8th Grade Mathematics
Curriculum used: Connected Mathematics Project 3

Holt Public Schools Vision Statement for K-12 Mathematics Instruction:

We believe students in mathematics in Holt Public Schools need a productive disposition towards mathematics and to view themselves as confident mathematicians. In order to build this disposition, students will gain strong conceptual knowledge that then supports development of their procedural skills. Students will make sense of problems and persevere in solving them. In those problems, students will model and reason abstractly and quantitatively. Students will construct viable arguments and critique the reasoning of others.

Math

Tiered Philosophy

In Holt Public Schools, we believe all students are able to become capable mathematicians. We recognize that this does not happen at the same pace for all students, so some students, at various times, will need additional support to be successful. Because we value all students experiencing rigorous math classes with their peers, the support students receive will be in addition to their regular, at-level math course. By increasing the amount of time students engage with mathematics during the day, we are able to help students close existing knowledge gaps that hinder success with their grade level course work, see connections between mathematical ideas, deepen their understanding of current and prior knowledge, and develop a positive mathematical identity.

According to Dr. Rebecca Sarlo, Tier 2 supports and interventions at the secondary level "should be designed to support student success with core instructional content (2014)." The supports should address knowledge or gaps that are more relevant to the current core instruction students are receiving. In addition to supporting students' acquisition of mathematical concepts, students also build their efficacy at being a successful mathematics student. This happens through increasing engagement through goal setting, high quality and high frequency feedback, and students monitoring their own progress.

Students who receive this support at grades 7-9 typically have some gaps in their prior knowledge or underdevelopment of some mathematical habits of mind that will be problematic for future success. Students are identified using data points such as prior course failures, common unit test or exam scores, unit screeners, or teacher recommendation. By utilizing the mathematic support classes, students are engaged in mathematics for more minutes during the day than their peers, which helps to close knowledge gaps. The class sizes are smaller so students receive more frequent teacher feedback. Students engage in the mathematical practice standards and collaborate with their peers in order to become more confident in themselves as capable and successful mathematicians. Teachers organize learning opportunities for students to build their mathematical habits of exploring ideas, orienting/organizing, thinking in reverse, representing, justifying, generalizing, checking for reasonableness, and using mathematical language (Horn 2012). In order to provide these experiences, instruction is not of an "I do, we do, you do" type model.

According to Rollins (2014), support that is remediation of prior content that is not relevant to what the student is expected to do in their current math class only keeps that student behind. She advocates for addressing past conceptual and procedural knowledge gaps connected to the new learning expected students experience in their grade level math class. As a result, the learning opportunities teachers provide are centered on mathematical content that is prerequisite knowledge for what students need to be successful in their core class in real time. This helps students engage in the core instruction with their peers rather than falling further behind and waiting to catch up.

Below are student experiences and related teacher knowledge or actions from literature on best mathematical teaching practices. The resources used to compile this were:

- *Small Steps, Big Changes*, Confer and Ramirez (2012)
- *Principles to Actions*, National Council of Teachers of Mathematics (2014)
- *Adding It Up*, National Research Council (2001)
- *Strength in Numbers*, Horn (2012)

We believe all students need to understand the following expectations and engage in these actions at all grades:

Student experiences	Related teacher knowledge or actions
Students justify their mathematical arguments and critique those of others.	• Teachers keep the complexity of authentic learning tasks • Teachers anticipate and use students' errors and misconceptions as learning opportunities • Teachers facilitate a high level of student discourse, probe student thinking through purposeful questions, and ask students to justify • Teachers have multiple mathematical representations and strategies to help support students in making connections between their mathematical ideas and those of others
Students apply multiple strategies.	• Teachers have a strong understanding of the mathematics they teach and how it connects: concepts, procedures, representations, strategies, language • Teachers gather evidence of knowledge during instruction and use assessment data strategically to help students refine their mathematical knowledge and support building connections between ideas.
Students write, talk about, and present their mathematical ideas.	• Teachers facilitate students making connections between mathematical ideas • Teachers anticipate common mathematical errors and misconceptions, and when students make these, use them as learning opportunities • Teachers facilitate a high level of student discourse, probe student thinking through purposeful questions, and ask students to justify
Students engage in solving mathematical problems with peers.	• Teachers keep the complexity of authentic learning tasks • Teachers build interdependence among students by facilitating group work and having norms.
Students engage in productive struggle and persevere.	• Teachers have a strong understanding of the mathematics they teach and how it connects (concepts, procedures, representations, strategies, language) in order to facilitate a productive struggle • Teachers keep the complexity of authentic learning tasks to promote productive struggle • Teachers facilitate a high level of student discourse, probe student thinking through purposeful questions, and ask students to justify • Teachers anticipate prior knowledge and common possible ways students will attempt a problem while planning in order to know entry points into the problems and suggestions of prior knowledge that

	will help students progress through complex tasks.
Students solve complex problems with multiple solution paths.	• Teachers have a strong understanding of the mathematics they teach and how it connects (concepts, procedures, representations, strategies, language) to allow multiple solution paths • Teachers have multiple mathematical representations and strategies to help teach students • Teachers keep the complexity of authentic learning tasks so there are multiple solution paths • Teachers gather evidence of knowledge during instruction and use assessment data strategically in order to facilitate students seeing a robust set of solution paths
Students create and use visual models and multiple representations.	• Teachers have a strong understanding of the mathematics they teach and how it connects (concepts, procedures, representations, strategies, language) to allow multiple representations • Teachers keep the complexity of authentic learning tasks
Students are self-assessing based on learning goals. Related to students use metacognitive strategies to know when to adjust their learning strategies in relation to learning goals.	• Teachers anticipate common mathematical errors and misconceptions, and when students make these, use them as learning opportunities • Teachers differentiate, when appropriate, for students who are struggling as well as those who need additional challenges
Students value mathematics.	• Teachers facilitate a high level of student discourse, probe student thinking through purposeful questions, and ask students to justify to provide multiple opportunities for students to see value in multiple aspects of mathematics • Teachers differentiate, when appropriate, for students who are struggling as well as those who need additional challenges
Students believe in their own efficacy.	• Teachers facilitate a high level of student discourse, probe student thinking through purposeful questions, and ask students to justify to provide multiple opportunities for students to grow their efficacy • Teachers gather evidence of knowledge during instruction and use assessment data strategically in order to provide support to students • Teachers differentiate, when appropriate, for students who are struggling as well as those who need additional challenges • Teachers anticipate prior knowledge and common possible ways students will attempt a problem while planning in order to support all students at being successful in mathematics
Students will make connections based on **conceptual** understandings.	• Teachers have a strong understanding of the mathematics they teach and how it connects: concepts, procedures, representations, strategies, language • Teachers facilitate students making connections between mathematical ideas • Teachers have multiple mathematical representations and strategies to help teach students • Teachers anticipate prior knowledge and common possible ways students will attempt a problem

	while planning
Students make connections between multiple representations.	• Teachers have a strong understanding of the mathematics they teach and how it connects: concepts, procedures, representations, strategies, language • Teachers have multiple mathematical representations and strategies to help teach students • Teachers facilitate students making connections between mathematical ideas in order to connect conceptual understandings to procedural knowledge and connections across mathematical ideas • Teachers anticipate prior knowledge and common possible ways students will attempt a problem while planning in order to identify the connections students should see

8th grade course overview

The purpose of eighth grade math is to transition students from proportional reasoning to function reasoning, and specifically linear relationships. Students also work with geometric concepts of Pythagorean Theorem, which also introduces rational and irrational numbers, and transformations of objects. Students explore bivariate data as another way to look at linear relationships.

Approximate learning timeline

Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun

Name of transition unit?	Thinking with Mathematical Models	Say It With Symbols	Growing, Growing, Growing	Looking for Pythagoras	It's In the System
Writing equation for linear relationship given any representation, with just 2 points as a focus; and…?	Linear models and equations, inverse variation models and equations, variability of numerical and categorical data	Equivalent expressions, solving linear and quadratic equations; identify and represent linear, exponential and quadratic functions	Representing exponential growth with tables, graphs, equations; rules for exponents, scientific notation	Use and proof of Pythagorean theorem and converse, square roots, cube roots, irrational and real numbers, equation of circle	Solving linear systems graphically and algebraically

8th grade proficiency scales (2017-2018 power standards only)
Questions in SAT column will be denoted as PSAT when appropriate.

Thinking with Mathematical Models

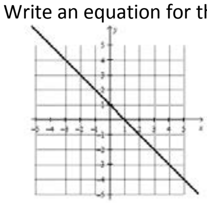
Scale	8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (*x*, *y*) values, including reading these from a table or from a graph. Interpret the rate of change 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. 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.*	HPS assessment question	SAT assessment question and strand aligned to
Advanced	Write a linear function from any representation working in all rational numbers determining the y-intercept and rate of change.	Write an equation	
Proficient	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	Ginger charges a constant rate per hour to babysit. For 5 hours and charges \$27.25. For 12 hours she charges \$57.00. Write an equation that represents the situation. (Hint: Think about the other ways you can represent linear situations)	SAT questions ask this content, but use function notation within the question. Function notation isn't learned until 10th grade. As a result, questions that would address this content are aligned with linear unit in Algebra A/B. PSAT

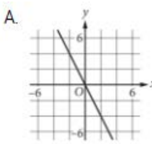
<table>
<tr>
<td></td>
<td>its graph or a table of values</td>
<td></td>
<td>10 A tree is planted and is expected to grow according to the model below, where t is the number of years since the tree was planted and H is the height of the tree, in feet.

$H = 3t + 5$
$0 \le H \le 100$

According to the model, which of the following statements is true?

A. The tree was 3 feet tall when planted.
B. The tree is expected to increase in height at a rate of 3 feet per year.
C. The tree is expected to increase in height at a rate of 1 foot every 3 years.
D. The tree is expected to reach a maximum height of 3 feet.</td>
</tr>
<tr>
<td>Developing</td>
<td>Write a linear equation given table or graph that does not contain an integer y-intercept, the y-intercept isn’t in the table, and/or the change in x varies.</td>
<td>Write an equation for the table.

<table><tr><th>Time (hours)</th><th>Distance (miles)</th></tr><tr><td>4</td><td>260</td></tr><tr><td>6</td><td>390</td></tr><tr><td>8</td><td>520</td></tr><tr><td>10</td><td>650</td></tr></table></td>
<td></td>
</tr>
<tr>
<td>Beginning</td>
<td>Write a linear equation given table or graph that contains the y-intercept and the change in x is 1.</td>
<td>Write an equation for the graph on the right.
</td>
<td>7 Which of the following is the graph of $y = \frac{1}{2}x - 2$ in the xy-plane?

A.

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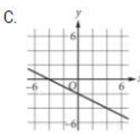
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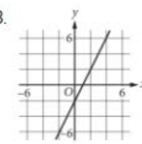
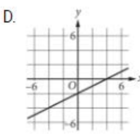

D.
</td>
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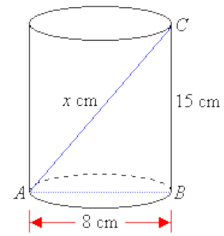
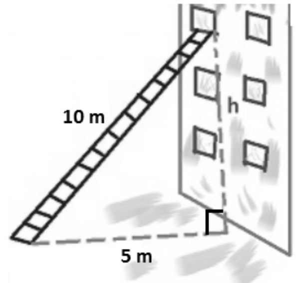
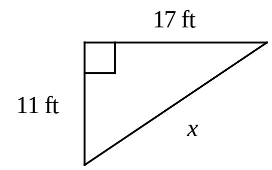
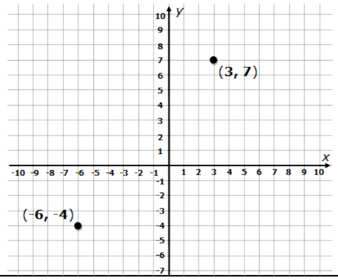
Scale	8.SP.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*	HPS assessment question	SAT assessment question and strand aligned to
Advanced	Level 3 but create equation from own linear model drawn on a given scatterplot.	Write an equation that represents the linear model given a graph.	
Proficient	Given the equation of a linear model, use the equation to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.		Recorded on HS standard in linear unit
Developing	Given data with a linear model drawn, use the model from the graph to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.		
Beginning	Know that straight lines are widely used to model relationships between two quantitative variables and draw a linear model to fit data. (8.SP.2)		

- 8.EE.7 and 7b are not taught to proficiency in this unit.
- For the remaining function standards, the language of function and function representations are part of instruction but not taught to proficiency or assessed in paper/pencil format. *Growing*, *Growing*, *Growing* will give students additional exposure on some of these standards.
- 8.SP.1 is addressed in instruction when working on 8.F.4.
- The investigations that address 8.SP.4 are intentionally not taught due to pacing and need to get to algebra standards for MSTEP and high school.

Looking for Pythagoras

Scale	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.	HPS assessment question	SAT assessment question and strand aligned to Not assessed Was assessed on MSTEP
Advanced	Create a real world problem where the Pythagorean Theorem is needed to find an answer.		
Proficient	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	Josh has a fish tank in the shape of a cylinder. Find the missing length "x." ***<u>SHOW YOUR WORK.</u>***  	
Developing	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two dimensions.	A 10-meter ladder is placed against a building and the ground making the triangle as shown. The ladder is placed on the ground 5 meters straight out from the base of the building. How far up the side of the building is the ladder placed? ***<u>SHOW YOUR WORK.</u>***  	
Beginning	Apply the Pythagorean Theorem to determine unknown hypotenuse lengths in right triangles in real-world and mathematical problems given two leg lengths.	Give the length of the hypotenuse.	

		 17 ft 11 ft x	

Scale	8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	HPS assessment question	SAT assessment question and strand aligned to Not assessed Was assessed on MSTEP
Advanced	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system where plotting the points and drawing the right triangle is difficult.		
Proficient	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	Find the distance between the points. ***SHOW YOUR WORK.*** 	
Developing	Given the two points plotted and connected by a line, find the distance between the two points using Pythagorean Theorem.		
Beginning	Given a right triangle on a coordinate grid and the coordinate points for the end points of the hypotenuse, find the length of the hypotenuse using Pythagorean Theorem.		

*Wondering whether an assessment question for level 1 should put on grid AND give 3 coordinate points.

*8.NS.2 Is taught but not considered a power standard

*8.EE.7 Is introduced in unit but assessed it IITS

Growing, Growing, Growing

- Inv 1 purpose to give students another non-linear example to address 8.F.2 and 8.F.3. It also gives reason to investigate scientific notation 8.EE.3 and 8.EE.4.

Scale	8.EE.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example,* $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.	HPS assessment question	SAT assessment question and strand aligned to
Advanced	Know and apply the properties of positive rational exponents to generate equivalent numerical expressions.		
Proficient	Know and apply the properties of integer exponents to generate equivalent numerical expressions.	Which of the following is equal to 3^{-4} What is 2^{-4} as a fraction?	**11** For a positive real number x, where $x^8 = 2$, what is the value of x^{24} ? A. $\sqrt[3]{24}$ B. 4 C. 6 D. 8
Developing	Know and apply the properties of positive integer exponents to generate equivalent numerical expressions.	Which of the following is equal to $\frac{10^6}{10^8}$? Which of the following is equal to $(x^7)^0$?	
Beginning	Identify and write expressions in exponential, expanded, and standard forms.		

Scale	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.	HPS assessment question	SAT assessment question and strand aligned to Not assessed on SAT Was assessed on MSTEP
Advanced	Perform all operations with numbers expressed in scientific notation.		
Proficient	Multiply and divide numbers expressed in scientific notation; choose units of appropriate size for very large or very small quantities; and interpret scientific notation that has been generated by technology.	What is the scientific notation for the product of $(5.1\times 10^{4})\cdot(3\times 10^{9})$? Which of the following is the scientific notation for the quotient? $(7.2 \times 10^{-18}) \div (2.4 \times 10^{6})$	
Developing	Level 3 with errors. Teachers will gather student work 2017-2018 to inform clearly defining a 2-level in 2018-2019. Teachers are anticipating these possibilities from students: • Multiply OR divide with numbers expressed in scientific notation • Multiply AND divide with numbers in scientific notation of an integer and power of 10 • Multiply AND divide with numbers in scientific notation with only positive powers of 10		
Beginning	Convert between standard form and scientific notation (as a power of 10 or from technology).	A restaurant claims to have served over 352,000,000 hamburgers. How is this amount shown when written in scientific notation? A jump drive currently has 4.2×10^{8}	

		bytes of information stored in the memory. What is this number in standard form?	

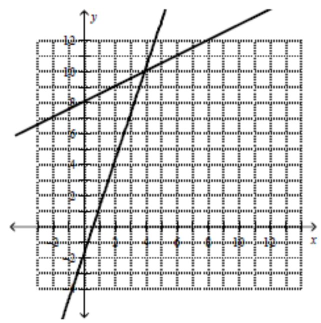
*We are interpreting “perform operations” as multiply and divide only.

Say it with Symbols

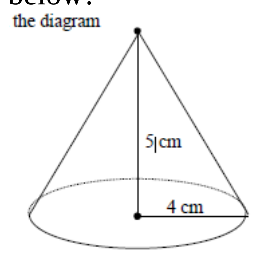
Students would still be using parts of 8.F.4 in writing equations in this unit, so it may be useful to have that posted during this unit. However, we will not have additional assessment questions on this.

Scale	8.EE.7b Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	HPS assessment question	SAT assessment question and strand aligned to
Advanced	Given a situation, write, simplify, and solve linear equations with rational number coefficients.		
Proficient	Solve linear equations with rational number coefficients using simplification when necessary.	Solve the following equation: a $5(v+4)-13=72$ b. $2(x + 4) = 3x – 6$ c. $5(x + 3) = 7(x – 2) + 3$ d. $9x – 7 = 6(x + 2)$	
Developing	Solve linear equations already simplified to *y* = *mx* + *b* with fraction or decimal coefficients OR solve correctly but have errors when simplifying.	Solve the equation $\frac{3}{5}x - 13 = 80$ Solve the equation $-2.95x+20 = 123$	PSAT (also level 3 for 7th grade standard) **8** If $3x-6=21$, what is the value of $x-2$? A. 3 B. 5 C. 7 D. 11
Beginning	Simplify expressions using distributive property and combining like terms.	Simplify each of the expressions shown below as much as possible. SHOW YOUR WORK. a. $(x + 2)(x + 6)$ b. $(3x – 6) – (x + 2)$ c. $2(x + 4) + 2(3x + 1)$ d. $-4(x – 2) – (x + 8)$	One strategy to find equivalent expressions is to simplify. **3** $5x^2-3(1-x)-2x(x+5)$ Which of the following polynomials is equivalent to the expression above? A. $3x^2-7x-3$ B. $3x^2+7x-3$ C. $5x^2-5x-3$ D. $5x^2-9x-3$

			1 Which expression is equivalent to $(2x^2-4)-(-3x^2+2x-7)$? A. $5x^2-2x+3$ B. $5x^2+2x-3$ C. $-x^2-2x-11$ D. $-x^2+2x-11$ PSAT: **10** Which of the following is equivalent to the expression x^2-8x-9 ? A. $(x-3)^2$ B. $(x-3)(x-6)$ C. $(x+9)(x-1)$ D. $(x-9)(x+1)$

Scale	8.EE.8b Solve systems of two linear equations in two variables algebraically. ~~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.*~~	HPS assessment question	SAT assessment question and strand aligned to
Advanced	Given a situation, write the system of equations and solve algebraically.		
Proficient	Solve systems of two linear equations in two variables algebraically.		
Developing	Given a system of equations, create the graph to estimate solutions by graphing the equations.		
Beginning	Given a graph, 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. (8.EE.8a)	Given the two lines on the graph below, the **solution to the system of equations** is when which of the following occurs? 	

**In this unit, we have students only responsible for levels 1, 3 and 4 on the assessment. And solving a system such as y = 2(x + 9) +10 and y = -10x + 3.5 by setting them equal to each other. There are other formats of systems that will be developed in the next unit of *It's in the System.*

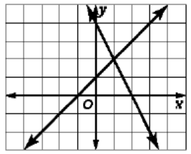
Scale	8.G.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.	HPS assessment question	SAT assessment question and strand aligned to Not assessed on SAT Was assessed on MSTEP
Advanced	Given the volume, find a missing dimension of the shape. OR find the volume of a composition of cones, cylinders, or spheres.		
Proficient	Use the formulas for the volumes of cones, cylinders, and spheres to solve real-world and mathematical problems.	A cylindrical glass with a radius of 5 cm and a height of 20 cm is **only half full** of milk. Given that 1 cubic cm = 1 milliliter, how many milliliters of milk are in the glass? What is the approximate volume of a spherical water balloon with a radius of 6 inches? Which approximate volume of the cone shown in the diagram below?  	
Developing	Use the formulas for volumes to solve real-world or mathematical problems of 2 of the following shapes: cones, cylinders, and spheres.		
Beginning	Use the formulas for volumes to solve real-world or mathematical problems of 1 of the following shapes: cones, cylinders, and spheres.		

*PSAT and SAT do not assess this standard. We feel it more important that students can use the formulas rather than have them memorized.

It's in the System

Scale	8.EE.7a 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).	HPS assessment question	SAT assessment question and strand aligned to
Advanced	Given a linear equation, students can create linear equations with one variable that have one solution, infinitely many solutions, and no solution.	Which of the following systems has no solutions?	23 $2x+3y=5$ $4x+cy=8$ In the system of equations above, c is a constant. For what value of c will there be no solution (x,y) to the system of equations? A. 3 B. 4 C. 5 D. 6 PSAT: 12 Line s is drawn in the xy-plane and has an equation $3y-6x=9$. Line t is parallel to line s. What is the slope of line t?
Proficient	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).	Based on the graphs, which system of equations has no solution?	
Developing	Students can identify which of the linear equations with one variable have one solution, infinitely many solutions, or no solutions.		

Beginning	Students can simplify expressions using the distributive property and combining like terms.		**3** $5x^2-3(1-x)-2x(x+5)$ Which of the following polynomials is equivalent to the expression above? A. $3x^2-7x-3$ B. $3x^2+7x-3$ C. $5x^2-5x-3$ D. $5x^2-9x-3$

Scale	8.EE.8b Solve systems of two linear equations in two variables algebraically. 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.*	HPS assessment question	SAT assessment question and strand aligned to
Advanced	Given a situation, write the system of equations and solve algebraically.		Heart of Algebra **1** A farmer sold 108 pounds of produce that consisted of *z* pounds of zucchini and *c* pounds of cucumbers. The farmer sold the zucchini for $1.69 per pound and the cucumbers for $0.99 per pound and collected a total of $150.32. Which of the following systems of equations can be used to find the number of pounds of zucchini that were sold? A. $z+c = 150.32$ $1.69z+0.99c = 108$ B. $z+c = 108$ $1.69z+0.99c = 150.32$ C. $z+c = 108$ $0.99z+1.69c = 150.32$ D. $z+c = 150.32$ $0.99z+1.69c = 108$ **18** Students in a science lab are working in groups to build both a small and a large electrical circuit. A large circuit uses 4 resistors and 2 capacitors, and a small circuit uses 3 resistors and 1 capacitor. There are 100 resistors and 70 capacitors available, and each group must have enough resistors and capacitors to make one large and one small circuit. What is the maximum number of groups that could work on this lab project?
Proficient	Solve systems of two linear equations in two variables algebraically, and solve simple cases by inspection.	Solve the system. $\begin{cases} y = 3x - 4 \\ x + y = 12 \end{cases}$	
Developing	Given a system of equations, create the graph to estimate solutions by graphing the equations.		
Beginning	Given a graph, 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. (8.EE.8a)	The graph shows two linear equations. What is the solution of the system? 	

Scale	8.EE.8c Solve real-world and mathematical problems leading to two linear equations in two variables given the equations using the method of their choice. *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.*	HPS assessment question	SAT assessment question and strand aligned to
Advanced	Given a situation, students can write the system of equations and justify which of the three methods is the most efficient/practical for the given data.		
Proficient	Solve real-world and mathematical problems leading to two linear equations in two variables given the equations using • Combinations • Substitution • Graphing	The costs of driving two different cars can be expressed as a pair of equations, with *x* representing the number of miles driven. Car A: 000, 304. 0 □ Car B: x y 10. 0 □ **Solve the set of equations to find how many miles car A must drive before it would start saving its owner money over Car B.**	**14** $2x-y=-4$ $2x+y=4$ For the solution of the system of equations above, what is the value of x ? A. -4 B. -2 C. 0 D. 2 **8** At a snack bar, each medium drink costs \$1.85 and each large drink costs c more dollars than a medium drink. If 5 medium drinks and 5 large drinks cost a total of \$20.50, what is the value of c ? A. 0.45 B. 0.40 C. 0.30 D. 0.25 PSAT: **22** Angelo grows vegetables and sells them at a farmers' market. The price of 2 cucumbers and 1 pepper is \$3.15, and the price of 3 cucumbers and 2 peppers is \$5.35. Based on this pricing, what would be the price, in dollars, of 4 cucumbers and 3 peppers? (Disregard the \$ sign when gridding your answer. For example, if your answer is \$1.37, grid 1.37) **23** $2y-2x=8$ $y+6x=11$ If (x,y) is the solution to the system of equations above, what is the value of $7y$?
Developing	Solve a system of equations in slope-intercept form. (Can find both x and y)	Solve the system.	

Beginning	Given two equations, students can find one of the two values of the solution set. (Can find x or y but not both)	$\begin{cases} y=3x-1 \\ y=8x+9 \end{cases}$	**7** $x+2y=16$ $0.5x-y=10$ The solution to the system of equations above is (x, y). What is the value of x ? A. -2 B. 2 C. 18 D. 36

Butterflies, Pinwheels, and Wallpaper

Scale	8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.	HPS assessment question	SAT assessment question and strand aligned to Not assessed on SAT Was assessed on MSTEP
Advanced	Create two-dimensional figures that are congruent to another by a sequence of rotations, reflections, or translations. Describe the sequence of transformations.		
Proficient	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.		
Developing	Students can use rotation, reflection, or translation to show that two figures are congruent.		
Beginning	Identify a rotation, reflection, or translation.	Jacob is playing with the sign at the right that says office. He decides to turn it 90 degrees counterclockwise around the center of the sign. How will the sign look after the rotation? If the dark figure at the right is reflected in the *y*-axis, which diagram shows the image?	

Scale	8.G.3 Describe the effect of ~~dilations,~~ translations, rotations, and reflections on two-dimensional figures using coordinates.	HPS assessment question	SAT assessment question and strand aligned to Not assessed on SAT Was assessed on MSTEP
Advanced	Create a two-dimensional figure requiring a variety of transformations using a coordinate grid and explain the sequence of transformations (translations, rotations, and reflections).		
Proficient	Describe the effect of translations, rotations, and reflections on two-dimensional figures using coordinates.	The vertices of ABC are *A*(5, 4) *B*(–5, –5) *C*(4, –1) Reflect the triangle over the *x*-axis and indicate which set of points shows the image of the original triangle. If Figure ABCD is translated so that the image of A is A –2, 2), then what will the coordinates of the image of C be after the translation (i.e. Where will C located)?	
Developing	Given the original and new image, students can identify translations, rotations, and reflections of two-dimensional figures on a coordinate grid.	Which of the following choices shows the translation of the hexagon as depicted in the illustration as 1 unit to the right and 2 units down?	
Beginning	Students can apply reflections and translations to a single point on a coordinate grid.		

*We usually run out of time in the year to get to the dilations. They are covered in 9th grade geometry.

Appendix

It is a struggle at grades 7-12 to get in all the content that the standards call for at the depth that students need to truly retain the knowledge by the end of the school year. To exacerbate this, we are asking our 7th graders to take the MSTEP (a test assessing all of 7th grade content standards) beginning the second week of May. Because we assess online, it takes about 3 weeks for students to cycle through our labs, so potentially some students have about 2 more weeks of content instruction than others when they take the test. Until school year 2018-2019, 8th graders were beginning their MSTEP (a test assessing all of 8th grade content standards) the first week back from spring break. Beginning with the 2018-2019 school year, the 8th graders will be taking the PSAT, which falls in early April, usually right after spring break.

In order to maximize our instruction time with students, we have prioritized some standards over others. We based these decisions on what content we know needs lots of time to develop conceptually and procedurally, the limited information we have about the more weighted content areas of the MSTEP, and what students will need most to be successful in our high school math courses and the SAT. What follows is the list of content standards we don't assess or have performance scales written for. The rationale behind why are explained below, along with whether or how students still gain exposure to the ideas of the standards.

8th grade

Standard	Still Taught?	Rationale
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.	Y	This is a small, brief part of the unit *Looking for Pythagoras*. Students explore this idea as they explore the square roots needed for Pythagorean Theorem. Students will have to record answers to application problems using Pythagorean Theorem as exact or approximate, which is where they would use the knowledge of rational or irrational numbers. A Performance Scale was not created as the standard was at the "know" and "understand informally" level.
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 $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*		
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.[1]	Y	Across the 8th grade year, students begin to transition to using all the function representations (table, graph, equation, situation) more frequently and translating between the representations. Students are not really exposed to any graphs or situations that are not functions, so they don't have any real reason to call them functions or make sense of them beyond what they see as linear or the individual representation types.
8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*	Y	Students gain exposure to this in the *Thinking With Mathematical Models* unit with inverse situations and again in *Growing, Growing, Growing* looking at exponential growth equations with integer growth rates (i.e. doubling).

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.*	Y	The crossed out part is addressed in three units in 8th grade. The rest of it is addressed in the same units as 8.F.2.
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.	Y	Students are asked to describe the graphs in multiple units when they make them. The graphs students make are usually accurately plotted graphs from situations, tables, or equations and not sketches.
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.	Y	This is how students interact with these transformations in the *Butterflies, Pinwheels, and Wallpaper* unit. Since this is the instruction, we do not assess them again on recreating our instruction. We instead have them apply these ideas to problems dealing with these transformations when assessing 8.G.2 and 8.G.3.
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.	N	This is content at the end of the *Butterflies, Pinwheels, and Wallpaper* unit that we run out of time in June to get to. Students have experienced scale factor and its effect on shapes in 7th grade and will see similarity again in high school geometry.
8.G.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.*	Y	The authors of CMP chose to keep the angle sum of interior angles in a triangle and parallel lines cut by a transversal with the related content of angles in the 7th grade standards along with the 7th grade book. The angle-angle criterion part will not be seen due to time constraints. Students will see this in high school geometry.
8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*	N	This is due in part to running out of time in the year. The quantitative bivariate data lends itself to further developing students' content knowledge around linear functions, which is imperative for success in high school. The qualitative analysis this standard calls for is not as crucial. The PSAT questions where students see these two-way tables ask for fractions or percents to be calculated, which are addressed in 6th and 7th grade content standards.

Parent Resources

- CMP-written parent letters per unit
- Family resources on the CMP website
- Others….?