Eighth Grade - Mathematics

Kentucky Core Academic Standards with Targets

Student Friendly Targets

Anderson County Schools

Safe, Prepared, Responsible

College and Career Readiness Anchor Standards for Math

The 6-8 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to eight mathematical practices: 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, and 8) Look for express regularity in repeated reasoning.

Mathematics is divided into five domains: 1) The Number Systems (NS), 2) Expressions and Equations (EE), 3) Functions (F), 4) Geometry (G), and 5) Statistics and Probability (SP).

Development of Pacing Document

During the summer 2011, Anderson County teachers and administrators developed learning targets for each of the Kentucky Core Content Standards. In winter 2012, curriculum resource teachers verified the congruency of the standards and targets and recommended revisions. Teachers refined the work and began planning the development of common assessments to ensure students learn the intended curriculum. Anderson County Schools would like to thank each of our outstanding teachers and administrators who contributed to this important math curriculum project. Special thanks to Tom Cannon, Natalie Frasure, Gina Fultz, Tammy Gilkison, Sandy Hendry, Alex Hunter, Sharon Jackman, Steve Karsner, Janice Meredith, and Jim Tyler.

North Carolina State Board of Education created a most helpful document entitled "Common Core Instructional Support Tools - Unpacking Standards". The document answers the question "What do the standards mean that a student must know and be able to do?" The "unpacking" is included in our "What Does This Standard Mean?" section. The complete North Carolina document can be found at http://www.dpi.state.nc.us/docs/acre/standards/common-core-tools/unpacking/math/8th.pdf

Grade 8

Grade 8 Overview

The Number System (NS)
- Know that there are numbers that are not rational, and approximate them by rational numbers.

Expressions and Equations (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.

Functions (F)
- Define, evaluate, and compare functions.
- Use functions to model relationships between quantities.

Geometry (G)
- 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 of cylinders, cones and spheres.

Statistics and Probability (SP)
- Investigate patterns of association in bivariate data.

Mathematical Practices (MP)
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.

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; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

(1) 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 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 $m \cdot A$. 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.

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) 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 function are reflected in the different representations.

(3) 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 the angles in a triangle is the angle formed by a straight line, and that various configurations of 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.

Coding for Document

Domain

Grade Level

Standard Number

KY Core Academic Standard (KCAS)
Bold, 14 pt

1. **7.RP.3. Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.***

Target Type

Knowledge Targets:

☐ Recognize situations in which percentage proportional relationships apply.

I can recognize situations in which percentage proportional relationships apply.

I can convert between fraction, decimal and percent.

KDE Target
Regular, 12 pt

Reasoning Targets:

Level Standard is Assessed
Highlighted

☐ Apply proportional reasoning to solve multistep ratio and percent problems, e.g., simple interest, tax, markups, markdowns, gratuities, commissions, fees, percent increase and decrease, percent error, etc.

I can apply proportional reasoning to solve multistep ratio and percent problems, e.g., simple interest, tax, markups, markdowns, gratuities, commissions, fees, percent increase and decrease, percent error, etc.

I can find discount and sales price of merchandise.

I can find the subtotal and total cost of an item including the taxation.

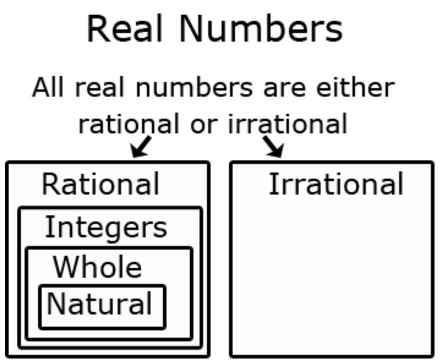
I can find sales commission calculated on merchandise.

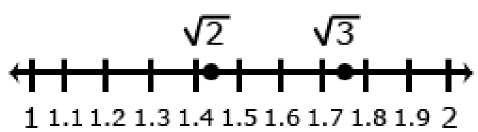
I can find percent increase and decrease.

AC Target
Bold, Italics, 12 pt

Anderson County Middle School

Math
Grade 8

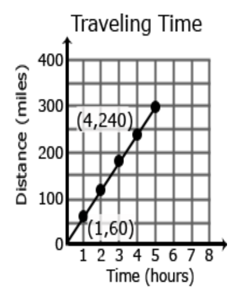
The Number System (NS) Know that there are numbers that are not rational, and approximate them by rational numbers.			
Kentucky Core Academic Standard	**ACT College Readiness Standard for EXPLORE**	**Common Core Mathematical Practice Standard**	**What Does This Standard Mean?**
8.NS.1. Know that numbers 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. **Knowledge Targets:** ☐ Define irrational numbers. ***I can define rational and irrational numbers.*** ***I can give examples of rational and irrational numbers.*** ☐ Show that the decimal expansion of rational numbers repeats eventually. ***I can show that the decimal expansion of rational numbers repeats eventually.*** ☐ Convert a decimal expansion which repeats eventually into a rational	**Numbers: Concepts and Properties:** -Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern identification, absolute value, primes, and greatest common factor.	8.MP.2. Reason abstractly and quantitatively. 8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure.	Students can use graphic organizers to show the relationship between the subsets of the real number system. 

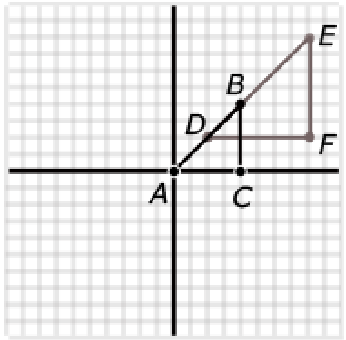
number. ***I can approximate (round) rational and irrational numbers.*** ☐ Show informally that every number has a decimal expansion. ***I can show expansion of a numbers.***			
8.NS.2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of √2, show that √2 is between 1and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.* **Knowledge Targets:** ☐ Approximate irrational numbers as rational numbers. ***I can approximate irrational numbers as rational numbers.*** ☐ Approximately locate irrational numbers on a number line. ***I can approximately locate irrational numbers on a number line.*** ☐ Estimate the value of expressions involving irrational numbers using rational approximations. (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.) ***I can approximate irrational expressions.*** **Reasoning Targets:** ☐ Compare the size of irrational numbers using rational approximations.	**Basic Operations and Applications:** -Solve some routine two-step arithmetic problems. -Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and computing with a given average. -Solve multistep arithmetic problems that involve planning or converting units of measure (e.g., feet per second to miles per hour). **Numbers: Concepts and Properties:** -Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern	8.MP.2. Reason abstractly and quantitatively. 8.MP.4. Model with mathematics. 8.MP.7. Look for and make use of structure. 8.MP.8. Look for and express regularity in repeated reasoning.	Students can approximate square roots by iterative processes. Examples: • Approximate the value of $\sqrt{5}$ to the nearest hundredth. Solution: Students start with a rough estimate based upon perfect squares. $\sqrt{5}$ falls between 2 and 3 because 5 falls between $2^2 = 4$ and $3^2 = 9$. The value will be closer to 2 than to 3. Students continue the iterative process with the tenths place value. $\sqrt{5}$ falls between 2.2 and 2.3 because 5 falls between $2.2^2 = 4.84$ and $2.3^2 = 5.29$. The value is closer to 2.2. Further iteration shows that the value of $\sqrt{5}$ is between 2.23 and 2.24 since 2.23^2 is 4.9729 and 2.24^2 is 5.0176. • Compare √2 and √3 by estimating their values, plotting them on a number line, and making comparative statements.  Solution: Statements for the comparison could include: √2 is approximately 0.3 less than √3 √2 is between the whole numbers 1 and 2 • √3 is between 1.7 and 1.8

I can approximate to compare the size of irrational numbers.	identification, absolute value, primes, and greatest common factor.		
Expressions and Equations (EE) Work with radicals and integer exponents.			
Kentucky Core Academic Standard	**ACT College Readiness Standard for EXPLORE**	**Common Core Mathematical Practice Standard**	**What Does This Standard Mean?**
8.EE.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.* **Knowledge Targets:** ☐ Explain the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$. ***I can explain the properties of integer exponents to generate equivalent numerical expressions.*** ☐ Apply the properties of integer exponents to produce equivalent numerical expressions. ***I can explain and apply the properties of integer exponents.***	**Numbers: Concepts and Properties:** -Work with scientific notation -Work problems involving positive integer exponents.	8.MP.2. Reason abstractly and quantitatively. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure.	Examples: • $\frac{4^3}{5^2} = \frac{64}{25}$ • $\frac{4^3}{4^7} = 4^{3-7} = 4^{-4} = \frac{1}{4^4} = \frac{1}{256}$ $\frac{4^{-3}}{5^2} = 4^{-3} \text{´} \frac{1}{5^2} = \frac{1}{4^3} \text{´} \frac{1}{5^2} = \frac{1}{64} \text{´} \frac{1}{25} = \frac{1}{16{,}000}$
8.EE.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	**Numbers: Concepts and Properties:** -Work with squares and square roots of numbers. -Work with cubes	8.MP.2. Reason abstractly and quantitatively. 8.MP.5. Use appropriate tools strategically.	Examples: • $3^2 = 9$ and $\sqrt{9} = \pm 3$ • $\left(\frac{1}{3}\right)^3 = \left(\frac{1^3}{3^3}\right) = \frac{1}{27}$ and $\sqrt[3]{\frac{1}{27}} = \frac{\sqrt[3]{1}}{\sqrt[3]{27}} = \frac{1}{3}$

small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. **Knowledge Targets:** ☐ 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. ***I can 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. ***I can evaluate square roots and cube roots.*** ☐ Evaluate cub roots of small perfect cubes. ***I can evaluate square roots and cube roots.*** ☐ Know that the square root of 2 is irrational. ***I can know that the square root of 2 is irrational.***	and cube roots of numbers.	8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure.	• Solve $x^2 = 9$ Solution: $x^2 = 9$ $\sqrt{x^2} = \pm\sqrt{9}$ $x = \pm 3$ • Solve $x^3 = 8$ Solution: $x^3 = 8$ $\sqrt[3]{x^3} = \sqrt[3]{8}$ $x = 2$
8.EE.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 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.*	**Numbers: Concepts and Properties:** -Work with scientific notation	8.MP.2. Reason abstractly and quantitatively. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to precision.	Example: $3 \times 10^{-5} < 2 \times 10^{6}$

Knowledge Targets: ☐ Express numbers as a single digit times an integer power of 10. ***I can express numbers as a single digit times an integer power of 10.*** ☐ Use scientific notation to estimate very large and/or very small quantities. ***I can express numbers in scientific notation.*** **Reasoning Targets:** ☐ Compare quantities to express how much larger one is compared to the other. ***I can compare numbers in scientific notation.***			
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 or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. **Knowledge Targets:** ☐ Perform operations using numbers expressed in scientific notations. ***I can multiply and divide numbers in scientific notation.*** ☐ Use scientific notation to express very large and very small quantities. ***I can use scientific notation to express very large and very small quantities.*** **Reasoning Targets:** ☐ Interpret scientific notation that has	**Basic Operations and Applications:** -Solve multistep arithmetic problems that involve planning or converting units of measure (e.g., feet per second to miles per hour). **Numbers: Concepts and Properties:** -Work with scientific notation .	8.MP.2. Reason abstractly and quantitatively. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to precision.	Students can convert decimal forms to scientific notation and apply rules of exponents to simplify expressions. In working with calculators or spreadsheets, it is important that students recognize scientific notation. Students should recognize that the output of 2.45E+23 is 2.45 x 10^{23} and 3.5E-4 is 3.5 x 10^{-4}. Students enter scientific notation using E or EE (scientific notation), * (multiplication), and ^ (exponent) symbols.

been generated by technology. ***I can interpret scientific notation using technology. (Underpinning target)*** ☐ Choose appropriate units of measure when using scientific notation. ***I can choose appropriate units of measure when using scientific notation. (Underpinning target)***			
Expressions and Equations (EE) Understand the connections between proportional relationships, lines, and linear equations Work with radicals and integer exponents.			
Kentucky Core Academic Standard	**ACT College Readiness Standard for EXPLORE**	**Common Core Mathematical Practice Standard**	**What Does This Standard Mean?**
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.* **Knowledge Targets:** ☐ Graph proportional relationships. ***I can graph proportional relationships.*** **Reasoning Targets:** ☐ 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 compare two different situations in***	**Graphical Representations:** -Locate points in the coordinate plane -Exhibit knowledge of slope -Match linear graphs with their equations.	8.MP.1. Make sense of problems and persevere in solving them. 8.MP.2. Reason abstractly and quantitatively. 8.MP.3. Construct viable arguments and critique the reasoning of others. 8.MP.4. Model with mathematics. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure. 8.MP.8. Look for and	Using graphs of experiences that are familiar to students increases accessibility and supports understanding and interpretation of proportional relationship. Students are expected to both sketch and interpret graphs. Example: • Compare the scenarios to determine which represents a greater speed. Include a description of each scenario including the unit rates in your explanation. Scenario 1:  Scenario 2: $y = 50x$ x is time in hours y is distance in miles

different ways. (equations, graphs, tables). ☐ Interpret the unit rate of proportional relationships as the slope of the graph. ***I can determine unit rate/slope from a graph.*** ***I can find the slope of a line.*** ***I can determine the y-intercept of a line.*** ***I can analyze patterns for points on a line through the origin.***		express regularity in repeated reasoning.	
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*. **Knowledge Targets:** ☐ Identify characteristics of similar triangles. ***I can identify characteristics of similar triangles.*** ☐ Find the slope of a line. ***I can find the slope of a line.*** ☐ Determine the y-intercept of a line. ***I can determine the y-intercept from a graph.*** (Interpreting unit rate as the slope of the graph is included in 8.EE.) **Reasoning Targets:** ☐ Analyze patterns for points on a line through the origin. ***I can analyze patterns for points on a line through the origin.***	**Graphical Representations:** -Match linear graphs with their equations.	8.MP.2. Reason abstractly and quantitatively. 8.MP.3. Construct viable arguments and critique the reasoning of others. 8.MP.4. Model with mathematics. 8.MP.5. Use appropriate tools strategically. 8.MP.7. Look for and make use of structure. **8.MP.8. Look for and express regularity in repeated reasoning.**	Example: • Explain why ΔACB is similar to ΔDFE, and deduce that $\overline{AB}$ has the same slope as $\overline{BE}$. Express each line as an equation. 

☐ Derive an equation of the form $y = mx$ for a line through the origin. ***I can formulate equations from a line on a graph.*** ☐ Analyze patterns for points on a line that do not pass through or include the origin. ***I can analyze patterns for points on a line that do not pass through or include the origin.*** ☐ Derive an equation of the form $y = mx + b$ for a line intercepting the vertical axis at b (the y-intercept). ***I can derive an equation of the form y = mx + b for a line intercepting the vertical axis at b (the y-intercept).*** ☐ 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. ***I can 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.***			

Expressions and Equations

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

Kentucky Core Academic Standard	ACT College Readiness Standard for EXPLORE	Common Core Mathematical Practice Standard	What Does This Standard Mean?
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,**	**Expressions, Equations, and Inequalities:** -Solve routine first-degree equations.	8.MP.2. Reason abstractly and quantitatively. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to precision. **8**.MP.7. Look for and	As students transform linear equations in one variable into simpler forms, they discover the equations can have one solution, infinitely many solutions, or no solutions. When the equation has one solution, the variable has one value that makes the equation true as in 12-4y=16. The only value for y that makes this equation true is -1. When the equation has infinitely many solutions, the equation is true for all real numbers as in 7x + 14 = 7 (x+2). As this equation is simplified, the variable terms cancel leaving 14 = 14 or 0 = 0.

until an equivalent equation of the form *x* = *a*, *a* = *a*, or *a* = *b* results (where *a* and *b* are different numbers). **Knowledge Targets:** ☐ Give examples of linear equations in one variable with one solution and show that the given example equation has one solution by successively transforming the equation into an equivalent equation of the form *x* = a. ***I can give examples of linear equations in one variable with one solution and show that the given example equation has one solution by successively transforming the equation into an equivalent equation of the form x = a.*** ☐ Give examples of linear equations in one variable with infinitely many solutions and show that the given example has infinitely many solutions by successively transforming the equation into an equivalent equation of the form *a* = *a.* ***I can give examples of linear equations in one variable with infinitely many solutions and show that the given example has infinitely many solutions by successively transforming the equation into an equivalent equation of the form a = a.*** ***I can solve linear equations with one variable (distributive property, variables on both sides, infinitely many, no solution.)*** ☐ Give examples of linear equations in one variable with no solution and show that the given example has no solution by successively transforming the		make use of structure.	Since the expressions are equivalent, the value for the two sides of the equation will be the same regardless which real number is used for the substitution. When an equation has no solutions it is also called an inconsistent equation. This is the case when the two expressions are not equivalent as in 5*x* - 2 = 5(*x*+1). When simplifying this equation, students will find that the solution appears to be two numbers that are not equal or -2 = 1. In this case, regardless which real number is used for the substitution, the equation is not true and therefore has no solution. Examples: • Solve for x: ○ $-3(x+7)=4$ ○ $3x-8=4x-8$ ○ $3(x+1)-5=3x-2$ • Solve: ○ $7(m-3)=7$ ○ $\frac{1}{4}-\frac{2}{3}y=\frac{3}{4}-\frac{1}{3}y$

equation into an equivalent equation of the form $b = a$, where a and b are different numbers. ***I can give examples of linear equations in one variable with no solution and show that the given example has no solution by successively transforming the equation into an equivalent equation of the form b = a, where a and b are different numbers***			
8.EE.7. Solve linear equations in one variable. **b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.** **Knowledge Targets:** ☐ Solve linear equations with rational number coefficients. ***I can solve linear equations with rational number coefficients.*** ☐ Solve equations whose solutions require expanding expressions using the distributive property and/or collecting like terms. ***I can solve linear equations with one variable (distributive property, variables on both sides, infinitely many, no solution.***	**Expressions, Equations, and Inequalities:** -Solve routine first-degree equations.	8.MP.2. Reason abstractly and quantitatively. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure.	As students transform linear equations in one variable into simpler forms, they discover the equations can have one solution, infinitely many solutions, or no solutions. When the equation has one solution, the variable has one value that makes the equation true as in 12-4y=16. The only value for y that makes this equation true is -1. When the equation has infinitely many solutions, the equation is true for all real numbers as in 7x + 14 = 7 (x+2). As this equation is simplified, the variable terms cancel leaving 14 = 14 or 0 = 0. Since the expressions are equivalent, the value for the two sides of the equation will be the same regardless which real number is used for the substitution. When an equation has no solutions it is also called an inconsistent equation. This is the case when the two expressions are not equivalent as in 5x - 2 = 5(x+1). When simplifying this equation, students will find that the solution appears to be two numbers that are not equal or -2 = 1. In this case, regardless which real number is used for the substitution, the equation is not true and therefore has no solution. Examples: • Solve for x: ○ $-3(x+7)=4$ ○ $3x-8=4x-8$ ○ $3(x+1)-5=3x-2$ • Solve:

<table>
<tr>
<td></td>
<td></td>
<td></td>
<td>
○ $7(m-3)=7$
○ $\frac{1}{4}-\frac{2}{3}y=\frac{3}{4}-\frac{1}{3}y$
</td>
</tr>
<tr>
<td>
8.EE.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.

Knowledge Targets:
☐ Identify the solution(s) to a system of two linear equations in two variables as the point(s) of intersection of their graphs.
I can identify the solution(s) to a system of two linear equations in two variables as the point(s) of intersection of their graphs. (Underpinning target)
☐ Describe the point(s) of intersection between two lines as points that satisfy both equations simultaneously.
I can describe the point(s) of intersection between two lines as points that satisfy both equations simultaneously.
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<td>
Expressions, Equations, and Inequalities:
-Find solutions to systems of linear equations.
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<td>
8.MP.1. Make sense of problems and persevere in solving them.

8.MP.2. Reason abstractly and quantitatively.

8.MP.3. Construct viable arguments and critique the reasoning of others.

8.MP.4. Model with mathematics.

8.MP.5. Use appropriate tools strategically.

8.MP.6. Attend to precision.

8.MP.7. Look for and make use of structure.

8.MP.8. Look for and express regularity in repeated reasoning.
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Systems of linear equations can also have one solution, infinitely many solutions or no solutions. Students will discover these cases as they graph systems of linear equations and solve them algebraically.

A system of linear equations whose graphs meet at one point (intersecting lines) has only one solution, the ordered pair representing the point of intersection. A system of linear equations whose graphs do not meet (parallel lines) has no solutions and the slopes of these lines are the same. A system of linear equations whose graphs are coincident (the same line) has infinitely many solutions, the set of ordered pairs representing all the points on the line.

By making connections between algebraic and graphical solutions and the context of the system of linear equations, students are able to make sense of their solutions. Students need opportunities to work with equations and context that include whole number and/or decimals/fractions.

Examples:
• Find x and y using elimination and then using substitution.
$3x + 4y = 7$
$-2x + 8y = 10$

• Plant A and Plant B are on different watering schedules. This affects their rate of growth. Compare the growth of the two plants to determine when their heights will be the same.
Let W = number of weeks
Let H = height of the plant after W weeks
<table>
<tr><th colspan="3">Plant A</th></tr>
<tr><td>W</td><td>H</td><td></td></tr>
<tr><td>0</td><td>4</td><td>(0,4)</td></tr>
<tr><td>1</td><td>6</td><td>(1,6)</td></tr>
<tr><td>2</td><td>8</td><td>(2,8)</td></tr>
</table>
<table>
<tr><th colspan="3">Plant B</th></tr>
<tr><td>W</td><td>H</td><td></td></tr>
<tr><td>0</td><td>2</td><td>(0,2)</td></tr>
<tr><td>1</td><td>6</td><td>(1,6)</td></tr>
<tr><td>2</td><td>10</td><td>(2,10)</td></tr>
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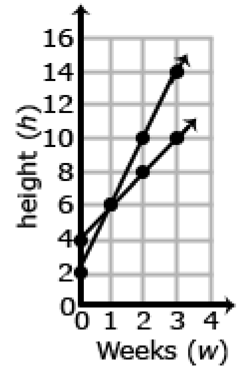
<table><tr><td>3</td><td>10</td><td>(3,10)</td></tr></table>
<table><tr><td>3</td><td>14</td><td>(3,14)</td></tr></table>
Continued on next page

Given each set of coordinates, graph their corresponding lines.
Solution:


Write an equation that represent the growth rate of Plant A and Plant B.

Solution:

Plant A $H = 2W + 4$
Plant B $H = 4W + 2$
At which week will the plants have the same height?

Solution:
The plants have the same height after one week.
Plant A: $H = 2W + 4$ Plant B: $H = 4W + 2$
Plant A: $H = 2(1) + 4$ Plant B: $H = 4(1) + 2$
Plant A: $H = 6$ Plant B: $H = 6$
After one week, the height of Plant A and Plant B are both 6 inches.

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<tr>
<td>8.EE.8. Analyze and solve pairs of simultaneous linear equations.</td>
<td>Expressions, Equations, and</td>
<td></td>
<td></td>
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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.** ***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.*** **Knowledge Targets:** ☐ Define inspection. ***I can define inspection. (Underpinning target)*** ☐ Identify cases in which a system of two equations in two unknowns has no solution. ***I can identify cases in which a system of two equations in two unknowns has no solution. (Underpinning target)*** ☐ Identify cases in which a system of two equations in two unknowns has an infinite number of solutions. ***I can identify cases in which a system of two equations in two unknowns has an infinite number of solutions.*** ***I can solve systems of equations by graphing.*** ☐ Solve a system of two equations (linear) in two unknowns algebraically.	**Inequalities:** -Find solutions to systems of linear equations.		

I can solve a system of two equations (linear) in two unknowns algebraically. ***I can solve systems of equations by addition/subtraction.*** ☐ Solve simple cases of systems of two linear equations in two variables by inspection. ***I can solve simple cases of systems of two linear equations in two variables by inspection.*** ***I can solve systems of equations by multiplication.*** **Reasoning Targets:** ☐ Estimate the point(s) of intersection for a system of two equations in two unknowns by graphing the equations. ***I can estimate the point(s) of intersection for a system of two equations in two unknowns by graphing the equations.***			
Functions (F) Define, evaluate, and compare functions.			
Kentucky Core Academic Standard	**ACT College Readiness Standard for EXPLORE**	**Common Core Mathematical Practice Standard**	**What Does This Standard Mean?**
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.) **Knowledge Targets:**	**Graphical Representations:** -Locate points in the coordinate plane.	8.MP.2. Reason abstractly and quantitatively. 8.MP.6. Attend to precision.	For example, the rule that takes x as input and gives x^2+5x+4 as output is a function. Using y to stand for the output we can represent this function with the equation $y = x^2+5x+4$, and the graph of the equation is the graph of the function. Students are not yet expected use function notation such as $f(x) = x^2+5x+4$.

☐ Define inspection. ***I can define inspection. (See systems)*** ☐ Identify cases in which a system of two equations in two unknowns has no solution. ***I can identify cases in which a system of two equations in two unknowns has no solution. (see systems)*** ☐ Identify cases in which a system of two equations in two unknowns has an infinite number of solutions. ***I can identify cases in which a system of two equations in two unknowns has an infinite number of solutions. (See systems)*** ☐ Solve a system of two equations (linear) in two unknowns algebraically. ***I can solve a system of two equations (linear) in two unknowns algebraically. (See systems)*** ☐ Solve simple cases of systems of two linear equations in two variables by inspection. ***I can solve simple cases of systems of two linear equations in two variables by inspection. (See systems)*** **Reasoning Targets:** ☐ Estimate the point(s) of intersection for a system of two equations in two unknowns by graphing the equations. ***I can estimate the point(s) of intersection for a system of two equations in two unknowns by graphing the equations. (see systems)***			
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***	**Graphical Representations:** -Locate points in the coordinate plane.	8.MP.1. Make sense of problems and persevere in solving them. 8.MP.2. Reason abstractly and quantitatively.	Examples: • Compare the two linear functions listed below and determine which equation represents a greater rate of change.

by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.

Knowledge Targets:

- ☐ Identify functions algebraically including slope and y-intercept.

  I can identify slope and y-intercept from a table and equation.
- ☐ Identify functions using a graph.

  I can identify functions using a graph.
- ☐ Identify functions using tables.

  I can identify functions represented algebraically, graphically and numerically.
- ☐ Identify functions using verbal descriptions.

  I can identify functions using verbal descriptions.

Reasoning Targets:

- ☐ Compare and contrast 2 functions with different representations.

  I can compare and contrast 2 functions with different representations. (see 8.EE.5)
- ☐ Draw conclusions based on different representations of functions.

  I can draw conclusions based on different representations of functions (see 8.EE.5).

8.MP.3. Construct viable arguments and critique the reasoning of others.

8.MP.4. Model with mathematics.

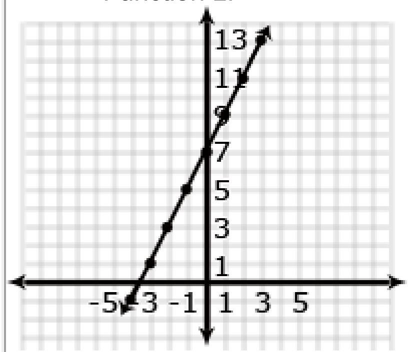
8.MP.5. Use appropriate tools strategically.

8.MP.6. Attend to precision.

8.MP.7. Look for and make use of structure.

8.MP.8. Look for and express regularity in repeated reasoning.

Function 1:



Function 2:

The function whose input x and output y are related by

$y = 3x + 7$

- Compare the two linear functions listed below and determine which has a negative slope.

Function 1: Gift Card
Samantha starts with $20 on a gift card for the book store. She spends $3.50 per week to buy a magazine. Let y be the amount remaining as a function of the number of weeks, *x*.

x	*y*
0	20
1	16.50
2	13.00
3	9.50
4	6.00

Function 2:
The school bookstore rents graphing calculators for $5 per month. It also collects a non-refundable fee of $10.00 for the school year. Write the rule for the total cost (c) of renting a calculator as a function of the number of months (*m*).

			Solution: Function 1 is an example of a function whose graph has negative slope. Samantha starts with $20 and spends money each week. The amount of money left on the gift card decreases each week. The graph has a negative slope of -3.5, which is the amount the gift card balance decreases with Samantha's weekly magazine purchase. Function 2 is an example of a function whose graph has positive slope. Students pay a yearly nonrefundable fee for renting the calculator and pay $5 for each month they rent the calculator. This function has a positive slope of 5 which is the amount of the monthly rental fee. An equation for Example 2 could be $c = 5m + 10$.
8.F.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 $A = s^2$ 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.* **Knowledge Targets:** ☐ Recognize that a linear function is graphed as a straight line. ***I can recognize that a linear function is graphed as a straight line.*** ☐ Recognize the equation $y = mx + b$ is the equation of a function whose graph is a straight line where m is the slope and b is the y-intercept. ***I can recognize the equation y = mx + b is the equation of a function whose graph is a straight line where m is the slope and b is the y-intercept.*** ☐ Provide examples of nonlinear functions using multiple representations. ***I can provide examples of nonlinear functions using multiple***	**Graphical Representations:** -Determine the slope of a line from points or equations. -Match linear graphs with their equations. -Interpret and use information from graphs in the coordinate plane.	8.MP.2. Reason abstractly and quantitatively. 8.MP.4. Model with mathematics. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure.	Example: • Determine which of the functions listed below are linear and which are not linear and explain your reasoning. ○ $y = -2x^2 + 3$ non linear ○ $y = 2x$ linear ○ $A = \pi r^2$ non linear ○ $y = 0.25 + 0.5(x - 2)$ linear

<table>
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<td>representations.
I can provide examples of linear and nonlinear functions/equations.
Reasoning Targets:
☐ Compare the characteristics of linear and nonlinear functions using various representations.
I can compare the characteristics of linear and nonlinear functions using various representations. (covered in 8.EE.5)</td>
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<td colspan="4">Functions (F)
Use functions to model relationships between quantities.</td>
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<th>Kentucky Core Academic Standard</th>
<th>ACT College Readiness Standard for EXPLORE</th>
<th>Common Core Mathematical Practice Standard</th>
<th>What Does This Standard Mean?</th>
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<td>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 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.

Knowledge Targets:
☐ Recognize that slope is determined by the constant rate of change.
I can construct a graph from a table.
☐ Recognize that the y-intercept is the initial value where x = 0.
I can construct a table given a function.</td>
<td>Expressions, Equations, and Equations:
-Solve real-world problems using first-degree equations.
-write expressions, equations or inequalities with a single variable for common pre-algebra settings (e.g., rate and distance problems and problems that can be solve by using proportions)

Graphical Representations:
-Determine the</td>
<td>8.MP.1. Make sense of problems and persevere in solving them.

8.MP.2. Reason abstractly and quantitatively.

8.MP.3. Construct viable arguments and critique the reasoning of others.

8.MP.4. Model with mathematics.

8.MP.5. Use appropriate tools strategically.

8.MP.6. Attend to precision.

8.MP.7. Look for and</td>
<td>Examples:
• The table below shows the cost of renting a car. The company charges $45 a day for the car as well as charging a one-time $25 fee for the car's navigation system (GPS).Write an expression for the cost in dollars, c, as a function of the number of days, d.

Students might write the equation c = 45d + 25 using the verbal description or by first making a table.

<table><tr><td>Days (d)</td><td>Cost (c) in dollars</td></tr><tr><td>1</td><td>70</td></tr><tr><td>2</td><td>115</td></tr><tr><td>3</td><td>160</td></tr><tr><td>4</td><td>205</td></tr></table>
Students should recognize that the rate of change is 45 (the cost of renting the car) and that initial cost (the first day charge) also includes paying for the navigation system. Classroom discussion about one time fees vs. recurrent fees will help students model contextual situations.</td>
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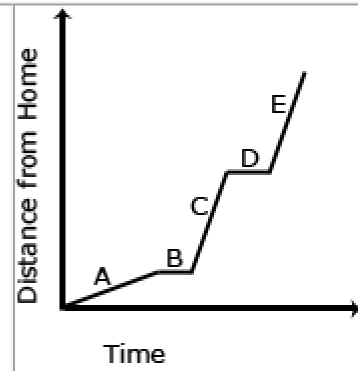
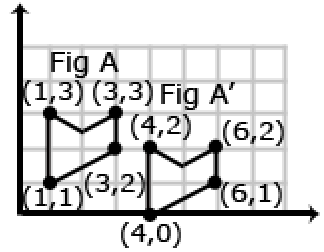
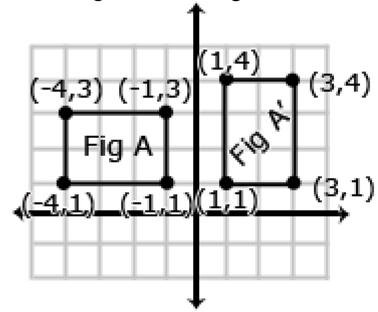
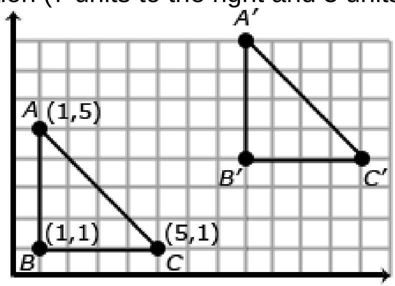
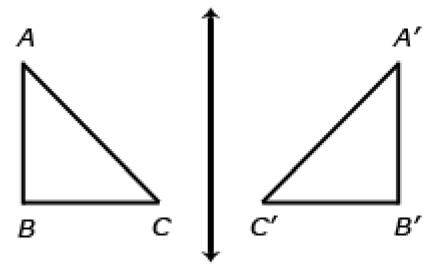
</table>

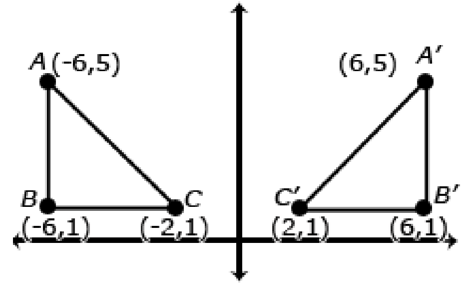
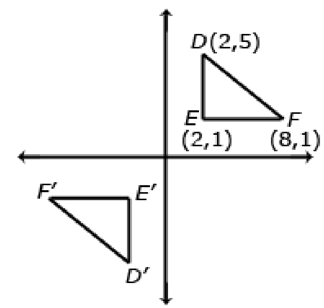
☐ Determine the rate of change from two (x,y) values, a verbal description, values in a table, or graph. ***I can contstruct a table given a function*** ☐ Determine the initial value from two (x,y) values, a verbal description, values in a table, or graph. ***I can construct a table from a graph.*** **Reasoning Targets:** ☐ Construct a function to model a linear relationship between two quantities. ***I can construct a function to model a linear relationship between two quantities.*** ☐ Relate the rate of change and initial value to real world quantities in a linear function in terms of the situation modeled and in terms of its graph or a table of values. ***I can relate the rate of change and initial value to real world quantities in a linear function in terms of the situation modeled and in terms of its graph or a table of values.***	slope of a line from points or equations. -Match linear graphs with their equations. -Interpret and use information from graphs in the coordinate plane.	make use of structure. 8.MP.8. Look for and express regularity in repeated reasoning.	• When scuba divers come back to the surface of the water, they need to be careful not to ascend too quickly. Divers should not come to the surface more quickly than a rate of 0.75 ft per second. If the divers start at a depth of 100 feet, the equation $d = 0.75t – 100$ shows the relationship between the time of the ascent in seconds (*t*) and the distance from the surface in feet (*d*). ○ Will they be at the surface in 5 minutes? How long will it take the divers to surface from their dive? Make a table of values showing several times and the corresponding distance of the divers from the surface. Explain what your table shows. How do the values in the table relate to your equation?
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. **Knowledge Targets:** ☐ Analyze a graph and describe the functional relationship between two quantities using the qualities of the graph.	**Graphical Representations:** -Interpret and use information from graphs in the coordinate plane.	8.MP.2. Reason abstractly and quantitatively. 8.MP.3. Construct viable arguments and critique the reasoning of others. 8.MP.4. Model with mathematics. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to precision.	Example: • The graph below shows a student's trip to school. This student walks to his friend's house and, together, they ride a bus to school. The bus stops once before arriving at school. Describe how each part A-E of the graph relates to the story.

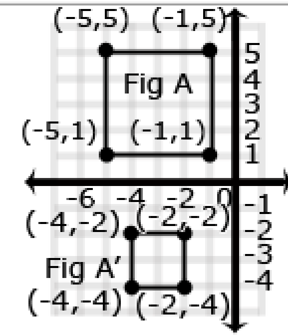
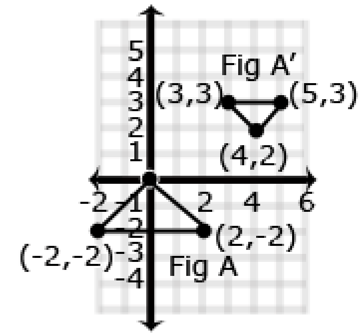
I can analyze a graph and describe the functional relationship between two quantities using the qualities of the graph. ☐ Sketch a graph given a verbal description of its qualitative features. ***I can sketch a graph given a description of a function.*** **Reasoning Targets:** ☐ Interpret the relationship between x and y values by analyzing a graph. ***I can interpret the relationship between x and y values by analyzing a graph.***		8.MP.7. Look for and make use of structure.	
Geometry (G) Understand congruence and similarity using physical models, transparencies, or geometry software.			
Kentucky Core Academic Standard	**ACT College Readiness Standard for EXPLORE**	**Common Core Mathematical Practice Standard**	**What Does This Standard Mean?**
8.G.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.** **Knowledge Targets:** ☐ Define and identify rotations, reflections, and translations. ***I can define and identify all transformations.*** ☐ Identify corresponding sides and	**Properties of Plan Figures:** -Exhibit some knowledge of the angles associated with parallel lines. .	8.MP.4. Model with mathematics. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure. 8.MP.8. Look for and express regularity in repeated reasoning.	Students need multiple opportunities to explore the transformation of figures so that they can appreciate that points stay the same distance apart and lines stay at the same angle after they have been rotated, reflected, and/or translated. Students are not expected to work formally with properties of dilations until high school.

corresponding angles. ***I can identify corresponding sides and corresponding angles (Underpinning target)*** ☐ Understand prime notation to describe an image after a translation, reflection or rotation. ***I can understand prime notation to describe an image after a translation, reflection or rotation. (Underpinning target).*** ☐ Identify center of rotation. ***I can identify center of rotation.*** ☐ Identify direction and degree of rotation. ***I can identify direction and degree of rotation.*** ☐ Identify line of reflection. ***I can identify line of reflection.*** **Reasoning Targets:** ☐ Use physical models, transparencies, or geometry software to verify the properties of rotations, reflections, and translations (I.e. Lines are taken to line and line segments to line segments of the same length, angles are taken to angles of the same measure, and parallel lines are taken to parallel lines. ***I can use physical models, transparencies, or geometry software to verify the properties of rotations, reflections, and translations (I.e. Lines are taken to line and line segments to line segments of the same length, angles are taken to angles of the same measure, and parallel lines are taken to parallel lines.***			
8.G.2. Understand that a two-dimensional figure is congruent to another if the second can be	**Properties of Plan Figures:** -Apply properties of	8.MP.2. Reason abstractly and quantitatively.	Examples: • Is Figure A congruent to Figure A'? Explain how you know.

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. **Knowledge Targets:** ☐ Define congruency. ***I can define congruency.*** ☐ Identify symbols for congruency. ***I can identify symbols for congruency.*** **Reasoning Targets:** ☐ Apply the concept of congruency to write congruent statements. ***I can apply the concept of congruency to write congruent statements.*** ***I can describe the transformations sequence of congruent and similar figures.*** ☐ Reason that a 2-D figure is congruent to another if the second can be obtained by a sequence of rotations, reflections, translations. ***I can reason that a 2-D figure is congruent to another if the second can be obtained by a sequence of rotations, reflections, translations.*** ☐ Describe the sequence of rotations, reflections, translations that exhibit the congruence between 2-D figures using words. ***I can describe the sequence of rotations, reflections, translations that exhibit the congruence between 2-D figures using words.***	30° -60° -90°, 45° -45 -90°, similar, and congruent triangles.	8.MP.4. Model with mathematics. 8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure.	 • Describe the sequence of transformations that results in the transformation of Figure A to Figure A’. 
8.G.3. Describe the effect of dilations,	**Graphical Representation:**	8.MP.3. Construct viable arguments and critique	A dilation is a transformation that moves each point along a ray emanating from a fixed center, and multiplies distances from the

translations, rotations, and reflections on two-dimensional figures using coordinates. **Knowledge Targets:** ☐ Define dilations as a reduction or enlargement of a figure. ***I can define dilations as a reduction or enlargement of a figure.*** ☐ Identify scale factor of the dilation. ***I can identify scale factor of the dilation.*** **Reasoning Targets:** ☐ Describe the effects of dilations, translations, rotations, and reflections on 2-D figures using coordinates. ***I can describe the effects of transformations using coordinates.***	-Locate points in the coordinate plane.	the reasoning of others. 8.MP.4. Model with mathematics. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure.	center by a common scale factor. In dilated figures, the dilated figure is *similar* to its pre-image. Translation: A translation is a transformation of an object that moves the object so that every point of the object moves in the same direction as well as the same distance. In a translation, the translated object is *congruent* to its pre-image. $\triangle ABC$ has been translated 7 units to the right and 3 units up. To get from A (1,5) to A' (8,8), move A 7 units to the right (from x = 1 to x = 8) and 3 units up (from y = 5 to y = 8). Points B + C also move in the same direction (7 units to the right and 3 units up).  Reflection: A reflection is a transformation that flips an object across a line of reflection (in a coordinate grid the line of reflection may be the x or y axis). In a rotation, the rotated object is *congruent* to its pre-image.  $\triangle ABC \cong \triangle A'B'C'$ Continued on next page When an object is reflected across the y axis, the reflected x coordinate is the opposite of the pre-image x coordinate.

			 Rotation: A rotated figure is a figure that has been turned about a fixed point. This is called the center of rotation. A figure can be rotated up to 360˚. Rotated figures are congruent to their pre-image figures. Consider when ΔDEF is rotated 180˚ clockwise about the origin. The coordinates of ΔDEF are D(2,5), E(2,1), and F(8,1). When rotated 180˚, $\Delta D'E'F'$ has new coordinates D'(-2,-5), E'(-2,-1) and F'(-8,-1). Each coordinate is the opposite of its pre-image. 
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.	**Properties of Plan Figures:** -Apply properties of 30° -60° -90°, 45° -45 -90°, similar, and congruent triangles.	8.MP.2. Reason abstractly and quantitatively. 8.MP.4. Model with mathematics. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to	Examples: • Is Figure A similar to Figure A'? Explain how you know.

Knowledge Targets: ☐ Define similar figures as corresponding angles are congruent and corresponding sides are proportional. ***I can define similar figures as corresponding angles are congruent and corresponding sides are proportional.*** ☐ Recognize symbol for similar. ***I can recognize symbol for similar.*** **Reasoning Targets:** ☐ Apply the concept of similarity to write similarity statements. ***I can apply the concept of similarity to write similarity statement.*** ***I can describe a transformation sequence of congruent and similar figures.*** ☐ Reason that a 2-D figure is similar to another if the second can be obtained by a sequence of rotations, reflections, translation, or dilation. ***I can reason that a 2-D figure is similar to another if the second can be obtained by a sequence of rotations, reflections, translation, or dilation.*** ☐ Describe the sequence of rotations, reflections, translations, or dilations that exhibits the similarity between 2-D figures using words and/or symbols. ***I can describe the sequence of rotations, reflections, translations, or dilations that exhibits the similarity between 2-D figures using words and/or symbols***.		precision. 8.MP.7. Look for and make use of structure.	 • Describe the sequence of transformations that results in the transformation of Figure A to Figure A'. 
8.G.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about	**Properties of Plan Figures:** -Exhibit some knowledge of the	8.MP.3. Construct viable arguments and critique the reasoning of others.	

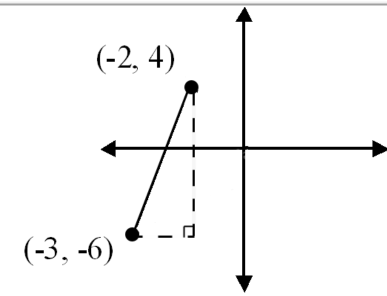
the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the three angles appear to form a line, and give an argument in terms of transversals why this is so.* **Knowledge Targets:** ☐ Define similar triangles. ***I can define similar triangles.*** ☐ Define and identify transversals. ***I can define and identify transversals.*** ☐ Identify angles created when parallel line is cut by transversal (alternate interior, alternate exterior, corresponding, vertical, adjacent, etc.) ***I can identify angles created when parallel line is cut by transversal (alternate interior, alternate exterior, corresponding, vertical, adjacent, etc.)*** **Reasoning Targets:** ☐ Justify that the sum of interior angles equals 180. (For example, arrange three copies of the same triangle so that the three angles appear to form a line.) ***I can justify that the sum of interior angles equals 180.*** ***I can identify and find the measure of angles created by a transversal.*** ☐ Justify that the exterior angle of a triangle is equal to the sum of the two remote interior angles. ***I can justify that the exterior angle of a triangle is equal to the sum of the two remote interior angles.*** ☐ Use Angle-Angle Criterion to prove	angles associated with parallel lines. -Find the measure of an angle using properties of parallel lines. -Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°)	8.MP.4. Model with mathematics. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure.	

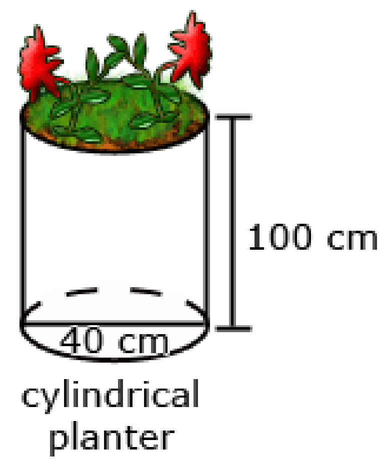
similarity among triangles. (Give an argument in terms of transversals why this is so.			

Geometry
Understand and apply the Pythagorean Theorem

Kentucky Core Academic Standard	ACT College Readiness Standard for EXPLORE	Common Core Mathematical Practice Standard	What Does This Standard Mean?
8.G.6. Explain a proof of the Pythagorean Theorem and its converse. **Knowledge Targets:** ☐ Define key vocabulary: square root, Pythagorean Theorem, right triangle, legs a and b, hypotenuse, sides, right angle, converse, base, height, proof. ***I can define key vocabulary: square root, Pythagorean Theorem, right triangle, legs a and b, hypotenuse, sides, right angle, converse, base, height, proof.*** ***I can identify and use the parts of the Pythagorean Theorem to find the missing sides of right triangles in 2 and 3 dimensional figures.*** ☐ Identify the legs and hypotenuse of a right triangle. ***I can identify the legs and hypotenuse of a right triangle.*** ☐ Explain a proof of the Pythagorean Theorem. ***I can explain a proof of the Pythagorean Theorem.*** ☐ Explain a proof of the converse of the Pythagorean Theorem. ***I can explain a proof of the converse of the Pythagorean Theorem.***	**Properties of Plane Figures:** -Use the Pythagorean theorem.	8.MP.3. Construct viable arguments and critique the reasoning of others. 8.MP.4. Model with mathematics. 8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure.	Students should verify, using a model, that the sum of the squares of the legs is equal to the square of the hypotenuse in a right triangle. Students should also understand that if the sum of the squares of the 2 smaller legs of a triangle is equal to the square of the third leg, then the triangle is a right triangle.

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. **Knowledge Targets:** ☐ Recall the Pythagorean Theorem and its converse. ***I can recall the Pythagorean Theorem and its converse.*** **Reasoning Targets:** ☐ Solve basic mathematical Pythagorean Theorem problems and its converse to find missing lengths of sides of triangles in two and three-dimensions. ***I can solve basic mathematical Pythagorean Theorem problems and its converse to find missing lengths of sides of triangles in two and three-dimensions.*** ☐ Apply Pythagorean Theorem in solving real-world problems dealing with two and three—dimensional shapes. ***I can apply Pythagorean Theorem in solving real-world problems dealing with two and three—dimensional shapes***	**Properties of Plane Figures:** -Recognize Pythagorean triples. -Use the Pythagorean theorem.	8.MP.1. Make sense of problems and persevere in solving them. 8.MP.2. Reason abstractly and quantitatively. 8.MP.4. Model with mathematics. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure.	Through authentic experiences and exploration, students should use the Pythagorean Theorem to solve problems. Problems can include working in both two and three dimensions. Students should be familiar with the common Pythagorean triplets.
8.G.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. **Knowledge Targets:** ☐ Recall the Pythagorean Theorem and its converse. ***I can recall the Pythagorean Theorem and its converse.*** **Reasoning Targets:** ☐ Determine how to create a right triangle from two points on a coordinate graph.	**Graphical Representations:** -Use the distance formula **Properties of Plane Figures:** -Recognize Pythagorean triples. -Use the Pythagorean theorem.	8.MP.1. Make sense of problems and persevere in solving them. 8.MP.2. Reason abstractly and quantitatively. 8.MP.4. Model with mathematics. 8.MP.5. Use appropriate tools strategically.	Example: • Students will create a right triangle from the two points given (as shown in the diagram below) and then use the Pythagorean Theorem to find the distance between the two given points.

I can determine how to create a right triangle from two points on a coordinate graph. ☐ Use the Pythagorean Theorem to solve for the distance between the two points. ***I can use the Pythagorean Theorem to solve for the distance between the two points*** ***I can apply the Pythagorean Theorem to find the distance between two points.***		8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure.	
Geometry Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.			
8.G.9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. **Knowledge Targets:** ☐ Identify and define vocabulary: cone, cylinder, sphere, radius, diameter, circumference, area, volume, pi, base, height. ***I can identify and define vocabulary: cone, cylinder, sphere, radius, diameter, circumference, area, volume, pi, base, height.*** ☐ Know formulas for volume of cones, cylinders, and spheres. ***I can know formulas for volume of cones, cylinders, and spheres.*** **Reasoning Targets:** ☐ Compare the volume of cones, cylinders, and spheres. ***I can compare the volume of cones, cylinders, and spheres.*** ☐ Determine and apply appropriate volume formulas in order to solve mathematical and real-world problems for the given shape.	**ACT College Readiness Standard for EXPLORE**	**Common Core Mathematical Practice Standard**	**What Does This Standard Mean?**

I can determine and apply appropriate volume formulas in order to solve mathematical and real-world problems for the given shape. ☐ Given the volume of a cone, cylinder, or sphere, find the radii, height, or approximate for π. ***I can find the radii, height, or approximate for π. given the volume of a one, cylinder, or sphere.*** ***I can solve real world mathematical problems involving volume of cylinders, cones, and spheres.***			
	Basic Operations and Applications: -Solve multistep arithmetic problems that involve planning or converting units of measure (e.g., feet per second to miles per hour). **Measurement:** -Use geometric formulas when all necessary information is given.	8.MP.1. Make sense of problems and persevere in solving them. 8.MP.2. Reason abstractly and quantitatively. 8.MP.3. Construct viable arguments and critique the reasoning of others. 8.MP.4. Model with mathematics. 8.MP.5. Use appropriate tools strategically. 8.MP.6. Attend to precision. 8.MP.7. Look for and make use of structure. 8.MP.8. Look for and express regularity in repeated reasoning.	• James wanted to plant pansies in his new planter. He wondered how much potting soil he should buy to fill it. Use the measurements in the diagram below to determine the planter's volume. 
Statistics and Probability (SP)			

<table>
<tr><th colspan="4">Investigate patterns of association in bivariate data.</th></tr>
<tr><th>Kentucky Core Academic Standard</th><th>ACT College Readiness Standard for EXPLORE</th><th>Common Core Mathematical Practice Standard</th><th>What Does This Standard Mean?</th></tr>
<tr>
<td>
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.

Knowledge Targets:
☐ Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
I can describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
☐ Construct scatter plots for bi-variate measurement data.
I can construct scatter plots.
Reasoning Targets:
☐ Interpret scatter plots for bi-variate (two different variables such as distance and time) measurement data to investigate patterns of association between two quantities.
I can interpret scatter plots for bi-variate (two different variables such as distance and time) measurement data to investigate patterns of association between two quantities.
I can determine relationships (correlation or associations) of scatter plots.
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<td>
Graphical Representations:
-Interpret and use information from graphs in the coordinate plane.
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<td>
8.MP.2. Reason abstractly and quantitatively.

8.MP.4. Model with mathematics.

8.MP.5. Use appropriate tools strategically.

8.MP.6. Attend to precision.

8.MP.7. Look for and make use of structure.
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Students build on their previous knowledge of scatter plots examine relationships between variables. They analyze scatterplots to determine positive and negative associations, the degree of association, and type of association. Students examine outliers to determine if data points are valid or represent a recording or measurement error. Students can use tools such as those at the National Center for Educational Statistics to create a graph or generate data sets. (http://nces.ed.gov/nceskids/createagraph/default.aspx)

Examples:
• Data for 10 students' Math and Science scores are provided in the chart. Describe the association between the Math and Science scores.
<table>
<tr><td>Student</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>Math</td><td>64</td><td>50</td><td>85</td><td>34</td><td>56</td><td>24</td><td>72</td><td>63</td><td>42</td><td>93</td></tr>
<tr><td>Science</td><td>68</td><td>70</td><td>83</td><td>33</td><td>60</td><td>27</td><td>74</td><td>63</td><td>40</td><td>96</td></tr>
</table>
• Data for 10 students' Math scores and the distance they live from school are provided in the table below. Describe the association between the Math scores and the distance they live from school.
<table>
<tr><td>Student</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>Math score</td><td>64</td><td>50</td><td>85</td><td>34</td><td>56</td><td>24</td><td>72</td><td>63</td><td>42</td><td>93</td></tr>
<tr><td>Dist from school (miles)</td><td>0.5</td><td>1.8</td><td>1</td><td>2.3</td><td>3.4</td><td>0.2</td><td>2.5</td><td>1.6</td><td>0.8</td><td>2.5</td></tr>
</table>
• Data from a local fast food restaurant is provided
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showing the number of staff members and the average time for filling an order are provided in the table below. Describe the association between the number of staff and the average time for filling an order.

Number of staff	3	4	5	6	7	8
Average time to fill order (seconds)	180	138	120	108	96	84

- The chart below lists the life expectancy in years for people in the United States every five years from 1970 to 2005. What would you expect the life expectancy of a person in the United States to be in 2010, 2015, and 2020 based upon this data? Explain how you determined your values.

Date	1970	1975	1980	1985	1990	1995	2000	2005
Life Expectancy (in years)	70.8	72.6	73.7	74.7	75.4	75.8	76.8	77.4

8.SP.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.

Knowledge Targets:

- ☐ Know straight lines are used to model relationships between two quantitative variables.

I can know straight lines are use to model relationships between two quantitative variables.

Reasoning Targets:

- ☐ Informally assess the model fit by judging the closeness of the data points to the line.

Graphical Representations:
- -Match linear graphs with their equations
- -Interpret and use information from graphs in the coordinate plane.

8.MP.2. Reason abstractly and quantitatively.

8.MP.4. Model with mathematics.

8.MP.5. Use appropriate tools strategically.

8.MP.6. Attend to precision.

8.MP.7. Look for and make use of structure.

Examples:

- The capacity of the fuel tank in a car is 13.5 gallons. The table below shows the number of miles traveled and how many gallons of gas are left in the tank. Describe the relationship between the variables. If the data is linear, determine a line of best fit. Do you think the line represents a good fit for the data set? Why or why not? What is the average fuel efficiency of the car in miles per gallon?

Miles Traveled	0	75	120	160	250	300
Gallons Used	0	2.3	4.5	5.7	9.7	10.7

<table>
<tr>
<td>I can informally assess the model fit by judging the closeness of the data points to the line.
I can model relationship using a line of best fit.
☐ Fit a straight line within the plotted data.
I can fit a straight line within the plotted data.</td>
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<td>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 additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.

Knowledge Targets:
☐ Find the slope and intercept of a linear equation.
I can find the slope and intercept of a linear equation.

Reasoning Targets:
☐ Interpret the meaning of the slope and intercept of a linear equation in terms of the situation. (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 associated with an additional 1.5 cm in mature plant height. (see 8.EE.5).
I can interpret the meaning of the slope and intercept of a linear equation in terms of the situation. (For example, in a linear model for a biology experiment, interpret a slope of 1.5</td>
<td>Graphical Representations:
-Determine the slope of a line from points or equations.
-Interpret and use information from graphs in the coordinate plane.</td>
<td>8.MP.2. Reason abstractly and quantitatively.

8.MP.4. Model with mathematics.

8.MP.5. Use appropriate tools strategically.

8.MP.6. Attend to precision.

8.MP.7. Look for and make use of structure.</td>
<td>Examples:

• 1. Given data from students' math scores and absences, make a scatterplot.
<table>
<tr><th>Absences</th><th>Math Scores</th></tr>
<tr><td>3</td><td>65</td></tr>
<tr><td>5</td><td>50</td></tr>
<tr><td>1</td><td>95</td></tr>
<tr><td>1</td><td>85</td></tr>
<tr><td>3</td><td>80</td></tr>
<tr><td>6</td><td>34</td></tr>
<tr><td>5</td><td>70</td></tr>
<tr><td>3</td><td>56</td></tr>
<tr><td>0</td><td>100</td></tr>
<tr><td>7</td><td>24</td></tr>
<tr><td>8</td><td>45</td></tr>
<tr><td>2</td><td>71</td></tr>
<tr><td>9</td><td>30</td></tr>
<tr><td>0</td><td>95</td></tr>
<tr><td>6</td><td>55</td></tr>
<tr><td>6</td><td>42</td></tr>
<tr><td>2</td><td>90</td></tr>
<tr><td>0</td><td>92</td></tr>
<tr><td>5</td><td>60</td></tr>
<tr><td>7</td><td>50</td></tr>
<tr><td>9</td><td>10</td></tr>
<tr><td>1</td><td>80</td></tr>
</table></td>
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cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.

☐ Solve problems using the equation of a linear model.

I can solve problems using the equation of a linear model.

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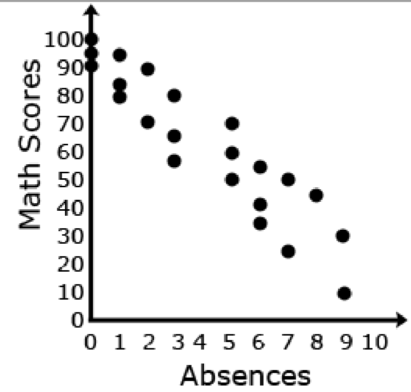
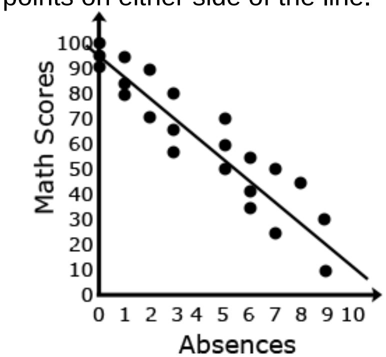


2. Draw a line of best fit, paying attention to the closeness of the data points on either side of the line.



- 3. From the line of best fit, determine an approximate linear equation that models the given data (about y = $-\frac{25}{3}x+95$)
- 4. Students should recognize that 95 represents the y intercept and $-\frac{25}{3}$ represents the slope of the line.
- 5. Students can use this linear model to solve problems. For example, through substitution, they can use the equation to determine that a student with 4 absences should expect to receive a math score of about 62. They can then compare this value to their line.

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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.

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Probability, Statistics and Data Analysis:
-Read tables and graphs

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8.MP.2. Reason abstractly and quantitatively.

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Example:

- The table illustrates the results when 100 students were asked the survey questions: Do you have a curfew? and Do you have assigned chores? Is there

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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?*

Knowledge Targets:

- ☐ Recognize patterns show in comparison of two sets of data.

I can recognize patterns show in comparison of two sets of data.

- ☐ Know how to construct a two-way table.

I can know how to construct a two-way table.

Reasoning Targets:

- ☐ Interpret the data in the two-way table to recognize patterns (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 interpret the data in the two-way table to recognize patterns.

- ☐ Use relative frequencies of the data to describe relationships (positive, negative, or no correlation).

I can use relative frequencies of the data to describe relationships (positive, negative, or no correlation).

I can construct and interpret a two-way table summarizing data.

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-Perform computations on data from tables and graphs
-Translate from one representation of data of another (e.g., a bar graph to a circle graph)
-Manipulate data from tables and graphs.
-Interpret and use information from figures, tables, and graphs.

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8.MP.3. Construct viable arguments and critique the reasoning of others.

8.MP.4. Model with mathematics.

8.MP.5. Use appropriate tools strategically.

8.MP.6. Attend to precision.

8.MP.7. Look for and make use of structure.

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evidence that those who have a curfew also tend to have chores?

<table>
<tr><td></td><td></td><td colspan="2">Curfew</td></tr>
<tr><td></td><td></td><td>Yes</td><td>No</td></tr>
<tr><td rowspan="2">Chores</td><td>Yes</td><td>40</td><td>10</td></tr>
<tr><td>No</td><td>10</td><td>40</td></tr>
</table>

Solution: Of the students who answered that they had a curfew, 40 had chores and 10 did not. Of the students who answered they did not have a curfew, 10 had chores and 40 did not. From this sample, there appears to be a positive correlation between having a curfew and having chores.

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Mathematical Practices Standard	Explanations and Examples
8.MP.1. Make sense of problems and persevere in solving them.	In grade 8, 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?”
8.MP.2. Reason abstractly and quantitatively.	In grade 8, 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.
8.MP.3. Construct viable arguments and critique the reasoning of others.	In grade 8, 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.
8.MP.4. Model with mathematics.	In grade 8, 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 a problem context.
8.MP.5. Use appropriate tools strategically.	Students consider available 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.
8.MP.6. Attend to precision.	In grade 8, 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.
8.MP.7. Look for and make use of structure.	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.MP.8. Look for and express regularity in repeated reasoning.	In grade 8, 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 rate of change are the same value. Students flexibly make connections between covariance, rates, and representations showing the relationships between quantities.