LAKEWOOD CITY SCHOOLS

6th Grade Mathematics Course of Study

The Mathematics Curriculum for middle school students in Lakewood City Schools is based on the Common Core State Standards as adopted by the Ohio State Board of Education.

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.
    a. 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. Completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers.
    a. 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. Writing, interpreting, and using expressions and equations.
    a. 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. Developing understanding of statistical thinking.
    a. 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 rectangle 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.

The Standards for Mathematical Practice describes varieties of expertise that mathematics educators at all levels should seek to develop in their students. These Standards appear at EVERY grade level. 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 flexibility, 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.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

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.

   In grade 6, students solve problems involving ratios and rates and discuss how they solved them. Students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?"

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 quantities 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.

   In grade 6, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

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 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 through 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.

In grade 6, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like "How did you get that?", "Why is that true?", "Does that always work?" They explain their thinking to others and respond to others' thinking.

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.

In grade 6, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students begin to explore covariance and represent two quantities simultaneously, Students use number lines to compare numbers and represent inequalities. They use measures of center and variability and data displays (i.e. box plots and histograms) to draw inferences about and make comparisons between data sets. Students need many opportunities to connect and

explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context.

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 algebraic system, a statistical package, or dynamic geometric 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.

   Students consider available tools (including estimation and technology) when solving a mathematical problem and decided when certain tools might be helpful. For instance, students in grade 6 may decide to represent similar data sets using dot plots with the same scale to visually compare the center and variability of the data. Additionally, students might use physical objects or applets to construct nets and calculate the surface area of three-dimensional figures.

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 f 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.

   In grade 6, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others in their own reasoning. Students use appropriate terminology when referring to rates, ratios, geometric figures, data, displays, and components of expressions, equations, or inequalities.

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 the 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 prospective. 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.

Students routinely seek patterns or structures to model and solve problems. For instance, students recognize patterns that exist in ratio tables recognizing both the additive and multiplicative properties. Students apply properties to generate equivalent expressions (i.e. $6 + 2x = 2(3 + x)$ *by distributive property) and solve equations (i.e.* $2c + 3 = 15, 2c = 12$ *by subtraction property of equality;* $c = 6$ *by division property of equality). Students compose and decompose two- and three-dimensional figures to solve real world problems involving area and volume.*

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.

In grade 6, students use repeated reasoning to understand algorithms and make generalizations about patterns. During multiple opportunities to solve and model problems, they may notice that $a/b \div c/d = ad/bc$ *and construct other examples and models that confirm their generalization. Students connect place value and their prior work with operations to understand algorithms to fluently divide multi-digit numbers and perform all operations with multi-digit decimals. Students informally begin to make connections between covariance, rates, and representations showing the relationships between quantities.*

Ratios and Proportional Relationships

- Understand ratio concepts and use ratio reasoning to solve problems.

The Number System

- Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
- Compute fluently with multi-digit numbers and find common factors and multiples.
- Apply and extend previous understandings of numbers to the system of rational numbers.

Expressions and Equations

- Apply and extend previous understandings of arithmetic to algebraic expressions.
- Reason about and solve one-variable equations and inequalities.
- Represent and analyze quantitative relationships between dependent and independent variables.

Geometry

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

Statistics and Probability

- Develop understanding of statistical problem solving.
- Summarize and describe distributions.

UNIT PACING

TITLE	STANDARDS COVERED	DAYS
Introduction		5
Rational Numbers and Absolute Value	6.NS.5 6.NS.8 6.NS.6 6.G.3 6.NS.7	15
Fractions and Decimals	6.NS.1 6.NS.2 6.NS.3	15
Ratio	6.RP.1 6.RP.3a 6.RP.2 6.RP.3c	15
Project		5
Quantitative Relationships	6.RP.2 6.EE.9 6.RP.3 6.G	20
Expressions	6.EE.1 6.EE.4 6.EE.2 6.NS.4 6.EE.3	15
Equations and Inequalities	6.EE.5 6.EE.7 6.EE.6 6.EE.8	20
Modeling		3
Formulas and Graphs	6.EE.9 6.SP.4 6.NS.8 6.G.2	7
Statistics	6.SP.1 6.SP.4 6.SP.2 6.SP.5 6.SP.3	15
Geometry	6.G.1 6.G.3 6.G.2 6.G.4	15
Project		5

Unit : Introduction

Days: 5

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

Unit Resources	Topics Covered	Approximate Days
One Rod Tall Fawn	6.RP	1
Cross Totals MARS	6.NS	1
Security Camera MARS	6.RP 6.G	3

UNIT : Rational Numbers and Absolute Value Days 15
6.NS.5, 6.NS.6, 6.NS.7, 6.NS.8, 6.G.3

Enduring Understandings for Unit:

- Rational numbers can be represented in multiple ways are useful when examining situations involving numbers that are not whole.
- Geometric attributes (such as shapes, lines, angles, figures, and planes) provide descriptive information about an object's properties and position in space and support visualization and problem solving.

Essential Questions for Unit:

- In what ways can rational numbers be useful?
- How does geometry better describe objects?

Clusters:

- Apply and extend previous understandings of numbers to the system of rational numbers.
- Solve real-world and mathematical problems involving area, surface area, and volume.

Standard	Clear Learning Targets	Mathematical Practices	Vocabulary
6.NS.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.	I can describe and give examples of how positive or negative numbers are used to describe quantities having opposite directions or opposite values. I can recognize that positive and negative signs represent opposite values and/or directions. I can explain that the number zero is the point at which direction or value will change.	1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure.	Positive Negative Opposite Elevation Sea level Debit/Credit Altitude

	I can use positive and negative numbers along with zero to represent real world situations.	8. Look for and express regularity in repeated reasoning.	
6.NS.6 Understanding a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grade 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	I can show and explain why every rational number can be represented by a point on a number line. I can plot a number and its opposite on a number line and recognize that they are equidistant from zero. I can find the opposite of any given number including zero. I can use the signs of the coordinates to determine the location of an ordered pair in the coordinate plane. I can reason about the location of two ordered pairs that have the same values but different signs. I can plot a point on a number line or coordinate plane. I can read a point from a number line or a coordinate plane.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. **7. Look for and make use of structure.** 8. Look for and express regularity in repeated reasoning.	Rational Number Integer Opposite Coordinate Plane Ordered Pair Quadrant Reflection X and Y axis Origin Horizontal Vertical

and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.			
6.NS.7 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*	I can describe the relative position of two numbers on a number line when given an inequality. I can interpret a given inequality in terms of a real world situation. I can define absolute value as it applies to a number line. I can describe absolute value as the magnitude of the number in a real world situation. I can compare between using a signed number and using the absolute value of a signed number when referring to real world situations.	1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Absolute value Magnitude Rational number Positive Negative Inequality

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.8 Solve real-world and mathematical problems by graphing points in all four quadrants of the	I can graph points in any quadrant of the coordinate plane to solve real-world and mathematical	**1. Make sense of problems and persevere in solving them.**	Coordinate Plane Quadrant

coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	problems. I can use absolute value to find the distance between two points with the same $x-$ coordinates or the same $y-$ coordinates.	2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Coordinates $x-$ coordinates $y-$ coordinates Absolute value
6.G.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.	I can plot vertices in the coordinate plane to draw specific polygons. I can use the coordinates of the vertices of a polygon to find the length of a specific side. I can plot points, draw figures, and find lengths on the coordinate plane to solve real-world problems.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. **5. Use appropriate tools strategically.** 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated	Vertex/vertices Coordinate Polygon

		reasoning.	
Unit Resources		Standards Covered	Approximate Days
Hot Summer, Cold Winter Yummymath		6.NS.5 6.NS.6 6.NS.7	3
Which rides can you go on? Robert		6.NS.7	2
Smallest & Largest Fawn		6.NS.2 6.NS.5 6.NS.6	1

UNIT : Fractions and Decimals Days 15

6.NS.1, 6.NS.2, 6.NS.3

Enduring Understandings for Unit:

- Rational numbers can be represented in multiple ways and are useful when examining situations involving numbers that are not whole.

Essential Questions for Unit:

- In what way can rational numbers be useful?

Clusters:

- Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
- Computer fluently with multi-digit numbers and find common factors and multiples.

Standard	Clear Learning Targets	Mathematical Practices	Vocabulary
6.NS.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* $(2/3)\div(3/4)$ *and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that* $(2/3)\div(3/4)=8/9$ *because* $3/4$ *of* $8/9$ *is* $2/3$. *(In general,* $(a/b)\div(c/d)=ad/bc$.*) How*	I can use a visual model to represent the division of a fraction by a fraction. I can divide fractions by fractions using an algorithm or mathematical reasoning. I can justify the quotient of a division problem by relating it to a multiplication problem. I can use mathematical reasoning to justify the standard algorithm for fraction division. I can solve real world problems involving the division of fractions and interpret the quotient in the context	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. **4. Model with mathematics.** 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated	Quotient Algorithm Dividend Divisor Reciprocal (Keep Change Flip)

much chocolate will each person get if 3 people share ½ lb of chocolate equally? How many3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length ¾ mi and area ½ square mi? Compute fluently with multi-digit numbers and find common factors and multiples.	of the problem. I can create story contexts for problems involving the division of a fraction by a fraction.	reasoning.	
6.NS.2 Fluently divide multi-digit numbers using a standard algorithm.	I can use the standard algorithm to fluently divide multi-digit numbers.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. **6. Attend to precision.** 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	N/A
6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using a standard algorithm for each operation.	I can fluently add and subtract multi-digit decimals using the standard algorithm. I can fluently multiply multi-digit	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments	N/A

	decimals using the standard algorithm. I can fluently divide multi-digit decimals using the standard algorithm.	and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. **6. Attend to precision.** 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	
Unit Resources		Standards Covered	Approximate Days
Firefighter Unit Conversions Firefighter Math		6.NS.1 6.NS.8	1
Pennies to Heaven Illustrative Mathematics		6.NS.3	1
How tall is Mini-me? Robert		6.NS.3	1

UNIT : Ratios Days 26

6.RP.1, 6.RP.2, 6.RP.3a, 6.RP.3c

Enduring Understandings for Unit:

- Ratios and proportional relationships are used to express how quantities are related and how quantities change in relation to each other.
- Rational numbers can be represented in multiple ways are useful when examining situations involving numbers that are not whole.

Essential Questions for Unit:

- How can ratios and proportional relationships be used to determine unknown quantities?
- In what ways can rational numbers be useful?

Clusters:

- Understand ratio concepts and use ratio reasoning to solve problems.
- Compute fluently with multi-digit numbers and find common factors and multiples.

Standard	Clear Learning Targets	Mathematical Practices	Vocabulary
6.RP.1 Understand the concept of a ratio and use rational 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 two wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*	I can define the term ratio and demonstrate my understanding by giving various examples. I can write a ratio that describes a relationship between two quantities. I can explain the relationship that a ratio represents.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. **4. Model with mathematics.** 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express	Ratio

		regularity in repeated reasoning.	
6.RP.2 Understand the concept of a unit rate a/b associated with a ratio of $a:b$ 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."*	I can define the term "unit rate" and demonstrate my understanding by giving various examples. I can recognize a ratio written as a unit rate, explain a unit rate, and give an example of a unit rate. I can convert a given ratio to a unit rate. I can describe the ratio relationship represented by a unit rate.	1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Ratio Rate Unit rate
6.RP.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. a. Make tables of equivalent ratios relating quantities with whole-number measurements find missing values in the tables, and plot	I can solve real-world problems involving proportional reasoning by using various diagrams. I can create a table of equivalent ratios. I can use the proportional relationship to find missing values in a table of equivalent ratios.	1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically.	Ratio Equivalent ratio Rate Unite rate Percent Coordinate plane Proportion

the pairs of values on the coordinate plane. Use tables to compare ratios.	I can compare ratios presented in various tables. I can plot corresponding values from an equivalent ratio table on a coordinate grid.	6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	
6.RP.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. 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 a percent.	I can write a percent as a rate per one-hundred. I can use proportional reasoning to find the percent of a given number. I can use proportional reasoning to find the whole when given both the part and the percent.	1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Ratio Equivalent ratio Rate Unite rate Percent Coordinate plane

Unit Resources	Standards Covered	Approximate Days
Partial Product Dan	6.RP.2	1
The Bone Collector Dan	6.RP.2	1
Amazon Percent Discount Dan	6.RP.3	1

Super Bear Dan	6.RP.3	1
Sugar Packets Dan	6.RP.3	1
Which carrots should you buy? Robert	6.RP.2 6.RP.3	1
Coke vs. Sprite Dan	6.RP.3	1
Nana's Chocolate Milk Dan	6.RP.3	1
Finals Week Dan	6.RP.2	1
Bolt Dan	6.RP.3	1
Shower vs. Bath Dan	6.RP.3	1
Speed of Light Dan	6.RP.3	1
Ratio & Proportion NYC Department of Education	6.RP.1 6.RP.2 6.RP.3	This is a 4-5 week unit; this unit may be used in its entirety or as portions of the unit.
Waverly Waves NYC Department of Education	6.RP.1 6.RP.3	This is a 3 week unit; this unit may be used in its entirety or as portions of the unit.
Ratio Reasoning NYC Department of Education	6.RP.1 6.RP.2 6.RP.3	This is a 3 week unit; this unit may be used in its entirety or as portions of the unit.
Going Marbles NYC Department of Education	6.RP.1 6.RP.2 6.RP.3	This is a unit; this unit may be used in its entirety or as portions of the unit.

Project Days 5

Resources	Standards Covered	Approximate Days
Lemonade Stand Robert	6.RP.1 6.RP.2 6.RP.3	5

UNIT : Quantitative Relationships Days 20
6.RP.2, 6.RP.3, 6.EE.9, 6.G

Enduring Understandings for Unit:

- Ratios and proportional relationships are used to express how quantities are related and how quantities change in relation to each other.
- Algebraic expressions and equations are used to model real-life problems and represent quantitatively relationships, so that the numbers and symbols can be mindfully manipulated to reach a solution or make sense of the quantitative relationships.
- Geometric attributes (such as shapes, lines, angles, figures, and planes) provide descriptive information about an object's properties and position in space and support visualization and problem solving.

Essential Questions for Unit:

- How can ratios and proportional relationships be used to determine unknown quantities?
- How can algebraic expression and equations be used to model, analyze, and solve mathematical situations?
- How does geometry better describe objects?

Clusters:

- Understand ratio concepts and use ratio reasoning to solve problems.
- Represent and analyze quantitative relationships between dependent and independent variables.
- Solve real-world and mathematical problems involving area, surface area, and volume.

Standard	Clear Learning Targets	Mathematical Practices	Vocabulary
6.RP.2 Understand the concept of a unit rate a/b associated with a	I can define the term "unit rate" and demonstrate my understanding by	1. Make sense of problems and persevere in solving them.	Ratio

ratio of $a:b$ 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."*	giving various examples. I can recognize a ratio written as a unit rate, explain a unit rate, and give an example of a unit rate. I can convert a given ratio to a unit rate. I can describe the ratio relationship represented by a unit rate.	**2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Rate Unit Rate
6.RP.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. 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	I can solve real-world problems involving proportional reasoning by using various diagrams. I can create a table of equivalent ratios. I can use the proportional relationship to find missing values in a table of equivalent ratios. I can compare ratios presented in various tables. I can plot corresponding values from an equivalent ratio table on a coordinate grid.	1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated	Ratio Equivalent ratio Rate Unite rate Percent Coordinate plane

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 a percent. d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.	I can use proportional reasoning to solve unit rate problems. I can use visual representations (e.g., strip diagrams, percent bars, one-hundred grids) to model percents. I can write a percent as a rate per one-hundred. I can use proportional reasoning to find the percent of a given number. I can use proportional reasoning to find the whole when given both the part and the percent. I can use a ratio as a conversion factor when working with measurements of different units.	reasoning.	
6.EE.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent	I can create a table of two variables that represents a real-world situation in which one quantity will change in relation to the other. I can explain the difference between the independent variable and the dependent variable and give examples of both.	**1. Make sense of problems and persevere in solving them.** 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics.	Independent variable Dependent variable Coordinate plane

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.*	I can determine the independent variable and dependent variable in a relationship. I can write an algebraic equation that represents the relationship between the two variables. I can create a graph by plotting the dependent variable on the $x-$ axis and the independent variable on the axis of a coordinate plane. I can analyze the relationship between the dependent and independent variables by comparing the table, graph and equation.	5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	
6.G Solve real-world and mathematical problems involving area, surface area, and volume.			

Unit Resources	Standards Covered	Approximate Days
Pizza Deals Robert	6.RP.2 6.RP.3	1
Fort Steuben Dan	6.RP.3	1
Ticket Options Robert	6.RP.2 6.RP.3	1
Sharing Costs: Traveling to School MARS	6.RP.2 6.RP.3	3
Pain Relief	6.RP.3	1

Dan		
Neptune Dan	6.RP.3	2
Leaky Faucet Dan	6.RP.3	1
Split Time Dan	6.RP.3	1
Print Job Dan	6.RP.3	1

UNIT : Expressions Days 15

6.EE.1, 6.EE.2, 6.EE.3, 6.EE.4, 6.NS.4

Enduring Understandings for Unit:

- Algebraic expressions and equations are used to model real-life problems and represent quantitative relationships, so that the numbers and symbols can be mindfully manipulated to reach a solution or make sense of the quantitative relationships.
- Rational numbers can be represented in multiple ways and are useful when examining situations involving numbers that are not whole.

Essential Questions for Unit:

- How can algebraic expressions and equations be used to model, analyze, and solve mathematical situations?
- In what ways can rational numbers be useful?

Clusters:

- Apply and evaluate numerical expressions involving whole-number exponents.
- Compute fluently with multi-digit numbers and find common factors and multiples.

Standard	Clear Learning Targets	Mathematical Practices	Vocabulary
6.EE.1 Write and evaluate numerical expressions involving whole-number exponents.	I can explain the meaning of a number raised to a power. I can write numerical expressions involving whole-number exponents. I can evaluate numerical expressions involving whole-number exponents.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. **6. Attend to precision.** 7. Look for and make use of structure.	Base Exponent Evaluate

		8. Look for and express regularity in repeated reasoning.	
6.EE.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.*	I can translate a relationship given in words into an algebraic expression. I can identify parts of an algebraic expression by using correct mathematical terms. I can recognize when an expression is representing a sum and/or difference of terms versus a product and/or quotient of terms (e.g., the expression $5(x+3)$ is representing a product of the terms 5 and $(x+3)$ while the expression $5x+3$ is representing a sum of the terms $5x$ and 3). I can recognize an expression as both a single value and as two or more terms on which an operation is performed. I can evaluate an algebraic expression for a given value. I can substitute values in formulas to	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. **6. Attend to precision.** 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Sum Difference Term Product Factor Quotient Coefficient Arithmetic expression Algebraic expression Substitute Evaluate Constant

c. Evaluate expressions at specific values of their variables. Including expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, using the algebraic order of operations when there are no parentheses to specify a particular order. *For example, use the formulas* $V = s^3$ *and* $A = 6s^2$ *to find the volume and surface area of a cube with sides of length* $s = 1/2.$	solve real-world problems. I can apply the order of operations when evaluating both arithmetic and algebraic expressions.		
6.EE.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* $24x+18y$	I can create a visual model to show two expressions are equivalent (e.g., use algebra tiles to model that $3(2+x)=6+3x).$ I can apply the properties of operations – especially the distributive property – to generate equivalent expressions.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools	Equivalent expressions Commutative property Associative property Distributive property

to produce the equivalent expression $6(4x+3y)$; *apply properties of operations to* $y+y+y$ *to produce the equivalent expression* $3y$.		strategically. 6. Attend to precision. 7. Look for and make use of structure. **8. Look for and express regularity in repeated reasoning.**	
6.EE.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.*	I can determine whether two expressions are equivalent by using the same value to evaluate both expressions. I can use the properties of operations to justify that two expressions are equivalent.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. **8. Look for and express regularity in repeated reasoning.**	Equivalent expressions Like terms
6.NS.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole	I can find all factors of any given number, less than or equal to 100. I can find the greatest common factor	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and	Factor Multiple

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* $4(9+2)$. *Apply and extend previous understandings of numbers to the system of rational numbers.*	of any two numbers, less than or equal to 100. I can create a list of multiples for any number less than or equal to 12. I can find the least common multiple of any two numbers, less than or equal to 12. I can use the distributive property to rewrite a simple addition problem when the addends have a common factor.	quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. **7. Look for and make use of structure.** 8. Look for and express regularity in repeated reasoning.	Greatest common factor Least common multiple Distributive property

Unit Resources	Standards Covered	Approximate Days
Story Math Malke	6.EE.2	1
Year of the Snake Yummymath	6.NS.4	1
Watch Out for Parentheses Illustrative Mathematics	6.EE	0.5
Factor Dominos Malke	6.NS.4	1
Rectangle Perimeter Illustrative Mathematics	6.EE	1
Laws of Arithmetic MARS	6.EE 6.G	3
Grocery & Quilt NYC Department of Education	6.EE.2 6.EE.3 6.EE.4	This is an entire 2-3 week unit; you may use the unit in its entirety or portions of the unit.

ElkStreet NYC Department of Education	6.EE.2 6.EE.3 6.EE.4 6.EE.5 6.EE.6	This is an entire 2-3 week unit; you may use the unit in its entirety or portions of the unit.

UNIT : Equations and Inequalities Days 20
6.EE.5, 6.EE.6, 6.EE.7, 6.EE.8

Enduring Understandings for Unit:

- Algebraic expressions and equations are used to model real-life problems and represent quantitative relationships, so that the numbers and symbols can be mindfully manipulated to reach a solution or make sense of the quantitative relationships.

Essential Questions for Unit:

- How can algebraic expression and equations be used to model, analyze, and solve mathematical situations?

Clusters:

- Reason about and solve one-variable equations and inequalities.

Standard	Clear Learning Targets	Mathematical Practices	Vocabulary
6.EE.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	I can explain that solving an equation or inequality leads to finding the value or values of the variable that will make a true mathematical statement. I can substitute a given value into an algebraic equation or inequality to determine whether it is part of the solution set.	1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated	Equation Inequality Substitute Solve Solution

		reasoning.	
6.EE.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.	I can use a variable to write an algebraic expression that represents a real-world situation when a specific number is unknown. I can explain and give examples of how a variable can represent a single unknown number (e.g., $x = 9,$ $5y = 10)$ or can represent any number in a specified set (e.g., $m < 8$ or $n + 6 > 10).$ I can use a variable to write an expression that represents a consistent relationship in a particular pattern (e.g., use function tables to write an expression that would represent the output for any input).	1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Variable Constant Algebraic expression
6.EE.7 Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.	I can solve equation in the form $x + p = q$ where p and q are given numbers. I can solve equations in the form $px = q$ where p and q are given numbers. I can write and solve algebraic	1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools	Algebraic equation Solve

	equations that represent real world problems.	strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	
6.EE.8 Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.	I can write a simple inequality to represent the constraints or conditions of numerical values in a real-world or mathematical problem. I can explain what the solution set of an inequality represents. I can show the solution set of an inequality by graphing it on a number line.	1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Inequality

Unit Resources	Standards Covered	Approximate Days
Log Ride Illustrative Mathematics	6.EE.5	1
Firefighter Allocation	6.EE.6	2

Illustrative Mathematics	6.EE.7	
Morning Walk Illustrative Mathematics	6.EE.7	1
Fishing Adventures Illustrative Mathematics	6.EE.8	1
Dance & Text NYC Department of Education	6.EE.5 6.EE.6 6.EE.7 6.EE.8 6.EE.9	This is an entire unit, portions can be used or the unit in its entirety.

MODELING UNIT Days 3

Resources		Standards Covered	Approximate Days
Fire behavior and spread Firefight Math			3

UNIT : Formulas and Graphs Days 7

6.EE.9, 6.NS.8, 6.G.2

Enduring Understandings for Unit:

- Algebraic expressions and equations are used to model real-life problems and represent quantitative relationships, so that the numbers and symbols can be mindfully manipulated to reach a solution or make sense of the quantitative relationships.
- Rational numbers can be represented in multiple ways and are useful when examining situations involving numbers that are not whole.
- Geometric attributes (such as shapes, lines, angles, figures, and planes) provide descriptive information about an object's properties and position in space and support visualization and problem solving.

Essential Questions for Unit:

- How can algebraic expression and equations be used to model, analyze, and solve mathematical situations?
- In what ways can rational numbers be useful?
- How does geometric better describe objects?

Clusters:

- Represent and analyze quantitative relationships between dependent and independent variables.
- Apply and extend previous understandings of numbers to the system of rational numbers.
- Solve real-world and mathematical problems involving area, surface area, and volume.

Standard	Clear Learning Targets	Mathematical Practices	Vocabulary
6.EE.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express	I can create a table of two variables that represents a real-world situation in which one quantity will change in relation to the other.	**1. Make sense of problems and persevere in solving them.** 2. Reason abstractly and quantitatively.	Independent variable Dependent variable

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.*	I can explain the difference between the independent variable and the dependent variable and give examples of both. I can determine the independent and dependent variable in a relationship. I can write an algebraic equation that represents the relationship between the two variables. I can create a graph by plotting the dependent variable on the $x-$ axis and the independent variable on the $y-$ axis of a coordinate plane. I can analyze the relationship between the dependent and independent variables by comparing the table, graph, and equation.	3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Coordinate plane
6.NS.8 Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	I can graph points in any quadrant of the coordinate plane to solve real-world and mathematical problems. I can use absolute values to find the distance between two points with the same $x-$ coordinates or the same	**1. Make sense of problems and persevere in solving them.** 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools	Coordinate plane Quadrant Coordinates $x-$ coordinate

	$y-$ coordinates.	strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	$y-$ coordinate Absolute value
6.G.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = Bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	I can find the volume of a rectangular prism by reasoning about the number of unit cubes it takes to cover the first layer of the prism and the number of layers needed to fill the entire prism. I can generalize finding the volume of a right rectangular prism to the equation $V = lwh$ or $V = Bh$ I can solve real-world problems that involve finding the volume of right rectangular prisms.	1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Right rectangular prism Base Height Area Volume Cubic unit

Unit Resources	Standards Covered	Approximate Days
Chocolate Bar Scales Illustrative Mathematics	6.EE.9	2
Life-sized Human Graphing Julie	6.NS.8	1
Computing Volume Progression 1	6.G.2	1

Illustrative Mathematics		
Computing Volume Progression 2 Illustrative Mathematics	6.G.2	1
Computing Volume Progression 3 Illustrative Mathematics	6.G.2	1
Computing Volume Progression 4 Illustrative Mathematics	6.G.2	1

UNIT : Statistics Days 15

6.SP.1, 6.SP.2, 6.SP.3, 6.SP.4, 6.SP.5

Enduring Understandings for Unit:

- The rules of probability can lead to more valid and reliable predictions about the likelihood of an event occurring.

Essential Questions for Unit:

- How is probability used to make informed decisions about uncertain events?

Clusters:

- Develop understanding of statistical problem solving.
- Summarize and describe distributions.

Standard	Clear Learning Targets	Mathematical Practices	Vocabulary

Develop understanding of statistical problem solving. 6.SP.1 Develop statistical reasoning by using the GAISE model: a. Formulate Questions: Recognize and formulate a statistical question as one that anticipates variability and can be answered with quantitative data. 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 of the variability in students' ages. (GAISE Model, step 1) b. Collect Data: Design and use a plan to collect appropriate data to answer a statistical question. (GAISE Model, step 2) c. Analyze Data: Select appropriate graphical methods and numerical measures to analyze data by displaying variability within a group, comparing individual to individual, and comparing individual to group. (GAISE model, step 4) d. Interpret Results: Draw logical conclusions from the dat based on the original question.(GAISE Model, step 4)	I can explain what makes a good statistical question. I can develop a statistical question that anticipates variability and can be answered with quantitative data. I can design and use a plan to collect appropriate data to answer a statistical question. I can select appropriate graphical and numerical methods to analyze data. I can recognize variability within a set of data. I can compare individual data to individual data and individual data to group data. I can draw logical conclusions from the data based on the question.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. **6. Attend to precision.** 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Variability Statistical question Quantitative data Numerical data Categorical data Individual Group

6.SP.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	I can explain the distribution of a set of data can be described: by its center, spread, and overall shape. I can describe the center of a set of statistical data in terms of the mean, median, and the mode. I can describe the spread of a set of statistical data in terms of extremes, clusters, gaps, and outliers. I can describe the overall shape of the set of data in terms of its symmetry or skewness.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. **4. Model with mathematics.** 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Distribution Center Spread Shape of data
6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.	I can define a measure of center as a single value that summarizes a data set. I can find measures of center by calculating the mean, median, and mode of a set of numerical data. I can define a measure of variation as a range of the data, relative to the	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools	Measure of center Mean Median (Q_2) Mode Measure of variation

	measures of center. I can find measures of variation by calculating the interquartile range of a set of numerical data.	strategically. **6. Attend to precision.** 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Range Interquartile range Extremes (top and bottom) Lower quartile (Q_1) Upper quartile (Q_3) Outlier
6.SP.4 Display numerical data in plots on a number line, including dot plots (line plots), histograms, and box plots. (GAISE Model, step 3)	I can organize and display data as a line or dot plot. I can organize and display data in a histogram. I can organize and display data in a box plot. I can determine the upper and lower extremes, median, and upper and lower quartiles of a set of data and use this information to display the data in a box plot. I can identify the similarities and differences of representing the same data in a line plot, a histogram, or a	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. **4. Model with mathematics.** 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Line plot Dot plot Histogram Median (Q_2) Lower extreme Lower quartile (Q_1) Upper quartile (Q_3) Upper extreme

	box plot. I can decide and explain which type of plot (dot plot, line plot, histogram, or box plot) is the best way to display my data depending on what I want to communicate about the data.		Box plot Outlier
6.SP.5 Summarize numerical data sets in relation to their context. a. Report the number of observations. b. b. Describe the nature of the attribute under investigation, including how it was measured and its units of measurement. c. c. Find the quantitative measures of center (median and/or mean) for a numerical data set and recognize that this value summarizes the data set with a single number. Interpret mean as an equal or fair share. Find measures of variability (range and interquartile range) as well as informally describe the shape and the presence of clusters, gaps, peaks, and outliers in a distribution. d. d. Choose the measures of center and variability, based on the shape of the data	I can write a data collection summary that includes the number of observations, what is being investigated, how it is measured, and the units of measurement. I can determine the measures of center and measures of variability of the collected data. I can justify the use of a particular measure of center or measure of variability based on the shape of the data. I can use a measure of center and a measure of variation to draw inferences about the shape of the data distribution. I can describe overall patterns in the data by identifying clusters, gaps, peaks, and outliers, and how they relate to the context of the problem.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. **3. Construct viable arguments and critique the reasoning of others.** 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Measure of center Mean Median Mode Measure of variability Range Interquartile range Mean absolute deviation Cluster Gaps Peaks Distribution

distribution and the context in which the data were gathered.			
Unit Resources		Standards Covered	Approximate Days
Buttons: Statistical Questions Illustrative Mathematics		6.SP.1	2
Suzi's Company MARS		6.SP.1 6.SP.2 6.SP.3 6.SP.4 6.SP.5	2
Mean, Median, Mode, Range MARS		6.SP.1 6.SP.2 6.SP.3 6.SP.4 6.SP.5	3
Puppy Weights Illustrative Mathematics		6.SP.2 6.SP.4	2
Candy Bars MARS		6.SP.1 6.SP.2 6.SP.3 6.SP.4 6.SP.5	2
Electoral College Illustrative Mathematics		6.SP.2 6.SP.5c	2

UNIT : Geometry Days 15

6.G.1, 6.G.2, 6.G.3, 6.G.4

Enduring Understandings for Unit:

- Geometric attributes (such as shapes, lines, angles, figures, and planes) provide descriptive information about an object's properties and position in space and support visualization and problem solving.

Essential Questions for Unit:

- How does geometry better describe objects?

Clusters:

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

Standard	Clear Learning Targets	Mathematical Practices	Vocabulary
6.G.1 Through composition into rectangles or decomposition into triangles, find the area of right triangles, other triangles, special quadrilaterals, and polygons; apply these techniques in the context of solving real-world and mathematical problems.	I can show how to find the area of a parallelogram by decomposing the parts to form a rectangle. I can show how to find the area of a right triangle by composing two of them into a rectangle. I can show how to find the area of a triangle by composing two of them into a parallelogram or rectangle or by decomposing the triangle and recomposing its parts to form a parallelogram or rectangle. I can show how to find the area of a trapezoid by composing two of them into a rectangle or parallelogram or	1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated	Polygon Triangle Right triangle Quadrilateral Parallelogram Trapezoid Area Square unit

	decomposing the trapezoid into a rectangle and one or more triangles. I can explain the relationship between the formulas for the area of rectangles, parallelograms, triangles, and trapezoids. I can solve real-world problems that involve finding the area of polygons.	reasoning.	
6.G.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $v = Bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	I can find the volume of a right rectangular prism by reasoning about the number of unit cubes it takes to cover the first layer of the prism and the number of layers needed to fill the entire prism. I can generalize finding the volume of a right rectangular prism to the equation $V = lwh$ and $v = Bh$ I can solve real-world problems that involve finding the volume of right rectangular prisms.	1. Make sense of problems and persevere in solving them. **2. Reason abstractly and quantitatively.** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Right rectangular prism Base Height Area Volume Cubic unit
6.G.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to	I can plot vertices in the coordinate plane to draw specific polygons.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and	Vertex/vertices Coordinate

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.	I can use the coordinates of the vertices of a polygon to find the length of a specific side. I can plot points, draw figures, and find lengths on the coordinate plane to solve real-world problems.	quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. **5. Use appropriate tools strategically.** 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Polygon
6.G.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.	I can match a net to the correct right rectangular prism, right triangular prism, right square pyramid, or right tetrahedron. I can draw a net for a given rectangular prism, right triangular prism, right square pyramid, or right tetrahedron. I can use a net to find the surface area of a given rectangular prism, right triangular prism, right pyramid, or right tetrahedron. I can solve real-world problems that involve finding the surface area of a	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. **4. Model with mathematics.** 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated	Right rectangular prism Right triangular prism Right square pyramid Right tetrahedron Net Surface area

	rectangular prism, right triangular prism, right square pyramid, or right tetrahedron.	reasoning.	
Unit Resources		Standards Covered	Approximate Days
Hexagon Hierarchy Christopher		6.G.1 6.G.3	1
Burn Area and Perimeter Firefighter Math		6.G.1 6.G.3	2
Banana Bread Illustrative Mathematics		6.G.2	1
Dollar Wall Dan		6.G.1	1
Irregular Shape Math Hunt Julie		6.G.1	1
Fruit Boxes MARS		6.G.2 6.G.4	1
Smoothie Box MARS		6.G.2 6.G.4	1
Candle Boxes MARS		6.G.2 6.G.4	1
Bubble Wrap Dan		6.G.1	2
Designing: Candy Cartons MARS		6.G.1 6.G.4	3

Resources used to create 6th Grade Mathematics Course of Study

"The Common Core: Clarifying Expectations for Teachers & Students." *MATH Grade 6*. Worthington: 2011. <http://www.qualityinstruction.org>.

Common Core State Standards: Mathematics

Emergent Math

Standards for Mathematical Practices Progression through Grade Levels