Fair Lawn
Public Schools
Fair Lawn, NJ

6th Grade Enriched Math

Adopted August

2015

Revised August 2015
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The 6E Mathematics course has been designed for the enriched math student and is aligned with the Grade 6 Common Core State Standards.

Math 6E

Fair Lawn School District

Committee Credits
Grade 6E Math Team

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Math 6E

I. Course Synopsis

In 6th grade enriched, 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.

Throughout the course, mathematical concepts will be taught with an emphasis on enduring understandings, essential questions, real-world application, technology, and cross-curricular interaction.

II. Philosophy & Rationale

The purpose of the math curriculum for sixth grade enriched is to help students develop and enhance mathematical abilities. Students should be able to reason logically and apply mathematical skills to real-world activities. Communicating about and through mathematics will enable students to view mathematics as relevant to their lives and understand it as it connect to other areas. Student should be able to make connections among the different strands of mathematics while feeling confident in using quantitative and spatial information to make decisions. The curriculum will enable students to become independent learners with a desire for lifelong learning. Technology will be infused through the curriculum.

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).

CCSS.MATH.PRACTICE.MP1 - 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.

CCSS.MATH.PRACTICE.MP2 - 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.

CCSS.MATH.PRACTICE.MP3 - 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.

CCSS.MATH.PRACTICE.MP4 - 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.

CCSS.MATH.PRACTICE.MP5 - 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.

CCSS.MATH.PRACTICE.MP6 - 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.

CCSS.MATH.PRACTICE.MP7 - Look for and make use of structure.
Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well-remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x-y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

CCSS.MATH.PRACTICE.MP8 - 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.

III. Scope & Sequence

Unit 1: Integers and Rational Numbers (7 Weeks):

Absolute Value
Comparing and Ordering Integers
Adding and Subtracting Integers
Multiplying and Dividing Integers
Properties of Numbers
Fractions and Decimals
Rational Numbers
Adding and Subtracting Rational Numbers
Multiplying Rational Numbers (Fractions and Decimals)
Dividing Rational Numbers (Fractions and Decimals)

Unit 2: Equations (6 Weeks):

Evaluating and Writing Algebraic Expressions (including Order of Operations)
Simplifying Expressions
Factoring Expressions
Solving One-Step Equations (including Word Problems)
Solving Two-Step Equations (including Word Problems)
Distributive Property
Solving Equations involving Distributive Property

Unit 3: Inequalities (2 Weeks):

Graphing and Writing Inequalities
Solving Inequalities by Adding and Subtracting
Solving Inequalities by Multiplying and Dividing
Solving Two-Step Inequalities
Word Problems

Unit 4: Ratios, Rates and Proportions (4 Weeks):

Ratios
Rates/Unit Rates
Complex Fractions
Proportions
Similar Figures
Indirect Measurement
Maps and Scale Drawings
Proportional Relationships

Unit 5: Percents (4 Weeks):

Percents, Decimals, Fractions

Solving Percent Problems Using Proportions
Solving Percent Problems Using Equations
Applications of Percents (sales tax, tip, commission, markup, discount)
Simple Interest
Percent of Change/Percent of Error

Unit 6: Geometry and Area (4 Weeks):

Angle Measures (vertical, adjacent, supplementary, complementary)
Drawing Geometric Figures/Drawing Triangles
Area (parallelogram, triangle, trapezoid, composite figures)
Circumference and Area of Circles

Unit 7: Surface Area and Volume (3 Weeks):

Three Dimensional Figures
Surface Area of Right Prisms and Cylinders
Volume of Right Prisms and Cylinders
Cross Sections

Unit 8: Geometry and Measurement (See Dynamic Math Curriculum):

Areas of Parallelograms and Triangles
Areas of Polygons
Three-Dimensional Figures and Spatial Reasoning
Surface Area of Prisms and Pyramids
Volumes of Rectangular Prisms

Unit 9: Data and Graphs (See Dynamic Math Curriculum):

Finding the Mean
Median and Mode
Frequency Tables and Dot Plots
Box and Whisker Plots
Histograms
Variability of Data
Shape of Distributions
Statistical Questions

IV. Unit Descriptions

Unit 1: Integers and Rational Numbers

Enduring Understanding

1. Rational numbers are a natural extension of the way that we use numbers.
2. Rational numbers include whole numbers, decimals, integers, and fractions.
3. Rational numbers allow us to solve problems that are not possible to solve with just whole numbers or integers.
4. Rational numbers have multiple interpretations.
5. Any rational number can be expressed as a fraction in a variety of ways.
6. Between any two rational numbers there are infinitely many rational numbers.

Essential Question(s)

1. How can we compare and order numbers?
2. How does the opposite of *n* differ from the absolute value of *n*?
3. What happens when you add, subtract, multiply, or divide rational numbers?
4. How can counting, measuring, or labeling help to make sense of the world around us?
5. How are properties of numbers applied to problem solving?

Learning Objectives

Students will be able to:

1. Compare and order rational numbers (including integers, fractions and decimals).
2. Find and add opposites.
3. Find the absolute value.
4. Add, subtract, multiply, and divide rational numbers.
5. Solve problems involving rational numbers.
6. Apply the properties of numbers.
7. Convert between fractions and decimals.

Common Core State Standards

- **6.NS.C.5** – Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
- **6.NS.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.6.A** – Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, and that 0 is its own opposite.
- **6.NS.6.C** – Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
- **6.NS.C. 7** – Understand ordering and absolute value of rational numbers.

- **6.NS.C.7.B –** Write, interpret, and explain statements of order for rational numbers in real-world contexts.
- **6.NS.C.7.C –** Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.
- **6.NS.C.7.D –** Distinguish comparisons of absolute value from statements about order.
- **7.NS.1. –** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
- **7.NS.1.a. –** Describe situations in which opposite quantities combine to make zero.
- **7.NS.1.b. –** Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
- **7.NS.1.c. –** Understand subtraction of rational numbers as adding the additive inverse, $p – q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
- **7.NS.1.d. –** Apply properties of operations as strategies to add and subtract rational numbers.
- **7.NS.2. –** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
- **7.NS.2.a. –** Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (-1)(-1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
- **7.NS.2.b. –** Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $–(p/q)= (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.
- **7.NS.2.c. –** Apply properties of operations as strategies to multiply and divide rational numbers.
- **7.NS.2.d. –** Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.
- **7.NS.3. –** Solve real-world and mathematical problems involving the four operations with rational numbers.
- **7.EE.3. –** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to,:

1. Activities
    a. Practice/review games
    b. Quizzes and test
    c. Scavenger Hunt
    d. PARCC Practice
2. English Language Learners.
    a. Read written instructions.
    b. Students may be provided with note organizers / study guides to reinforce key topics.
    c. Model and provide examples
    d. Extended time on assessments when needed.
    e. Establish a non-verbal cue to redirect student when not on task.
    f. Students may use a bilingual dictionary.
3. Special Education/504 Students.
    a. Students may be provided with note organizers / study guides to reinforce key topics.
    b. Extended time on assessments when needed.
    c. Preferred seating to be determined by student and teacher.
    d. Provide modified assessments when necessary.
    e. Student may complete assessments in alternate setting when requested.
    f. Establish a non-verbal cue to redirect student when not on task.
    g. Maintain strong teacher / parent communication.
4. Gifted and Talented Students.
    a. Provide enrichment activities to expand upon the curriculum.
    b. Use higher level questioning techniques in class and on assessments.

New Jersey Core Curriculum Standards - Technology

- 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.
- 8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
- 8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results.
- 8.2.8.A.4 Redesign an existing product that impacts the environment to lessen its impact(s) on the environment.

Career Readiness Practices

- CRP1. Act as a responsible and contributing citizen and employee.
- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11. Use technology to enhance productivity.

NJCCSS 9.2 - Career Awareness, Exploration, and Preparation

- 9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Unit 2: Equations

Enduring Understanding

1. Algebraic expressions can be used to represent situations.
2. Two or more expressions may be equivalent, even when their symbolic forms differ.
3. A variable represents an unknown quantity and is used in problem-solving situations.
4. The equals sign indicates that two expressions are equivalent. It is often important to find the value of a variable for which two expressions represent the same quantity.
5. Finding the value of a variable for which two expressions represent the same quantity is known as *solving an equation.* There is exactly one solution to an equation.
6. The properties of equality are used to solve equations.

Essential Question(s)

1. What does it mean to say that two quantities are equal?
2. How can you use numbers and symbols to represent mathematical ideas?
3. What are the steps involved in simplifying expressions?
4. How can the idea of a balance be used to solve an equation?
5. How can expressions and equations be used to solve real-world problems?

Learning Objectives

Students will be able to:

1. Write and evaluate algebraic expressions.
2. Simplify algebraic expressions.
3. Factor algebraic expressions.
4. Solve one-step equations using addition, subtraction, multiplication, or division.
5. Solve two-step equations using inverse operations.
6. Solve equations using the distributive property.

Common Core State Standards

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

- **6.EE.A.2.** – Write, read, and evaluate expressions in which letters stand for numbers.
- **6.EE.A.2.A** – Write expressions that record operations with numbers and with letters standing for numbers.
- **6.EE.A.2.B** – Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.
- **6.EE.A.2.C** – Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
- **6.EE.A.3** – Apply the properties of operations to generate equivalent expressions.
- **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 substitution to determine whether a given number in a specified set makes an equation or inequality true.
- **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.
- **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.
- **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 the equation.
- **7.NS.1.** – Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
- **7.NS.1.d.** – Apply properties of operations as strategies to add and subtract rational numbers.
- **7.NS.2.** – Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
- **7.NS.2.c.** – Apply properties of operations as strategies to multiply and divide rational numbers.
- **7.NS.3.** – Solve real-world and mathematical problems involving the four operations with rational numbers.
- **7.EE.1.** – Apply properties of operations as strategies to add, subtract factor, and expand linear expressions with rational coefficients.

- **7.EE.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.4.a.** – Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations using each approach.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to,:

1. Activities
    a. Practice/review games
    b. Quizzes and test
    c. Scavenger Hunt
    d. PARCC Practice
2. English Language Learners.
    a. Read written instructions.
    b. Students may be provided with note organizers / study guides to reinforce key topics.
    c. Model and provide examples
    d. Extended time on assessments when needed.
    e. Establish a non-verbal cue to redirect student when not on task.
    f. Students may use a bilingual dictionary.
3. Special Education/504 Students.
    a. Students may be provided with note organizers / study guides to reinforce key topics.
    b. Extended time on assessments when needed.
    c. Preferred seating to be determined by student and teacher.
    d. Provide modified assessments when necessary.
    e. Student may complete assessments in alternate setting when requested.
    f. Establish a non-verbal cue to redirect student when not on task.
    g. Maintain strong teacher / parent communication.
4. Gifted and Talented Students.
    a. Provide enrichment activities to expand upon the curriculum.
    b. Use higher level questioning techniques in class and on assessments.

New Jersey Core Curriculum Standards - Technology

- 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.

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- 8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results.
- 8.2.8.A.4 Redesign an existing product that impacts the environment to lessen its impact(s) on the environment.

Career Readiness Practices

- CRP1. Act as a responsible and contributing citizen and employee.
- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
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NJCCSS 9.2 - Career Awareness, Exploration, and Preparation

- 9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Unit 3: Inequalities

Enduring Understanding

1. An inequality is another way to describe a relationship between expressions; instead of showing that the values of two expressions are equal, inequalities indicate that the value of one expression is greater than (or greater than or equal to) the value of the other expression.
2. The properties of equality are used to solve inequalities.
3. In solving an inequality, multiplying or dividing both expressions by a negative number reverses the sign that indicates the relationship between the two expressions.
4. A number line shows that there are an infinite number of solutions to an inequality.

Essential Question(s)

1. How can inequalities represent real-life situations?
2. How can the idea of a balance be used to solve an inequality?
3. How does one interpret the solution set to an inequality?
4. Do students use all four inequality symbols and related terminology correctly (at most, at least, up to, etc.)?
5. How do you represent an inequality on a number line?

Learning Objectives

Students will be able to:

1. Graph, read, and write algebraic inequalities.
2. Solve inequalities by adding, subtracting, multiplying, or dividing.

3. Solve two-step inequalities using inverse operations.
4. Write and solve an inequality for real-life situations.

Common Core State Standards

- **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 substitution to determine whether a given number in a specified set makes an equation or inequality true.
- **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.
- **7.NS.1. –** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
- **7.NS.1.d. –** Apply properties of operations as strategies to add and subtract rational numbers.
- **7.NS.2. –** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
- **7.NS.2.c. –** Apply properties of operations as strategies to multiply and divide rational numbers.
- **7.NS.3. –** Solve real-world and mathematical problems involving the four operations with rational numbers.
- **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.4.b. –** Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to,:

1. Activities
    a. Practice/review games
    b. Quizzes and test
    c. Scavenger Hunt
    d. PARCC Practice
2. English Language Learners.
    a. Read written instructions.
    b. Students may be provided with note organizers / study guides to reinforce key topics.

c. Model and provide examples
d. Extended time on assessments when needed.
e. Establish a non-verbal cue to redirect student when not on task.
f. Students may use a bilingual dictionary.

3. Special Education/504 Students.
   a. Students may be provided with note organizers / study guides to reinforce key topics.
   b. Extended time on assessments when needed.
   c. Preferred seating to be determined by student and teacher.
   d. Provide modified assessments when necessary.
   e. Student may complete assessments in alternate setting when requested.
   f. Establish a non-verbal cue to redirect student when not on task.
   g. Maintain strong teacher / parent communication.
4. Gifted and Talented Students.
   a. Provide enrichment activities to expand upon the curriculum.
   b. Use higher level questioning techniques in class and on assessments.

Career Readiness Practices

- CRP1. Act as a responsible and contributing citizen and employee.
- CRP2. Apply appropriate academic and technical skills.
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NJCCSS 9.2 - Career Awareness, Exploration, and Preparation

- 9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Unit 4: Ratios, Rates, and Proportions

Enduring Understanding

1. A ratio is a comparison of two quantities by division. All ratios can be written in fraction form a/b.
2. All fractions are ratios, but not all ratios are fractions. Ratios are often used to make "part-part" comparisons, but fractions are not.
3. A unit rate is a measure of one quantity per unit of another quantity.
4. A proportion is a relationship of equality between two ratios. If one quantity in a ratio is multiplied or divided by a particular factor, then the other quantity must be multiplied or divided by the same factor to maintain the proportional relationship.

5. Similar figures, maps, and scale drawings have corresponding quantities that vary proportionally.
6. The graph of a proportional relationship is a straight line through the origin. The point (1, r) on the graph of any proportional relationship represents the unit rate. The unit rate is equivalent to the constant of proportionality.

Essential Question(s)

1. How are equivalent ratios, values in a table, and ordered pairs connected?
2. What are the types/varieties of situations in life that depend on or require the application of ratios and proportional reasoning?
3. How can a complex fraction be simplified?
4. What is the difference between a unit rate and a ratio?
5. What is a proportion?
6. What characteristics define the graphs of all proportional relationships?

Learning Objectives

Students will be able to:

1. Write ratios and use them to compare quantities.
2. Find unit rates and unit costs using proportional reasoning.
3. Test whether ratios form a proportion by using equivalent ratios and cross products.
4. Solve proportions using unit rates, mental math, and cross products.
5. Use proportions to find lengths in similar figures, solve problems involving scale and indirect measurement.
6. Identify proportional relationships and find constants of proportionality.
7. Represent proportional relationships on a graph.

Common Core State Standards

- **6.RP.A.1** – Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- **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.
- **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.
- **6.RP.A.3.A** – Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
- **6.RP.A.3.B** – Solve unit rate problems including those involving unit pricing and constant speed.
- **7.RP.1.** – Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.
- **7.RP.2.** – Recognize and represent proportional relationships between quantities.

- **7.RP.2.a.** – Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
- **7.RP.2.b.** – Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
- **7.RP.2.c.** – Represent proportional relationships by equations.
- **7.RP.2.d.** – Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.
- **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.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to,:

1. Activities
    a. Practice/review games
    b. Quizzes and test
    c. Scavenger Hunt
    d. PARCC Practice
2. English Language Learners.
    a. Read written instructions.
    b. Students may be provided with note organizers / study guides to reinforce key topics.
    c. Model and provide examples
    d. Extended time on assessments when needed.
    e. Establish a non-verbal cue to redirect student when not on task.
    f. Students may use a bilingual dictionary.
3. Special Education/504 Students.
    a. Students may be provided with note organizers / study guides to reinforce key topics.
    b. Extended time on assessments when needed.
    c. Preferred seating to be determined by student and teacher.
    d. Provide modified assessments when necessary.
    e. Student may complete assessments in alternate setting when requested.
    f. Establish a non-verbal cue to redirect student when not on task.
    g. Maintain strong teacher / parent communication.
4. Gifted and Talented Students.
    a. Provide enrichment activities to expand upon the curriculum.
    b. Use higher level questioning techniques in class and on assessments.

New Jersey Core Curriculum Standards - Technology

- 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.
- 8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
- 8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results.
- 8.2.8.A.4 Redesign an existing product that impacts the environment to lessen its impact(s) on the environment.

Career Readiness Practices

- CRP1. Act as a responsible and contributing citizen and employee.
- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11. Use technology to enhance productivity.

NJCCSS 9.2 - Career Awareness, Exploration, and Preparation

- 9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Unit 5: Percents

Enduring Understanding

1. A percent is a ratio that compares a number to 100.
2. Rational numbers can be expressed as fractions, decimals, and percents (ex ½ = 0.5 = 50%).
3. Proportions and/or equations can be used to solve real-world problems.
4. An understanding of "part" and "whole" is crucial in preventing errors while setting up proportions/equations.
5. An understanding of related vocabulary (tax, tip, discount, markup, commission, interest, etc.) must precede calculations and problem solving.

Essential Question(s)

1. How can percent help you understand situations involving money?
2. How are proportions and/or equations used in problems involving percent?
3. How can two amounts of change be the same but the percents of change be different?
4. How can percent help to make sense of the world around us?

Learning Objectives

Students will be able to:

1. Convert fractions, decimals, and percents.
2. Use proportions and equations to solve problems involving percent.
3. Find solutions to application problems involving percent such as tax, tip, commission, markup, discount, and simple interest.
4. Find percent of increase/decrease and percent error.

Common Core State Standards

- **6.RP.A.3.C –** Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
- **7.RP.3.** – Use proportional relationships to solve multi-step ratio and percent problems.
- **7.EE.2.** – Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.
- **7.EE.3.** – Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to,:

1. Activities
    a. Practice/review games
    b. Quizzes and test
    c. Scavenger Hunt
    d. PARCC Practice
    e. Viewing tv shows to calculate percent of change (biggest loser, extreme couponing).
2. English Language Learners.
    a. Read written instructions.
    b. Students may be provided with note organizers / study guides to reinforce key topics.
    c. Model and provide examples
    d. Extended time on assessments when needed.
    e. Establish a non-verbal cue to redirect student when not on task.
    f. Students may use a bilingual dictionary.
3. Special Education/504 Students.
    a. Students may be provided with note organizers / study guides to reinforce key topics.
    b. Extended time on assessments when needed.
    c. Preferred seating to be determined by student and teacher.

d. Provide modified assessments when necessary.
e. Student may complete assessments in alternate setting when requested.
f. Establish a non-verbal cue to redirect student when not on task.
g. Maintain strong teacher / parent communication.

4. Gifted and Talented Students.
    a. Provide enrichment activities to expand upon the curriculum.
    b. Use higher level questioning techniques in class and on assessments.

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Unit 6: Geometry

Enduring Understanding

1. The measure of an angle describes the opening between the two sides, or rays, that form the angle. It does not depend on the lengths of the sides.
2. The sum of any two sides of a triangle must be greater than the third side. The sum of the angles of a triangle is 180 degrees.
3. Any side of a parallelogram or triangle can be its base. The base and the height of any polygon are always perpendicular to each other.
4. A composite or irregular figure is made up of familiar figures for which we have the tools to find area and perimeter.

5. The ratio of the circumference of a circle to its diameter is pi. Pi is approximately 3.14 or 22/7.
6. The area of a circle is the product of the circumference of that circle and its radius.

Essential Question(s)

1. How do geometric relationships help us to solve problems?
2. Why are vertical angles congruent?
3. How are complementary angles different from supplementary angles?
4. How can solving equations be applied to angle relationships?
5. How do you determine whether a triangle can be formed?
6. What are the various types and properties of triangles?
7. How is the circumference of a circle used to derive the area of a circle?

Learning Objectives

Students will be able to:

1. Identify different pairs of angles.
2. Write and solve equations to find unknown angle measures.
3. Determine whether a unique triangle, more than one triangle, or no triangle can be formed when given three measurements.
4. Find the areas of parallelograms, triangles, trapezoids, and composite figures.
5. Find the circumference and area of a circle.

Common Core State Standards

- **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.
- **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.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.
- **7.G.4.** – Know the formula for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
- **7.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.
- **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.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to,:

1. Activities
    a. Practice/review games
    b. Quizzes and test
    c. Scavenger Hunt
    d. PARCC Practice
2. English Language Learners.
    a. Read written instructions.
    b. Students may be provided with note organizers / study guides to reinforce key topics.
    c. Model and provide examples
    d. Extended time on assessments when needed.
    e. Establish a non-verbal cue to redirect student when not on task.
    f. Students may use a bilingual dictionary.
3. Special Education/504 Students.
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    g. Maintain strong teacher / parent communication.
4. Gifted and Talented Students.
    a. Provide enrichment activities to expand upon the curriculum.
    b. Use higher level questioning techniques in class and on assessments.

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- 8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results.
- 8.2.8.A.4 Redesign an existing product that impacts the environment to lessen its impact(s) on the environment.

Career Readiness Practices

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NJCCSS 9.2 - Career Awareness, Exploration, and Preparation

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Unit 7: Surface Area and Volume

Enduring Understanding

1. Prisms and pyramids have faces that are flat surfaces.
2. The surface area of a three-dimensional solid is the sum of the areas of its faces.
3. You can find the volume of any prism by multiplying its base area (B) by the height (h) of the solid.
4. A cross section is the two-dimensional shape you see after slicing through a three-dimensional object.

Essential Question(s)

1. How can spatial relationships be described by careful use of geometric language?
2. How can knowledge of three-dimensional objects help us understand the world around us?
3. How are area and volume properties related?
4. How do prisms compare to pyramids of the same base?

Learning Objectives

Students will be able to:

1. Classify and draw three-dimensional figures.
2. Find the surface area of prisms and pyramids.
3. Find the volume of prisms and pyramids.
4. Describe and draw cross sections that result from slicing three-dimensional figures.

Common Core State Standards

- **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.
  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.

- **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.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.
- **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.

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NJCCSS 9.2 - Career Awareness, Exploration, and Preparation

- 9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

V. Course Materials

1. Charles, Randall I. Prentice Hall Mathematics, Course 2: Common Core. 2013 ed. Boston, Mass.: Pearson Prentice Hall, 2013.
2. Course 2 Mathematics Common Core Workbook
3. Textbook website: http://www.phschool.com
4. Calculators

VI. Assessments

1. Do now
2. Exit Ticket
3. Quiz
4. Test
5. Project
6. Midterm and Final

VII. Cross Curricular Aspects

1. Calculator use (Science)
2. Discuss real world applications of integers, for example timelines, stock market, sports, weather. (Social Studies, Science, Physical Education)
3. Use proportions to calculate unit rates and other measurements. (Physical Education)
4. Population Density (Social Studies)
5. Percent of Change- Inflation (Social Studies)