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

In Grade 8, instructional time should focus on three critical areas:

1. Formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation and solving linear equations and systems of linear equations.
    a. Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions ($y/x = m$ or $y = mx$) as a special linear equations ($y = mx + b$), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A , the output or y-coordinate changes by the amount $m\square A$. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation.
    b. Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.
2. Grasping the concept of a function and using functions to describe quantitative relationships.
    a. Students grasp the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the functions are reflected in the different representations.
3. Analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.
    a. Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about

congruence and similarity to describe and analyze two dimensional figures and to solve problems. Students show that the sum of two angles in a triangle is the angle formed by a straight line, and that various configurations of the lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students understand the statement of the Pythagorean Theorem and its converse, and can explain why the Pythagorean Theorem holds, for example, by decomposing a square in two different ways. They apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

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 eighth grade, 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 eighth grade, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. They examine patterns in data and assess the degree of linearity of functions. 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 eighth grade, 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 eighth grade, 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 solve systems of linear equations and compare properties of functions provided in different forms. Students use scatterplots to represent data and describe associations between variables. 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 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.

In eighth grade, students consider appropriate tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 8 may translate a set of data given in tabular form to a graphical representation to compare it to another data set. Students might draw pictures, use applets, or write equations to show the relationships between the angles created by a transversal.

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 eighth grade, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to the number system, functions, geometric figures, and data displays.

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 $7\times5+7\times3$, 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.

In eighth grade, students routinely seek patterns or structures to model and solve problems. In grade 8, students apply properties to generate equivalent expressions and solve equations. Students examine patterns in tables and graphs to generate equations and describe relationships. Additionally, students experimentally verify the effects of transformations and describe them in terms of congruence and similarity.

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 eighth grade, students use repeated reasoning to understand algorithms and make generalizations about patterns. Students use iterative processes to determine more precise rational approximations for irrational numbers. During multiple opportunities to solve and model problems, they notice that the slope of a line and the rate of change are the same value. Students flexibly make connections between covariance, rates, and representations showing the relationships between quantities.

The Number System

- Know that there are numbers that are not rational, and approximate them by rational numbers.

Expressions and Equations

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

Functions

- Define, evaluate, and compare functions.
- Use functions to model relationships between quantities.

Geometry

- Understand congruence and similarity using physical models, transparencies, or geometric software.
- Understand and apply the Pythagorean Theorem.

Statistics and Probability

- Investigate patterns of association in bivariate data.

UNIT PACING

TITLE	STANDARDS COVERED	DAYS
Introduction		5
Numerical Expressions	8.NS.1 8.EE.2 8.NS.2 8.EE.3 8.EE.1 8.EE.4	15
Linear Relationships	8.EE.5 8.EE.6 7.RP2 7.RP.3	15
Linear Equations & Systems	8.EE.7 8.EE.8	18
Modeling	8.EE.8	3
Functions	8.F.1 8.F.2 8.F.3 8.F.4 8.F.5	14
Project		5
Transformations	7.G.1 8.G.1 8.G.2 8.G.3 8.G.4	12
Shape and Form	8.G.5 8.G.6 8.G.7 8.G.8 8.G.9	25
Project		5
Bivariate Data	8.SP.1	15

	8.SP.2 8.SP.3 8.SP.4	
Patterns and Formulas	8.F 7.G.1 8.G 8.SP 8.EE	15
Modeling		3

Unit 0: INTRODUCTION 5 Days

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

Supreme Court Welcome
(Recognizing Patterns, Algebraic, Numeric, Geometric Representations)

Cubes Everywhere
(2 and 3 Dimensional Objects, Geometry Vocabulary)

How old are they?
(Forming Expressions, Solving Equations)

UNIT 1: NUMERICAL EXPRESSIONS Days 15

8.NS.1, 8.NS.2, 8.EE.1, 8.EE.2, 8.EE.3, 8.EE.4

Enduring Understandings for Unit:

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

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

Clusters:

- Know that there are numbers that are not rational, and approximate them by rational numbers.
- Work with radicals and integer exponents.

Standard	Clear Learning Targets	Mathematical Practices	Vocabulary
8.NS.1 Know that real numbers are either rational or irrational. Understand informally that every number has a decimal expansion which is repeating, terminating, or is non-repeating and non-terminating.	I can classify a number as rational or irrational based on its decimal expansion. I can convert a repeating decimal into a rational number.	1. Make sense of problems and persevere in solving them. **2. <u>Reason abstractly and quantitatively.</u>** 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.	Rational Number Irrational Number

		8. Look for and express regularity in repeated reasoning.	
8.NS.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g. π^2). For example, by truncating the decimal expansion $\sqrt{2}$ show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.	I can use reasoning to determine between which two consecutive whole numbers a square root will fall. I can plot the estimated value of an irrational number. I can estimate the value of an irrational number by rounding to a specific place value. I can use estimated values to compare two or more irrational 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. <u>Attend to precision.</u>** 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Rational Number Irrational Number
8.EE.1 Understand, explain and apply the properties of integer exponents to generate equivalent numerical expressions. *For example:* $3^2 \times 3^{-5} = 3^{-3} = \frac{1}{3^3} = \frac{1}{27}$	I can determine the properties of integer exponents by exploring patterns and applying my understanding of properties of whole number exponents. I can use the properties of integer exponents to simplify 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 strategically. 6. Attend to precision.	Integer Exponent

		7. <u>Look for and make use of structure.</u> 8. Look for and express regularity in repeated reasoning.	
8.EE.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.	I can recognize taking a square root as the inverse of squaring a number. I can recognize taking a cube root as the inverse of cubing a number. I can evaluate the square root of a perfect square. I can evaluate the cube root of a perfect cube. I can justify that the square root of a non-perfect square will be irrational.	1. Make sense of problems and persevere in solving them. **2. <u>Reason abstractly and quantitatively.</u>** 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.	Cube Square Cube root Square root Radical Perfect Square Perfect Cube Irrational
8.EE.3 Use numbers expressed in the form of a single digit times a whole-number power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 times* 10^8	I can write an estimation of a large quantity by expressing it as a product of a single-digit number and a positive power of ten. I can write an estimation of a very small quantity by expressing it as the product of a single-digit number and a negative power of ten.	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	Power of ten

and the population of the world as 7 times 10^9*, and determine that the world population is more than twenty times larger.*	I can compare quantities written as the product of a single-digit number and a power of ten by stating that their multiplicative relationships.	strategically. 6. Attend to precision. **7. <u>Look for and make use of structure.</u>** 8. Look for and express regularity in repeated reasoning.	
8.EE.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large and very small quantities (e.g. use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.	I can add and subtract two numbers written in scientific notation. I can multiply and divide two numbers written in scientific notation. I can select the appropriate units for measuring derived measurements when comparing quantities written in scientific notation. I can identify and interpret the various ways scientific notation is displayed on calculations and through computer software.	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. <u>Attend to precision.</u>** 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	Scientific notation Power of ten

Unit Resources	Standards Covered	Approximate Days
Square Roots Go Rational NCTM Illumiations	8.NS.2 8.EE.1 8.EE.2	1
Repeating Decimals MARS	8.NS.1 8.EE.8	3

Cost of Super Bowl Commercials Yummymath	6.EE.1 7.EE.1 8.EE.1 8.EE.2 8.EE.3 8.EE.4 N.RN	1
Estimating Length Using Scientific Notation MARS	8.EE.1	3
How many stars in the universe? Robert	8.EE.3 8.EE.4	1
March Madness is here again Yummymath	2.MD.10 5.NBT 7.RP 7.NS 8.EE.3 8.EE.4	2
The Perfect Bracket Yummymath	6.RP.3d 7.SP.8 8.EE.3 8.EE.4	1

UNIT 2: LINEAR RELATIONSHIPS Days: 15
8.EE.5, 8.EE.6, 7.RP2, 7.RP.3

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.
- FROM 7th Grade – Ratios and Proportional relationships are used to express how quantities are related and how quantities change in relation to each other.

Essential Questions:

- How can algebraic expressions and equations be used to model, analyze, and solve mathematical situations?
- FROM 7th Grade – How can ratios and proportional relationships be used to determine unknown quantities?

Clusters:

- Understand the connections between proportional relationships, lines, and linear equations.

Standards	Clear Learning Targets	Mathematical Practices	Vocabulary
8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*	I can graph a proportional relationship in the coordinate plane. I can interpret the unit rate of a proportional relationship as the slope of the graph. I can justify that the graph of a proportional relationship will always intersect the origin $(0,0)$ of the graph. I can use a graph, table, or an	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.	Proportional relationship Unit Rate Slope

	equation to determine the unit rate of a proportional relationship and use the unit rate to make comparisons between various proportional relationships.	**8. <u>Look for and express regularity in repeated reasoning.</u>**	
8.EE.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b .	I can create right triangles by drawing a horizontal line segment and a vertical line segment from any two points on a non-vertical line in the coordinate plane. I can justify that these right triangles are similar by comparing the ratios of the lengths of the corresponding legs. I can justify that since the triangles are similar, the ratios of all corresponding hypotenuses, representing the slope of the line, will be equivalent. I can justify that an equation in the form $y = mx + b$ will represent the graph of a proportional relationship with a slope of m and a y-intercept of 0. I can justify that an equation in the form $y = mx + b$ represents the graph of a linear relationship with a	**1. <u>Make sense of problems and persevere in solving them.</u>** 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 triangle Leg Hypotenuse Similar triangles Ratio Slope Proportional relationship y-intercept

	slope of m and a y-intercept of b.		
Unit Resources		Standards Covered	Approximate Days
Cheesy Gold Fish Yummymath		8.EE.5 8.F.4 7.RP.2 7.RP.3	2
Rise and Run Triangles NCTM		8.EE.5 8.EE.6	1
Staircases and Steepness Fawn		8.EE.5 8.EE.6	1
Journey MARS		8.EE.5 8.EE.6	1
Shelves MARS		8.EE.5 8.EE.6	1
Colinear square corners David		8.EE.5 7.RP.1 7.RP.2 7.RP.3	1
Bike Ride MARS		8.EE.5 8.EE.6	1
Constant Dimensions NCTM		8.EE.5 8.EE.6	1
Representing and Interpreting Proportional Relationships NYC Department of Education		8.EE.5 8.EE.6 8.F.4 7.RP.2 7.RP.2b	This is an entire unit, portions can be used or the unit in its entirety.
Slippery Slopes NYC Department of Education		8.EE.5 8.EE.6 8.F.4	This is an entire 2-3 week unit, portions could be used.

UNIT 3: LINEAR EQUATIONS AND SYSTEMS Days 18
8.EE.7, 8.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 expressions and equations be used to model, analyze, and solve mathematical situations?

Clusters:

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

Standard	Clear Learning Targets	Mathematical Practices	Vocabulary
8.EE.7 Solve linear equations in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and	I can use the properties of real numbers to determine the solution of a linear equation. I can simplify a linear equation by using the distributive property and/or combining like terms. I can give examples of linear equations with one solution, infinitely many solutions, or no solution.	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. <u>Look for and make use of structure.</u>** 8. Look for and express regularity in repeated	Linear equation Equivalent equations Rational Number Coefficient Like terms Solution

b are different numbers.) b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.		reasoning.	
8.EE.8 Analyze and solve pairs of simultaneous linear equations graphically. a. Understand that the solution to a pair of linear equations in two variables correspond to the point(s) of intersection of their graphs, because the point(s) of intersection satisfy both equations simultaneously. b. Use graphs to find or estimate the solution to a pair of two simultaneous linear equations in two variables. Equations should include all three solution types: one solution, no solution, infinitely many solutions.	I can explain how a line represents the infinite number of solutions to a linear equation with two variables. I can explain how the point(s) of intersection of two graphs will represent the solution to a system of two linear equations because that/those point(s) are solutions to both equations. I can use the graphs of two linear equations to estimate the solution of the system. I can identify the types of solutions a simple pair of equations have by inspecting them. I can solve real-world problems and mathematical problems dealing with	1. Make sense of problems and persevere in solving them. **2. <u>Reason abstractly and quantitatively.</u>** 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.	Linear equation System of linear equations (also, simultaneous linear equations) Intersection

Solve simple cases by inspection. For example, $3x + 2y = 5$ *and* $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously equal 5 and 6. c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.* (Limit solutions to those that can be addressed by graphing).	systems of linear equations and interpret the solution in the context of the problem using solving systems by graphing.		
Unit Resources		Standards Covered	Approximate Days
Solving Special Case Equations Sarah		8.EE.7 8.EE.7a	1
Solving for Y with Cups and Kisses Julie		8.EE.7 8.EE.7a	1
Ditch Diggers Dan		8.EE.7	2
Solving linear equations in one variable		8.EE.7	3

MARS		
DVR Dilemma Yummymath	8.EE.7 8.EE.8 A.CED 6.RP 7.RP	2
Chips and Candy MARS	8.EE.8	1
Hot Under the Collar MARS	8.EE.8	1
Playing Catch Up Dan	8.EE.8	1
Building and Solving Equations 1 MARS	8.EE.8	3
Classifying Solutions to Systems of Equations MARS	8.EE.8	3
Talk and Text Plans NYC Department of Education	8.EE.7 8.EE.7b 8.EE.8 8.EE.8a 8.EE.8b	This is an entire 2-3 week unit, portions could be used.

MODELING UNIT Days 3

Resources	Standards Covered	Approximate Days
Solving Real Life Problems: Baseball Jerseys MARS	8.EE.8	3

UNIT 4: FUNCTIONS Days 14

8.F.1, 8.F.2, 8.F.3, 8.F.4, 8.F.5

Enduring Understanding for Unit:

- The characteristics of functions and their representations are useful in making sense of patterns and solving problems involving quantitative relationships.

Essential Question for Unit:

- How are functions useful?

Clusters:

- Define, evaluate, and compare functions.
- Use functions to model relationships between quantities.

Standard	Clear Learning Targets	Mathematical Practices	Vocabulary
8.F.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.* **Function notation is not required in Grade 8.*	I can explain that a function represents a relationship between an input and an output where the output depends on the input; there can be only one output for each input. I can show the relationship between the inputs and outputs of a function by graphing them as ordered pairs on	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. **3. <u>Construct viable arguments and critique the reasoning of others.</u>** 4. Model with mathematics.	Function Input Output

	a coordinate grid.	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.	
8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions.) *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*	I can determine the properties of a function written in algebraic form (e.g., rate of change, meaning of y-intercept, linear, non-linear). I can determine the properties of a function when given the inputs and outputs in a table. I can determine the properties of a function represented as a graph. I can determine the properties of a function when given the situation verbally. I can compare the properties of two functions that are represented differently (e.g., as an equation, in a table, graphically or a verbal representation).	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. **3. <u>Construct viable arguments and critique the reasoning of others.</u>** 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. **7. <u>Look for and make use of structure.</u>** 8. Look for and express regularity in repeated reasoning.	Function Linear function Rate of change
8.F.3 Interpret the equation	I can explain why the equation	1. Make sense of problems and	Linear function

$y = mx + b$ as defining a linear function, whose graph is a straight line, give examples of functions that are not linear. *For example, the function* $A = s^2$ *giving the area of a square as a function of its side length is not linear because its graph contains the points* $(1,1)$, $(2,4)$ *and* $(3,9)$, *which are not on a straight line.*	$y = mx + b$ represents a linear function and interpret the slope and y-intercept in relation to the function. I can give examples of relationships that are non-linear that are non-linear functions. I can analyze the rate of change between input and output values to determine if function is linear or non-linear. I can create a table of values that can be defined as a non-linear function.	persevere in solving them. 2. Reason abstractly and quantitatively. **3. <u>Construct viable arguments and critique the reasoning of others.</u>** 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.	
8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship of from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.	I can write a linear function that models given situation given verbally as a table of x- and y- values or as a graph. I can define the initial value of the function in relation to the situation. I can define the rate of change in relation to the situation. I can define the y-intercept in relation to the situation. I can explain any constraints on the domain in relation to the situation.	**1. <u>Make sense of problems and persevere in solving them.</u>** 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	Linear function Rate of change

		regularity in repeated reasoning.	
8.F.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear.) Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	I can match the graph of function to a given situation. I can write a story that describes the functional relationship between two variables depicted on a graph. I can create a graph of function that describes the relationship between two variables.	**1. <u>Make sense of problems and persevere in solving them.</u>** 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. **4. <u>Model with mathematics.</u>** 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.	Increasing Decreasing Linear Nonlinear

Unit Resources	Standards Covered	Approximate Days
Meal Out MARS	8.F.3	1
Interpreting Distance vs. Time Graphs MARS	8.F.4	3
Modeling Situations with Linear Equations MARS	8.F.4	3
Generalizing Patterns: The Difference of Two Squares MARS	8.F.3 8.F.4	3
Lifespan of a meme, the Harlem Shake Yummymath	8.F.3 8.F.5	1

	HSS.IC.B.6	
Lines and Linear Equations MARS	8.EE.5 8.F.4	3
How many hot dogs did they eat? Robert	8.F.3 8.F.4 F.BF.1 F.BF.2 F.IF.6 F.LE.5	1
Joulies Dan	8.F.5	1
The Picture Frame Problem NYC Department of Education	8.F.3 8.F.4 8.F.5 8.EE.6 8.EE.7	
200 Freestyle NYC Department of Education	8.F.1 8.F.5	

PROJECT Days 5

Resources	Standards Covered	Approximate Days
		5

UNIT 5: TRANSFORMATIONS Days 12
7.G.1, 8.G.1. 8.G.2, 8.G.3, 8.G.4

Enduring Understanding 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 Question for Unit:

- How does geometry better describe objects?

Clusters:

- Understand congruence and similarity using physical models, transparencies, or geometric software.

Standards	Clear Learning Targets	Mathematical Practices	Vocabulary
8.G.1 Verify experimentally the properties of rotations, reflections, and translations (include examples both with and without coordinates): a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to	I can verify that after a figure has been translated, corresponding lines and line segments remain the length, corresponding angles have the same measure, and corresponding parallel lines remain parallel. I can verify that after a figure has been reflected, corresponding lines and line segments remain the length, corresponding angles have the same	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. **3. <u>Construct viable arguments and critique the reasoning of others.</u>** 4. Model with mathematics. 5. Use appropriate tools strategically.	Transformation Translation Reflection Rotation Parallel lines

parallel lines.	measure, and corresponding parallel lines remain parallel. I can verify that after a figure has been rotated, corresponding lines and line segments remain the length, corresponding angles have the same measure, and corresponding parallel lines remain parallel.	6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	
8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describes a sequence that exhibits the congruence between them. (include examples both with and without coordinates)	I can explain how transformations can be used to prove that two figures are congruent. I can perform transformations to show whether two given figures are congruent.	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. <u>Model with mathematics.</u>** 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.	Congruent Transformation Reflection Rotation Translation
8.G.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	I can describe the changes occurring to the coordinates(*x* and y*)* of a figure after a translation.	1. Make sense of problems and persevere in solving them. **2. <u>Reason abstractly and quantitatively.</u>**	Transformation Translation

	I can describe the changes occurring to the coordinates(*x* and y*)* of a figure after a reflection. I can describe the changes occurring to the coordinates(*x* and *y)* of a figure after a rotation. I can describe the changes occurring to the coordinates(*x* and *y)* of a figure after a dilation	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.	Reflection Rotation Dilation
8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. (include examples both with and without coordinates)	I can explain how dilations can be used to prove two figures are similar. I can describe a sequence of transformations to show that two given figures are similar.	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. <u>Model with mathematics.</u>** 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.	Similar Transformation Translation Reflection Rotation Dilation

Unit Resources	Standards Covered	Approximate Days
Aaron's Designs MARS	8.G.2 8.G.3	1
Representing and Combining Transformations MARS	8.G.2 8.G.3	3
Identifying Similar Triangles MARS	8.G.4	3
How did they make Mrs. Pac-Man? Robert	8.G.1 8.G.2 8.G.3 8.G.4 G.SRT.2 G.CO.6	2

UNIT 6: SHAPE AND FORM Days 25

8.G.5, 8.G.6, 8.G.7, 8.G.8, 8.G.9

Enduring Understanding 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 Question for Unit:

- How does geometry better describe objects?

Clusters

- Understand congruence and similarity using physical models, transparencies, or geometry software.
- Understand and apply the Pythagorean Theorem.
- Solve real-world and mathematical problems involving volume or cylinders, cones, and spheres.

Standards	Clear Learning Targets	Mathematical Practices	Vocabulary
8.G.5 Use information arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*	I can prove that the sum of any triangle's interior angles will have that same measure as a straight line. I can prove that the sum of any polygon's exterior angles will be 360°. I can make conjectures regarding the relationships and measurements of the angles created when two parallel line are cut by a transversal. I can apply proven relationships (SAS, ASA, AAA) to justify similarity.	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. <u>Model with mathematics.</u>** 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express	Interior angles Exterior angles Parallel lines Transversal Similar

		regularity in repeated.	
8.G.6 Analyze and justify an informal proof of the Pythagorean Theorem and its converse.	I can use visual models to demonstrate the relationship of three side lengths of any right triangle. I can use algebraic reasoning to relate the visual model to the Pythagorean Theorem. I can use the Pythagorean Theorem to determine if a given triangle is a right triangle.	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. <u>Model with mathematics.</u>** 5. Use appropriate tools strategically. 6. Attend to precision. **7. <u>Look for and make use of structure.</u>** 8. Look for and express regularity in repeated.	Pythagorean Theorem Leg Hypotenuse Converse
8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	I can apply the Pythagorean Theorem to find an unknown side length of a right triangle. I can draw a diagram and use the Pythagorean Theorem to solve real-world problems involving right triangles. I can draw a diagram to find right triangles in a three-dimensional figure and use the Pythagorean Theorem to calculate various dimensions.	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. <u>Model with mathematics.</u>** 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of	Pythagorean Theorem Leg Hypotenuse

		structure. 8. Look for and express regularity in repeated.	
8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	I can connect any two points on a coordinate grid to a third point so that the three points form a right triangle. I can use the right triangle and Pythagorean Theorem to find the distance between the original two points.	1. Make sense of problems and persevere in solving them. **2. <u>Reason abstractly and quantitatively.</u>** 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.	Pythagorean Theorem Leg Hypotenuse
8.G.9 Solve real-world and mathematical problems for the volumes of cones, cylinders, and spheres.	I can describe the similarity between finding the volume of a cylinder and the volume of a right prism. I can recall the formula to find the volume of a cylinder. I can informally prove the relationship between the volume of a cylinder and the volume of a cone with the same base.	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. <u>Model with mathematics.</u>** 5. Use appropriate tools strategically.	Cylinder Cone Sphere Volume

	I can informally prove the relationship between the volume of a sphere and the volume of a circumscribed cylinder. I can use the formulas to find the volume of cylinders, cones, and spheres. I can solve real-world problems involving the volume of cylinders, cones, and spheres.	6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated.	
Unit Resources		Standards Covered	Approximate Days
Jane's TV MARS		8.G.6 8.G.7 8.G.8	1
The Pythagorean Theorem: Square Areas MARS		8.G.6 8.G.7 8.G.8	3
Watson Save Yummy Math		8.G.8	1
Taco Cart Dan		8.G.7 F.IF.4	2
Largest Cup of Coffee Ever Yummymath		8.G.9	1
Modeling: Making Matchsticks MARS		8.G.9	3
Area Contractor NCTM		8.G.8 8.G.9	2
Amazing Watermelons John		8.G.9	1

Spaceballs & Megamaid Geoff	8.G.9	2

PROJECT Days 5

Unit Resources	Standards Covered	Approximate Days
Remodel Sarah		5

UNIT 7: BIVARIATE DATA Days 15
8.SP.1, 8.SP.2, 8.SP.3, 8.SP.4

Enduring Understanding for Unit:

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

Essential Question for Unit:

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

Clusters:

- Investigate patterns of association in bivariate data.

Standards	Clear Learning Targets	Mathematical Practices	Vocabulary
8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. (GAISE Model, steps 3 and 4)	I can plot ordered pairs on a coordinate grid representing the relationship between two data sets. I can describe patterns in the plotted points as clustering, outliers, positive or negative association, and linear or nonlinear association and describe the pattern in the context of the measurement data.	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. <u>Model with mathematics.</u>** 5. Use appropriate tools strategically.	Scatter plot Bivariate Clustering Outliers Positive association Negative association

	I can interpret the patterns of association in the context of the data sample.	6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated.	Linear association Nonlinear association
8.SP.2 Understand that straight lines are widely used to model relationships between two variables. For scatter plots that suggest a linear association, informally for a straight line, and informally assess the model fit by judging the closeness of the data points to the line. (GAISE Model, steps 3 and 4)	I can recognize whether or not data plotted on a scatter plot have a linear association. I can draw a straight trend line to approximate the linear relationship between the plotted points of two data sets. I can make inferences regarding the reliability of the trend line by noting the closeness of the data points to the line.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. **3. <u>Construct viable arguments and critique the reasoning of others.</u>** 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.	Scatter plot Linear association Trend line Line of best fit
8.SP.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an*	I can determine the equation of the trend line that approximates the linear relationship between the plotted points of two data sets. I can interpret the y-intercept of the equation in the context of the collected data.	1. Make sense of problems and persevere in solving them. **2. <u>Reason abstractly and quantitatively.</u>** 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics.	Linear model Bivariate Slope y-intercpet trend line

additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height. (GAISE Model, steps 3 and 4)	I can interpret the slope of the equation in the context of the collected data. I can use the equation of the trend line to summarize the given data and make predictions regarding additional data points.	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.	line of best fit
8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*	I can create a two-way table to record the frequencies of bivariate categorical values. I can determine the relative frequencies for rows and/or columns of a two-way table. I can use the relative frequencies and context of the problem to describe possible associations between the two sets of data.	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. **3. <u>Construct viable arguments and critique the reasoning of others.</u>** 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.	Bivariate Categorical data Two-way table Frequency Relative frequency
Unit Resources		Standards Covered	Approximate Days
Opening Day Yummymath		8.SP.1 8.SP.2	1

	8.SP.3 7.SP	
Hand Span and Height Illustrative Mathematics	8.SP.1	1
Birds Eggs MARS	8.SP.1	2
Texting and Grades Illustrative Mathematics	8.SP.1	2
Exploring Linear Data NCTM	8.SP.1 8.SP.2	1
U.S. Airports Illustrative Mathematics	8.SP.3	2
Music and Sports Illustrative Mathematics	8.SP.4	2
What's your favorite subject? Illustrative Mathematics	8.SP.4	1
Scatter Diagram MARS	8.SP.1 8.SP.2 8.SP.3 8.SP.4	2

UNIT 8: PATTERNS AND FORMULAS Days 15

8.F, 7.G.1, 8.G, 8.SP, 8.EE

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.
- The characteristics of functions and their representations are useful in making sense of patterns and solving problems involving 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.
- The rules of probability can lead to more valid and reliable predictions about the likelihood of an event occurring.

Essential Questions for Unit:

- How can algebraic expressions and equations be used to model, analyze, and solve mathematical situations?
- How are functions useful?
- How does geometry better describe objects?
- How is probability used to make informed decisions about uncertain events?

Clusters	Clear Learning Targets	Mathematical Practices	Vocabulary
8.F Define, evaluate, and compare functions. Use functions to model relationships between quantities.		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.	
8.G Understand congruence and similarity using physical models, transparencies, or geometric software. Understand and apply the Pythagorean Theorem. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.		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	
8.SP Investigate patterns of association in bivariate data.		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	
8.EE Work with radicals and integer exponents. Understand the connections between proportional relationships, lines, and linear equations. Analyze and solve linear equations and pairs of simultaneous linear equations.		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	
Unit Resources		Standards Covered	Approximate Days
Adjacent Circles NCTM		8.EE	1
Do You Notice Sum-Thing? NCTM		8.EE	1
Follow the Diagonal! Kate		8.F 8.G 8.EE	1

Adding it all up NCTM	8.F 8.G 8.EE	1
A Lunch-in Affair NCTM	8.EE	1
One Grain of Rice NCTM	8.EE 8.F	1
Printing Books NCTM	8.EE 8.SP	1
How sharp is the iPhone's retina display? Robert	8.G.7 G.SRT.8 G.GPE.7	1
Gumball profits Robert	8.G.9 7.SP.6 5.MD.3 5.MD.4 5.MD.5	2
Expressions & Equations NYC Department of Education	7.RP.2 7.RP.2a 8.EE.5 8.EE.6 8.EE.7 8.EE.8 8.F.1 8.F.4	

MODELING UNIT Days 3

Resources	Standards Covered	Approximate Days

Resources used to create 8th Grade Mathematics Course of Study

"The Common Core: Clarifying Expectations for Teachers & Students." *MATH Grade 8*. Worthington: 2011. <http://www.qualityinstruction.org>.

Common Core State Standards: Mathematics

Emergent Math

Standards for Mathematical Practices Progression through Grade Levels