LESTER C. NOECKER SCHOOL
ROSELAND SCHOOL DISTRICT

Math Curriculum

Sixth Grade

Updated and aligned NJ SLS

August 2024

Approved by the Roseland Board of Education
August 2024

Giuseppe Leone, Superintendent
With special appreciation to Michele Smith & the Math Curriculum Writing Staff

Roseland Mathematics

Grade Level: 6

Contents

1. Instructional Materials p. 1
2. Supplemental Resources p. 1
3. Interdisciplinary Connections p. 2
4. New Jersey Student Learning Standards and Resources pp. 3 – 15
5. Connecting the Standards for Mathematical Content to the Standards for Mathematical Practice p. 16
6. Standards for Mathematical Practice pp.17 – 18
7. 21st Century Life and Careers p. 19
8. 21st Themes pp. 20 – 21
9. Differentiation Strategies
    a. Students with Disabilities/ Students at Risk of School Failure p. 22
    b. Gifted and Talented p. 23
    c. English Language Learners p. 23

Instructional Materials

Connected Mathematics Project 3 (CMP3)
© Pearson 2012
http://dashweb.pearsoncmg.com/
https://connectedmath.msu.edu/

Supplemental Resources

- Illustrative Mathematics https://www.illustrativemathematics.org/
- Khan Academy https://www.khanacademy.org/
- National Council of Teachers of Mathematics http://www.nctm.org/
- National Library of Virtual Manipulatives http://nlvm.usu.edu/
- NCTM Illuminations Resources for Teaching Math http://illuminations.nctm.org/

Interdisciplinary Connections

Mathematics is a unified body of knowledge whose concepts build upon each other. Connecting mathematical concepts includes linking ideas to related ideas learned previously.

Major emphasis should be given to ideas and concepts across mathematical content areas that help students see that mathematics is a web of closely connected ideas. Students need to connect their mathematical learning to appropriate real-world contexts. They need to create interest and maintain the interest after the novelty of the work has worn off.

Mathematics is the language of science and is greatly utilized in industry and business. It gives us the power to solve difficult real-world problems, but also helps us to understand how the universe operates.

Every mathematics teacher needs to make students unafraid of the subject by convincing the students of the usefulness of learning mathematics in their daily lives and for higher studies. The world today, which leans more and more heavily on Science and Technology, demands more from mathematics. Tomorrow's world will, no doubt, make still greater demands from mathematics.

Interdisciplinary Connections for Grade 6

Covering & Surrounding

Language Arts/Science –
- Design an Aquarium – Unit Project

Comparing Bits & Pieces

Geography/Maps/Weather
- Extend the Number Line – Problem 3.1 E #1;
- Ace Question 24 – above/below sea level
- Ace Questions 16 – 19 temperatures

Science
- Microscope lens – Ace Question 93

Variables & Patterns

Physical Education
- Jumping Jacks – Problem 1.1

Social Studies/History
- Bike trip – Investigation 1

Business
- Income/Cost/Profit – Investigation 2

Construction
- Ace Question 42

New Jersey Student Learning Standards (NJSLS)

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

(1) Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.

(2) Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

(3) Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between quantities.

(4) Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability. Students learn to describe and summarize numerical data sets,

identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

Students in Grade 6 also build on their work with area in elementary school by reasoning about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging or removing pieces, and relating the shapes to rectangles. Using these methods, students discuss, develop, and justify formulas for areas of triangles and parallelograms. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths. They prepare for work on scale drawings and constructions in Grade 7 by drawing polygons in the coordinate plane.

Ratios and Proportional Relationships

Understand ratio concepts and use ratio reasoning to solve problems

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."*

6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."*[1]

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.

a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*
c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

[1] Expectations for unit rates in this grade are limited to non-complex fractions.

Understandings	Essential Questions
Students will understand that… ● ratios compare two values. ● unit rates are a/b given that the ratio is $a:b$, such that $b \neq 0$.	• Why does one need to compare numbers? • When does one need to use ratios to compare numbers? • How can one compare and contrast numbers?
Knowledge	**Skills**
Students will know… • ratio language (the ratio of $a:b$ means that there is a of something for every b of a corresponding item). • a/b is the same as $a:b$ or a *to* b. • how to relate a percent of a quantity to a rate per 100.	Students will be able to… • use ratio language to describe a ratio relationship between two quantities. • use rate language in the context of a ratio relationship. • use ratio and rate reasoning to solve real-world and mathematical problems. • make a table of equivalent ratios relating quantities with whole-number measurements. • solve unit rate problems including those involving unit pricing and constant rate. • find a percent of a quantity as a rate per 100 and solve problems involving finding the whole, given a part or the percent.

	• use ratio reasoning to convert measurement units. • manipulate and transform units appropriately when multiplying or dividing quantities.
RESOURCES	
• Comparing Bits and Pieces: Inv. 1, 2, 3, 4; Decimal OPS: Inv. 1, 4; Variables and Patterns Inv. 3, 4	

The Number System

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. *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?*

Understandings	Essential Questions
Students will understand that… • the size of a factor impacts the size of the answer with respect to the other factor. • division by a rational number may result in a quotient whose value is bigger than, equal to, or smaller than the value of the dividend.	• What is represented by division of a fraction by a fraction? • What type of visual models can be used to represent division of fractions? • How are division and multiplication of a fraction by a fraction related?
Knowledge	**Skills**
Students will know… • multiplication with fractions represents part of a part. • division of a fraction by a proper fraction creates a larger answer. • multiplication of a fraction by a proper fraction creates a smaller answer.	Students will be able to… • compute quotients of fractions. • interpret quotients of fractions. • create a story context for division. • solve word problems involving division of fractions.

RESOURCES

- Let's Be Rational: Inv. 3, 4

The Number System

Compute fluently with multi-digit numbers and find common factors and multiples

6.NS.B.2 With accuracy and efficiency, divide **multi-digit numbers** using **the standard algorithm**.

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

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. *For example, express 36 + 8 as 4 (9 + 2).*

Understandings	Essential Questions
Students will understand that… • the proper operations and procedures must be determined in order to solve problems. • factors of a (whole) number are always less than or equal to the number itself. • multiples of a (whole) number are always greater than or equal to the number itself.	• Why would one need to find common factors and multiples? • In what situation would one want to use the distributive property to add two whole numbers? • What type(s) of problems require using multi-digit decimal operations?
Knowledge	**Skills**
Students will know… • the standard algorithm for division of multi-digit numbers • the standard algorithms for addition, subtraction, multiplication, and division of multi-digit decimals • the definition of a factor. • the process of finding a factor. • the definition of a multiple. • the process of finding a multiple. • how to find the prime factorization of a number. • how to factor out a number from the sum of two whole numbers	Students will be able to… • fluently divide using the standard algorithm. • fluently add multi-digit decimals using the standard algorithm. • fluently subtract multi-digit decimals using the standard algorithm. • fluently multiply multi-digit decimals using the standard algorithm. • fluently divide multi-digit decimals using the standard algorithm. • find the greatest common factor of two whole numbers less than or equal to 100 • find 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 the sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4(9 + 2).*

RESOURCES

- Comparing Bits and Pieces: Inv. 1, 2, 3, 4; Let's Be Rational: Inv. 1, 2, 3, 4; Decimal OPS: Inv. 1, 2, 3, 4; Data About Us: Inv. 3; Prime Time: Inv. 2

The Number System

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.

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.

a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite.
b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

6.NS.C.7 Understand ordering and absolute value of rational numbers.

a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.*
b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3 °C > –7 °C to express the fact that –3 °C is warmer than –7 °C.*
c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.*
d. Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.*

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.

Understandings	Essential Questions
Students will 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). ● a rational number is a point on the number line. ● rational numbers on the number line are oriented from left to right	● What are some rational numbers around us? ● What are some non-rational numbers around us? ● How can ordering of rational numbers help to make sense of the world around us?

• rational numbers have an order that exists related to their location on a number line. • the absolute value of a rational number is its distance from 0 on the number line. • the distance from a point on the coordinate system to the origin (0,0) is related to the absolute value of its x- and y- coordinates .	• When is the absolute value of a rational number used in real life?
Knowledge	**Skills**
Students will know… • opposite signs of numbers indicate locations on opposite sides of 0 on the number line. • the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite. • signs of numbers in ordered pairs indicate locations in quadrants of the coordinate plane. • that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. • how to find the absolute value of a rational number.	Students will be able to… • use positive and negative numbers to represent quantities in real-world contexts. • explain the meaning of 0 in situations using positive and negative numbers. • extend number-line diagrams and coordinate axes to represent points on the line and in the plane with negative number coordinates. • 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. • 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.* • 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.* • interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.* • distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.*

	• solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. • find distances between points with the same first coordinate or the same second coordinate, using coordinates and absolute value.
RESOURCES	
• Comparing Bits and Pieces: Inv. 3; Let's Be Rational: Inv. 1; Variables and Patterns: Inv. 1, 2, 3, 4; Covering and Surrounding: Inv. 1	

Expressions and Equations

Apply and extend previous understandings of arithmetic to algebraic expressions

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.

a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.*
b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.*
c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas $V = s^3$ and $A = 6 s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$.*

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.*

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.*

Understandings	Essential Questions
Students will understand that… • algebraic expressions have letters that stand for numbers and arithmetic expressions have only numbers and no letters. • numbers can be substituted in place of letters in algebraic expressions • algebraic expressions can be equivalent to each other • area, perimeter, or volume formulas are algebraic expressions • that verbal sentences or expressions can be written as algebraic expressions	• How are mathematical expressions in which letters stand for numbers useful in real life? • What is the purpose of identifying equivalent expressions? • What is the difference between an algebraic expression and an arithmetic expression?

Knowledge	Skills
Students will know… • the definition of sum, term, product, factor, quotient, coefficient. • how to identify two algebraic expressions that are equivalent . • to apply the conventional order of operations when no parentheses are given. • how to apply the distributive property.	Students will be able to… • write numerical expressions involving whole-number exponents. • evaluate numerical expressions involving whole-number exponents. • write expressions in which letters stand for numbers. • read expressions in which letters stand for numbers. • evaluate expressions in which letters stand for numbers. • write expressions that record operations with numbers and with letters standing for numbers. • identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. • evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). • apply the properties of operations to generate equivalent expressions. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).
RESOURCES	
• Prime Time: Inv. 1, 2, 3, 4; Let's Be Rational: Inv. 4; Covering and Surrounding: Inv. 1, 2, 3, 4; Decimal OPS: Inv. 2, 3; Variables and Patterns: Inv. 3, 4; Data About Us: Inv. 3	

Expressions and Equations

Reason about and solve one-variable equations and inequalities

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.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.

Understandings	Essential Questions
Students will understand that… • solving an equation or inequality will find the value(s) that will make the statement true. • a variable can represent an unknown number. • a variable can represent any number in a specified set.	• What is the difference between an equation and an inequality? • What does it mean when a number does not satisfy an equation or inequality?
Knowledge	**Skills**
Students will know… • that a random number may not make an equation or inequality true. • that a variable in an equation or inequality represents an unknown number. • inequalities of the form $x > c$ or $x <$ c have infinitely many solutions. • that solutions of inequalities of form x>c or x<c can be represented as intervals on the number line. • that while inequalities may have infinitely many solutions, equations have a finite number of solutions.	Students will be able to… • use substitution to determine whether a given number in a specified set will make an equation or inequality true. • use variables to represent numbers • solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ for cases in which p, q and x are all nonnegative rational numbers. • solve real-world and mathematical problems by writing and solving equations of the form $px = q$ for cases in which p, q and x are all nonnegative rational numbers. • write 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 inequalities on number line diagrams

RESOURCES
• Let's Be Rational: Inv. 4; Variables and Patterns: Inv. 3, 4; Covering and Surrounding: Inv. 1, 2, 4

Expressions and Equations

Represent and analyze quantitative relationships between dependent and independent variables

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**. *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.*

Understandings	Essential Questions
Students will understand that… • quantities can change in relation to one another and the relationship can be expressed as an equation relating the two. • the value of one quantity determines the value of the second quantity. • two quantities may or may not be related.	• How is a relationship represented in tables? • How is a relationship represented in graphs? • How is a relationship represented in an equation? • How can one tell that there is a relationship between two quantities? • Why is it useful to write an equation to express one quantity in terms of another quantity?
Knowledge	**Skills**
Students will know… • the meaning of a dependent variable. • the meaning of an independent variable. • when two quantities are related to each other.	Students will be able to… • 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. • use the equation of a relationship between two dependent and independent variables to predict ordered pairs that are not displaced in a given graph or table
RESOURCES	

- Variables and Patterns: Inv. 1, 2, 3, 4; Covering and Surrounding: Inv. 1

Geometry

Solve real-world and mathematical problems involving area, surface area, and volume

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.

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 $V = Bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

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.

6.G.A.4. Represent three-dimensional figures (e.g., pyramid, triangular prism, rectangular prism) 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.

Understandings	Essential Questions
Students will understand that… • triangles and rectangles can be used to find areas of other polygons • a 2-D net of a 3-D figure can be used to find the surface area of the figure • surface area is related to "wrapping" or "covering" of a surface with square units, i.e. squares with side length of one unit • volume is related to "filling" of space with cubic units, i.e. cubes with edges of one-unit length	• Why would one want to calculate areas of polygons? • How are areas of polygons found? • How are volume and surface area of a right rectangular prism found? • Why are volumes represented in cubic units? • What is the connection between the net and surface area of 3-D figures?
Knowledge	**Skills**
Students will know… • that areas of triangles, including right triangles, and rectangles can be used to find areas of other polygons, when the other polygons are decomposed into triangles or composed into rectangles	Students will be able to… • find the area of right triangles. • find the area of other triangles. • find the area of special quadrilaterals. • find the areas of polygons by composing them into rectangles or decomposing them into triangles

• that the volume of a right rectangular prism is the number of unit cubes it contains (of the appropriate unit fraction edge length) • the total area of a net of a 3-D figure is the surface area of the figure	• represent three-dimensional figures using nets • to find the surface area of a 3-D figure by finding the total area of its 2-D net
RESOURCES	
● Covering and Surrounding: Inv. 1, 2, 3, 4; Decimal OPS: Inv. 3	

Statistics and Probability

Develop understanding of statistical variability

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. *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.*

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.

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 vary with a single number.

Understandings	Essential Questions
Students will understand that… • statistical questions anticipate variability • a set of data has a distribution • center and spread are two related but different ways of describing a set of data	• What is a statistical question? • What is a distribution? • What is the difference between the center and the spread of a numerical set? • How are data sets described?
Knowledge	**Skills**
Students will know… • that a set of data can be described by its center, spread, and overall shape • how to find the center of a numerical data set • the center summarizes a data set with a single number • the spread is a measure of variation of all values in a data set about the center	Students will be able to… • recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.* • 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. • recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

RESOURCES

- Data About Us: Inv. 1, 2, 3, 4

Statistics and Probability

Summarize and describe distributions

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

6.SP.B.5. Summarize numerical data sets in relation to their context, such as by:

a. Reporting the number of observations.
b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Understandings	Essential Questions
Students will understand that… • numerical data can be displayed in multiple ways. • summaries of numerical data vary based on their contexts. • overall patterns of numerical data can vary. • some patters in numerical data can have striking deviations.	• How do measures of center and variability help us make sense of the world around us? • In what contexts are the measures of center and variability preferred descriptions of the data? • Why do we need multiple ways of describing numerical data?
Knowledge	**Skills**
Students will know… • how to display numerical data using dot plots, histograms, and box plots. • how to summarize numerical data in multiple ways. • that the choice of measures of center and variability depends on the context. • how to identify a striking deviation from the overall pattern. • real life examples of patterns with, and without, striking deviations.	Students will be able to… • construct dot plots, histograms, and box plots. • summarize numerical data by: o reporting the number of observations; o describing the nature of the attribute under investigation, including how it was measured and its units of measurement; o giving quantitative measures of center (median and/or mean) o giving quantitative measures of variability (interquartile range and/or mean absolute deviation); o describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered;

	○ 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.
RESOURCES	
• Data About Us: Inv. 1, 2, 3, 4	

Connecting the Standards for Mathematical Content to the Standards for Mathematical Practice

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction.

The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word "understand" are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices.

In this respect, those content standards, which set an expectation of understanding, are potential "points of intersection" between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

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 7×8 equals the well-remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being

composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8. Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard 9
21st Century Life and Careers

In today's global economy, students need to be lifelong learners who have the knowledge and skills to adapt to an evolving workplace and world. To address these demands, Standard 9, 21st Century Life and Careers, which includes the 12 Career Ready Practices, establishes clear guidelines for what students need to know and be able to do in order to be successful in their future careers and to achieve financial independence.

Mission: *21st century life and career skills enable students to make informed decisions that prepare them to engage as active citizens in a dynamic global society and to successfully meet the challenges and opportunities of the 21st century global workplace.*

Vision: To integrate 21st Century life and career skills across the K-12 curriculum and in Career and Technical Education (CTE) programs to foster a population that:

- Continually self-reflects and seeks to improve the essential life and career practices that lead to success.
- Uses effective communication and collaboration skills and resources to interact with a global society.
- Is financially literate and financially responsible at home and in the broader community.
- Is knowledgeable about careers and can plan, execute, and alter career goals in response to changing societal and economic conditions.
- Seeks to attain skill and content mastery to achieve success in a chosen career path.

The Standards: Standard 9 is composed of the Career Ready Practices and Standard 9.1, 9.2, and 9.3 which are outlined below:

- **The 12 Career Ready Practices**
  These practices outline the skills that all individuals need to have to truly be adaptable, reflective, and proactive in life and careers. These are researched practices that are essential to career readiness.
- **9.1 Personal Financial Literacy**
  This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is

an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

- **9.2 Career Awareness, Exploration, and Preparation**
  This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.
- **9.3 Career and Technical Education**
  This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.

For students to be college and career ready they must have opportunities to understand career concepts and financial literacy. This includes helping students make informed decisions about their future personal, educational, work, and financial goals. By integrating Standard 9 into instruction, New Jersey students will acquire the necessary academic and life skills to not only achieve individual success but also to contribute to the success of our society.

21st Century Themes

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

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills.

CRP3. Attend to personal health and financial well-being.

CRP4. Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP9. Model integrity, ethical leadership and effective management.

CRP10. Plan education and career paths aligned to personal goals.

CRP11. Use technology to enhance productivity.

CRP12. Work productively in teams while using cultural global competence.

CRP1. **Act as a responsible and contributing citizen and employee**
Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

CRP2. Apply appropriate academic and technical skills.

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation

CRP3. Attend to personal health and financial well-being.

Career-ready individuals understand the relationship between personal health, workplace performance and personal well-being; they act on that understanding to regularly practice healthy diet, exercise and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial wellbeing, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.

CRP4. Communicate clearly and effectively and with reason.

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP5. Consider the environmental, social and economic impacts of decisions.

Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

CRP6. Demonstrate creativity and innovation.

Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP7. Employ valid and reliable research strategies.

Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

CRP9. Model integrity, ethical leadership and effective management.

Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a

clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.

CRP10. Plan education and career paths aligned to personal goals.

Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.

CRP11. Use technology to enhance productivity.

Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

CRP12. Work productively in teams while using cultural global competence.

Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

Differentiation Strategies

Students with Disabilities/ Students at Risk of School Failure

(For students with disabilities, appropriate accommodations, instructional adaptations, and/or modifications should be determined by the IEP or 504 team)

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Give repetition and practice exercises
- Model skills/techniques to be mastered
- Give extended time to complete class work
- Provide copy of class notes
- Determine if preferential seating would be beneficial
- Provide access to a computer
- Provide copies of textbooks for home
- Provide access to books on tape/CD/digital media, as available and appropriate
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long and short term planning of assignments
- Encourage student to proofread assignments and tests

- Provide regular parent/school communication

Modifications for Homework and Assignments

- Provide extended time to complete assignments
- Break down assignments
- Provide the student with clearly stated (written) expectations and grading criteria for assignments
- Implement RAFT activities as they pertain to the types/modes of communication (role, audience, format, topic)

Modifications for Assessments

- Provide extended time on classroom tests and quizzes
- Provide alternate setting as needed
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests
- Establish procedures for accommodations /modifications for assessments

Differentiation Strategies

Gifted and Talented

(content, process, product and learning environment)

- Allow students to pursue independent projects based on their individual interests
- Provide enrichment activities that include more advanced material
- Allow team-teaching opportunities and collaboration
- Set individual goals
- Conduct research and provide presentation of appropriate topics
- Design surveys to generate and analyze data to be used in discussion.
- Use Higher-Level Questioning Techniques
- Provide assessments at a higher level of thinking

English Language Learners

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Provide repetition and practice
- Model skills/techniques to be mastered

Modifications for Homework/Assignments

- Provide Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)
- Provide extended time for assignment completion as needed
- Highlight key vocabulary
- Use graphic organizers