| ● the angle relationships made when parallel lines are cut by a transversal | ● identify relationships of angles formed by two parallel lines cut by a transversal |

- the relationship among the legs and hypotenuse of a right triangle
- how to use the Pythagorean Theorem to find distance between two points on the coordinate plane
- how figures are transformed on the coordinate plane
- why transformations create congruent images
- the properties of similar polygons
- how the scale factor of a dilation relates to the ratio of two of the corresponding sides of the preimage and the image
- how the volume and surface area of a 3D figure differs
- how changing the radius or height of a figure affects the volume

- model the relationship among the sides of a right triangle
- apply the Pythagorean Theorem
- find distance between two points on the coordinate plane
- graph transformations on the coordinate plane
- use scale factors to graph dilations
- use a series of transformations to create congruent figures
- write congruent statements for congruent figures
- use transformations to create similar figures
- identify similar polygons and find missing measures
- relate the slope of a line to similar triangles
- find the relationship between areas and perimeters of similar figures
- find the volume of cylinders, cones and spheres
- find the surface area of cylinders and cones
- solve problems involving similar solids

**Key Vocabulary and Terms:**

- alternate interior/exterior angles
- corresponding angles
- hypotenuse
- interior angles
- legs
- parallel lines
- perpendicular lines
- polygon
- Pythagorean Theorem
- transversal
- angle of rotation
- center of dilation
- center of rotation
- congruent

- dilation
- image
- line of reflection
- preimage
- reflection
- rotation
- transformation
- translation
- corresponding parts
- indirect measurement
- scale factor
- similar polygons
- composite solids
- cone
- cylinder
- hemisphere
- lateral area
- nets
- polyhedron
- similar solids
- sphere
- surface area
- volume

**Assessment Evidence:**

| *Performance Tasks:* | *Other Assessment Measures: *Include Benchmarks* |
|---|---|
| <ul><li>varied formative and summative concept assessments<ul><li>for example but not limited to:</li></ul></li></ul> | <ul><li>GLENCOE Math - Built to the Common Core<ul><li>pre/post assessment per unit</li></ul></li></ul> |

| | | |
|---|---|---|
| | ■ graphic organizers, exit slips, individual wipe boards, open ended questions, peer assessments<br>■ written end of unit tests, projects with rubrics, self-evaluation<br>● [Aaron's Designs Project](#)<br>● [Patterns in Prague Project](#)<br>● Glencoe Math - Power Up Performance Task<br>    ○ pg. 443, 499, 581, 653 | ○ [Pretest Chapter 5](#)<br>○ [Pretest Chapter 6](#)<br>○ [Pretest Chapter 7](#)<br>○ [Pretest Chapter 8](#)<br>○ [Posttest Chapter 5](#)<br>○ [Posttest Chapter 6](#)<br>○ [Posttest Chapter 7](#)<br>○ [Posttest Chapter 8](#)<br>● STAR Assessment - benchmark<br>● Grade 8 Model Curriculum Assessment |
| | *Teaching and Learning Actions:  (What learning experiences and instruction will enable students to achieve the desired results?)* | |
| | *Instructional Strategies and Activities  (add rows as needed) *D*<br><br>**Title** | ***Consider how will the design will:***<br><br>**Description with Modifications, number of days, etc. -** Modifications made as the need becomes apparent or as stated in IEPs, 504s and ELL documents.<br>● **[List of modifications available in IEP Direct](#)** |
| | 1. concept map/graphic organizer | ● Promote use of graphic organizer<br>● Allow graphic organizer to assist in means of test taking<br>● Refer to graphic organizers, concept map, and/or mnemonic devices<br>● Use of symbolic representations, such as pictures, to assist in making language connections |
| | 2. concept instruction | ● Teacher models the desired learning strategy or task, and then teacher will gradually shift responsibility to the students. |
| | 3. practice, and problem solving practice | ● Apply a variety of strategies to comprehend vocabulary and mathematical concepts.<br>● Monitor Student Understanding |

| 4. groups, individual, and partner activities | ● Assist those who require additional help |
|---|---|
| | ● Allow extended time |

| Resources: |
|---|
| <ul><li>Glencoe Math - consumable text</li><li>Glencoe Math - Power Up for PARCC</li><li>various online resources<ul><li>http://www.insidemathematics.org/performance-assessment-tasks</li><li>www.mathplayground.com</li><li>www.teacherspayteachers.com</li><li>www.kahnacademy.org</li><li>www.xpmath.com</li><li>www.illustrativemathematics.org</li><li>www.mathbitsnotebook.com</li><li></li></ul></li></ul> |

| Suggested Time Frame: | 10 weeks (50 days) instruction - 2 weeks (10 days) assessment = 12 weeks (60 days) |
|---|---|

## Unit Five-Statistics

| Content Area: | Math | | Grade(s) 8 |
|---|---|---|---|
| Unit Plan Title: | Statistics - Chapter 9 | | |

| Overview/Rationale |
|---|
| It is essential that this curriculum unit build on the statistical reasoning that students bring with them to school.  Statistical reasoning skills are advantageous in making everyday decisions based on data.  This problem solving process will guide our students to formulate questions, collect data, analyze data and interpret results. |

| Standard(s)  Number and Description |
|---|

**Investigate patterns of association in bivariate data.**

CCSS.Math.Content.8.SP.A.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.
CCSS.Math.Content.8.SP.A.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.
CCSS.Math.Content.8.SP.A.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*.
CCSS.Math.Content.8.SP.A.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?*

**Math Practice Standards  Number and Description**

MP1 - Make sense of problems and persevere in solving them.
MP2 - Reason abstractly and quantitatively.
MP3 - Construct viable arguments and critique the reasoning of others.
MP4 - Model with mathematics.
MP5 - Use appropriate tools strategically.
MP6 - Attend to precision.
MP7 - Look for and make use of structure.
MP8 - Look for and express regularity in repeated reasoning.

**Technology Standard(s)  Number and Description**

TECH.8.2.8.C - The design process is a systematic approach to solving problems.

| TECH.8.2.2.C.1 - Brainstorm ideas on how to solve a problem or build a product. |
|---|

**Interdisciplinary Standard(s)  Number and Description**

LA.8.W.1 - Write arguments to support claims with clear reasons and relevant evidence.

SCI.MS-ETS1-3 - Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

**Enduring Understandings:**

***Students will understand that…***
- Investigate patterns of association in bivariate data.

**Essential Questions :**
- What inferences can be collected and drawn from sets of data when having positive, negative or no association?

**21st Century Connections**

| *Check all that apply.* | | *Indicate whether these skills are **E**-Encouraged, **T**-Taught, and/or **A**-Assessed in this unit by marking **E, T, A** in the box before the appropriate skill.* | |
|---|---|---|---|
| **21st Century Interdisciplinary Themes** | | **21st Century Skills** | |
| X | **Global Awareness** | E,T,A | **Critical Thinking and Problem Solving** |
| X | **Environmental Literacy** | E,A | **Creativity and Innovation** |
| X | **Health Literacy** | E | **Communication and Collaboration** |
| | **Civic Literacy** | E | **Flexibility and Adaptability** |

| | |
|---|---|
| | **Financial, Economic, Business and Entrepreneurial Literacy** |

| | |
|---|---|
| E | **Initiative and Self-Direction** |
| E | **Social and Cross-Cultural Skills** |
| E,T,A | **Productivity and Accountability** |
| E | **Leadership and Responsibility** |
| E,T,A | **Informational Literacy Skills** |
| E | **Media Literacy Skills** |
| E | **Information, Communication, and Technology (ICT) Literacy** |

**Career Ready Practices:**

*Indicate whether these skills are **E**-Encouraged, **T**-Taught, or **A**-Assessed in this unit by marking **E, T, A** on the line before the appropriate skill.*

| | |
|---|---|
| E | **CRP1.  Act as a responsible and contributing citizen and employee** |
| E,T,A | **CRP2.  Apply appropriate academic and technical skills** |
| E | **CRP3.  Attend to personal health and financial well-being** |
| E,T,A | **CRP4.  Communicate clearly and effectively with reason** |
| E | **CRP5.  Consider the environmental, social and economic impacts of decisions** |
| E,T,A | **CRP6.  Demonstrate creativity and innovation** |
| E | **CRP7.  Employ valid and reliable research strategies** |
| E,T,A | **CRP8.  Utilize critical thinking to make sense of problems and persevere in solving them** |
| E,T | **CRP9.  Model integrity, ethical leadership, and effective management** |
| E | **CRP10.  Plan education and career paths aligned to personal goals** |
| E | **CRP11.  Use technology to enhance productivity** |

| E | CRP12.  Work productively in teams while using cultural global competence |
|---|---|

**Student Learning Goals/Objectives:**

| *Students will know….* | *Students will be able to (do)…* |
|---|---|
| ● how to estimate a line of best fit for a scatter plot<br>● what a box and whisker plot tell you about a set of data<br>● how to determine when the median best describes the spread of distribution | ● use a scatter plot to investigate the relationship between two sets of data<br>● draw lines of best fit and use them to make predictions<br>● find the measures of center and variation<br>● find and interpret the mean absolute deviation<br>● analyze data distributions |

**Key Vocabulary and Terms:**

- bivariate data
- distribution
- line of best fit
- mean absolute deviation
- qualitative data
- quantitative data
- relative frequency
- scatter plot
- standard deviation

**Assessment Evidence:**

| *Performance Tasks:* | *Other Assessment Measures:  *Include Benchmarks* |
|---|---|
| ● varied formative and summative concept assessments<br>   ○ for example but not limited to:<br>      ■ graphic organizers, exit slips, individual wipe boards, open ended questions, peer | ● GLENCOE Math - Built to the Common Core<br>   ○ pre/post assessment per unit<br>   ○ Pretest Chapter 9<br>   ○ Posttest Chapter 9 |

| | | |
|---|---|---|
| | assessments<br>■ written end of unit tests, projects with rubrics, self-evaluation<br>● House Prices Project<br>● Scatter Diagram Project<br>● Glencoe Math - Power Up Performance Task - pg. 731 | ● STAR Assessment - benchmark<br>● Grade 8 Model Curriculum Assessment |

| *Teaching and Learning Actions: (What learning experiences and instruction will enable students to achieve the desired results?)* |
|---|

| *Instructional Strategies and Activities (add rows as needed) *D*<br><br><br><br>**Title** | **Consider how will the design will:**<br><br>**Description with Modifications, number of days, etc. -** Modifications made as the need becomes apparent or as stated in IEPs, 504s and ELL documents.<br>● **List of modifications available in IEP Direct** |
|---|---|
| 1. concept map/graphic organizer | ● Promote use of graphic organizer<br>● Allow graphic organizer to assist in means of test taking<br>● Refer to graphic organizers, concept map, and/or mnemonic devices<br>● Use of symbolic representations, such as pictures, to assist in making language connections |
| 2. concept instruction | ● Teacher models the desired learning strategy or task, and then teacher will gradually shift responsibility to the students. |
| 3. practice, and problem solving practice | ● Apply a variety of strategies to comprehend vocabulary and mathematical concepts.<br>● Monitor Student Understanding |
| 4. groups, individual, and partner activities | ● Assist those who require additional help<br>● Allow extended time |
| Resources: | |

- Glencoe Math - consumable text
- Glencoe Math - Power Up for PARCC
- various online resources
  - http://www.insidemathematics.org/performance-assessment-tasks
  - www.mathplayground.com
  - www.teacherspayteachers.com
  - www.kahnacademy.org
  - www.xpmath.com
  - www.illustrativemathematics.org
  - www.mathbitsnotebook.com
  -

| Suggested Time Frame: | 2 weeks (10 days) instruction - 1 week (5 days) assessment = 3 weeks (15 days) |
|---|---|

## 8th Grade Math Standards Curriculum Map

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| **Unit 1**<br><br><br>**Exponents, Expressions, and Equations** | ■ 8.EE.A.1<br>◎ 8.G.C.9<br>■ 8.EE.A.3<br>■ 8.EE.A.4<br>□ 8.NS.A.1<br>□ 8.NS.A.2<br>■ 8.EE.B.5<br>■ 8.EE.B.6 | • Work with integer exponents<br>• Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres<br>• Know that there are numbers that are not rational, and approximate them by rational numbers<br>• Understand the connections between proportional relationships, lines, and linear equations | MP.1 Make sense of problems and persevere in solving them. |
| *Unit 1:*<br><br>*Suggested Open Educational Resources* | 8.EE.A.1 Extending the Definitions of Exponents<br><br>8.G.C.9 A Canister of Tennis Balls<br><br>8.EE.A.3 Ant and Elephant<br><br>8.EE.A.4 Giant burgers<br><br>8.NS.A.1 Converting Decimal Representations of Rational Numbers to Fraction Representations<br><br>8.NS.A.2 Irrational Numbers on the Number Line<br><br>8.EE.B.5 Who Has the Best Job?<br><br>8.EE.B.6 Slopes Between Points on a Line | | MP.2 Reason abstractly and quantitatively.<br><br><br>MP.3 Construct viable arguments & critique the reasoning. of others.<br><br><br>MP.4 Model with mathematics. |

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| **[Unit 2](#)**<br><br>**Functions, Equations, and Solutions** | ■ 8.F.A.1<br>■ 8.F.A.2<br>■ 8.F.A.3<br>■ 8.F.B.4*<br>■ 8.F.B.5<br>■ 8.EE.C.7<br>■ 8.EE.C.8* | • Define, evaluate, and compare functions<br>• Use functions to model relationships between quantities<br>• Analyze and solve linear equations and simultaneous linear equations | MP.5 Use appropriate tools strategically.<br><br><br>MP.6 Attend to precision. |
| *Unit 2:*<br><br>*Suggested Open Educational Resources* | 8.F.A.1 Function Rules<br><br>8.F.A.2 Battery Charging<br><br>8.F.A.3 Introduction to Linear Functions<br><br>8.F.B.4 Chicken and Steak, Variation 1<br><br>8.F.B.4 Baseball Cards<br><br>8.EE.C.7 The Sign of Solutions<br><br>8.EE.C.7 Coupon versus discount<br><br>8.EE.C.8a Intersection of Two Lines<br><br>8.EE.C.8 How Many Solutions | | MP.7 Look for and make use of structure.<br><br><br>MP.8 Look for and express regularity in repeated reasoning. |

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| | | | |
| **Unit 3**<br><br>**Geometry: Pythagorean Theorem, Congruence and Similarity Transformations** | ■ 8.EE.A.2<br>◎ 8.G.C.9<br>■ 8.G.B.6<br>■ 8.G.B.7<br>■ 8.G.B.8*<br>■ 8.G.A.1<br>■ 8.G.A.2<br>■ 8.G.A.3<br>■ 8.G.A.4<br>■ 8.G.A.5 | • Work with radicals and integer exponents<br>• Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres<br>• Understand and apply the Pythagorean Theorem<br>• Understand congruence and similarity using physical models, transparencies, or geometry software | |
| *Unit 3:*<br><br>*Suggested Open Educational Resources* | 8.G.B.6 Converse of the Pythagorean Theorem<br><br>8.G.B.7 Running on the Football Field<br><br>8.G.B.8 Finding isosceles triangles<br><br>8.G.A.1 Reflections, Rotations, and Translations<br><br>8.G.A.2 Congruent Triangles<br><br>8.G.A.3 Effects of Dilations on Length, Area, and Angles<br><br>8.G.A.4 Are They Similar<br><br>8.G.A.5 Street Intersections<br><br>8.G.A.5 Similar Triangles II<br><br>8.G.A.5 Triangle's Interior Angles | | MP.1 Make sense of problems and persevere in solving them.<br><br><br>MP.2 Reason abstractly and quantitatively.<br><br><br>MP.3 Construct viable arguments & critique the reasoning. of others. |

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| | | | MP.4 Model with mathematics. |
| | | | MP.5 Use appropriate tools strategically. |
| **Unit 4**<br><br>**Statistics and Probability: Scatterplots and Association** | ☐ 8.SP.A.1<br>☐ 8.SP.A.2<br>☐ 8.SP.A.3<br>☐ 8.SP.A.4<br>■ 8.F.B.4*<br>■ 8.G.B.8*<br>■ 8.EE.C.8c* | • Investigate patterns of association in bivariate data<br>• Use functions to model relationships between quantities<br>• Understand and apply the Pythagorean Theorem<br>• Analyze and solve linear equations and simultaneous linear equations | MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. |
| *Unit 4:*<br><br>*Suggested Open Educational Resources* | 8.SP.A.1 Texting and Grades 1<br><br>8.SP.A.2 Animal Brains<br><br>8.SP.A.3 US Airports<br><br>8.SP.A.4 What's Your Favorite Subject<br><br>8.SP.A.4 Music and Sports<br><br>8.F.B.4 Delivering the Mail<br><br>8.G.B.8 Finding the distance between points | | MP.8 Look for and express regularity in repeated reasoning. |

| Overview | Standards for Mathematical Content | Unit Focus | | Standards for Mathematical Practice |
|---|---|---|---|---|
| | 8.EE.C.8 Kimi and Jordan | | | |

<div align="center">

**Unit 1 Grade 8**

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| Content Standards | Suggested Standards for Mathematical Practice | Critical Knowledge & Skills |
|---|---|---|
| ■ 8.EE.A.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.*<br><br>◎ 8.G.C.9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure.<br><br>MP.8 Look for and express regularity in repeated reasoning. | Concept(s):<br><br>• Exponents as simplified representation of repeated multiplication.<br>Students are able to:<br><br>• Apply properties of exponents to numerical expressions.<br>• Generate equivalent numerical expressions using positive and negative integer exponents.<br>• Find volume of cones, cylinders and spheres using to solve real world problems.<br><br>Learning Goal 1:  Apply the properties of integer exponents to write equivalent numerical expressions; apply formulas to find the volume of a cone, a cylinder, or a sphere when solving real-world and mathematical problems. |

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| ■ 8.EE.A.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 $3 \times 10^8$ and the population of the world as $7 \times 10^9$, and determine that the world population is more than 20 times larger.* | MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure.<br><br>MP.8 Look for and express regularity in repeated reasoning. | Concept(s):<br><br>• Very large and very small quantities can be approximated with numbers expressed in the form of a single digit times an integer power of 10.<br>Students are able to:<br><br>• Estimate very large and very small quantities with numbers expressed in the form of a single digit times an integer power of 10.<br>• Compare numbers written in the form of a single digit times an integer power of 10 and express how many times as much one is than the other.<br><br>Learning Goal 2: Estimate and express the values of very large or very small numbers with numbers expressed in the form of a single digit times an integer power of 10. Compare numbers expressed in this form, expressing how many times larger or smaller one is than the other. | |
| ■ 8.EE.A.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. | MP. 2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure.<br><br>MP.8 Look for and express regularity in repeated reasoning. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Multiply and divide numbers expressed in scientific notation, including problems in which one number is in decimal form and one is in scientific notation.<br>• Add and subtract numbers expressed in scientific notation, including problems in which one number is in decimal form and one is in scientific notation.<br>• Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities.<br>• Interpret scientific notation that has been generated by technology (e.g. recognize 4.1E-2 and 4.1e-2 as $4.1 \times 10^{-2}$).<br><br>Learning Goal 3: Perform operations using numbers expressed in scientific notation, | |

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| | | | including problems where both decimals and scientific notation are used.  In real-world problem-solving situations, choose units of appropriate size for measurement of very small and very large quantities and interpret scientific notation generated when technology has been used for calculations. |
| ☐ 8.NS.A.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. | MP. 2 Reason abstractly and quantitatively. | | Concept(s): <br><br> • Numbers that are not rational are irrational. <br> • Every number has a decimal expansion. <br> Students are able to: <br><br> • Compare decimal expansions of rational and irrational numbers. <br> • Represent a rational number with its decimal expansion, showing that it repeats eventually. <br> • Convert a decimal expansion (which repeats eventually) into a rational number. <br><br> Learning Goal 4: Represent a rational number with its decimal expansion, showing that it eventually repeats, and convert such decimal expansions into rational numbers. |
| ☐ 8.NS.A.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., $\pi^2$). *For example, by truncating the decimal expansion of $\sqrt{2}$, show that  $\sqrt{2}$ is between 1 and 2, then* | MP.1 Make sense of problems and persevere in solving them. <br><br> MP.4 Model with mathematics. <br><br> MP.5 Use appropriate tools strategically. | | Concept(s): <br><br> • Rational approximation of irrational numbers <br> Students are able to: <br><br> • Compare irrational numbers by replacing each with its rational approximation. <br> • Locate rational approximations on a number line. <br> • Estimate the value of expressions containing irrational numbers. |

| Overview | Standards for Mathematical Content | Unit Focus | | Standards for Mathematical Practice |
|---|---|---|---|---|
| *between 1.4 and 1.5, and explain how to continue on to get better approximations.* | | | | Learning Goal 5: Use rational numbers to approximate irrational numbers, locate irrational numbers on a number line, and estimate the value of expressions containing irrational numbers. |
| ■ 8.EE.B.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.* | MP.2 Reason abstractly and quantitatively. <br><br> MP.4 Model with mathematics. <br><br> MP.5 Use appropriate tools strategically. <br> MP.6 Attend to precision. <br><br> MP.7 Look for and make use of structure. <br><br> MP.8 Look for and express regularity in repeated reasoning. | Concept(s): <br><br> • Quantitative relationships can be represented in different ways. <br> Students are able to: <br><br> • Graph proportional relationships. <br> • Interpret unit rate as the slope of a graph. <br> • Compare two different proportional relationships that are represented indifferent ways (table of values, equation, graph, verbal description). <br><br> Learning Goal 6: Graph proportional relationships, interpreting slope as unit rate, and compare two proportional relationships, each represented in different ways. | | |
| ■ 8.EE.B.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*. | MP.2 Reason abstractly and quantitatively. <br><br> MP.4 Model with mathematics. <br><br> MP.5 Use appropriate tools strategically. <br><br> MP.6 Attend to precision. <br><br> MP.7 Look for and make use of structure. <br><br> MP.8 Look for and express regularity in repeated reasoning. | Concept(s): No new concept(s) introduced <br><br> Students are able to: <br><br> • Show, using similar triangles, and explain why the slope, *m*, is the same between any two distinct points on a non-vertical line. <br> • Derive, from two points, the equation $y = mx$ for a line through the origin. <br> • Derive, from two points, the equation $y = mx + b$ for a line intercepting the vertical axis at *b*. <br><br> Learning Goal 7: Derive the equation of a line ($y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at *b*) and use similar triangles to explain why the slope (*m*) is the same between any | | |

| Overview | Standards for Mathematical Content | Unit Focus | | Standards for Mathematical Practice |
|---|---|---|---|---|
| | | | two points on a non-vertical line in the coordinate plane. | |

| Unit 1 Grade 8 What This May Look Like | |
|---|---|
| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
| *Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.* | *Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* |

| Focus Mathematical Concepts |
|---|
| *Districts should consider listing prerequisites skills. Concepts that include a focus on relationships and representation might be listed as grade level appropriate.*<br>Prerequisite skills:<br><br>Common Misconceptions: |

| **District/School Tasks** | **District/School Primary and Supplementary Resources** |
|---|---|
| *Exemplar tasks or illustrative models could be provided.* | *District/school resources and supplementary resources that are texts as well as digital resources used to support the instruction.* |

| Instructional Best Practices and Exemplars |
|---|
| *This is a place to capture examples of standards integration and instructional best practices.* |

| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
|  |  |  |  |

| Unit 2 Grade 8 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| ■ 8.F.A.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. | MP.2 Reason abstractly and quantitatively.<br><br>MP.5 Use appropriate tools strategically. | Concept(s):<br><br>• A function is a rule.<br>• If a rule is a function, then for each input there is exactly one output.<br>Students are able to:<br><br>• Use function language.<br>• Describe a function as providing a single output for each input.<br>• Determine whether non-numerical relationships are functions.<br>• Describe a function as a set of ordered pairs.<br>• Read inputs and outputs from a graph.<br>• Describe the ordered pairs as containing an input, and the corresponding output.<br><br>Learning Goal 1:  Define a function as a rule that assigns one output to each input and determine if data represented as a graph or in a table is a function. |
| ■ 8.F.A.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.* | MP.5 Use appropriate tools strategically.<br><br>MP.8 Look for and express regularity in repeated reasoning. | Concept(s):<br><br>• Functions (quantitative relationships) can be represented in different ways.<br>• Functions have properties; properties of linear functions.<br>Students are able to:<br><br>• Analyze functions represented algebraically, as a table of values, and as a graph.<br>• Interpret functions represented by a verbal description.<br>• Given two functions, each represented in a different way, compare their properties.<br><br>Learning Goal 2: Compare two functions each represented in a different way (numerically, verbally, graphically, and algebraically) and draw conclusions about their properties (rate of change and intercepts). |
| ■ 8.F.A.3 Interpret the equation *y = mx + b* as defining a linear function, | MP.2 Reason abstractly and | Concept(s): |

| Unit 2 Grade 8 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| whose graph is a straight line; give examples of functions that are not linear. *For example, the function A = s² 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.* | quantitatively.<br><br>MP.3 Construct viable arguments and critique the reasoning of others.<br><br>MP.5 Use appropriate tools strategically. | • A linear function is defined by the equation $y = mx + b$.<br>• The graph of a linear function is a straight line.<br>Students are able to:<br><br>• Analyze tables of values, graphs, and equations in order to classify a function as linear or non-linear.<br>• Determine if equations presented in forms other than y = mx + b (for example 3y – 2x = 7) define a linear function.<br>• Give examples of equations that are non-linear functions.<br>• Show that a function is not linear using pairs of points.<br><br>Learning Goal 3: Classify functions as linear or non-linear by analyzing equations, graphs, and tables of values; interpret the equation $y = mx + b$ as defining a linear function. |
| ■ 8.F.B.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. | MP.6 Attend to precision.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br><br>• As with equations, two (x, y) values can be used to construct a function.<br>Students are able to:<br><br>• Determine the rate of change and initial value of a function from a description of a relationship.<br>• Determine the rate of change and initial value of a function from two (*x*, *y*) values by reading from a table of values.<br>• Determine the rate of change and initial value of a function from two (*x*, *y*) values by reading these from a graph.<br>• Construct a function in order to model a linear relationship.<br>• Interpret the rate of change and initial value of a linear function in context.<br><br>Learning Goal 4: Model a linear relationship by constructing a function from two (x, y) values. Interpret the rate of change and initial value of the linear function in terms of the situation it models, and in terms of its graph or a table of |

| Unit 2 Grade 8 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| | | values. |
| ■ 8.F.B.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. | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Analyze a graph.<br>• Provide qualitative descriptions of graphs (e.g. where increasing or decreasing, linear or non-linear).<br>• Given a verbal description, sketch a graph of a function based on the qualitative features described.<br><br><br>Learning Goal 5: Sketch a graph of a function from a qualitative description and give a qualitative description of a graph of a function. |
| ■ 8.EE.C.7. Solve linear equations in one variable.<br>   8EE.C.7a. 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).<br><br>   8.EE.C.7b. Solve linear equations with rational number | MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision. | Concept(s):<br><br>• Linear equations may have an infinite number of solutions.<br>• Linear equations may have no solution or a single solution.<br>Students are able to:<br><br>• Give examples of linear equations in one variable with one solution *(x = a)*, infinitely many solutions *(a = a)*, or no solutions *(a = b.)*<br>• Transform a given equation, using the properties of equality, into simpler forms.<br>• Transform a given equation until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results *(a and b are different numbers)*.<br>• Solve linear equations that have fractional coefficients; include equations requiring use of the distributive property and collecting like terms.<br><br><br>Learning Goal 6: Apply the distributive property and collect like terms to solve linear equations in one variable that contain rational numbers as coefficients. |

| Unit 2 Grade 8 | | |
|---|---|---|
| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. | | Use an equivalent equation of the form $x = a$, $a = a$, or $a = b$ (where $a$ and $b$ are different numbers) to describe the number of solutions. |
| ■ 8.EE.C.8. Analyze and solve pairs of simultaneous linear equations.<br>  8.EE.C.8a. 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.<br><br>  8.EE.C.8b. 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.*<br><br>  8.EE.C.8c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given* | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br><br>• Simultaneous linear equations may have an infinite number of solutions.<br>• Simultaneous linear equations may have no solution or a single solution.<br>• Solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs.<br>Students will be able to:<br><br>• Solve systems of two linear equations in two variables algebraically.<br>• Estimate solutions of a linear system of two equations by graphing.<br>• Solve simple cases of a linear system of two equations by inspection.<br>• Solve real-world and mathematical problems leading to two linear equations in two variables.<br><br>Learning Goal 7: Solve systems of linear equations in two variables algebraically and by inspection. Estimate solutions by graphing, explain that points of intersection satisfy both equations simultaneously, and interpret solutions in context. |

| Unit 2 Grade 8 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| *coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.* | | |

| Unit 2 Grade 8 What This May Look Like | |
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| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
| *Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.* | *Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* |

| Focus Mathematical Concepts |
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| *Districts should consider listing prerequisites skills. Concepts that include a focus on relationships and representation might be listed as grade level appropriate.* <br> Prerequisite skills: <br><br> Common Misconceptions: |

| **District/School Tasks** | **District/School Primary and Supplementary Resources** |
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| *Exemplar tasks or illustrative models could be provided.* | *District/school resources and supplementary resources that are texts as well as digital resources used to support the instruction.* |

| Instructional Best Practices and Exemplars |
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| *This is a place to capture examples of standards integration and instructional best practices.* |

| Unit 3 Grade 8 |
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| Content Standards | Suggested Standards for Mathematical Practice | Critical Knowledge & Skills |
|---|---|---|
| ■ 8.EE.A.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 $\sqrt{2}$ is irrational.<br><br>◉ 8.G.C.9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. | MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure.<br><br>MP.8 Look for and express regularity in repeated reasoning. | Concept(s):<br><br>• Square root and cube roots; perfect squares and perfect cubes<br>• Inverse relationship between powers and square roots<br>Students are able to:<br><br>• Give the value of square roots of small perfect squares.<br>• Solve equations of the form $x^2 = p$, where $p$ is a positive rational number.<br>• Use the square root symbol to represent solutions to equations of the form $x^2 = p$.<br>• Give the value of cube roots of small perfect cubes.<br>• Solve equations of the form $x^3 = p$, where $p$ is a positive rational number.<br>• Use the cube root symbol to represent solutions to equations of the form $x^3 = p$.<br>• Show or explain that $\sqrt{2}$ is an irrational number.<br>• Use volume formulas to find a single unknown dimension of cones, cylinders and spheres when solving real world problems.<br><br>Learning Goal 1: Evaluate square roots and cubic roots of small perfect squares and cubes respectively and use square 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; identify $\sqrt{2}$ as irrational.<br><br>Learning Goal 2: Apply the formula for the volume of a cone, a cylinder, or a sphere to find a single unknown dimension when solving real-world and mathematical problems. |
| ■ 8.G.B.6. Explain a proof of the Pythagorean Theorem and its converse. | MP.2 Reason abstractly and quantitatively. | Concept(s):<br><br>• Pythagorean Theorem<br>• If the square of one side of a triangle is equal to the sum of the squares of the other two sides, then the triangle is a right triangle (Pythagorean theorem converse).<br>Students are able to:<br><br>• Given a proof of the Pythagorean theorem, explain the proof.<br>• Given a proof of the converse of the Pythagorean theorem, explain the proof. |

| Unit 3 Grade 8 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| | | Learning Goal 3: Explain a proof of the Pythagorean Theorem and its converse. |
| ■ 8.G.B.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. | MP.2 Reason abstractly and quantitatively.<br><br>MP.7 Look for and make use of structure. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving two dimensional spaces.<br>• Determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving three dimensional spaces.<br><br>Learning Goal 4: Apply the Pythagorean Theorem to determine unknown side lengths of right triangles in two and three dimensional cases when solving real-world and mathematical problems. |
| ■ 8.G.B.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system | MP.2 Reason abstractly and quantitatively.<br><br>MP.7 Look for and make use of structure. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Determine the distance between two points in a coordinate plane by drawing a right triangle and applying the Pythagorean Theorem.<br><br>Learning Goal 5: Use the Pythagorean Theorem to determine the distance between two points in the coordinate plane. |
| ■ 8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations:<br>    8.G.A.1a. Lines are transformed to lines, and line segments to line segments of the same length. | MP.3 Construct viable arguments and critique the reasoning of others.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.8 Look for and express regularity in | Concept(s):<br><br>• A property of rigid motion transformations (rotation, reflection, and translation) is that the measure of a two-dimensional object under the transformation remains unchanged.<br>Students are able to: |

| Unit 3 Grade 8 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| 8.G.A.1b. Angles are transformed to angles of the same measure.<br><br>8.G.A.1c. Parallel lines are transformed to parallel lines. | repeated reasoning. | • Show and explain that performing rotations, reflections, and translations on lines results in a line.<br>• Show and explain that performing rotations, reflections, and translations on line segments results in a line segment and does not alter the length of the line segment.<br>• Show and explain that performing rotations, reflections, and translations on angles results in an angle and does not alter the measure of the angle.<br>• Show and explain that performing rotations, reflections, and translations on parallel lines results in parallel lines.<br>• Explain that a property of rigid motion transformations (rotation, reflection, and translation) is that the measure of a two-dimensional object under the transformation remains unchanged.<br><br>Learning Goal 6: Explain and model the properties of rotations, reflections, and translations with physical representations and/or geometry software using pre-images and resultant images of lines, line segments, and angles. |
| ■ 8.G.A.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. | MP.2 Reason abstractly and quantitatively.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br><br>• 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.<br>Students are able to:<br><br>• given two congruent figures, describe a transformation or sequence of transformations that shows the congruence between them.<br><br>Learning Goal 7: Describe and perform a sequence of rotations, reflections, and/or translations on a two dimensional figure in order to prove that two figures are congruent. |
| ■ 8.G.A.3. Describe the effect of dilations, translations, rotations, and | MP.2 Reason abstractly and | Concept(s): No new concept(s) introduced |

| Unit 3 Grade 8 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| reflections on two-dimensional figures using coordinates. | quantitatively.<br><br>MP.3 Construct viable arguments and critique the reasoning. of others.<br><br>MP.5 Use appropriate tools strategically. | Students are able to:<br><br>• Describe, using coordinates, the resulting two-dimensional figure after applying dilations with scale factor greater than, less than, and equal to 1.<br>• Describe, using coordinates, the resulting two-dimensional figure after applying translation, rotation, and reflection.<br><br>Learning Goal 8: Use the coordinate plane to locate images or pre-images of two-dimensional figures and determine the coordinates of a resultant image after applying dilations, rotations, reflections, and translations. |
| ■ 8.G.A.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. | MP.2 Reason abstractly and quantitatively.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br><br>• 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.<br>• Congruent figures are also similar.<br>Students are able to:<br><br>• Describe a transformation or sequence of transformations that show the similarity between them given two similar two-dimensional figures.<br><br>Learning Goal 9: Apply an effective sequence of transformations to determine that figures are similar when corresponding angles are congruent and corresponding sides are proportional. Write similarity statements based on such transformations. |
| ■ 8.G.A.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. | MP.2 Reason abstractly and quantitatively.<br><br>MP.3 Construct viable arguments and critique the reasoning. of others. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Give informal arguments to establish facts about the angle sum of triangles.<br>• Give informal arguments to establish facts about exterior angles of triangles.<br>• Give informal arguments to establish facts about the angles created when parallel |

| Unit 3 Grade 8 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| *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.* | | lines are cut by a transversal.<br>• Give informal arguments to establish the angle-angle criterion for similarity of triangles.<br><br>Learning Goal 10: Give informal arguments to justify facts about the exterior angles of a triangle, the sum of the measures of the interior angles of a triangle, the angle-angle relationship used to determine similar triangles, and the angles created when parallel lines are cut by a transversal. |

| Unit 3 Grade 8 What This May Look Like | |
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| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
| *Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.* | *Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* |

| Focus Mathematical Concepts |
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| *Districts should consider listing prerequisites skills. Concepts that include a focus on relationships and representation might be listed as grade level appropriate.*<br>Prerequisite skills:<br><br>Common Misconceptions: |

| **District/School Tasks** | **District/School Primary and Supplementary Resources** |
|---|---|
| *Exemplar tasks or illustrative models could be provided.* | *District/school resources and supplementary resources that are texts as well as digital resources used to support the instruction.* |

| Instructional Best Practices and Exemplars |
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| *This is a place to capture examples of standards integration and instructional best practices.* |

| Unit 4 Grade 8 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| ☐ 8.SP.A.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. | MP.3 Construct viable arguments and critique the reasoning. of others. <br><br> MP.5 Use appropriate tools strategically. <br><br> MP.7 Look for and make use of structure. | Concept(s): <br><br> • Association in data (bivariate measurement data) <br> Students are able to: <br><br> • Construct and interpret scatter plots. <br> • Analyze patterns of association between the two quantities represented in a scatter plot. <br> • Describe clustering, outliers, positive or negative association, linear or non-linear association when explaining patterns of association in a scatter plot. <br><br> Learning Goal 1: Construct and interpret scatter plots for bivariate measurement data and describe visual patterns of association (clusters, outliers, positive or negative association, linear association and nonlinear association, strong, weak, and no association). |
| ☐ 8.SP.A.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. | MP.2 Reason abstractly and quantitatively. <br><br> MP.5 Use appropriate tools strategically. <br><br> MP.7 Look for and make use of structure. | Concept(s): <br><br> • Straight lines are used to model *approximately* linear relationships between quantitative variables. <br> Students are able to: <br><br> • Informally fit a line (of best fit) to a scatter plot that suggests a linear association. <br> • Informally assess the model's fit by judging the closeness of the data points to the line (line of best fit). <br><br> Learning Goal 2: For scatter plots that suggest a linear association, informally fit a straight line and informally assess the model's fit. |

| Unit 4 Grade 8 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| ☐ 8.SP.A.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.* | MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Given the equation for a linear model (line of best fit), interpret the slope and intercept.<br>• Given the equation for a linear model, solve problems in the context of measurement data.<br><br>Learning Goal 3: Use a linear model (equation) representing measurement data to solve problems, interpreting the slope and intercept in the context of the situation. |
| ☐ 8.SP.A.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* | MP.2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.5 Use appropriate tools strategically.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br><br>• Categorical data: patterns of association can also be observed in bivariate categorical data through analyzing two-way tables containing frequencies or relative frequencies.<br>Students are able to:<br><br>• Construct and interpret a two-way frequency table containing data on two categorical variables.<br>• Construct and interpret a two-way relative frequency table containing data on two categorical variables.<br>• Describe any association between the two categorical variables using relative frequencies calculated for rows or columns.<br><br>Learning Goal 4: Construct two-way frequency tables and two-way relative frequency tables, and describe possible associations between two variables. |

| Unit 4 Grade 8 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| *a curfew also tend to have chores?* | | |
| ■ 8.F.B.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. | MP.2 Reason abstractly and quantitatively.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br><br>• As with equations, two (x,y) values can be used to construct a function.<br>Students are able to:<br><br>• Construct a function in order to model a linear relationship.<br>• Interpret the rate of change and initial value of a linear function in context.<br><br>Learning Goal 5: Model a linear relationship by constructing a function from two (x,y) values.  Interpret the rate of change and initial value of the linear function in terms of the situation it models, and in terms of its graph or a table of values. |
| ■ 8.G.B.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.<br>■ 8.G.B.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. | MP.2 Reason abstractly and quantitatively.<br><br>MP.7 Look for and make use of structure. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>• Determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems in two and three dimensions.<br>• Determine the distance between two points in a coordinate plane by applying the Pythagorean Theorem.<br><br>Learning Goal 6:  Apply the Pythagorean Theorem to determine unknown side lengths of right triangles in two and three dimensions to solve real-world and mathematical problems and to determine the distance between two points in the coordinate plane. |

| Unit 4 Grade 8 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| ■ 8.EE.C.8. Analyze and solve pairs of simultaneous linear equations.<br><br>8.EE.C.8c. 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.* | MP.2 Reason abstractly and quantitatively.<br><br>MP.6 Attend to precision.<br><br>MP.1 Make sense of problems and persevere in solving them.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br><br>• Simultaneous linear equations may have an infinite number of solutions.<br>• Simultaneous linear equations may have no solution or a single solution.<br>• Solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs.<br>Students will be able to:<br><br>• Solve systems of two linear equations in two variables algebraically.<br>• Estimate solutions of a linear system of two equations by graphing.<br>• Solve simple cases of a linear system of two equations by inspection.<br>• Solve real-world and mathematical problems leading to two linear equations in two variables.<br><br>Learning Goal 7: Solve real world and mathematical problems leading to two linear equations in two variables, interpreting solutions in context. |

| Unit 4 Grade 8 What This May Look Like | |
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| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
| *Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.* | *Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* |

| Focus Mathematical Concepts |
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| *Districts should consider listing prerequisites skills. Concepts that include a focus on relationships and representation might be listed as grade level appropriate.*<br>Prerequisite skills:<br><br>Common Misconceptions: |

| Unit 4 Grade 8 | | |
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| **Content Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |

| Number Fluency  (for grades K-5): |
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| **District/School Tasks** | **District/School Primary and Supplementary Resources** |
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| *Exemplar tasks or illustrative models could be provided.* | *District/school resources and supplementary resources that are texts as well as digital resources used to support the instruction.* |

| **Instructional Best Practices and Exemplars** |
| --- |
| *This is a place to capture examples of standards integration and instructional best practices.* |