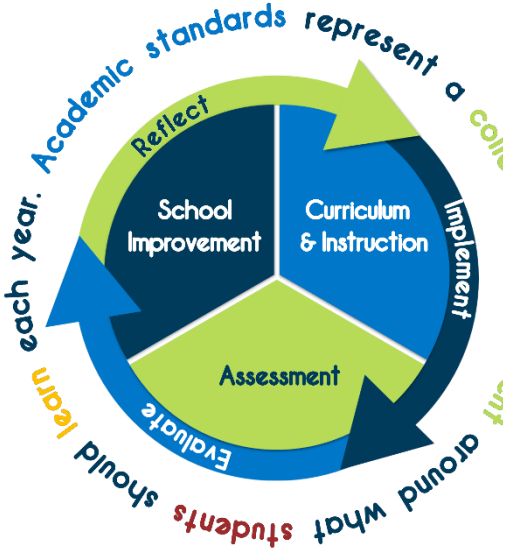
ILLINOIS STATE BOARD OF EDUCATION

Samples to Success

Sample items provide valuable insight into how students engage with different texts, tasks, and contexts, highlighting the types of opportunities they need for success in the classroom. These items offer a shared reference point for understanding proficiency expectations, complementing the assessment's role in measuring learning. By analyzing items alongside performance data, educators can gain a deeper understanding of students' strengths and areas for growth. Students thrive in environments rich with diverse materials, challenges that vary in task type, and multiple avenues for demonstrating understanding. High-quality instruction, aligned with the learning goals, is the most effective way to support students' growth and prepare them for success.



The items featured in this rubric are a mix of items representative of those found on the Illinois Assessment of Readiness (IAR) and items appropriate for classroom instruction to support and build the skills measured on the IAR. The distinction between a student scoring proficient and above proficient on the IAR is primarily determined by the total points earned on items that require modeling and/or reasoning. Students who can effectively explain and demonstrate their thinking are most likely to earn these points.

MATHEMATICS
GRADE 8

Functions

8.F.1-1 Expectation at Proficient:	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Determine whether a relation is a function.	Sarah is comparing the number of apples and oranges she has. She knows that for every 3 apples, there are 5 oranges. If Sarah as 6 apples, how many oranges does she have? A. 2 B. 8 C. 9 D. 10	The table shows a relation. Input / Output −1 / 2 3 / −1 1 / 2 −2 / 3 −1 / 1 The relation is not a function. Which input provides evidence that the relation is not a function? A. -1 B. 3 C. 1 D. -2	The table shows a relation. Input / Output −1 / 2 3 / −1 1 / 2 −2 / 3 −1 / 1 Which statement about the relation is correct? A. The relation is a function because each input has exactly one output. B. The relation is a function because each output has exactly one input. C. The relation is not a function because one input has more than one output. D. The relation is not a function because one output has more than one input.	The table shows a relation. Input / Output 1 / 2 2 / 3 3 / 4 4 / 4 Is the relation a function? Answer: yes If not, explain why not? If so, is it a one-to-one function? Explain why or why not. The relation is not a one-to-one function because an input of 3 and an input of 4 both result in an output of 4.

Functions

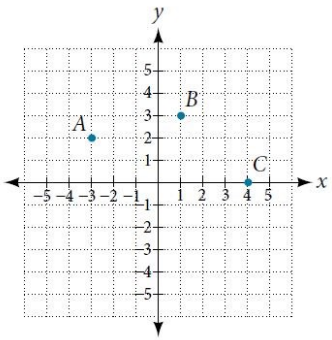
8.F.1-2

Expectation at Proficient:

Graph the set of ordered pairs consisting of an input and the corresponding output.

Below Proficient

A coordinate plane and points A, B, and C are shown.

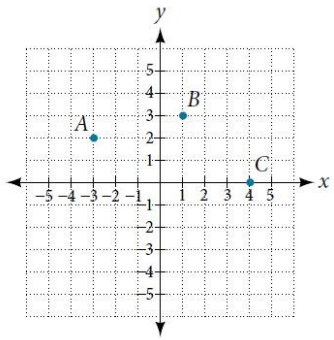


Complete the table of input and output values for the points A, B, and C.

Point	Input	Output
A	-3	2
B	1	3
C	4	0

Approaching Proficient

A coordinate plane and points A, B, and C are shown.



Complete the table of input and output values for the points A, B, and C.

Point	Input	Output
A	-3	2
B	1	3
C	4	0

Proficient

A table of input and output values for a relation is shown.

Input	Output
−1	2
3	−1
1	2
−2	3
−1	1

Graph the set of ordered pairs in the table on a coordinate plane.

Above Proficient

A function is shown.

$$f(x) = 2x^2 + 3$$

Evaluate the function for the following inputs values.

$f(1) =$ ___

$f(2) =$ ___

$f(-2) =$ ___

Answers:

$f(1) = 5$

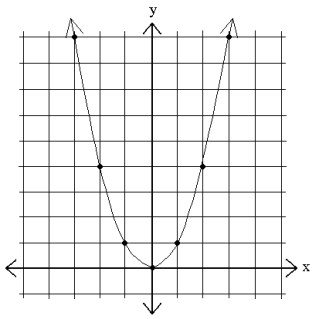
$f(2) = 11$

$f(-2) = 11$

Functions

8.F.2 Expectation at Proficient:	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Compare properties of two functions each represented in a different way (e.g., algebraically, graphically, numerically in tables, or by verbal descriptions).	Two linear functions are shown. **Function 1** $y = \frac{4}{3}x + 2$ **Function 2** x | y −3 | −2.5 −1 | 0.5 2 | 5 4 | 8 Which function has the greater output when the input is 2? Answer: Function 2	Two linear functions are shown. **Function 1** $y = \frac{4}{3}x + 2$ **Function 2** x | y −3 | −2.5 −1 | 0.5 2 | 5 4 | 8 Which function has the greater y-intercept? A. Function 1 B. Function 2 C. Neither, both have a y-intercept of (0,2) D. Neither, both have a y-intercept of (0,1)	Two linear functions are shown. **Function 1** $y = \frac{4}{3}x + 2$ **Function 2** x | y −3 | −2.5 −1 | 0.5 2 | 5 4 | 8 Which function has the higher rate of change? Explain how you know. Function 2; The slope of Function 1 is $\frac{4}{3}$ while the slope of Function 2 is $\frac{3}{2}$ (which is greater than $\frac{4}{3}$).	Two linear functions are shown. **Function 1** $y = \frac{4}{3}x + 2$ **Function 2** x | y −3 | −2.5 −1 | 0.5 2 | 5 4 | 8 Graph each function on the same coordinate pane. Compare and contrast their graphs analyzing the slope and y-intercept of each. The student response could include that the y-intercepts are the same, but the slope of Function 2 is greater.

Functions

8.F.3	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: 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.	Choose the term that best completes the statement. The graph of the function $y = 3x + 2$ is (linear, non-linear).	Which equation represents a function that is linear? A. $y = 2x^2 + 5 - 3x^3$ B. $y = \frac{1}{x}$ C. $y = \sqrt{x}$ D. $y = 3x + 2$	Which equations represent functions that are linear? Select **all** that apply. A. $y = x$ B. $2y = \frac{1}{2}x$ C. $y = x^2$ D. $y = \frac{1}{x}$ E. $y = \frac{1}{3} - 5x$ F. $y = 2x^2 + 5 - 3x^3$	The graph of a function is shown.  Describe the domain and range of the function. Answer: all real numbers For what intervals is the function increasing and decreasing? Answer: Inc: $(0, \infty)$, Dec: $(-\infty, 0)$ Explain if the function is linear or non-linear. The student response should explain that the function is not linear.

Functions

8.F.4 Expectation at 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.

Below Proficient

A function is given.

$$y = \frac{1}{2}x + 2$$

What is the slope and y-intercept of the function?

Slope: _____

y-intercept: _____

Answers: $\frac{1}{2}$, 2

Approaching Proficient

Write an equation in $y = mx + b$ form of a function with a slope of $\frac{1}{2}$ and a y-intercept at (0,2).

Answer: $y = \frac{1}{2}x + 2$

Proficient

To ship a package, a company charges a one-time fee plus a fee based on the weight of the package. This table shows the total shipping costs for four packages of different weights.

Shipping Costs

Weight of Package (pounds)	Total Shipping Cost (dollars)
4	$11.00
8	$17.00
12	$23.00
16	$29.00

What is the rate of change of the shipping cost, in dollars per pound?

Answer: $\frac{3}{2}$ or 1.5

What is the initial value of the function?

Answer: 5

Above Proficient

The following table shows the number of hours a student spends studying and the corresponding score they received on a test.

Hours studied (x)	Test score (y)
0	50
1	55
2	60
3	65
4	70

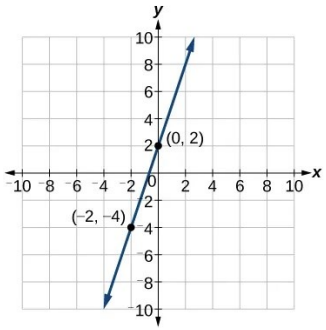
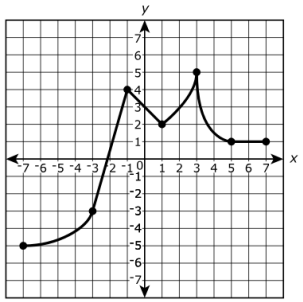
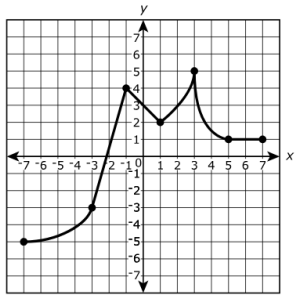
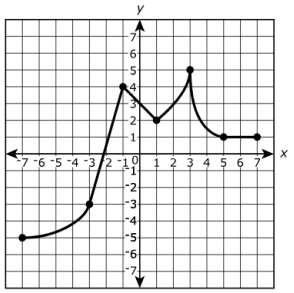
Write an equation in slope-intercept form to model the relationship.

Answer: $y = 5x + 50$

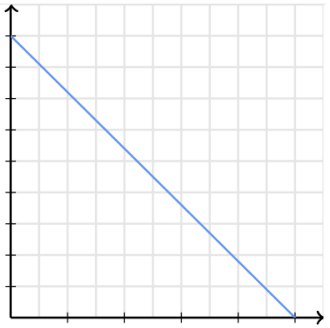
Make a conjecture about the data using the slope and initial value.

For every hour of studying, the test score rises by 5.

Functions

8.F.5-1 **Expectation at Proficient:** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear).	**Below Proficient**	**Approaching Proficient**	**Proficient**	**Above Proficient**
	The graph shows y as a function of x.  Which term best describes the behavior of the graph? A. Increasing B. Decreasing C. Constant D. Undefined	The graph shows y as a function of x.  Over the interval x=1 to x=3, which term best describes the behavior of the graph? A. Increasing B. Decreasing C. Constant D. Undefined	The graph shows y as a function of x.  For which interval is the function decreasing? A. $-7 < x < -3$ B. $1 < x < 3$ C. $3 < x < 5$ D. $5 < x < 7$	The graph shows y as a function of x.  Analyze the graph of the function by identifying the domain and range and explaining intervals of increase and decrease. Answer: Domain: [-7,7] Range: [-5,5] Increase: (-7,-1), (1,3) Decrease: (-1,1), (3,5)

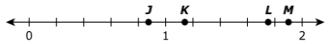
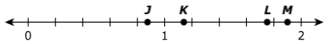
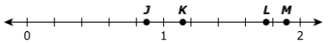
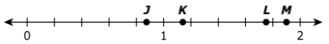
Functions

8.F.5-2 **Expectation at Proficient:** Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	**Below Proficient**	**Approaching Proficient**	**Proficient**	**Above Proficient**
	Sketch a graph of the function with the following features: y-intercept: (0,4) Slope: $\frac{4}{5}$ The graph should include a point at 4 on the y-axis with points up 4 and right 5 (as well as down 4 and left 5).	A function is shown. $y = \frac{4}{5}x + 4$ Graph the function on a coordinate plane. The graph should include a point at 4 on the y-axis with points up 4 and right 5 (as well as down 4 and left 5).	The graph of a function is made up of two connected line segments. The y -intercept of the graph is 4. From $x = 0$ to $x = 5$, the slope of the graph is $\frac{4}{5}$. From $x = 5$ to $x = 10$, the slope of the graph is $-\frac{2}{5}$. Graph the given function on a coordinate plane. The graph should start on (0,4) with a slope up 4 and right 5 to the point (4,9). From the point (4,9), the graph shifts downward, down 2 right 5 until it reaches the point (9,7).	The graph of a linear function is shown.  Describe a real-world situation that would be represented by the given graph. Answers will vary.

The Number System

8.NS.1	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: Convert a fraction with a double-digit dividend and a single digit divisor into rational or irrational numbers that have decimal expansions up to 3 or more place values and convert decimals with 3 or more place values into fractions.	Which division problem is created with the fraction $\frac{6}{13}$? A. $1 \div \frac{6}{13}$ B. $13 \div 6$ C. $6 \div 13$ D. $6 \div \frac{6}{13}$	Which fraction is equivalent to $0.3\overline{18}$? A. $\frac{8}{21}$ B. $\frac{7}{22}$ C. $\frac{6}{23}$ D. $\frac{5}{24}$	Which number is equivalent to $\frac{22}{3}$? A. 0.136 B. $0.1\overline{36}$ C. 7.3 D. $7.\overline{3}$	Convert 0.3756 into a fraction. Simplify the fraction. Answer: $\frac{3756}{10000} = \frac{939}{2500}$

The Number System

8.NS.2	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: Compare rational and irrational numbers to two decimal places on a number line.	The number line shows the location of points J, K, L, and M.  Which point represents a value that is between 0 and 1? Answer: J	The number line shows the location of points J, K, L, and M.  Which point best represents a value that is less than 1? Answer: J	The number line shows the location of points J, K, L, and M.  Which point best represents $\sqrt{3}$? Answer: L	The number line shows the location of points J, K, L, and M.  Which point best represents each of the following values? 1. $\sqrt{3}$ 2. $1.006 + 0.894$ 3. $\frac{16}{18}$ 4. $2(0.575)$ Answers: L, M, J, K

Expressions & Equations

8.EE.1	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: Evaluate and generate equivalent numerical expressions using and applying properties of integer exponents.	What is the equivalent value of $5^7 \cdot 5^{-4}$? A. 5^3 B. 5^{11} C. 5^{28} D. 5^{-28}	Simplify $5^7 \cdot 5^{-4}$. Answer: 5^3	Which expression is equivalent to 5^3? Select **all** that apply. A. $5^7 \cdot 5^{-4}$ B. $\frac{5^{12}}{5^4}$ C. $5 + 5^2$ D. $5^0 \cdot 5^3$ E. $5^3 - 5^0$	A scientist is studying bacteria growth. The bacteria population doubles every hour. If there are initially 500 bacteria, the population after t hours can be modeled by the expression: 500×2^t After 3 hours, how many bacteria will there be? Use the properties of exponents to evaluate the expression. Answer: 4,000

Expressions & Equations

8.EE.2	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: Solve equations using square root and cube root symbols to represent solutions (solutions are positive rational numbers) and solutions are perfect squares or perfect cubes. Evaluate perfect squares and perfect cubes.	Evaluate each radical. $\sqrt{36} =$ ____ $\sqrt[3]{8} =$ ____ Answer: 6, 2	An equation is partially solved. $x^3 = \frac{64}{27}$ $\frac{\sqrt[3]{64}}{\sqrt[3]{27}} =$ — Which value completes the equation? A. $\frac{64}{27}$ B. $\frac{8}{3}$ C. $\frac{4}{3}$ D. $\frac{2}{1}$	Two equations are shown. $x^3 = \frac{64}{27}$ What value(s) of x makes the equation true? Answer: $\frac{4}{3}$ $y^2 = 36$ What value(s) of y makes the equation true? Answer: ± 6	A globe of the earth is in the shape of a sphere. The globe has a radius of 10 inches. The formula to determine the volume of a sphere is $V = \frac{4}{3}\pi r^3$ where V represents the volume and r represents the radius. What is the volume, in cubic inches, of the globe to the nearest tenth? Answers range from 4,186.7 to 4,188.8 (depending on the value of pi used).

Expressions & Equations

8.EE.3	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: Use numbers expressed in scientific notation to estimate very large and very small quantities. Express how many times as much one number written in scientific notation is than another number written in scientific notation.	Which number written in scientific notation is equivalent to 5,000? A. 5×10^{-3} B. 5×10^{-2} C. 5×10^{2} D. 5×10^{3}	A number written in scientific notation is shown. 2.9×10^{5} Which value represents the best estimate of the number in standard form? A. 0.00003 B. 0.0003 C. 300,000 D.3,000,000	The body of an adult person contains approximately 2×10^{-1} milligrams of gold and 6×10^{1} milligrams of aluminum. Express each value in standard form. Answers: Gold: 0.2 Aluminum: 60	The body of a 154-pound person contains approximately 2×10^{-1} milligrams of gold and 6×10^{1} milligrams of aluminum. Based on this information, the number of milligrams of aluminum in the body is how many times the number of milligrams of gold in the body? Answer: 300

Expressions & Equations

8.EE.4-1 8.EE.4-2	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: Perform operations with numbers expressed in scientific notation including problems where both decimal and scientific notation are used. Choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology.	A number written in scientific notation is shown. 4×10^3 Which number is equivalent to 4×10^3? A. 40 B. 400 C. 4,000 D. 40,000	Jackson drives 3×10^3 miles on Monday and 2×10^3 miles on Tuesday. What is the total number of miles, written in scientific notation, Jackson drives both days? Answer: 5×10^3	A carpenter bought 750 nails. Each nail has a mass of 5.2×10^{-3} kilogram. What is the total mass, in kilograms, of the nails the carpenter bought? Write your answer as a decimal. Answer: 3.9	A carpenter bought 750 nails. Each nail has a mass of 5.2×10^{-3} kilogram. What is the total mass, in kilograms, of the nails the carpenter bought? Write your answer in scientific notation. Answer: 3.9×10^0 *or* 3.9

Expressions & Equations

8.EE.5-1
8.EE.5-2

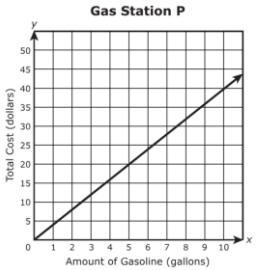
Expectation at Proficient:

Graph proportional relationships; interpret the unit rate as the slope of the graph.

Compare two different real world proportional relationships represented in different ways.

Below Proficient

The graph shows the amount of gasoline, in gallons, x, and the total cost in dollars, y, of gasoline at Gas Station P.



Complete the sentence:

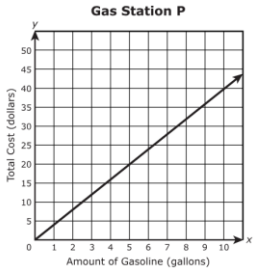
The relationship between the amount of gasoline and the total cost is (proportional/not proportional).

Approaching Proficient

The graph and table show the amount of gasoline, in gallons, x, and the total cost in dollars, y, of gasoline at two gas stations.

Gas Station M

x	y
5	19.00
10	38.00
15	57.00



What is the cost, in dollars, to buy 5 gallons of gasoline at each station?

Answer:

Gas Station M: 19

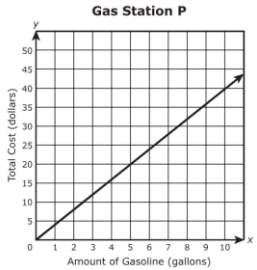
Gas Station P: 20

Proficient

The graph and table show the amount of gasoline, in gallons, x, and the total cost in dollars, y, of gasoline at two gas stations.

Gas Station M

x	y
5	19.00
10	38.00
15	57.00



What is the unit price of gasoline at each station?

Answer:

Gas Station M: 3.8

Gas Station P: 4

Which station charges more for gasoline per gallon?

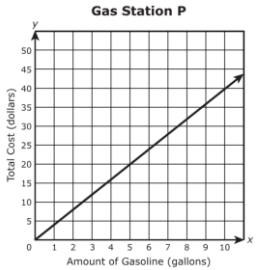
Answer: Gas Station P

Above Proficient

The graph and table show the amount of gasoline, in gallons, x, and the total cost in dollars, y, of gasoline at two gas stations.

Gas Station M

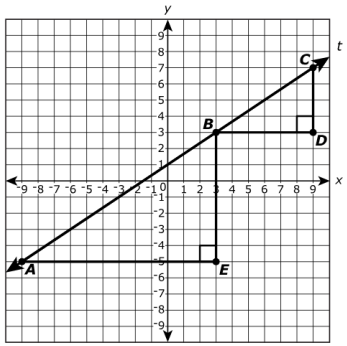
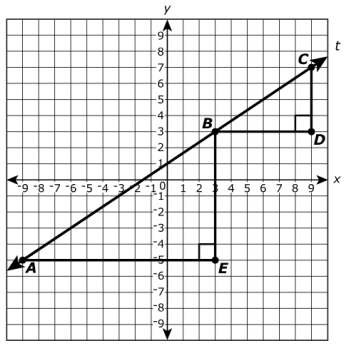
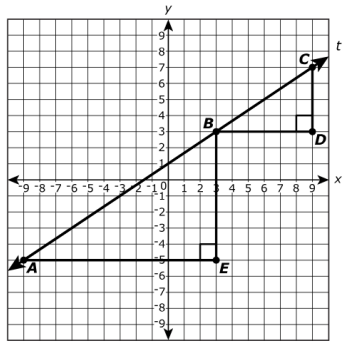
x	y
5	19.00
10	38.00
15	57.00



Benji needs to fill 4 gasoline canisters that hold 3 gallons each. From which gasoline station should he buy the gasoline to reduce the cost? How much money, in dollars, will he save? Explain your answer.

Answer: Station M, $2.40, explanation/work shown.

Expressions & Equations

8.EE.6	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: 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.	Determine if the relationship shown by the graph is proportional or non-proportional.  Select the best answer. A. The relationship is proportional because the graph is a straight line that passes through the origin. B. The relationship is proportional because the graph is a straight line that does **not** pass through the origin. C. The relationship is **not** proportional because the graph is a straight line that passes through the origin. D. The relationship is **not** proportional because the graph is a straight line that does **not** pass through the origin.	Similar triangles ABE and BCD are shown on the coordinate plane. Line t passes through points A, B, and C.  Use the height and length of the triangles in the diagram to answer the questions. What is the slope of line AB? Answer: $\frac{2}{3}$ What is the slope of line BC? Answer: $\frac{2}{3}$	Similar triangles ABE and BCD are shown on the coordinate plane. Line t passes through points A, B, and C.  Use ratios of the side lengths of triangle ABE and triangle BCD to explain why the slope of segment $\overline{AB}$ and the slope of segment $\overline{BC}$ are the same. Answer: $\frac{BE}{EA} = \frac{CD}{DB}$ (or equivalent)	Sarah is starting a small business selling handmade bracelets. She charges a one-time fee of $5 for materials, and each bracelet she sells costs an additional $3 to make. Write a linear equation to represent Sarah's total cost, C, in terms of the number of bracelets, b, she makes. Answer: $C = 3b + 5$ Graph the equation on a coordinate plane. Interpret the meaning of the slope and y-intercept in the context of Sarah's business. The student response should illustrate/explain a slope of 3 and a y-intercept of 5.

Expressions & Equations

8.EE.7b **Expectation at Proficient:** Solve multi-step equations with rational coefficients and can use the distributive property. Solve and identify the solution set for a multi-step equation as one, no, or infinitely many solutions by simplifying an equation into the form x = a, a = a, or a = b (where a and b are different values).	**Below Proficient**	**Approaching Proficient**	**Proficient**	**Above Proficient**
	An equation is shown. $-2(1-12x) = -2+24x$ Determine if each value is a solution to the equation. Yes or No. -2 _____ 0 _____ 2 _____ Answers: yes, yes, yes	An equation is shown. $-2(1-12x) = -2+24x$ Determine whether the equation has no solution, one solution, or infinitely many solutions. Answer: infinitely many	An equation is shown. $-2(1-12x) = -4(1-6x)$ Determine whether the equation has no solution, one solution, or infinitely many solutions. Answer: no solution	An equation is shown. $-2(1-12x) = -4(1-6x)$ Determine whether the equation has no solution, one solution, or infinitely many solutions. Explain how you know. Answer: no solution; explanation or work similar to $-2+24x = -4+24x$ $-2 = -4$ which is not true so there are no solutions.

Expressions & Equations

8.EE.8a

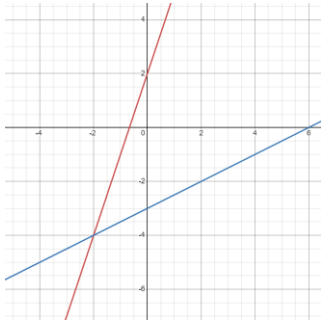
Expectation at Proficient:

Analyze and solve pairs of simultaneous linear equations in two variables graphically and identify the point of intersection as the values for the variables that will satisfy both equations.

Below Proficient

A system of equations is shown.

$$\begin{cases} y = 3x + 2 \\ y = \frac{1}{2}x - 3 \end{cases}$$



Which coordinate point represents the solution to the system?

A. (0,2)

B. (6,0)

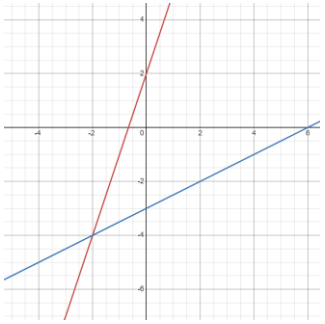
C. (-2,-4)

D. (-4,-2)

Approaching Proficient

A system of equations is shown.

$$\begin{cases} y = 3x + 2 \\ y = \frac{1}{2}x - 3 \end{cases}$$



What coordinate point represents the solution to the system?

Answer: (-2,-4)

Proficient

A system of equations is shown.

$$\begin{cases} y = 3x + 2 \\ y = \frac{1}{2}x - 3 \end{cases}$$

Graph the system of equations.

What coordinate point represents the solution to the system?

The graph should be similar to what is shown in the columns to the left; (-2, -4).

Above Proficient

A system of equations is shown.

$$\begin{cases} y = 3x + 2 \\ y = \frac{1}{2}x - 3 \end{cases}$$

Graph the system of equations.

What coordinate point represents the solution to the system?

Answer: (-2,-4)

Algebraically justify your answer.

The student work should justify the solution (substitution or elimination methods).

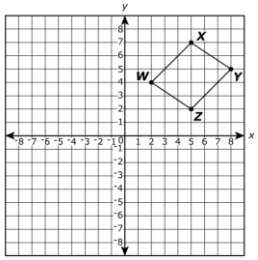
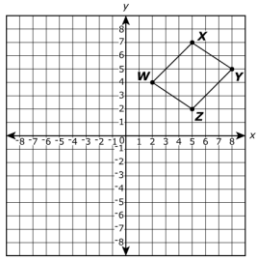
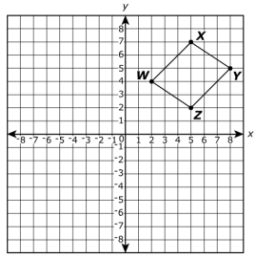
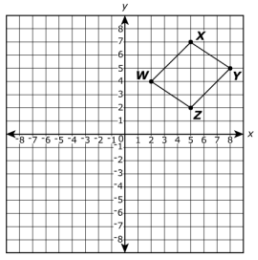
Expressions & Equations

8.EE.8b-1 8.EE.8b-2 8.EE.8b-3	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: Identify, by inspection, a simple case of no or infinite solutions to a pair of simultaneous equations. For example, 3x + 2y = 5 and 3x + 2y = 6 cannot simultaneously be 5 and 6 and therefore have no solution.	A system of equations is shown. $\begin{cases} 4x - y = 6 \\ y = 2x + 8 \end{cases}$ What is the x-value of the solution of the system? Use substitution to solve the system of equations. The first step is done for you. $4x - \boldsymbol{y} = 6$ $4x - (\boldsymbol{2x + 8}) = 6$ A. 2 B. 4 C. 5 D. 7	A system of equations is shown. $\begin{cases} 4x - y = 6 \\ y = 2x + 8 \end{cases}$ Use substitution to solve the system of equations. The first step is done for you. $4x - \boldsymbol{y} = 6$ $4x - (\boldsymbol{2x + 8}) = 6$ Answer: (7, 22)	A system of equations is shown. $\begin{cases} 4x - y = 6 \\ -4x + y = 8 \end{cases}$ Which statement correctly describes the system of equations shown? A. The system has no solution because the graph of the system represents the same line. B. The system has no solution because the graph of the system represents parallel lines. C. The system has infinitely many solutions because the graph of the system represents the same line. D. The system has infinitely many solutions because the graph of the system represents parallel lines.	A system of equations is shown. $\begin{cases} 4x - y = 6 \\ y = 4x + 8 \end{cases}$ Explain if the system has no solution, infinitely many solutions, or one solution. The student response should explain or show work to justify that the system has no solution.

Expressions & Equations

8.EE.8c	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: Solve real-world and mathematical problems leading to two linear equations in two variables. Solve by graphing algebraically and identify the solution and interpret the solution as it pertains to the real-world situation.	Tim has \$20 to buy snacks for 12 people in an office. Each person will get one snack. Tim is buying bags of pretzels that cost \$1.50 per bag and bags of crackers that cost \$2.00 per bag. Tim is buying x bags of pretzels and y bags of crackers. $\begin{cases} 1.50x + 2.00y = 20 \\ x + y = 12 \end{cases}$ Use the given system of equations to determine the value of x. A. 2 B. 4 C. 6 D. 8	Tim has \$20 to buy snacks for 12 people in an office. Each person will get one snack. Tim is buying bags of pretzels that cost \$1.50 per bag and bags of crackers that cost \$2.00 per bag. Tim is buying x bags of pretzels and y bags of crackers. $\begin{cases} 1.50x + 2.00y = 20 \\ x + y = 12 \end{cases}$ Use the given system of equations to determine the values of x and y. Answers: $x = 8, y = 4$	Tim has \$20 to buy snacks for 12 people in an office. Each person will get one snack. Tim is buying bags of pretzels that cost \$1.50 per bag and bags of crackers that cost \$2.00 per bag. Tim is buying x bags of pretzels and y bags of crackers. Write a system of equations can be used to find the value of x and y? Answer: see left How many bags of pretzels does Tim buy? Answer: 8	Tim has \$20 to buy snacks for 12 people in an office. Each person will get one snack. Tim is buying bags of pretzels that cost \$1.50 per bag and bags of crackers that cost \$2.00 per bag. Tim is buying x bags of pretzels and y bags of crackers. Write a system of equations can be used to find the value of x and y? Answer: see left How many bags of pretzels and bags of crackers does Tim buy? Justify your answer graphically. Answer: 8 bags of pretzels and 4 bags of crackers; graph the system to show the point of intersection is (8,4).

Geometry

8.G.1a 8.G.1b 8.G.1c	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: Verify congruence of a planar figure (line, line segment, angle, or parallel line) that has been rotated, reflected, or translated on a coordinate plane using physical models, transparencies, or geometry software.	Parallelogram WXYZ is shown on the coordinate plane.  Which line segment is parallel to $\overline{WX}$? A. $\overline{WY}$ B. $\overline{ZY}$ C. $\overline{YX}$ D. $\overline{ZX}$	Parallelogram WXYZ is shown on the coordinate plane.  Which transformation of parallelogram will create an image that is congruent to parallelogram WXYZ. A. Translation B. Reflection C. Rotation D. All of the above	Parallelogram WXYZ is shown on the coordinate plane.  Parallelogram W'X'Y'Z' (not shown) is the reflection of parallelogram WXYZ across the y-axis. Which segment is parallel to $\overline{W'X'}$? A. $\overline{X'Y'}$ B. $\overline{W'Z'}$ C. $\overline{Y'X'}$ D. $\overline{Z'Y'}$	Parallelogram WXYZ is shown on the coordinate plane.  Sketch a congruent parallelogram for each of the following transformations. 1. Translation left 10 units 2. Reflection across the x-axis 3. Rotation 180° about the origin Explain how you know the preimage and image are congruent. Translations, reflections, and rotations preserve angle measures and side lengths.

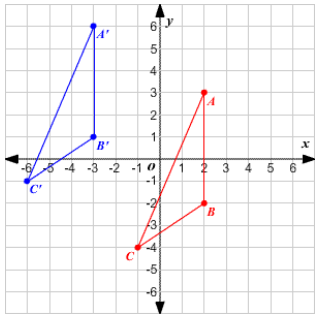
Geometry

8.G.2
Expectation at Proficient:

Demonstrate 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.

Below Proficient

Triangle ABC and its transformed image triangle A'B'C' are shown on the graph.



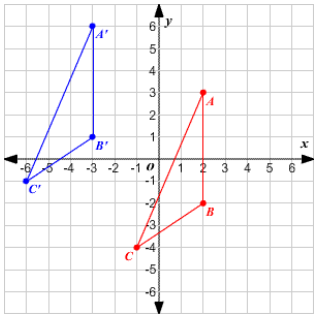
Complete the translation that maps triangle ABC to triangle A'B'C'.

Translate triangle ABC ____ units to the left and ___ units up.

Answers: 5, 3

Approaching Proficient

Triangle ABC and its transformed image triangle A'B'C' are shown on the graph.

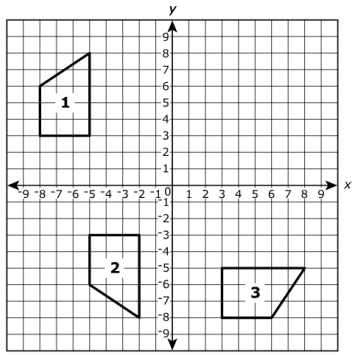


Describe the transformation the maps triangle ABC to triangle A'B'C'?

Translate triangle ABC 5 units to the left and 3 units up.

Proficient

Three congruent figures are shown in the coordinate plane.

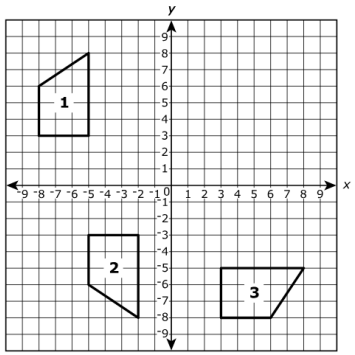


Describe a series of transformations that transforms figure 1 into figure 2.

Reflection across the x-axis followed by a translation right 3 units.

Above Proficient

Three congruent figures are shown in the coordinate plane.



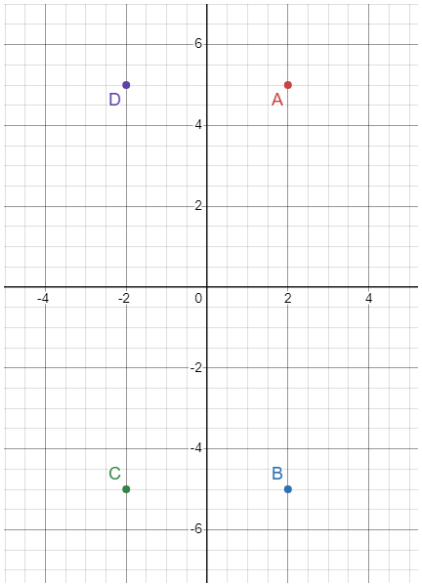
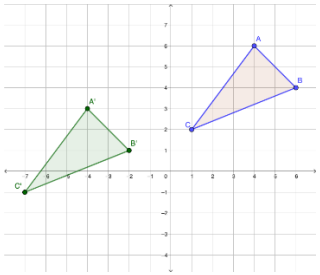
Describe a series of transformations that transforms figure 1 into figure 2.

Reflection across the x-axis followed by a translation right 3 units.

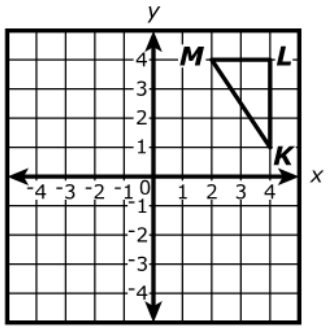
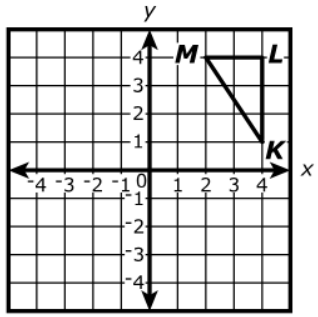
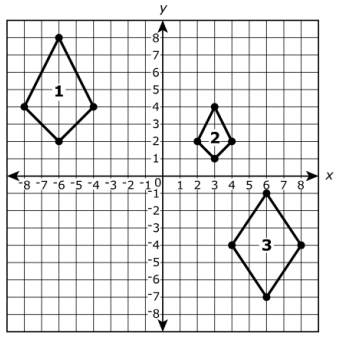
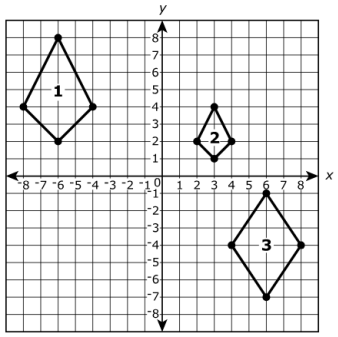
Describe a series of transformations that transforms figure 1 into figure 3.

Rotation 90° clockwise about the origin, followed by a reflection across the x-axis.

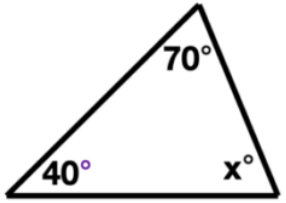
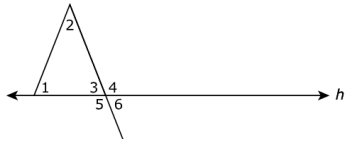
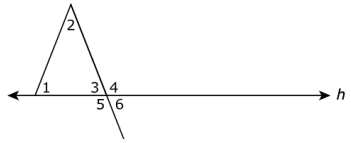
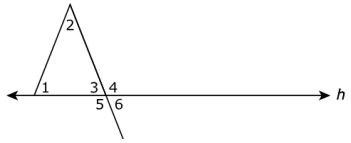
Geometry

8.G.3 Expectation at Proficient:	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	Given the coordinate points for A, B, C, and D, graph rectangle ABCD on a coordinate plan. A. (2,5) B. (2,-5) C. (-2,-5) D. (-2,5) Answer:  	Triangle ABC and its image are shown on the graph.  What are the coordinates of the image of triangle ABC after the reflection? $A' = (\_\_, \_\_)$ $B' = (\_\_, \_\_)$ $C' = (\_\_, \_\_)$ Answer: A'= (−4, 3), B'= (−2, 1), C'= (−7, −1)	The coordinates of a triangle ABC are A(2,1), B(2,5), and C(4,1). Triangle ABC is rotated $180°$ counterclockwise about the origin. What are the coordinates of the image of triangle ABC after the rotation? $A' = (\_\_, \_\_)$ $B' = (\_\_, \_\_)$ $C' = (\_\_, \_\_)$ Answer: $A' = (-2.-1)$ $B' = (-2,-5)$ $C' = (-4,-1)$	The coordinates of a triangle ABC are A(2,1), B(2,5), and C(4,1). Triangle ABC is rotated $180°$ counterclockwise about the origin. What are the coordinates of the image of triangle ABC after the rotation? $A' = (\_\_, \_\_)$ $B' = (\_\_, \_\_)$ $C' = (\_\_, \_\_)$ Answer: $A' = (-2.-1)$ $B' = (-2,-5)$ $C' = (-4,-1)$ Describe the effects of the rotation on triangle ABC. The student response should include that the coordinates change signs.

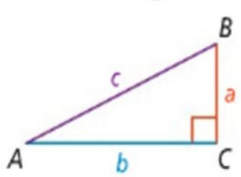
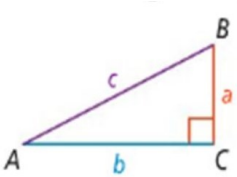
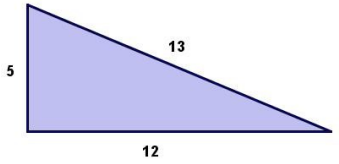
Geometry

8.G.4 Expectation at Proficient:	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Demonstrate 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.	The graph of triangle KLM is shown.  Graph the image of triangle KLM after a reflection across the y-axis. The graph should include a triangle with vertices K'(-4,1), L'(-4,4), M'(-2,4).	The graph of triangle KLM is shown.  Graph the image of triangle KLM after a rotation of 180° centered at the origin, followed by a reflection across the x-axis. The graph should include a triangle with vertices K'(-4,1), L'(-4,4), M'(-2,4).	Three figures are shown on the coordinate plane.  Is figure 1 similar to figure 2? If so, describe a series of transformations to transform figure 1 into figure 2. Yes; figure 2 is the image of figure 1 after a dilation with scale factor $\frac{1}{2}$ centered at the origin followed by a reflection across the y-axis.	Three figures are shown on the coordinate plane.  Is figure 1 similar to figure 2? If so, describe a series of transformations to transform figure 1 into figure 2. Yes; figure 2 is the image of figure 1 after a dilation with scale factor $\frac{1}{2}$ centered at the origin followed by a reflection across the y-axis. Is figure 1 similar to figure 3? If so, describe a series of transformations to transform figure 1 into figure 3. No, the figures are not similar.

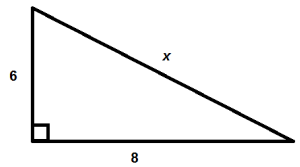
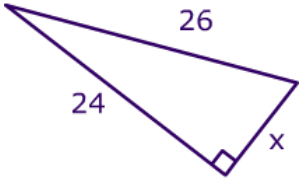
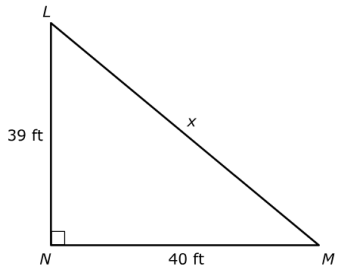
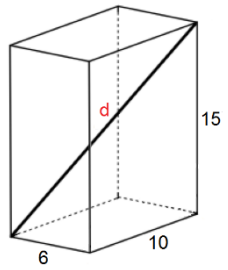
Geometry

8.G.5	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: 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. Give an argument in terms of transversals why this is so.	A triangle and some angle measures, in degrees, are shown.  What is the value of x? Which name best describes the triangle? A. Right B. Acute C. Obtuse D. Equiangular	One side of a triangle lies along line h. The measure of angle 4 is 120°.  Determine if each statement is true or false. $m\angle 3 = 60°$ _____ $m\angle 5 = 60°$ _____ $m\angle 6 = 60°$ _____ $m\angle 1 + m\angle 2 = 120°$ _____ Answers: True, False, True, True	One side of a triangle lies along line h. The measure of angle 4 is 120°.  Determine the measure, in degrees, of angles 3, 4, and 5. Determine the sum of angles 1 and 2. $m\angle 3 =$ ____ $m\angle 5 =$ ____ $m\angle 6 =$ ____ $m\angle 1 + m\angle 2 =$ ____ Answers: 60°, 120°, 60°, 120°	One side of a triangle lies along line h. The measure of angle 4 is 120°.  Jada claims that $m\angle 1 + m\angle 2 > m\angle 4$. Explain why Jada's claim is incorrect. Answer: $m\angle 1 + m\angle 2 + m\angle 3 = 180°, and\ m\angle 3 + m\angle 4 = 180°, so\ m\angle 1 + m\angle 2\ cannot = m\angle 4$. What is the correct relationship between $m\angle 1, m\angle 2$ and $m\angle 4$? Answer: $m\angle 1 + m\angle 2 = m\angle 4$

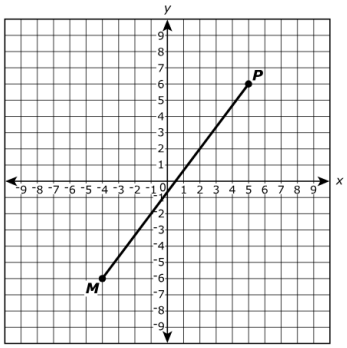
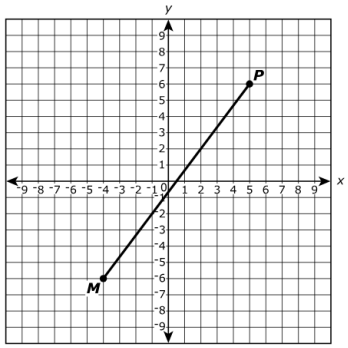
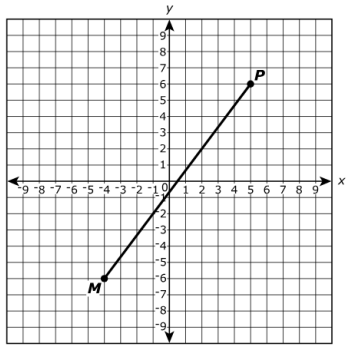
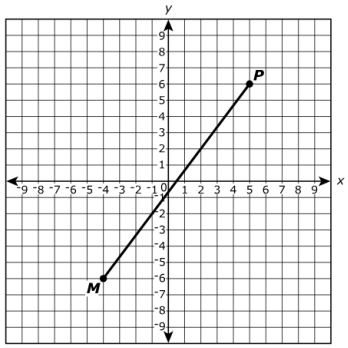
Geometry

8.G.6	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: Explain a proof of the Pythagorean Theorem and its converse.	Which equation represents the Pythagorean theorem, a true statement for the right triangle shown?  A. $a^2 + b^2 = c^2$ B. $a^2 - b^2 = c^2$ C. $a^2 + b^2 > c^2$ D. $a^2 - b^2 > c^2$	A triangle is shown.  Use the Pythagorean theorem to complete the following statements. If triangle ABC is a right triangle, the $a^2 + b^2 =$ ___. Answer: c^2	A triangle is shown.  Use the Pythagorean theorem to explain why the triangle is a right triangle. Answer: $5^2 + 12^2 = 13^2$ so it satisfies the Pythagorean theorem and therefore must be a right triangle.	A 10-ft ladder rests against a building. The base of the ladder is 6 feet from the building. Explain how the Pythagorean theorem can be used to determine the height, in feet, of the ladder resting on the building. The Pythagorean theorem can be used because we can assume the building forms a right angle with the ground. $6^2 + b^2 = 10^2$ $b^2 = 64$ $b = 8$

Geometry

8.G.7	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	A right triangle and some side lengths, in units, are shown.  Use the Pythagorean theorem to determine the length, in units, of the missing side, x. A. 7 B. 9 C. 10 D. 12	A right triangle and some side lengths, in units, are shown.  Determine the length in units, of the missing side, x. A. 9 B. 10 C.12 D. 15	Cory's garden is in the shape of a right triangle (as shown). One side of the garden is 39 feet, and another side length is 40 feet.  How long is the unknown side, x, in feet? Answer: 55.9	Cory measured a cereal box in the shape of a rectangular prism. Cory recorded the measurements in inches, as shown.  Determine the value of d, the length of the diagonal, in inches. Answer: 19

Geometry

8.G.8 Expectation at Proficient:	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Apply the Pythagorean theorem to find the distance between two points in a coordinate system.	A segment is graphed on a coordinate plane as shown.  Draw a right triangle by plotting a third point, N, with hypotenuse $\overline{MP}$. Point N can be drawn at either (5,-6) or (-4,6).	A segment is graphed on a coordinate plane as shown.  Draw a right triangle by plotting a third point, N, with hypotenuse $\overline{MP}$. Point N can be drawn at either (5,-6) or (-4,6). Determine the length of each segment. $\overline{NM} =$ ____ $\overline{NP} =$ ____ Answers: 9, 12 (or 12, 9)	A segment is graphed on a coordinate plane as shown.  Determine the length, in units, of $\overline{MP}$. Answer: 15	A segment is graphed on a coordinate plane as shown.  Determine the length, in units, of $\overline{MP}$. Answer: 15 Use the Pythagorean theorem to explain your answer. Answer: $9^2 + 12^2 = c^2$ $81 + 144 = c^2$ $225 = c^2$ $c = \sqrt{225} = 15$

Geometry

8.G.9
Expectation at Proficient:

Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Below Proficient

Match the volume formula with its figure.

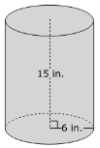
Figure	Volume Formula
Cylinder	$V = \frac{1}{3}\pi r^2 h$
Cone	$V = \frac{4}{3}\pi r^3$
Sphere	$V = \pi r^2 h$

Answer:

Cylinder	$V = \pi r^2 h$
Cone	$V = \frac{1}{3}\pi r^2 h$
Sphere	$V = \frac{4}{3}\pi r^3$

Approaching Proficient

Josh wants to fill a cylindrical planter with soil. The planter and its dimensions are shown.

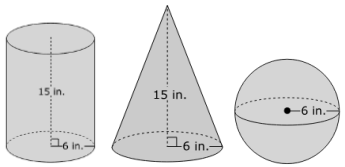


How many cubic inches of soil does Josh need to fill the planter? (The formula for calculating the volume of a cylinder is $V = \pi r^2 h$.)

Answer: 1,696

Proficient

Three figures are shown.

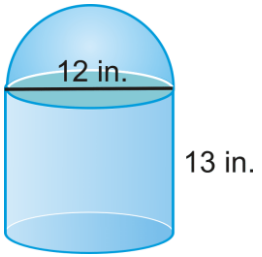


Determine the volume, in cubic inches, of each figure.

Answer: Cylinder: 1,696; Cone: 565; Sphere: 905

Above Proficient

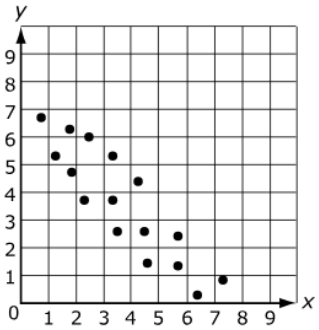
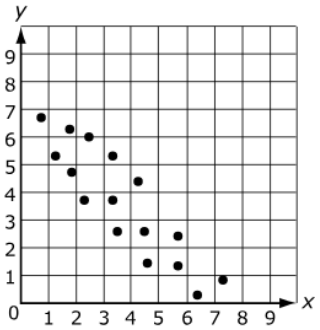
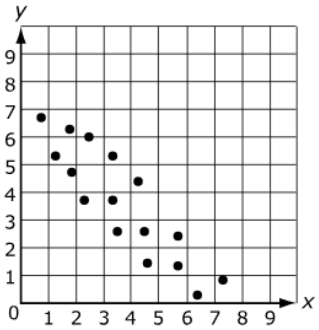
A water tank is in the shape of a cylinder and hemisphere as shown.



What is the volume, in cubic **feet,** of the water tank?

Answer: $612\pi \approx 1{,}923$

Statistics & Probability

8.SP.1	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities.	A scatter plot is shown.  True or False: The data in the scatter plot appear to have a negative, linear association. Answer: True	A scatter plot is shown.  Choose the term that best complete the statement. As the x *value* increases, *the* y *value* (increases, decreases).	A scatter plot is shown.  Which statement correctly describes the association in the scatter plot. A. The data have a nonlinear association. B. The data have a negative association. C. The data have no association. D. The data have an outlier.	Find a bivariate data set. Graph the points on a coordinate plane. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. Answers will vary.

Statistics & Probability

8.SP.2 Expectation at Proficient:

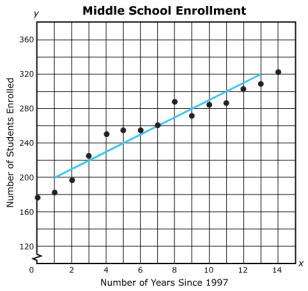
Use a straight line to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line.

Below Proficient

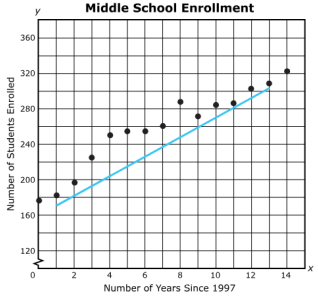
The scatterplots show the number of students at a middle school over time.

Which graph best shows the line of best fit for the data?

A.

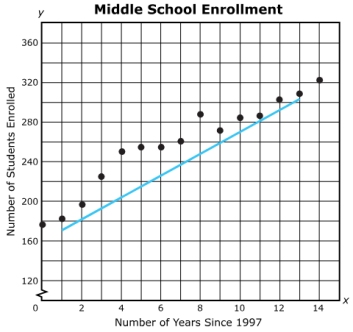


B.



Approaching Proficient

The scatterplot shows the number of students at a middle school over time.

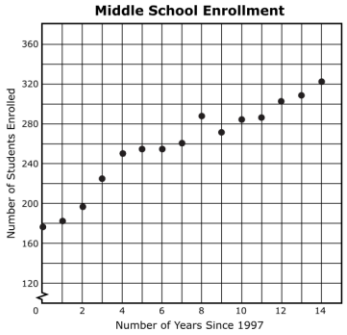


A line is drawn on the scatterplot. Is the line a good representation of the line of best fit? Explain why or why not?

No, too many points are above the line.

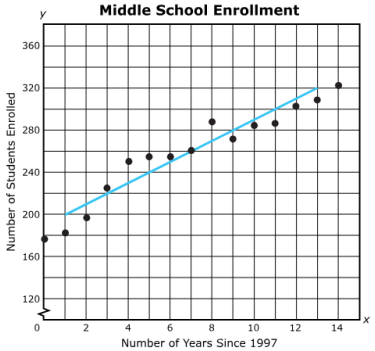
Proficient

The scatterplot shows the number of students at a middle school over time.



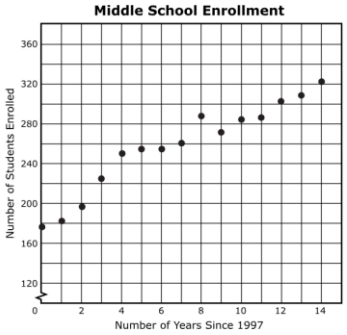
Sketch the line of best fit for the data.

Answer:



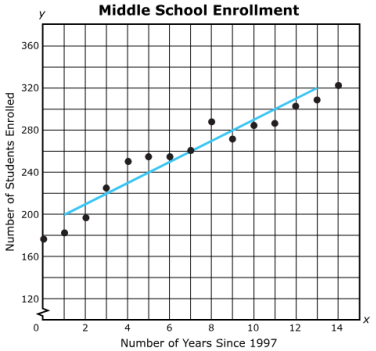
Above Proficient

The scatterplot shows the number of students at a middle school over time.



Sketch the line of best fit for the data.

Answer:



Explain why the line you drew is an accurate line of best fit.

An equal number of points are above and below line.

Statistics & Probability

8.SP.3	Below Proficient	Approaching Proficient	Proficient	Above Proficient
Expectation at Proficient: Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.	A local gym charges an initial fee of $65 and $32.50 for each month of membership. Which equation best models this situation where y represents the total cost, in dollars, for a membership for a certain number of months, x. A. $y = 65x + 32.50$ B. $y = 32.50x + 65$ C. $x = 65y + 32.50$ D. $x = 32.50y + 65$	In one city, the cost for a gym membership is given by the equation $y = 32.50x + 65$, where y is the total cost, in dollars, for a membership for a certain number of months, x. What is the cost, in dollars, of a gym membership for 6 months? Answer: 260	In one city, the cost for a gym membership is given by the equation $y = 32.50x + 65$, where y is the total cost, in dollars, for a membership for a certain number of months, x. What does the slope represent? Answer: 32.5; the monthly fee What does the y-intercept represent? Answer: 65; the initial cost What is the cost, in dollars, of a gym membership for 6 months? Answer: 260	A gym collects data on the number of hours a person exercises, x, and the number of calories they burn, y. Alex and Beth record the data in the table. Alex: (1,210) (2,395) (3,605) (4,790) Beth: (1,150) (2,300) (3,450) (4,600) An equation is given for each student is given. Alex: $y = 200x$ Beth: $y = 150x$ Sketch the data points and a line of best fit for each data set. Interpret the slope and y-intercept. The student response should include that Alex's data has a slope of 200 and Beth's data has a slope of 150; both sets of data have a y-intercept of 0.

Statistics & Probability

8.SP.4
Expectation at Proficient:

Represent 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.

Below Proficient

A survey of 7th and 8th grade students asked whether they were in favor of or against school uniforms. The two-way table shows the results.

Survey Results

Grade	Number of Students		
	In Favor	Against	Total
7th	48	64	112
8th	68	70	138
Total	116	134	250

How many of the 7th grade students were in favor of wearing school uniforms?

Answer: 48

Approaching Proficient

A survey of 7th and 8th grade students asked whether they were in favor of or against school uniforms. The two-way table shows the results.

Survey Results

Grade	Number of Students		
	In Favor	Against	Total
7th	48	64	112
8th	68	70	138
Total	116	134	250

How many total students from both 7th grade and 8th grade were in favor of wearing school uniforms?

Answer: 116

Proficient

A survey of 7th and 8th grade students asked whether they were in favor of or against school uniforms. The two-way table shows the results.

Survey Results

Grade	Number of Students		
	In Favor	Against	Total
7th	48	64	112
8th	68	70	138
Total	116	134	250

To the nearest tenth of a percent, what percent of the 7th grade students were in favor of wearing school uniforms?

Answer: 42.9%

Above Proficient

A survey of 7th and 8th grade students asked whether they were in favor of or against school uniforms. The two-way table shows the results.

Survey Results

Grade	Number of Students		
	In Favor	Against	Total
7th	48	64	112
8th	68	70	138
Total	116	134	250

Were 7th grade students or 8th grade students statistically more in favor of wearing school uniforms? Justify your answer using percents.

Answer: 8th grade students; 42.9% of 7th graders and 49.3% of 8th graders were in favor of school uniforms.