Grade Eight Mathematics

Domain	***The Number System***	
Cluster	***Know that there are numbers that are not rational, and approximate them by rational numbers.***	**Pacing** **1st Quarter**

Standards

1. ***Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.***

   Learning Targets:
   - I can identify and apply various algebraic properties (1-1, 1-2, 2-7, 2-8) (associative, commutative, identity, and inverse).
   - I can write an algebraic expression using variables to describe patterns (1-2, 1-3).
   - I can determine if algebraic expressions are equivalent (1-3, 2-5).
   - I can identify numbers and classify them within the real-number system (1-4).
   - I can apply the distributive property to do mental math (2-1).
   - I can simplify expressions using the distributive property and combining like terms (2-1).
   - I can represent real-life scenarios using algebraic expressions and equations (2-8).
   - I can make and/or interpret a table or graph in order to find the solution to an equation (3-1, 3-2, 4-3).
   - I can write equations to represent and solve real-world situations (3-2, 3-3, 3-5, 4-3, 4-4).

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., √2).***
   For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.

Content Elaborations

Standards of Mathematical Practice

Mathematically proficient students:

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.

From the K-8 Math Standards Progression.

Examples of Key Advances from Grade 7 to Grade 8

- Students build on previous work with proportional relationships, unit rates, and graphing to connect these ideas and understand that the points (x, y) on a nonvertical line are the solutions of the equation y = mx + b, where m is the slope of the line as well as the unit rate of a proportional relationship (in the case b = 0). Students also formalize their previous work with linear relationships by working with functions – rules that assign to each input exactly one output.
- By working with equations such as x2 = 2 and in geometric contexts such as the Pythagorean theorem, students enlarge their concept of number beyond the system of rationals to include irrational numbers. They represent these numbers with radical expressions and approximate these numbers with rationals.

Fluency Expectations or Examples of Culminating Standards

8.EE.7 Students have been working informally with one-variable linear

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Learning Targets:

- I can use reasoning to determine between which two consecutive integers a square root will fall.
- I can plot the estimated value of an irrational number on a number line.
- 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.

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equations since as early as kindergarten. This important line of development culminates in grade 8 with the solution of general one-variable linear equations, including cases with infinitely many solutions or no solutions as well as cases requiring algebraic manipulation using properties of operations. Coefficients and constants in these equations may be any rational numbers.

8.G.9 When students learn to solve problems involving volumes of cones, cylinders, and spheres – together with their previous grade 7 work in angle measure, area, surface area, and volume (7.G.4-6) – they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.3), can be combined and used in flexible ways as part of modeling during high school – not to mention after high school for college and careers.

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Content Vocabulary

- rational number
- irrational number

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Academic Vocabulary

- simplify
- identify
- interpret

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Formative Assessments

- performance tasks
- pretests
- interviews
- quizzes

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Summative Assessments

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- PARCC

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- PARCC Model Content Frameworks

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Enrichment Strategies

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Integrations

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Intervention Strategies

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Grade Eight Mathematics

Domain ***Expressions and Equations***

Cluster ***Work with radicals and integer exponents.***

Pacing

1st Quarter

Standards

1. ***Know and apply the properties of integer exponents to generate equivalent numerical expressions.***
   For example, 32 x 3-5 = 3-3 = 1/33 = 1/27.

   Learning Targets:
   - 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.

2. ***Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.***

   Learning Targets:
   - I can recognize that taking a square root of a number is the inverse of squaring a number.
   - I can recognize that taking a cube root of a number is 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.

3. ***Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.***
   For example, estimate the population of the United States as 3 x 108 and the population of the world as 7 x 109, and determine that the world population is more than 20 times larger.

Content Elaborations

Standards of Mathematical Practice

Mathematically proficient students:

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.

From the K-8 Math Standards Progression.

Examples of Key Advances from Grade 7 to Grade 8

- Students build on previous work with proportional relationships, unit rates, and graphing to connect these ideas and understand that the points (x, y) on a nonvertical line are the solutions of the equation y = mx + b, where m is the slope of the line as well as the unit rate of a proportional relationship (in the case b = 0). Students also formalize their previous work with linear relationships by working with functions – rules that assign to each input exactly one output.
- By working with equations such as x2 = 2 and in geometric contexts such as the Pythagorean theorem, students enlarge their concept of number beyond the system of rationals to include irrational numbers. They represent these numbers with radical expressions and approximate these numbers with rationals.

Fluency Expectations or Examples of Culminating Standards

8.EE.7 Students have been working informally with one-variable linear equations since as early as kindergarten. This important line of

Learning Targets:

- I can estimate large and small numbers using scientific notation.
- I can compare quantities that are written in scientific notation without using technology.

4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

Learning Targets:

- I can add and subtract two numbers written in scientific notation.
- I can multiply and divide two numbers written in scientific notation.
- I can choose an appropriate unit for measurements dealing with scientific notation.
- I can understand scientific notation represented on various types of technology; i.e., calculators and computer software.

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8.G.9 When students learn to solve problems involving volumes of cones, cylinders, and spheres – together with their previous grade 7 work in angle measure, area, surface area, and volume (7.G.4-6) – they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.3), can be combined and used in flexible ways as part of modeling during high school – not to mention after high school for college and careers.

Content Vocabulary

- integer
- exponent
- cube
- square
- square root
- radical
- perfect square
- perfect cube
- irrational
- power of ten
- scientific notation

Academic Vocabulary

- evaluate

Formative Assessments

- performance tasks
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- interviews
- quizzes

Summative Assessments

- Teacher created assessments
- PARCC

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- PARCC Model Content Frameworks

Enrichment Strategies

Integrations	**Intervention Strategies**

Grade Eight Mathematics

Domain	***Expressions and Equations***	
Cluster	***Understand the connections between proportional relationships, lines, and linear equations.***	**Pacing** **2nd Quarter**
Standards		**Content Elaborations**
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.* **Learning Targets:** • I can graph a proportional relationship on 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). • I can use a graph, a table, or an equation to determine the unit rate of a proportional relationship and use the unit rate to make comparisons. ***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.*** **Learning Targets:** • 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 will represent the graph	**Standards of Mathematical Practice** ***Mathematically proficient students:*** 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. **From the K-8 Math Standards Progression.** **<u>Examples of Key Advances from Grade 7 to Grade 8</u>** • Students build on previous work with proportional relationships, unit rates, and graphing to connect these ideas and understand that the points (x, y) on a nonvertical line are the solutions of the equation y = mx + b, where m is the slope of the line as well as the unit rate of a proportional relationship (in the case b = 0). Students also formalize their previous work with linear relationships by working with functions – rules that assign to each input exactly one output. • By working with equations such as x2 = 2 and in geometric contexts such as the Pythagorean theorem, students enlarge their concept of number beyond the system of rationals to include irrational numbers. They represent these numbers with radical expressions and approximate these numbers with rationals. **<u>Fluency Expectations or Examples of Culminating Standards</u>** **8.EE.7** Students have been working informally with one-variable linear

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• I can justify that an equation in the form of y = mx + b represents the graph of a linear relationship with a slope of m and a y-intercept of b.</td>
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8.G.9 When students learn to solve problems involving volumes of cones, cylinders, and spheres – together with their previous grade 7 work in angle measure, area, surface area, and volume (7.G.4-6) – they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.3), can be combined and used in flexible ways as part of modeling during high school – not to mention after high school for college and careers.</td>
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• proportional relationship
• unit rate
• slope
• right triangle
• leg
• hypotenuse
• similar triangles
• ratio
• slope
• proportional relationship
• y-intercept</td>
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Grade Eight Mathematics

Domain	***Expressions and Equations***
Cluster	***Analyze and solve linear equations and pairs of simultaneous linear equations.***

Pacing

1st Quarter

Standards

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 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.

Learning Targets:

- I can solve linear equations and check my solutions (3-4, 3-4).
- I can solve equations by first clearing the fractions (3-8).
- I can solve equations that contain a variable on both sides of the problem (4-4).
- I can solve percent problems involving percent and change in percent (4-1).
- I can solve a formula for one of the variables (4-7).

8. Analyze and solve pairs of simultaneous linear equations.

a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.
For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.

c. Solve real-world and mathematical problems leading to two linear equations in two variables.

Content Elaborations

Standards of Mathematical Practice

Mathematically proficient students:

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.
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From the K-8 Math Standards Progression.

Examples of Key Advances from Grade 7 to Grade 8

- Students build on previous work with proportional relationships, unit rates, and graphing to connect these ideas and understand that the points (x, y) on a nonvertical line are the solutions of the equation y = mx + b, where m is the slope of the line as well as the unit rate of a proportional relationship (in the case b = 0). Students also formalize their previous work with linear relationships by working with functions – rules that assign to each input exactly one output.
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Fluency Expectations or Examples of Culminating Standards

8.EE.7 Students have been working informally with one-variable linear

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. **Learning Targets:** • I can solve systems of equations using graphing. • I can solve systems of equations using substitution. • I can solve systems of equations using elimination. • I can explain the meaning to the solutions of a system. • I can write systems of equations to represent and solve real-world situations.	equations since as early as kindergarten. This important line of development culminates in grade 8 with the solution of general one-variable linear equations, including cases with infinitely many solutions or no solutions as well as cases requiring algebraic manipulation using properties of operations. Coefficients and constants in these equations may be any rational numbers. **8.G.9** When students learn to solve problems involving volumes of cones, cylinders, and spheres – together with their previous grade 7 work in angle measure, area, surface area, and volume (7.G.4-6) – they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.3), can be combined and used in flexible ways as part of modeling during high school – not to mention after high school for college and careers.
Content Vocabulary • linear equation • equivalent equations • rational number • coefficient • like terms • solution • system of equations	**Academic Vocabulary**
Formative Assessments • performance tasks • pretests • interviews • quizzes	**Summative Assessments** • Teacher created assessments • PARCC
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Integrations	**Intervention Strategies**

Grade Eight Mathematics

Domain ***Functions***	
Cluster ***Define, evaluate, and compare functions.***	**Pacing** **3rd Quarter**
Standards	**Content Elaborations**

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.

Learning Targets:
- I can define what a function is.
- I can graph functions on the coordinate plane.

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.

Learning Targets:
- I can determine the properties of a function when it is written as an equation (slope, meaning of y-intercept, if it is linear or nonlinear, etc.).
- I can determine the properties of a function when it is given as a table.
- I can determine the properties of a function when it is given as a graph.
- I can determine the properties of a function when given a situation verbally.
- I can compare the properties of two functions that are represented in different forms.

3. Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.
For example, the function A = s2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4), and (3,9), which are not on a straight line.

Learning Targets:

Standards of Mathematical Practice

Mathematically proficient students:
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
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Examples of Key Advances from Grade 7 to Grade 8

- Students build on previous work with proportional relationships, unit rates, and graphing to connect these ideas and understand that the points (x, y) on a nonvertical line are the solutions of the equation y = mx + b, where m is the slope of the line as well as the unit rate of a proportional relationship (in the case b = 0). Students also formalize their previous work with linear relationships by working with functions – rules that assign to each input exactly one output.
- By working with equations such as x2 = 2 and in geometric contexts such as the Pythagorean theorem, students enlarge their concept of number beyond the system of rationals to include irrational numbers. They represent these numbers with radical expressions and approximate these numbers with rationals.

Fluency Expectations or Examples of Culminating Standards

8.EE.7 Students have been working informally with one-variable linear equations since as early as kindergarten. This important line of

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- I can explain why the equation 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 nonlinear functions.
- I can analyze the rates of change between input and output values to determine if a function is linear or nonlinear.
- I can create a table of values that can be defined as a nonlinear function.

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Content Vocabulary

- fraction
- input
- output
- function
- linear function
- rate of change

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Academic Vocabulary

- analyze
- interpret
- determine
- compare

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Grade Eight Mathematics

Domain *Functions*	
Cluster *Use functions to model relationships between quantities.*	**Pacing** **3rd Quarter**
Standards ***4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.*** **Learning Targets:** • I can describe slope and its properties. • I can calculate slope. • I can graph linear equations by using slope and the y-intercept. • I can write equations for a line in slope-intercept form. • I can write equations to represent and solve real-world situations. • I can write equations for a line in standard form or slope-intercept form. • I can write equations to represent and solve real-world situations. • I can graph linear equations by using slope and the y-intercept and the x- and y-intercepts. ***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.*** **Learning Targets:** • 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.	**Content Elaborations** **Standards of Mathematical Practice** ***Mathematically proficient students:*** 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. **From the K-8 Math Standards Progression.** **<u>Examples of Key Advances from Grade 7 to Grade 8</u>** • Students build on previous work with proportional relationships, unit rates, and graphing to connect these ideas and understand that the points (x, y) on a nonvertical line are the solutions of the equation y = mx + b, where m is the slope of the line as well as the unit rate of a proportional relationship (in the case b = 0). Students also formalize their previous work with linear relationships by working with functions – rules that assign to each input exactly one output. • By working with equations such as x2 = 2 and in geometric contexts such as the Pythagorean theorem, students enlarge their concept of number beyond the system of rationals to include irrational numbers. They represent these numbers with radical expressions and approximate these numbers with rationals. **<u>Fluency Expectations or Examples of Culminating Standards</u>** **8.EE.7** Students have been working informally with one-variable linear equations since as early as kindergarten. This important line of

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• rate of change
• increasing
• decreasing
• linear
• nonlinear</td><td>Academic Vocabulary
• construct
• describe</td></tr>
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Grade Eight Mathematics

Domain	***Geometry***	
Cluster	***Understand congruence and similarity using physical models, transparencies, or geometry software.***	**Pacing** **3rd Quarter**

Standards

1. ***Verify experimentally the properties of rotations, reflections, and translations.***
   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 parallel lines.

Learning Targets:

- I can verify—by measuring and comparing lengths, angle measures, and parallelism of a figure and its image—that after a figure has been translated, corresponding lines and line segments remain the same length, corresponding angles have the same measure, and corresponding parallel lines remain parallel.
- I can verify—by measuring and comparing lengths, angle measures, and parallelism of a figure and its image—that after a figure has been reflected corresponding lines and line segments remain the same length, corresponding angles have the same measure, and corresponding parallel lines remain parallel.
- I can verify—by measuring and comparing lengths, angle measures, and parallelism of a figure and its image—that after a figure has been rotated corresponding lines and line segments remain the same length, corresponding angles have the same measure, and corresponding parallel lines remain parallel.

2. ***Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.***

Learning Targets:

Content Elaborations

Standards of Mathematical Practice

Mathematically proficient students:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
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Fluency Expectations or Examples of Culminating Standards

8.EE.7 Students have been working informally with one-variable linear

- I can explain how transformations can be used to prove that two figures are congruent.
- I can perform a series of transformations (reflections, rotations, and/or translations) to prove or disprove that two given figures are congruent.

3. ***Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.***

Learning Targets:
- I can describe the changes occurring to the x- and y-coordinates of a figure after a translation.
- I can describe the changes occurring to the x- and y-coordinates of a figure after a reflection.
- I can describe the changes occurring to the x- and y-coordinates of a figure after a rotation.
- I can describe the changes occurring to the x- and y-coordinates of a figure after a dilation.

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.***

Learning Targets:
- I can explain how transformations can be used to prove that two figures are similar.
- I can describe a sequence of transformations to prove or disprove that two given figures are similar.

5. ***Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.***
For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

Learning Targets:
- I can informally prove that the sum of a triangle's interior angles will have the same measure as a straight angle (i.e., by tearing off the three

equations since as early as kindergarten. This important line of development culminates in grade 8 with the solution of general one-variable linear equations, including cases with infinitely many solutions or no solutions as well as cases requiring algebraic manipulation using properties of operations. Coefficients and constants in these equations may be any rational numbers.

8.G.9 When students learn to solve problems involving volumes of cones, cylinders, and spheres – together with their previous grade 7 work in angle measure, area, surface area, and volume (7.G.4-6) – they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.3), can be combined and used in flexible ways as part of modeling during high school – not to mention after high school for college and careers.

<table>
<tr>
<td>corners of a triangle and arranging them to form a 180° straight angle).
• I can informally prove that the sum of any polygon's exterior angles will be 360-degrees.
• I can make conjectures regarding the relationships and measurements of the angles created when two parallel lines are cut by a transversal.
• I can apply proven relationships to establish minimal properties to justify similarity.</td>
<td></td>
</tr>
<tr>
<td>Content Vocabulary
• transformation
• translation
• rotation
• reflection
• parallel line
• congruent
• dilation
• interior angle
• exterior angle
• parallel lines
• transversal</td>
<td>Academic Vocabulary
• informally prove
• apply
• verify</td>
</tr>
<tr>
<td>Formative Assessments
• performance tasks
• pretests
• interviews
• quizzes</td>
<td>Summative Assessments
• Teacher created assessments
• PARCC</td>
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<tr>
<td>Resources
• UCSMP Algebra, Geometry
• PARCC Model Content Frameworks</td>
<td>Enrichment Strategies</td>
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<tr>
<td>Integrations</td>
<td>Intervention Strategies</td>
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Grade Eight Mathematics

Domain	***Geometry***	
Cluster	***Understand and apply the Pythagorean Theorem.***	**Pacing** **3rd Quarter**
Standards ***6. Explain a proof of the Pythagorean Theorem and its converse.*** **Learning Targets:** • I can use visual models to demonstrate the relationship of the 3 sides 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. ***7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.*** **Learning Targets:** • I can use the Pythagorean Theorem to find the 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. ***8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.*** **Learning Targets:** • 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 the Pythagorean Theorem to find the distance between the original two points.	**Content Elaborations** **Standards of Mathematical Practice** ***Mathematically proficient students:*** 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. **From the K-8 Math Standards Progression.** **<u>Examples of Key Advances from Grade 7 to Grade 8</u>** • Students build on previous work with proportional relationships, unit rates, and graphing to connect these ideas and understand that the points (x, y) on a nonvertical line are the solutions of the equation y = mx + b, where m is the slope of the line as well as the unit rate of a proportional relationship (in the case b = 0). Students also formalize their previous work with linear relationships by working with functions – rules that assign to each input exactly one output. • By working with equations such as x2 = 2 and in geometric contexts such as the Pythagorean theorem, students enlarge their concept of number beyond the system of rationals to include irrational numbers. They represent these numbers with radical expressions and approximate these numbers with rationals. **<u>Fluency Expectations or Examples of Culminating Standards</u>** **8.EE.7** Students have been working informally with one-variable linear equations since as early as kindergarten. This important line of

	development culminates in grade 8 with the solution of general one-variable linear equations, including cases with infinitely many solutions or no solutions as well as cases requiring algebraic manipulation using properties of operations. Coefficients and constants in these equations may be any rational numbers. **8.G.9** When students learn to solve problems involving volumes of cones, cylinders, and spheres – together with their previous grade 7 work in angle measure, area, surface area, and volume (7.G.4-6) – they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.3), can be combined and used in flexible ways as part of modeling during high school – not to mention after high school for college and careers.
Content Vocabulary • Pythagorean Theorem • leg • hypotenuse • converse	**Academic Vocabulary** • connect • apply
Formative Assessments • performance tasks • pretests • interviews • quizzes	**Summative Assessments** • Teacher created assessments • PARCC
Resources • UCSMP Algebra, Geometry • PARCC Model Content Frameworks	**Enrichment Strategies**
Integrations	**Intervention Strategies**

Grade Eight Mathematics

Domain	***Geometry***	
Cluster	***Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.***	**Pacing** **3rd Quarter**
Standards ***9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve-real world and mathematical problems.*** **Learning Targets:** • I can informally prove the relationship between the volume of a cylinder and the volume of a cone with the same base. • I can recall the formula to find the volume of a cone. • I can informally prove the relationship between the volume of a sphere and the volume of a circumscribed cylinder. • I can recall the formula to find the volume of a sphere. • 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, spheres.	**Content Elaborations** **Standards of Mathematical Practice** ***Mathematically proficient students:*** 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. **From the K-8 Math Standards Progression.** **<u>Examples of Key Advances from Grade 7 to Grade 8</u>** • Students build on previous work with proportional relationships, unit rates, and graphing to connect these ideas and understand that the points (x, y) on a nonvertical line are the solutions of the equation y = mx + b, where m is the slope of the line as well as the unit rate of a proportional relationship (in the case b = 0). Students also formalize their previous work with linear relationships by working with functions – rules that assign to each input exactly one output. • By working with equations such as x2 = 2 and in geometric contexts such as the Pythagorean theorem, students enlarge their concept of number beyond the system of rationals to include irrational numbers. They represent these numbers with radical expressions and approximate these numbers with rationals. **<u>Fluency Expectations or Examples of Culminating Standards</u>** **8.EE.7** Students have been working informally with one-variable linear

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Content Vocabulary • cylinder • cone • sphere • volume	**Academic Vocabulary** • informally • prove • recall • solve
Formative Assessments • performance tasks • pretests • interviews • quizzes	**Summative Assessments** • Teacher created assessments
Resources • UCSMP Algebra, Geometry • PARCC Model Content Frameworks	**Enrichment Strategies**
Integrations	**Intervention Strategies**

Grade Eight Mathematics

Domain	***Statistics and Probability***
Cluster ***Investigate patterns of association in bivariate data.***	**Pacing** **4th Quarter**
Standards ***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.*** **Learning Targets:** • I can plot ordered pairs on a coordinate grid representing the relationship between two data sets. (K) • I can describe patterns in the plotted points such as clustering, outliers, positive or negative association, and linear or nonlinear association and describe the pattern in the context of the measurement data. (R) • I can interpret the patterns of association in the context of the data sample. (R) ***2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.*** **Learning Targets:** • I can recognize whether or not data plotted on a scatter plot have a linear association. (K) • I can draw a straight trend line to approximate the linear relationship between the plotted points of two data sets. (S) • I can make inferences regarding the reliability of the trend line by noting the closeness of the data points to the line. ***3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.*** *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is*	**Content Elaborations** **Standards of Mathematical Practice** ***Mathematically proficient students:*** 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. **From the K-8 Math Standards Progression.** **<u>Examples of Key Advances from Grade 7 to Grade 8</u>** • Students build on previous work with proportional relationships, unit rates, and graphing to connect these ideas and understand that the points (x, y) on a nonvertical line are the solutions of the equation y = mx + b, where m is the slope of the line as well as the unit rate of a proportional relationship (in the case b = 0). Students also formalize their previous work with linear relationships by working with functions – rules that assign to each input exactly one output. • By working with equations such as x2 = 2 and in geometric contexts such as the Pythagorean theorem, students enlarge their concept of number beyond the system of rationals to include irrational numbers. They represent these numbers with radical expressions and approximate these numbers with rationals. **<u>Fluency Expectations or Examples of Culminating Standards</u>** **8.EE.7** Students have been working informally with one-variable linear equations since as early as kindergarten. This important line of

associated with an additional 1.5 cm in mature plant height.

Learning Targets:

- I can draw a "best line of fit" on a scatterplot and write equations for real-world situations.

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?

Learning Targets:

- 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.

development culminates in grade 8 with the solution of general one-variable linear equations, including cases with infinitely many solutions or no solutions as well as cases requiring algebraic manipulation using properties of operations. Coefficients and constants in these equations may be any rational numbers.

8.G.9 When students learn to solve problems involving volumes of cones, cylinders, and spheres – together with their previous grade 7 work in angle measure, area, surface area, and volume (7.G.4-6) – they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.3), can be combined and used in flexible ways as part of modeling during high school – not to mention after high school for college and careers.

Content Vocabulary

- bivariate
- clustering
- outliers
- positive association
- negative association
- nonlinear association
- scatter plot
- linear association
- trend line
- linear model
- slope
- y-intercept
- line of best fit
- categorical data
- two-way table
- frequency
- relative frequency

Academic Vocabulary

- construct
- interpret

Formative Assessments

- performance tasks
- pretests

Summative Assessments

- Teacher created assessments
- PARCC

• interviews • quizzes	
Resources • UCSMP Algebra, Geometry • Websites • PARCC Model Content Frameworks	**Enrichment Strategies**
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