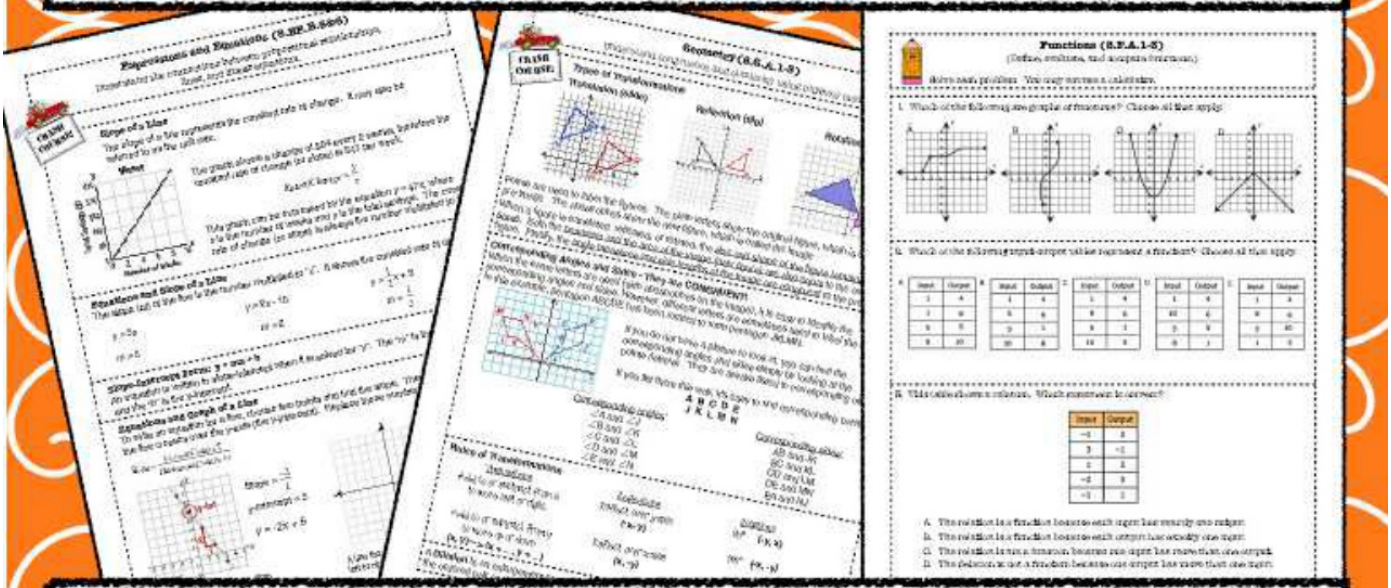
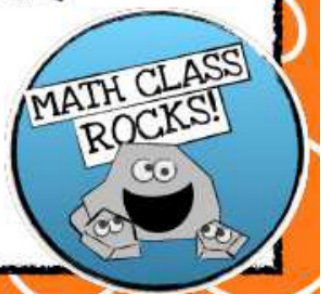
8th GRADE COMMON CORE MATH



COMPLETE REVIEW for STANDARDIZED TESTING!



8th Grade Common Core Standardized Test Review

If you need to prepare your students for a standardized test based on the Common Core, this "crash course" is exactly what you need!

When I realized that my students had to take the state test during the first week of April, I knew it would be impossible for me to cover all of the material to prepare them for the test! So, I created this review and am hoping that it will, at the very least, familiarize them with concepts and help them to be successful!

This review consists of "crash course" reviews, examples, and practice problems for each of the following common core standards:

The Number System

- Know that there are numbers that are not rational, and approximate them by rational numbers. CCSS.MATH.CONTENT.8.NS.A.1-2

Expressions and Equations

- Work with radicals and integer exponents. CCSS.MATH.CONTENT.8.EE.A.1-4
- Understand the connections between proportional relationships, lines, and linear equations. CCSS.MATH.CONTENT.8.EE.B.5-6
- Analyze and solve linear equations and pairs of simultaneous linear equations. CCSS.MATH.CONTENT.8.EE.C.7

Functions

- Define, evaluate, and compare functions. CCSS.MATH.CONTENT.8.F.A.1-3
- Use functions to model relationships between quantities. CCSS.MATH.CONTENT.8.F.B.4-5

Geometry

- Understand congruence and similarity using physical models, transparencies, or geometry software. CCSS.MATH.CONTENT.8.G.A.1-5
- Understand and apply the Pythagorean Theorem. CCSS.MATH.CONTENT.8.G.B.6-8
- Solve real-world and mathematical problems involving volume of cylinders, cones and spheres. CCSS.MATH.CONTENT.8.G.C.9

Statistics and Probability

- Investigate patterns of association in bivariate data. CCSS.MATH.CONTENT.8.SP.A.1-4

To make this review more authentic, many of the practice problems are "released items" from standardized testing websites. These problems have been made available to prepare our students for the test. I spent a significant amount of time grouping the items according to each standard and creating reviews that focus on the specific content. Problems have been modified and revised to increase rigor.

The Number System (8.NS.A.1&2)

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

Rational vs. Irrational Numbers

A **Rational** can be written as the ratio of two integers (a simple fraction).
A rational number **terminates (ends) or repeats** when written in decimal form.

1.5 is rational, because it can be written as the ratio **3/2**
7 is rational, because it can be written as the ratio **7/1**
0.333... (3 repeating) is also rational, because it can be written as the ratio **1/3**

An **Irrational** number cannot be written as the ratio of a simple fraction.
An irrational number **does not terminate or repeat** when written in decimal form.

π = 3.14159265358979323846264338327 95 (and more...)
You **cannot** write down a simple fraction, so it is an irrational number.

$\sqrt{50}$ = 7.07106781187...
When the number inside the $\sqrt{\ }$ is not a perfect square, the number is irrational.

Approximating a Square Root to the Nearest Integer (Whole Number)

Estimate $\sqrt{75}$ to the nearest integer.

1. Find the two perfect squares the number falls between.
2. Decide which is closer to the given number (circle it).
3. Find its square root.

$\sqrt{75}$
$\sqrt{64}$ $\sqrt{81}$
$\sqrt{75} = 9$

Approximating a Square Root to the Nearest Tenth

Estimate $\sqrt{75}$ to the nearest tenth.

1. Plot the two perfect squares the given number falls between. ($\sqrt{64}$ and $\sqrt{81}$)
2. Plot the number you are estimating. ($\sqrt{75}$)
3. Using the midpoint of the number line as a guide, estimate to the nearest tenth.

Since $\sqrt{75}$ is to the right of the midpoint, it will be higher than 8.5.
So, a reasonable estimate would be $\sqrt{75} \approx$ 8.6 or 8.7

Common Repeating Decimal Equivalents

$\frac{1}{3} = 0.\overline{3}$ $\frac{2}{3} = 0.\overline{6}$ $\frac{1}{9} = 0.\overline{1}$ $\frac{2}{9} = 0.\overline{2}$ $\frac{8}{9} = 0.\overline{8}$

*Notice the pattern when the denominator is "9".

Kim Coffield ©2016

The Number System (8.NS.A.1&2)

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

Rational vs. Irrational Numbers

A **Rational** can be written as the ratio of two integers (a simple fraction).
A rational number **terminates (ends) or repeats** when written in decimal form.

1.5 is rational, because it can be written as the ratio **3/2**
7 is rational, because it can be written as the ratio **7/1**
0.333... (3 repeating) is also rational, because it can be written as the ratio **1/3**

An **Irrational** number cannot be written as the ratio of a simple fraction.
An irrational number **does not terminate or repeat** when written in decimal form.

π = 3.14159265358979323846264338327 95 (and more…)
You **cannot** write down a simple fraction, so it is an irrational number.

$\sqrt{50}$ = 7.07106781187…
When the number inside the $\sqrt{\ }$ is not a perfect square, the number is irrational.

Approximating a Square Root to the Nearest Integer (Whole Number)

Estimate $\sqrt{75}$ to the nearest integer.

1. Find the two perfect squares the number falls between.
2. Decide which is closer to the given number (circle it).
3. Find its square root.

$\sqrt{75}$
$\sqrt{64}$ $\quad$ $\sqrt{81}$
$\sqrt{75} \approx 9$

Approximating a Square Root to the Nearest Tenth

Estimate $\sqrt{75}$ to the nearest tenth.

1. Plot the two perfect squares the given number falls between. ($\sqrt{64}$ and $\sqrt{81}$)
2. Find the difference between the lower perfect square and the one you need to find. (75 - 64)
3. Find the difference between the two perfect squares. (81 - 64)
4. Write a ratio. (11/17)
5. Divide and round to the nearest tenth. (11/17 rounds to 0.6)
6. Attach the decimal to the lower perfect square.

11 — $\sqrt{75}$
$\sqrt{64}$ — $\sqrt{81}$
17

$\frac{11}{17}$ = 0.6470…

The square root of 75 will fall between 8 and 9. The decimal 0.6470… will round to 0.6, so the estimate to the nearest tenth is 8.6

Common Repeating Decimal Equivalents

$\frac{1}{3} = 0.\overline{3}$ $\quad$ $\frac{2}{3} = 0.\overline{6}$ $\quad$ $\frac{1}{9} = 0.\overline{1}$ $\quad$ $\frac{2}{9} = 0.\overline{2}$ $\quad$ $\frac{8}{9} = 0.\overline{8}$

* Notice the pattern when the denominator is "9".

Kim Coffield ©2016 https://www.teacherspayteachers.com/Store/Math-Class-Rocks

The Number System (8.NS.A.1&2)

Solve each problem. You may NOT use a calculator for this set of problems.

1. The length of the diagonal of a rectangle is $\sqrt{181}$ inches. Which statement describes the length of the diagonal?

   A. The length is between 12 and 13 inches.

   B. The length is between 13 and 14 inches.

   C. The length is between 14 and 15 inches.

   D. The length is between 15 and 16 inches.

2. Which of the following are NOT rational numbers? (Choose all that apply.)

   A. $\sqrt{5}$

   B. 0.666...

   C. $\frac{16}{9}$

   D. $\frac{-30}{1}$

3. What is the square of 169?

   A. 11

   B. 13

   C. 28,561

   D. 28,730

4. Write $0.\overline{4}$ as a fraction in simplest form.

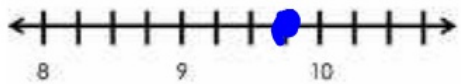
   A. $\frac{4}{10}$

   B. $\frac{44}{100}$

   C. $\frac{4}{9}$

   D. $\frac{2}{5}$

5. Estimate the location of $\sqrt{95}$ on the number line below.



6. Estimate $\sqrt{130}$ to the nearest tenth.

Kim Coffield ©2016

https://www.teacherspayteachers.com/Store/Math-Class-Rocks

The Number System (8.NS.A.1&2)

Solve each problem. You may NOT use a calculator for this set of problems.

1. The length of the diagonal of a rectangle is $\sqrt{181}$ inches. Which statement describes the length of the diagonal?

   A. The length is between 12 and 13 inches.

   B. The length is between 13 and 14 inches.

   C. The length is between 14 and 15 inches.

   D. The length is between 15 and 16 inches.

2. Which of the following are NOT rational numbers? (Choose all that apply.)

   A. $\sqrt{5}$

   B. 0.666

   C. $\frac{16}{9}$

   D. -30

3. What is the square of 169?

   A. 11

   B. 13

   C. 28,561

   D. 28,730

4. Write $0.\overline{4}$ as a fraction in simplest form.

   A. $\frac{4}{10}$

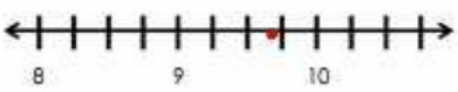
   B. $\frac{44}{100}$

   C. $\frac{4}{9}$

   D. $\frac{2}{5}$

5. Estimate the location of $\sqrt{94}$ on the number line below.

   $\sqrt{81}$ $\sqrt{100}$



6. Estimate $\sqrt{130}$ to the nearest tenth.

   11.4

Kim Coffield ©2016

https://www.teacherspayteachers.com/Store/Math-Class-Rocks

Expressions and Equations (8.EE.A.1-4)

Work with radicals and integer exponents.

Rules of Exponents

To multiply, add the exponents. $4^5 \cdot 4^{-2} = 4^3$

To divide, subtract the exponents. $9^9 \div 9^3 = 9^6$

To raise a power to a power, multiply the exponents. $(6^4)^2 = 6^8$

Negative Exponents

$$4^{-7} \div 4^{-4} = 4^{-3} = \frac{1}{4^3} = \frac{1}{64}$$

Scientific Notation

7,300,000

1. Place a decimal at the end.
2. Move left until there is one number in front of the decimal point.

7.3×10^6

3. Multiply by 10. The exponent is the number of times you moved the decimal. Because it started as number less than one, the exponent is negative. *On your calculator, it may look like this 7.3E+6*

0.000205

1. Move the decimal right until there is one number in front of it.
2. Multiply by 10. The exponent is the number of times you moved the decimal. Because it started as number less than one, the exponent is negative. *On your calculator, it may look like this 2.05E-4*

2.05×10^{-4}

Standard Form

3.991×10^7 When the exponent is positive, move the decimal to the right.

39,910,000 Add zeros if necessary. (In this case, you'll have to add 4 zeros.)

5.8×10^{-3} When the exponent is negative, move the decimal to the left.

0.0058 Add zeros if necessary. (In this case, you'll have to add 2 zeros.)

Operations with Numbers in Scientific Notation

$(3.5 \times 10^4)(2.1 \times 10^{-3}) = 7.35 \times 10^1$ Multiply the coefficients and add the exponents.

$(8.4 \times 10^9) \div (2.1 \times 10^2) = 4 \times 10^7$ Divide the coefficients and subtract the exponents.

$(7.05 \times 10^3) + (1.92 \times 10^3) = 8.97 \times 10^3$ Add the coefficients and keep the exponent.

$(9 \times 10^{-7}) - (4.25 \times 10^{-7}) = 4.75 \times 10^{-7}$ Subtract the coefficients and keep the exponent.

Helpful Hints

When adding or subtracting, the exponents must be the same. This is how you can change the exponent when adding or subtracting or rewrite your answers in proper scientific notation.

Moving the decimal to the left, adds to the exponent. $42.5 \times 10^7 = 4.25 \times 10^8$

Moving the decimal to the right subtracts from the exponent. $0.672 \times 10^{10} = 6.72 \times 10^9$

Kim Coffield ©2016

Expressions and Equations (8.EE.A.1-4)

(Radicals and Integer Exponents)

Solve each problem. You may NOT use a calculator for this set of problems.

1. Which expressions are equivalent to $5^6 \times 5^{-3}$? (Choose all that apply.)

$5^{(6-3)}$ $\quad$ $(5^6)^{-3}$ $\quad$ $\frac{5^6}{5^3}$ $\quad$ 5^9

5^3 $\quad$ 5^{-18} $\quad$ 5^3

$5^{-3} \cdot \frac{1}{5^3}$ $\quad$ 5^3 $\quad$ $5^{18} \cdot \frac{1}{5^{18}}$ $\quad$ $\frac{5^6}{5^{-3}}$ 5^9

2. Which of these expressions represent solutions to the equation $y^3 = 27$. Choose all that apply.

$-\sqrt[3]{27}$ $\quad$ $\sqrt[3]{27}$ $\quad$ 3 $\quad$ -3

3

3. A carpenter bought 850 nails. Each nail has a mass of 5.2×10^{-3} kg. What is the total mass, in kilograms, of the nails the carpenter bought. Express your answer as a decimal.

$850(5.2 \times 10^{-3})$

4.42 kg

4. The figure below shows the mass, in grams, of several samples of cells. The spreadsheet automatically converts them into scientific notation. How many times larger is Sample D than Sample B?

Sample	Mass (grams)
A	6.16 E -5
B	3.75 E -6
C	8.00 E -10
D	7.50 E -5

$\frac{7.5 \times 10^{-5}}{3.75 \times 10^{-6}}$

2×10^1

20

5. Which expressions are equivalent to $\frac{3^{-3}}{3^{-2}}$? Choose all that apply.

A. 3^{-3}

B. 3^{-7}

C. $\frac{1}{3^3}$

D. $\frac{1}{27}$

3^{-3}

$\frac{1}{3^3} = \frac{1}{27}$

6. The distance from Mars to the Sun is 1.416×10^8 miles. The distance from Earth to the Sun is 9.296×10^7 miles. How many more miles is the distance from Mars to the Sun than the distance from Earth to the Sun?

A. 4.864×10^1

B. 7.880×10^1

C. 4.864×10^7

D. 7.880×10^7

$1.416 \times 10^8 - 9.296 \times 10^7$

$14.16 \times 10^7 - 9.296 \times 10^7$

4.864×10^7

Kim Coffield ©2016

https://www.teacherspayteachers.com/Store/Math-Class-Rocks

Expressions and Equations (8.EE.A.1-4)

(Radicals and Integer Exponents)

Solve each problem. You may NOT use a calculator for this set of problems.

1. Which expressions are equivalent to 5 (Choose all that apply.)

$5^{(6-3)}$ $\frac{5^6}{5^3}$

5^{-3} $\frac{5^6}{5^{-3}}$

2. Which of these expressions represent solutions to the equation $y^3 = 27$. Choose all that apply.

$-\sqrt[3]{27}$ $\sqrt[3]{27}$ 3 -3

3. A carpenter bought 850 nails. Each nail has a mass of 5.2 x 10
mass, in kilograms, of the nails the carpenter bought. Express your answer as a decimal.

850(5.2 x 10^{-3})
4,420 x 10^{-3}
4.420

4. The figure below shows the mass, in grams, of several samples of cells. The spreadsheet automatically converts them into scientific notation. How many times larger is Sample D than Sample B?

Sample	Mass (grams)
A	6.16 E -5
B	3.75 E -6
C	8.00 E -10
D	7.50 E -5

2 x 10^1 or 20 times larger

5. Which expression is equivalent to $\frac{3^{-5}}{3^{-2}}$?

A. 3

B. 3

C. $\frac{1}{3^3}$

D. $\frac{1}{27}$

6. The distance from Mars to the Sun is 1.416 x 10
to the Sun is 9.296 x 10
more miles is the distance from Mars to the Sun than the distance from Earth to the Sun?

A. 4.864 x 10

B. 7.880 x 10

C. 4.864 x 10

D. 7.880 x 10

Kim Coffield ©2016

https://www.teacherspayteachers.com/Store/Math-Class-Rocks

Expressions and Equations (8.EE.B.5&6)

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

Slope of a Line

The slope of a line represents the constant rate of change. It may also be referred to as the unit rate.

The graph shows a change of $94 every 2 weeks, therefore the constant rate of change (or slope) is $47 per week.

$$Rate of Change = \frac{y}{x}$$

This graph can be expressed by the equation $y = 47x$, where x is the number of weeks and y is the total savings. The constant rate of change (or slope) is always the number multiplied to "x".

Equations and Slope of a Line

The slope (m) of the line is the number multiplied to "x". It shows the constant rate of change.

$y = 5x$	$y = 2x - 10$	$y = \frac{1}{2}x + 3$
$m = 5$	$m = 2$	$m = \frac{1}{2}$

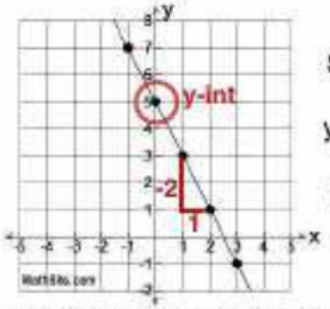
Slope-Intercept Form: y = mx + b

An equation is written in slope-intercept when it is solved for "y". The "m" is the slope of the line and the "b" is the y-intercept.

Equations and Graph of a Line

To write an equation for a line, choose two points and find the slope. Then find the point where the line crosses over the y-axis (the y-intercept). Replace these numbers in **y = mx + b.**

$$Slope = \frac{Vertical Change \updownarrow}{Horizontal Change \leftrightarrow}$$

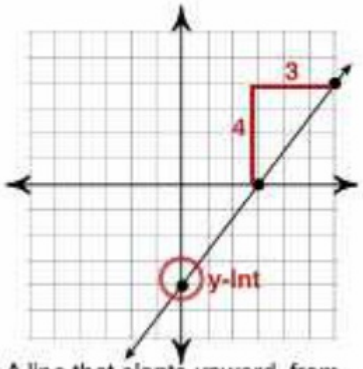


Slope = $\frac{-2}{1}$

y-Intercept = 5

y = -2x + 5

A line that slants downward, from left to right, has a negative slope.



Slope = $\frac{4}{3}$

y-Intercept = -4

y = $\frac{4}{3}$x - 4

A line that slants upward, from left to right, has a positive slope.

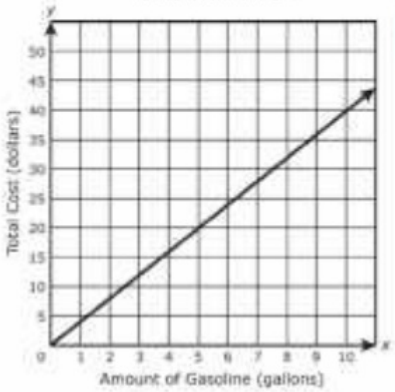
Expressions and Equations (8.EE.B.5&6)

(Understand the connections between proportional relationships, lines, & linear equations.)

Solve each problem. You may use a calculator, but must show all of your work.

1. Find the unit rate for a gallon of gas at each gas station. Use this information to determine which station charges more for gas. Show or explain your work.

Gas Station P



Gas Station M

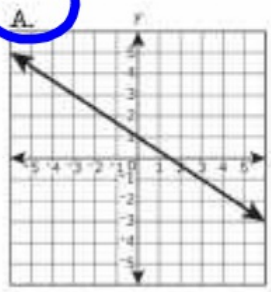
x	y
5	19.00
10	38.00
15	57.00

$\frac{20}{5} = \$4$ P

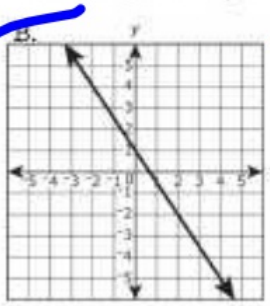
$\frac{19}{5} = \$3.80$ M

2. Which graph represents the equation $y = -2/3x + 1$?

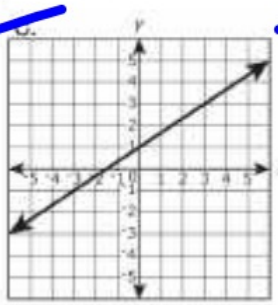
A.



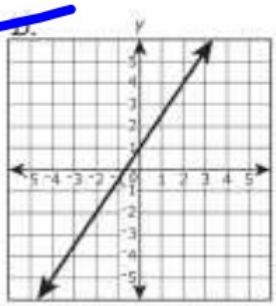
B.



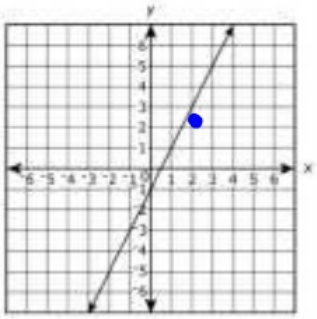
C.



D.



3. Which of the following equations have the same slope as the line graphed below?



2x+3	#2	#3
y = 3 + 2x	y = 2	y = 3/2x + 6

A. Equation 1 only

B. Equation 3 only

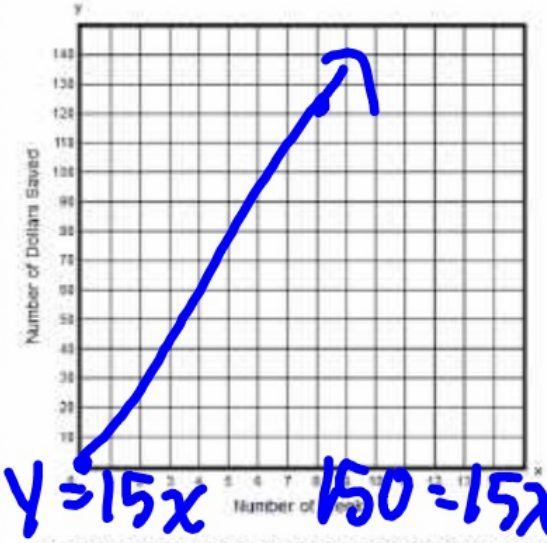
C. Equations 1 and 2

D. Equations 1 and 3

Kim Coffield ©2016

https://www.teacherspayteachers.com/Store/Math-Class-Rocks

4. You decide to start saving money. You start with $0 and after 8 weeks, you have $120. You're not sure how much you save each week, but assume that you saved your money at a constant rate from when you started through the 8th week.



a. Create a graph that can be used to model the amount of money you saved (y) in x weeks.

b. Explain what the slope of your line represents.

$\frac{120}{8} = \$15$

you save $15 per week

$y = 15x$ $150 = 15x$

c. Explain how the graph you drew can be used to predict the number of weeks it will take you to save $150. Include in your explanation any assumptions that must be made in order to make this prediction.

5. Bill drove his car at a constant rate of speed while on a trip. Kevin drove his car at a different constant rate of speed while on the same trip. The graph and table show information about the trips.

Which sentence correctly compares the rates at which Bill and Kevin drove on their trips?

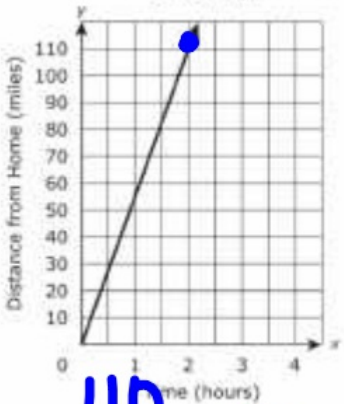
A. Bill's rate was 10 mph slower than Kevin's rate.

B. Bill's rate was 10 mph faster than Kevin's rate.

C. Bill's rate was 20 mph slower than Kevin's rate.

D. Bill's rate was 20 mph faster than Kevin's rate.

Bill's Trip



Kevin's Trip

Time (hours)	Distance from Home (miles)
0	0
2	90
3	135
5	225
6	270

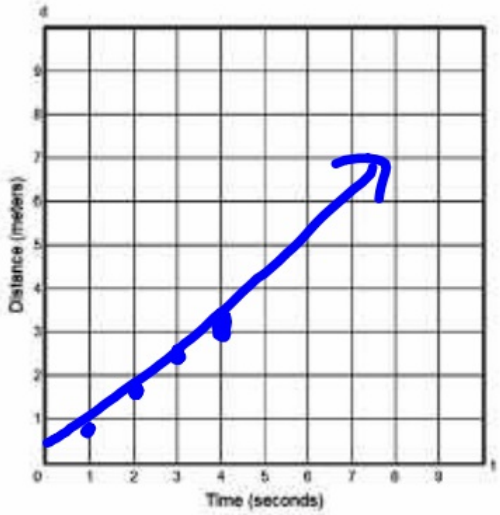
$\frac{110}{2} = 55mph$

$\frac{90}{2} = 45mph$

Kim Coffield ©2016

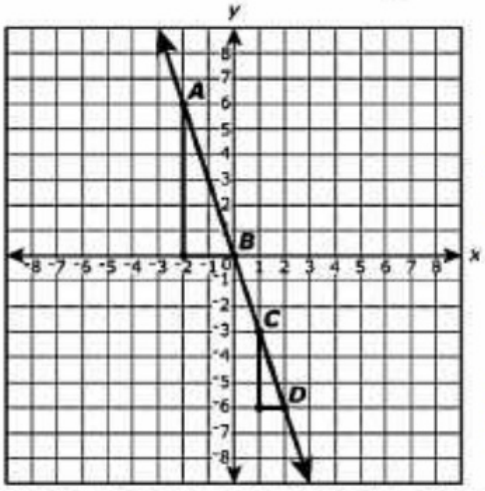
https://www.teacherspayteachers.com/Store/Math-Class-Rocks

6. A model train is traveling at a constant rate of 0.75 meter per second when Lucy starts a stopwatch. Create a graph that represents the relationship between t, the amount of time since Lucy started her stopwatch, and d, the total distance the train has traveled during that time.



$d = .75t$

7. On the coordinate plane below, points A, B, C, and D lie on the same line.



Is the slope of line segment AB congruent to the slope of line segment CD? Clearly explain your answer.

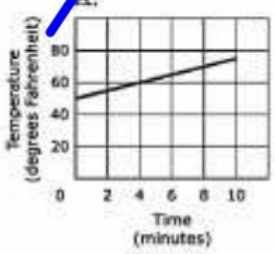
A (2,6) B (0,0)

$\frac{6}{2} = 3$

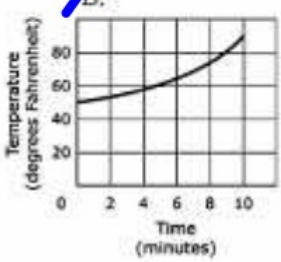
C (1,-3) D (2,-6) $\frac{-3}{1}$

8. During a 10 minute science experiment, the temperature of a subsance decreases at a constant rate. Which graph represents this situation?

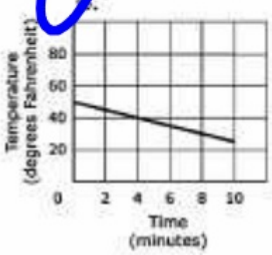
A.



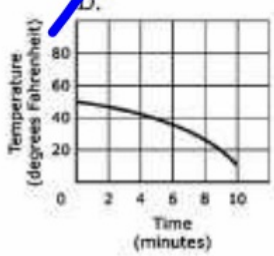
B.



C.



D.



Kim Coffield ©2016 https://www.teacherspayteachers.com/Store/Math-Class-Rocks

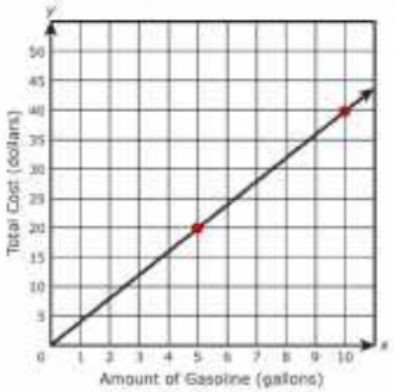
Expressions and Equations (8.EE.B.5&6)

(Understand the connections between proportional relationships, lines, & linear equations.)

Solve each problem. You may use a calculator, but must show all of your work.

1. Find the unit rate for a gallon of gas at each gas station. Use this information to determine which station charges more for gas. Show or explain your work.

Gas Station P



Gas Station M

x	y
5	19.00
10	38.00
15	57.00

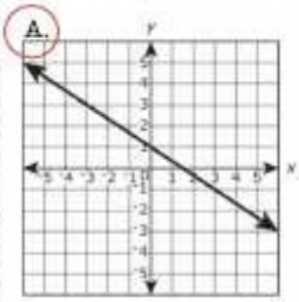
Gas Station P = $4.00/gallon
I chose two points of intersection on the graph. (5, 20) and (10, 40).
20/5 = 4 and 40/10 = 4, so the unit rate is $4.00

Gas Station M = $3.80/gallon
$19/5 = $3.80, $38/10 = $3.80. $57/15 = $3.80

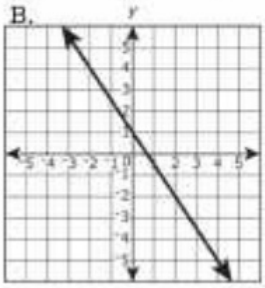
Gas Station P is more expensive!

2. Which graph represents the equation y = -2/3x + 1?

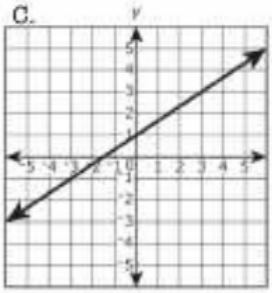
A.



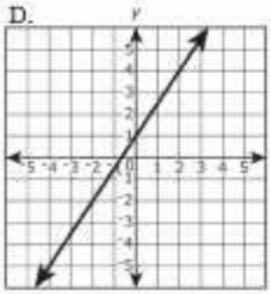
B.



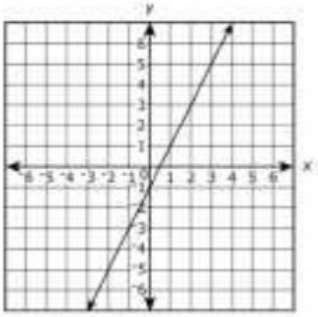
C.



D.



3. Which of the following equations have the same slope as the line graphed below?



#1	#2	#3
y = 3 + 2x	y = 2	y = 3/2x + 6

A. Equation 1 only

B. Equation 3 only

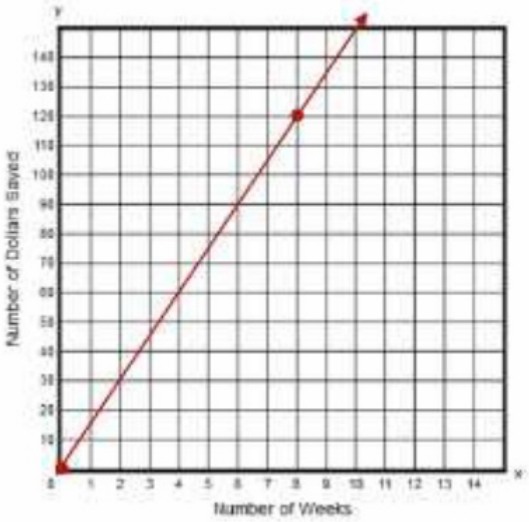
C. Equations 1 and 2

D. Equations 1 and 3

Kim Coffield ©2016

https://www.teacherspayteachers.com/Store/Math-Class-Rocks

4. You decide to start saving money. You start with $0 and after 8 weeks, you have $120. You're not sure how much you save each week, but assume that you saved your money at a constant rate from when you started through the 8th week.



a. Create a graph that can be used to model the amount of money you saved (y) in x weeks.

b. Explain what the slope of your line represents.

The slope of the line represents the amount of money that was saved each week.

m = $15

c. Explain how the graph you drew can be used to predict the number of weeks it will take you to save $150. Include in your explanation any assumptions that must be made in order to make this prediction.

The graph could be extended beyond the 8th week. When extended, you find that it would reach $150 at week 10. Another way to use the graph is to find the slope, which is a rate of change of $15 per week, and solve the equation 15x = 150 where x is the number of weeks.

5. Bill drove his car at a constant rate of speed while on a trip. Kevin drove his car at a different constant rate of speed while on the same trip. The graph and table show information about the trips.

Which sentence correctly compares the rates at which Bill and Kevin drove on their trips?

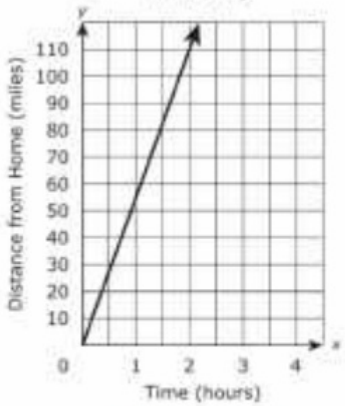
A. Bill's rate was 10 mph slower thank Kevin's rate.

B. Bill's rate was 10 mph faster thank Kevin's rate.

C. Bill's rate was 20 mph slower thank Kevin's rate.

D. Bill's rate was 20 mph faster thank Kevin's rate.

Bill's Trip



Bill = 55 mph

Kevin's Trip

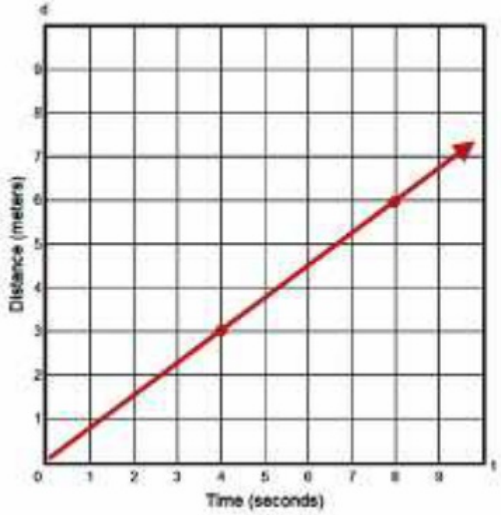
Time (hours)	Distance from Home (miles)
0	0
2	90
3	135
5	225
6	270

Kevin = 45 mph

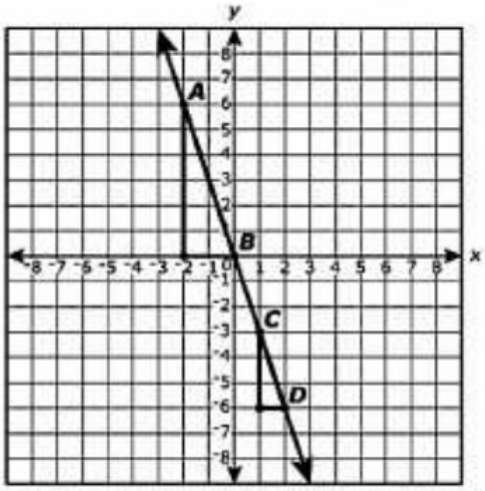
Kim Coffield ©2018

https://www.teacherspayteachers.com/Store/Math-Class-Rocks

6. A model train is traveling at a constant rate of 0.75 meter per second when Lucy starts a stopwatch. Create a graph that represents the relationship between t, the amount of time since Lucy started her stopwatch, and d, the total distance the train has traveled during that time.



7. On the coordinate plane below, points A, B, C, and D lie on the same line.



Is the slope of line segment AB congruent to the slope of line segment CD? Clearly explain your answer.

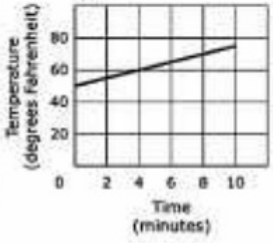
The slope of segment AB is -6/2.

The slope of segment of CD is -3/1.

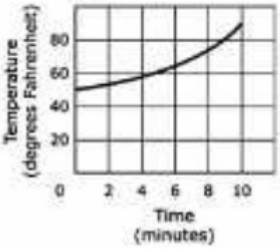
Both slopes simplify to -3, therefore they are congruent.

8. During a 10 minute science experiment, the temperature of a subsance decreases at a constant rate. Which graph represents this situation?

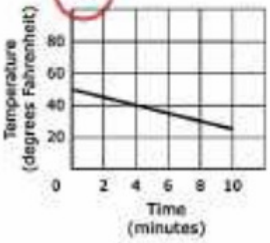
A.



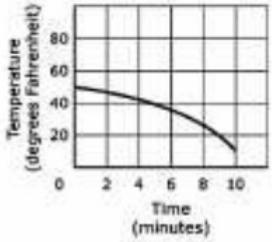
B.



C.



D.



Kim Coffield ©2016
https://www.teacherspayteachers.com/Store/Math-Class-Rocks

Expressions and Equations (8.EE.C.7&8)

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

How to Solve Multi-Step Equations: $-3x - 4(-8 + 4x) = -3(1 + 8x)$

1. Use the Distributive Property

$$-3x - 4(-8 + 4x) = -3(1 + 8x)$$

2. Combine Like Terms

$$-3x + 32 - 16x = -3 - 24x$$

3. Bring the variable to one side of the equation.

$$-19x + 32 = -3 - 24x$$
$$+24x \qquad\qquad +24x$$

4. Use inverse operations to solve for the variable.

$$5x + 32 = -3$$
$$-32 \quad -32$$
$$\frac{5x}{5} = \frac{-35}{5}$$
$$x = -7$$

Systems of Equations

A system of equations is a pair of equations that contain the same variables.
The solution of a system is an ordered pair (x, y) that make BOTH equations true.

How can you prove that (-4, 3) is the solution of the following system? $2x + y = -5$, $y = -5x - 17$

If you replace the values in the equations, both are true.

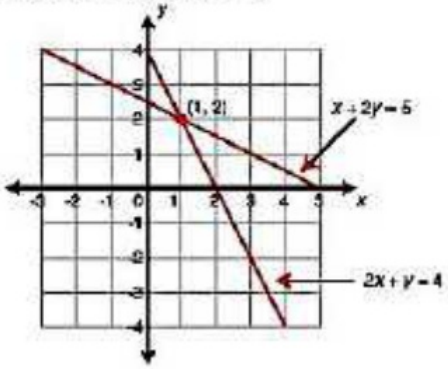
$2x + y = -5$	$y = -5x - 17$
$2(-4) + 3 = -5$	$3 = -5(-4) - 17$
$-8 + 3 = -5$	$3 = 20 - 17$
$\mathbf{-5 = -5}$	$\mathbf{3 = 3}$

Solving Systems by Graphing (Always write the solution as an ordered pair!)

Solve the following system using a graph.

$x + 2y = 5$
$2y = -x + 5$
$\mathbf{y = -0.5x + 2.5}$

$2x + y = 4$
$\mathbf{y = -2x + 4}$



1. Graph each equation on the same coordinate plane. (Solve for y and use the slope and the y-intercept.)
2. Find the point of intersection. **(1, 2)**

Kim Coffield ©2016

Solving a System using Substitution

1. If one of the equations is not already solved for a variable, you need to solve one of the equations for "x" or "y" (whichever is easier!)
2. Substitute that value in the second equation and solve for the variable. (You now have either the "x" or "y" value!)
3. Replace that value in either one of the original equations to solve for the other variable.
4. Write the solution as an ordered pair.

Here's an example:

$x = 4y + 1$
$2x - 3y = 12$

$x = 4y + 1$

$2x - 3y = 12$
$2(4y + 1) - 3y = 12$
$8y + 2 - 3y = 12$
$5y + 2 = 12$
$5y = 10$
$y = 2$

$x = 4y + 1$
$x = 4(2) + 1$
$x = 8 + 1$
$x = 9$

Solution
(2, 9)

Solving a System using Elimination

1. Make sure the equations are written in standard form (Ax + By = C)
2. Check to see if one of the variables has opposite coefficients. If not, you need to multiply one (or both) of the equations by a number that will result it opposite coefficients.
3. Add the equations to eliminate one of the variables.
4. Solve the equation. This will give you the first value in the solution.
5. Replace this value into one of the original equations to find the other value in the solution.

Here's an example:

$-4x + 2y = -18$
$7x - 2y = 33$

$3x = 15$
$x = 5$

$-4(5) + 2y = -18$
$-20 + 2y = -18$
$2y = 2$
$y = 1$

Solution is (5, 1)

How Do I Find the Number of Solutions??

Solve both equations in the system for "y" and compare the slopes and y-intercepts.

One Solution

The equations have <u>different slopes</u>.

y = 4x + 7
y = -9x - 2

Infinite Solutions

The equations have the <u>same slope and the same y-intercept</u>. When solved for y, the equations are exactly the same!

$2x + y = 6$ —> **$y = -2x + 6$**
$4x + 2y = 12$ —> **$y = -2x + 6$**

No Solution

The equations have the <u>same slope, but the y-intercepts are different</u>. The lines are parallel and will never intersect.

$2y - 10x = 4$ —> **$y = 5x + 4$**
$-5x + y = 13$ —> **$y = 5x + 13$**

Kim Coffield ©2016

Expressions and Equations (8.EE.C.7&8)

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

Solve each problem. You may not use a calculator.

1. Which equation has the same solution as $4 - 2(x - 5) = x - 19$?

   A. $2(x + 5) = -8$

   B. $3(x - 3) = 9$

   C. $x + 2 = 2x - 3$

   D. $3x - 4 = 2x + 7$

2. What value of x makes the equation $3(x - 6) - 8x = -2 + 5(2x + 1)$ true?

3. What value of x makes the equation true?

$$\frac{3}{4}(x+8)=9$$

4. John wrote the equation $t = 2m + 60$ to represent the temperature, t, in degrees Celcius, after a substance had been heated for m minutes. Describe the relationship between the temperature of the substance and the time it has been heated.

   A. The temperature was initially _____ degrees Celcius.

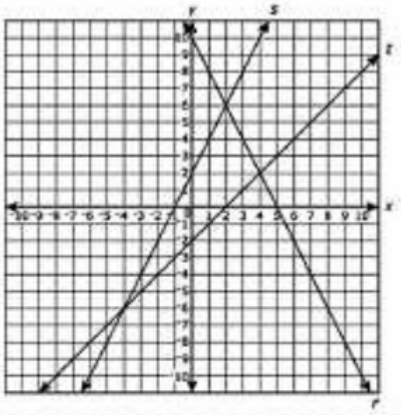
   B. The temperature increased by _____degrees every _____ minute(s) it was heated.

   C. Based on John's equation, how many minutes does the substance have to be heated to reach a temperature of 100 degrees Celcius?

Kim Coffield ©2016

https://www.teacherspayteachers.com/Store/Math-Class-Rocks

5. Write the solution of each system as an ordered pair.



A. Line s and line t _____

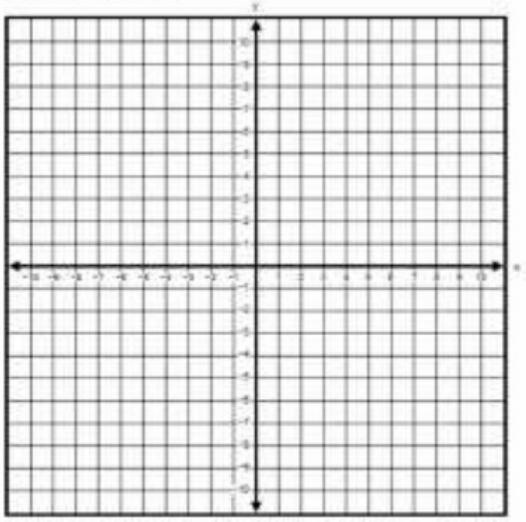
B. Line t and line r _____

C. Line s and line r _____

6. Solve the system by graphing. Label the solution "P".

$y = -2x + 8$

$y = 3x - 7$



7. Indicate whether each of the four systems of equations has no solution, one solution, or infinitely many solutions.

System of Equations	$2x + 3y = -6$ $4x + 6y = -12$	$x = 1$ $y = 2$	$x - 2y = 4$ $x - 2y = 5$	$y = 5x + 20$ $3y = 15x + 60$
No Solution	○	○	○	○
One Solution	○	○	○	○
Infinitely Many Solutions	○	○	○	○

Kim Coffield ©2018 https://www.teacherspayteachers.com/Store/Math-Class-Rocks

8. Find the value of y in the following system:

$$x+\frac{1}{2}y=0 \qquad x-\frac{3}{2}y=4$$

9. A system of two linear equations is graphed on a coordinate plane. If the system has infinitely many solutions, which statement must be true?

A. On the graph, there are no points (x, y) that satisfy both equations.

B. On the graph, there is exactly one point (x, y) that satisfies both of the equations.

C. On the graph, any point (x, y) that satisfies one of the equations cannot satisfy the other equation.

D. On the graph, any point (x, y) that satisfies one of the equations must also satisfy the other equation.

10. Linda has $20 to buy snacks for 12 people in an office. Each person will get one snack. Linda is buying bags of pretzels that cost $1.50 per bag and bags of crackers that cost $2.00 bag.

Linda is buying x bags of pretzels and y bags of crackers. Which system of equations can be used to find the value of x and y?

A. $x + y = 20$
$1.5x + 2y = 12$

B. $x + y = 20$
$2x + 1.5y = 12$

C. $x + y = 12$
$1.5x + 2y = 20$

D. $x + y = 12$
$2x + 1.5y = 20$

How many bags of pretzels did Linda buy?

Kim Coffield ©2018

11. The 8th graders are selling wrapping paper as a fundraiser. The wrapping paper was sold in small rolls and large rolls.

- They earned $3.00 for every small roll sold.
- They earned $4.50 for every large roll sold.
- The club sold 10 more large rolls than small rolls.
- The club collected $135.00 more from sales of large rolls than from sales of small rolls.

The equation **$3s + 135 = 4.5(s + 10)$** can be used to represent this situation, where "s" represents the number of small rolls the 8th graders sold.

A. In the equation, what does the expression 3s represent?

a. The total number of small rolls sold
b. The total number of large rolls sold
c. The total number of dollars earned from selling small rolls
d. The total number of dollars earned from selling large rolls

B. In the equation, what does the expression (s + 10) represent?

a. The total number of small rolls sold
b. The total number of large rolls sold
c. The total number of dollars earned from selling small rolls
d. The total number of dollars earned from selling large rolls

C. How many small rolls did the 8th graders sell?

D. How much money, in dollars, did the 8th graders earn from selling small and large rolls?

Kim Coffield ©2016 https://www.teacherspayteachers.com/Store/Math-Class-Rocks

Functions (8.F.A.1-3)

Define, evaluate, and compare functions.

Functions and Relations

A relation is a set of ordered pairs. A function is a set of ordered pairs in which each input (x) has exactly one output (y). In other words, the "x" values cannot be repeated!!

This set of ordered pairs represents a function: {(2, -3), (-5, 1), (0, 7), (-4, 7)}
Notice that all of the x-values are different. It's ok if the y-values repeat.

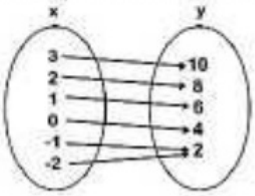
Identifying Funtions

From a Table

x	y
-1	-4
0	-1
1	2
2	5

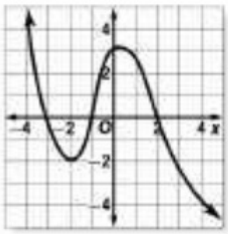
The x-values do not repeat!

From a Function Table



Each x-value is only used once. It's ok that two x-values are paired with the same y-value.

From a Graph



This graph passes the "vertical line test".

Linear Equations and Functions

How can I tell if an equation is linear?

When degree of "x" (the exponent) is "1", the equation is linear. This means that, when graphed, the equation makes a straight line. If the x has any other exponent, the equation is non-linear. If the equation contains x

Linear	Non-Linear
$y = 2x + 4$	$y = 2x^2 + 2$

How can I tell if a linear equation is a function?

Almost all linear equations are functions. Horizontal lines (such as y = 10) are functions. They have a slope of zero, but the x-values are not repeated and the graph passes the vertical line test. Vertical lines, however, are not functions. So, the equation x = -9 is linear, but is not a function.

Solutions of Linear Equations and Functions

Linear equations have an infinite number of solutions. You can determine whether an ordered pair is a solution by replacing the x (input) and y(output) values into the equation to see if it works!

$y = 3x - 9$ Possible solutions: (-1, -12), (0, -9), (1, -6), (2, -3), (3, 0), (4, 3),…

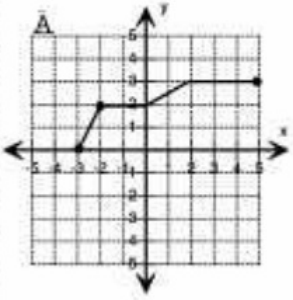
Kim Coffield ©2016

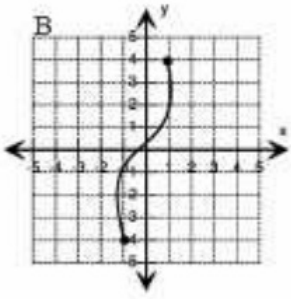
Functions (8.F.A.1-3)

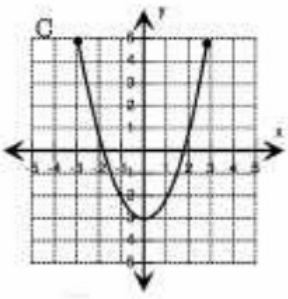
(Define, evaluate, and compare functions.)

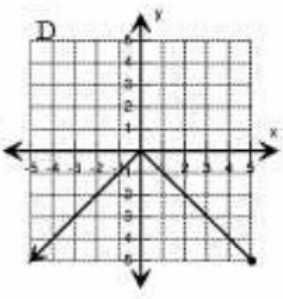
Solve each problem. You may not use a calculator.

1. Which of the following are graphs of functions? Choose all that apply.

A 

B 

C 

D 

2. Which of the following input-output tables represent a function? Choose all that apply.

A.

Input	Output
1	4
1	6
5	5
8	10

B.

Input	Output
1	4
5	6
5	1
10	8

C.

Input	Output
1	4
8	6
5	1
10	5

D.

Input	Output
1	4
10	6
5	5
8	1

E.

Input	Output
1	4
8	6
5	10
1	5

3. This table shows a relation. Which statement is correct?

Input	Output
-1	2
3	-1
1	2
-2	3
-1	1

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.

Kim Coffield ©2016

https://www.teacherspayteachers.com/Store/Math-Class-Rocks

4. A relationship between x and y is defined by the equation **-5x + 3y = 12**, where x is the input and y is the output.

Select True or False for each statement.

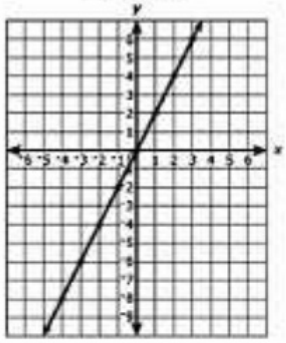
STATEMENT	TRUE	FALSE
y is a function of x		
The graph of the relationship is a line.		
The graph of the relationship passes through the origin.		
When the input is 6, the output is 14.		

5. Some values of linear functions A and B are shown in the table and graph.

Function A

x	y
0	1
1	1.25
2	1.5
3	1.75
4	2

Function B



Which of the following describes the y-intercepts of the two functions?

A. The y-intercept of Function A is equal to the y-intercept of Function B.
B. The y-intercept of Function A is 1 unit less than the y-intercept of Function B.
C. The y-intercept of Function A is 1 unit greater than the y-intercept of Function B.
D. The y-intercept of Function A is 2 units greater than the y-intercept of Function B.

6. Which functions are non-liner? Choose all that apply

A. $y=\frac{x}{5}$ B. $y=5-x^2$ C. $-3x+2y=4$

D. $y=3x^2+1$ E. $y=-5x-2$ F. $y=x^3$

7. Which ordered pairs are solutions of -2x - 3y = 24? Select all that apply.

a. (0, -8) b. (4, 10) c. (-18, 4) d. (-12, 0) e. (-6, -4)

Functions (8.F.B.4&5)

Use functions to model relationships between quantities.

Writing Equations

When writing equations, keep in mind that the repeated change is the number that is multiplied to the variable (the slope) and the number you have at the start is the number added or subtracted (the y-intercept).

You have $175 in your bank account and deposit $50 each week. Write an equation for the amount of money, M, you'll have in your account after *w* weeks.

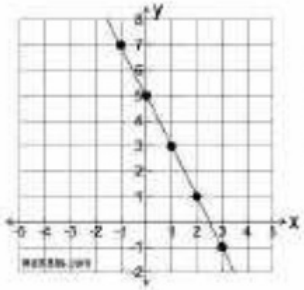
Starting amount: $175
Repeated change: + $50
Equation: M = 175 + 50w
or **M = 50w + 175**

The book you are reading has 425 pages. You decide to read 25 pages each night. Write an equation for the number of pages, P, you still have to read after *n* nights.

Starting amount: 425
Repeated change: - 25
Equation: P = 425 - 25n
or **P = -25n + 425**

Writing Equations from the Graph of a Linear Equation

Identify the slope and the y-intercept. Replace these values in y = mx + b.



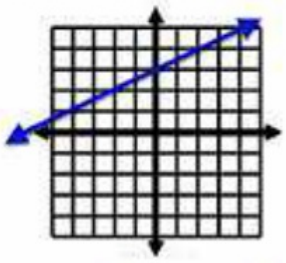
Slope = -2
y-intercept = 5

y = -2x + 5

Writing Equations Given the Slope, the y-intercept, and/or an Ordered Pair

Write an equation for a line passing though (-4,1) and (2,4).

1. Plot the points, draw a line.
2. Find the slope and y-int.
3. Write equation.



Slope: 1/2 y-Int: 3

Equation: y = 1/2x + 3

Write an equation for a line with a slope of 3 that passes through (5,-1).

x y

1. Start with y = mx + b — y = mx + b
2. Replace the given values for the slope, x, and y. — -1 = 3(5) + b
3. Solve for b. — -1 = 15 + b
4. Write the equation in slope-intercept form. — -16 = b

y = 3x - 16

Writing an Equation from a Table of Values

	x	y	
+2	-2	5	-3
+2	0	2	-3
+2	2	-1	-3
	4	-4	

Slope: -3/2 y-int. 2

Equation: y = -3/2x + 2

1. Find the change in y and the change in x. Write this ratio. This is the slope.
2. Find the y-intercept. It is the the value of y when x = 0.

Describing Graphs

When describing a graph, you should be as specific as possible.

Positive - As x increases, y increases. Slants upward.

Negative - As x increases, y decreases. Slants downward.

Constant - No change.

Linear - Makes a straight line.

Non Linear - Does not make it straight line.

This graph shows a non-linear relationship. From the years 1960-1965, the number of cases remains constant (100 cases). From 1965-1970, the number of cases increases at a rate of 20 cases per year. From 1970-1975, the number of cases increases more dramatically at a rate of 60 cases per year. Again, the number of cases remains constant from 1975-1980. Over the next 10 years, the number of cases decreases at a rate of -30 cases per year from 1980-1985 and then -70 cases per year from 1985-1990. From 1990 - 1995 there were no cases reported.

Kim Coffield ©2016

Functions (8.F.B.4&5)

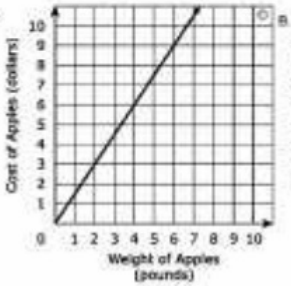
Use functions to model relationships between quantities.

Solve each problem. You may not use a calculator.

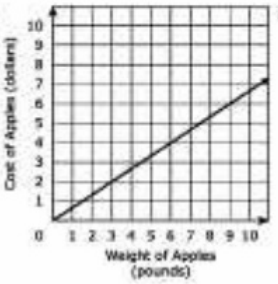
1. At a local market, the cost of apples is directly proportional to the weight of the apples. Brian bought 10 pounds of apples for a cost of $15.00.

   Which graph shows the relationship between the weight of the apples, in pounds, and the cost of the apples?

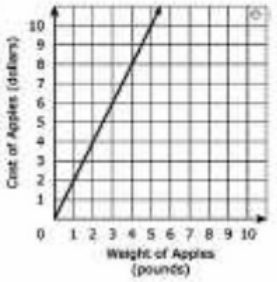
A



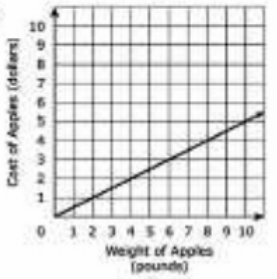
B



C

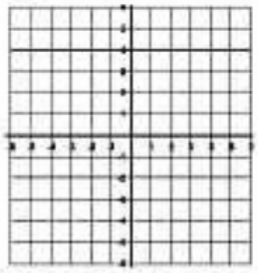


D



   Write an equation to represent this relationship.
   Let C = the cost and p = the price for one pound of apples. _____

2. A line passes through points (-1, -2) and (1, 4). What is the equation of the line?



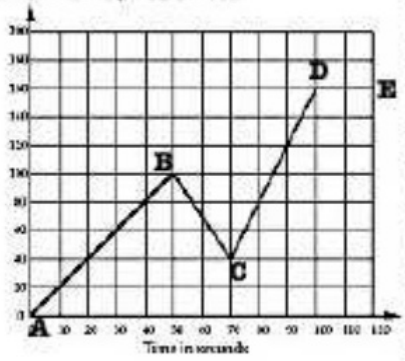
3. Clearly describe this graph in terms of the real-world situation it represents.

   From A to B:

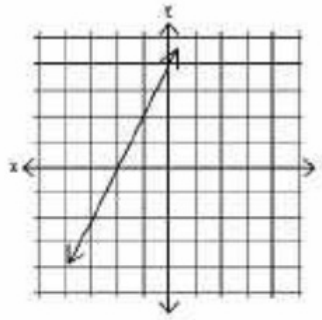
   From B to C:

   From C to D:

   From D to E:



4. Write an equation for the linear relationship shown below.



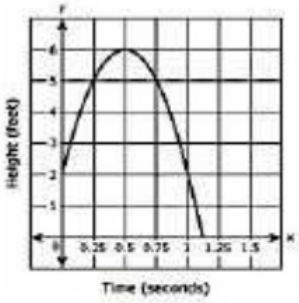
5. Write an equation for the linear relationship shown below.

x	y
4	1
6	7
8	13
10	19

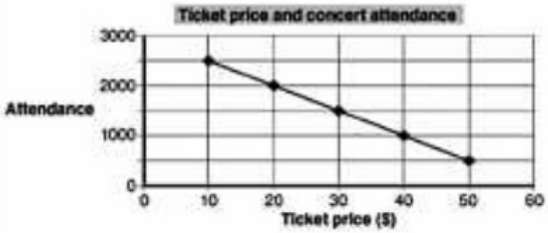
6. A line has a y-intercept of 4 and passes through the point (2, 0). Write the equation for this line.

7. A mechanic charges $205 for parts plus $55 per hour to fix your car. Write an equation to represent the total cost, C, as a function of the number of hours, h, it takes him to fix your car.

8. Describe the following graph. Use terms like increasing, decreasing, constant, linear, non-linear, etc...



9. Describe the following graph. Use terms like increasing, decreasing, constant, linear, non-linear, etc...



Kim Coffield ©2016

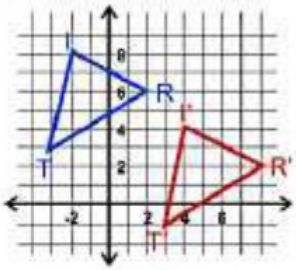
https://www.teacherspayteachers.com/Store/Math-Class-Rocks

Geometry (8.G.A.1-5)

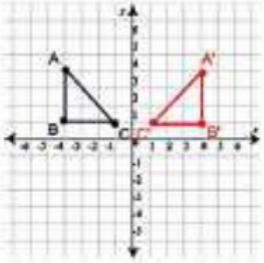
Understand congruence and similarity using physical models

Types of Transformations

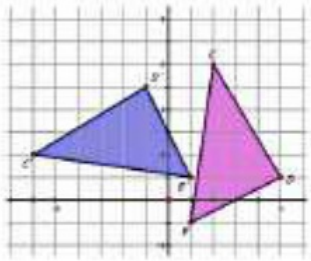
Translation (slide)



Reflection (flip)



Rotation (turn)

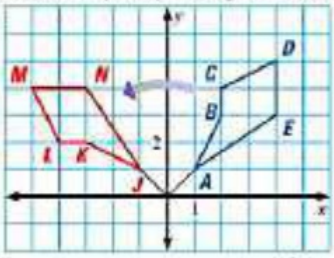


Points are used to label the figures. The plain letters show the original figure, which is called the pre-image. The apostrophes show the new figure, which is called the image.

When a figure is translated, reflected, or rotated, the size and shape of the figure remains the same. Both the perimeter and the area of the image (new figure) are also equal to the original figure. Finally, the angle measures and side lengths of the image are congruent to the pre-image.

Corresponding Angles and Sides - They are CONGRUENT!

When the same letters are used (with apostrophes on the image), it is easy to identify the corresponding angles and sides. However, different letters are sometimes used to label the image. In this example, pentagon ABCDE has been rotated to form pentagon JKLMN.



If you do not have a picture to look at, you can find the corresponding angles and sides simply by looking at the points (letters). They are always listed in corresponding order.

If you list them this way, it's easy to find corresponding parts.

A B C D E
J K L M N

Corresponding angles:

∠A and ∠J
∠B and ∠K
∠C and ∠L
∠D and ∠M
∠E and ∠N

Corresponding sides:

AB and JK
BC and KL
CD and LM
DE and MN
EA and NJ

Rules of Transformations

Translations	Reflections	Rotations
Add to or subtract from x to move left or right.	Reflect over y-axis **(-x, y)**	90° **(-y, x)**
		180° **(-x, -y)**
Add to or subtract from y to move up or down.	Reflect over x-axis **(x, -y)**	270° **(y, -x)**
(x, y)—> (x + _ , y + _)		

A **Dilation** is an enlargement or a reduction. The scale factor (k) is the number that is multiplied to the ordered pair or side length of the original figure to get the new figure. **(x, y)—> (kx, ky)**

Kim Coffield ©2016

Geometry (8.G.A.1-5)

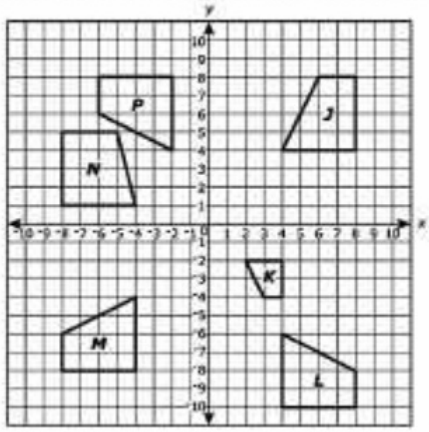
Understand congruence and similarity using physical models, transparencies, or geometry software.

Solve each problem. You may not use a calculator.

1.

a. Which figure can be transformed into figure P by a translation 2 units to the right followed by a reflection across the x-axis?

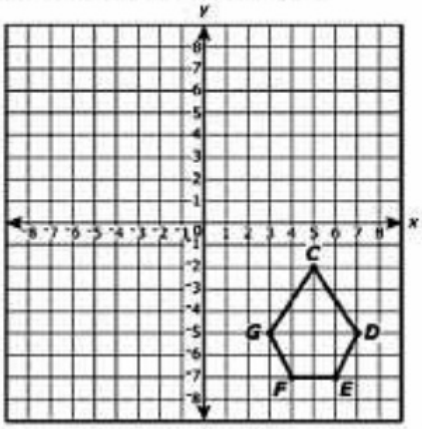
b. Which figure can be transformed into figure L by a 90° rotation clockwise about the origin followed by a translation 2 units down?



2. Translate pentagon CDEFG is translated 7 units up and 5 units left, resulting in pentagon C'D'E'F'G.

a. How does the length of side CG compare to side C'G'?

b. How does the perimeter of CDEFG compare to the perimeter of C'D'E'F'G'?



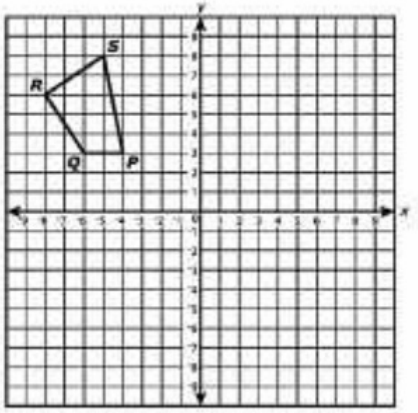
3. Polygon KLMN is the image of polygon of PQRS after a 180° rotation. Which angle of KLMN is congruent to angle S?

a. ∠ K

b. ∠ L

c. ∠ M

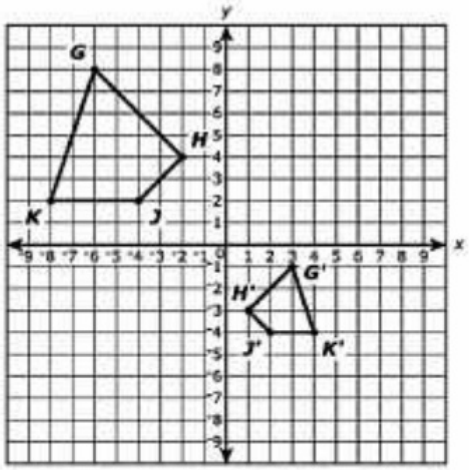
d. ∠ N



Kim Coffield ©2016

https://www.teacherspayteachers.com/Store/Math-Class-Rocks

4. Which describes a possible sequence of transformations that transforms polygon GHJK into polygon G'H'J'K'?



a. a 180° rotation about the origin, followed by a dilation centered at the origin with a scale factor of 1/2.

b. a reflection across the line y = x, followed by a dilation centered at the origin with a scale factor of 2.

c. a reflection across the y-axis, followed by a reflection across the x-axis, followed by a dilation centered at the origin with a scale factor of 2.

d. a reflection across the y-axis, followed by a translation down 10 units, followed by a dilation centered at the origin with a scale factor of 1/2.

5. The best described the relationship between polygon GHJK and G'H'J'K'?

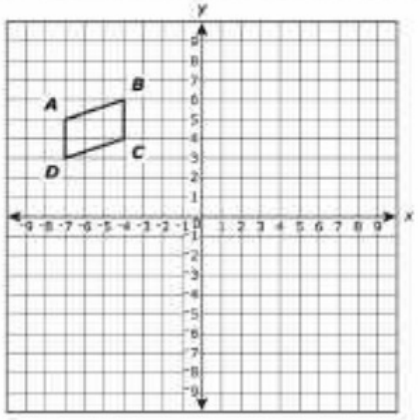
a. They are similar because GHJK can be obtained from polygon G'H'J'K' by a sequence of transformations.

b. They are similar because the area of G'H'J'K' is the same as the area of polygon GHJK.

c. They are not similar because G'H'J'K' cannot be obtained from polygon GHJK by a single transformation.

d. They are not similar because the orientation of polygon GHJK is not the same as the orientation of polygon G'H'J'K'.

6. Parallelogram A'B'C'D' (not shown) is the image of parallelogram ABCD after a rotation of 180° about origin. Which statements about A'B'C'D" are true? Select each correct statement.



A. A'B' is parallel to B'C'

B. A'B' is parallel to A'D'

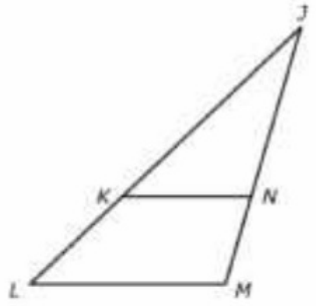
C. A'B' is parallel to C'D'

D. A'D' is parallel to B'C'

E. A'D' is parallel to D'C'

Kim Coffield ©2018 https://www.teacherspayteachers.com/Store/Math-Class-Rocks

7. In the figure shown KN is parallel to LM.



a. When comparing $\triangle$KJN and $\triangle$LJM, Brian says that $\angle$ KJN and $\angle$ LJM are congruent. Explain why Brian's statement is correct.

b. Brian wants to prove that a second pair of corresponding angles from $\triangle$ KJN and $\triangle$ LJM are congruent. Determine a second pair of corresponding angles from $\triangle$ KJN and $\triangle$ LJM that are congruent. Then explain how you know that the two angles are congruent.

8. In a coordinate plane, triangle ABC has vertices of A(1, 1), B(1, 5), and C(5, 1).

a. Triangle ABC is reflected across the x-axis, resulting in triangle A'B'C'. What are the coordinates of Point B'?

b. Triangle A'B'C' is then dilated by a scale factor of 2 with the origin as the center of dilation, resulting in triangle A"B"C". What is the length of line segment A"B"?

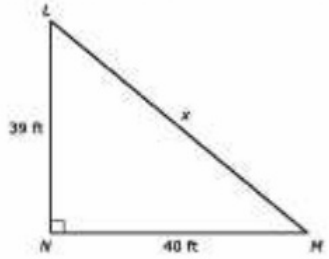
Kim Coffield ©2016 https://www.teacherspayteachers.com/Store/Math-Class-Rocks

Geometry 8.G.B.6-8

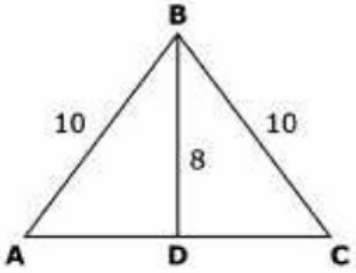
Understand and apply the Pythagorean Theorem.

Solve each problem. You may use a calculator.

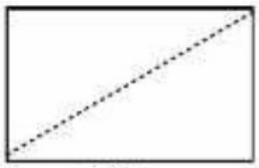
1. Find the measure of side "x".



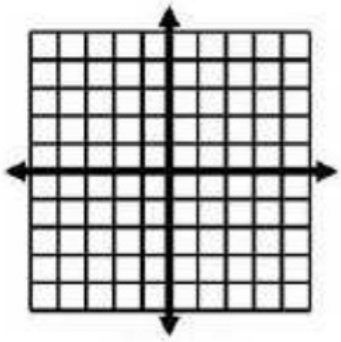
2. In $\triangle ABC$, BD is perpendicular to AC. The dimensions are shown in centimeters. What is the length in centimeters, of AC?



3. The rectangle below has an area of 297 in. Find the length of the diagonal.



4. Find the distance between (-4, 3) and (-1, -5).



Kim Coffield ©2016

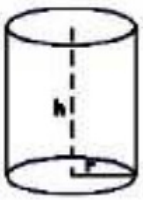
https://www.teacherspayteachers.com/Store/Math-Class-Rocks

Geometry 8.G.C.9

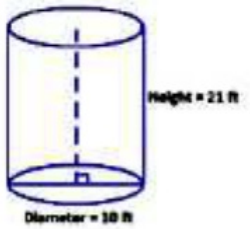
Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

Volume of a Cylinder

$V = \pi r^2 \cdot h$



Example:



$V = \pi r^2 \cdot h$

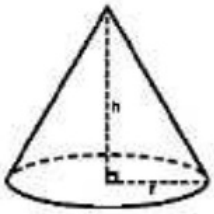
$V = 3.14 \cdot 5^2 \cdot 21$

$V = 1648.5 \text{ ft}^3$

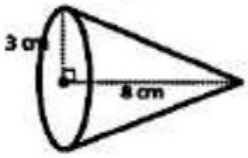
If you are given the diameter, divide it by 2 to find the radius.

Volume of a Cone

$V = \frac{1}{3}\pi r^2 \cdot h$



Example:



$V = \frac{1}{3}\pi r^2 \cdot h$

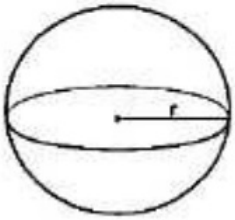
$V = \frac{1}{3} \cdot 3.14 \cdot 3^2 \cdot 8$

$V = 75.36 \text{ cm}^3$

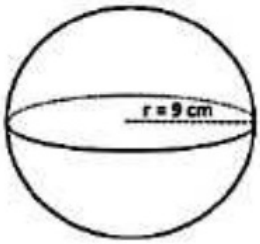
The height must be perpendicular to the base. This means that it makes a right angle.

Volume of a Sphere

$V = \frac{4}{3}\pi r^3$



Example:



$V = \frac{4}{3}\pi r^3$

$V = \frac{4}{3} \cdot 3.14 \cdot 9^3$

$V = 3052.08 \text{ cm}^3$

Kim Coffield ©2016

https://www.teacherspayteachers.com/Store/Math-Class-Rocks

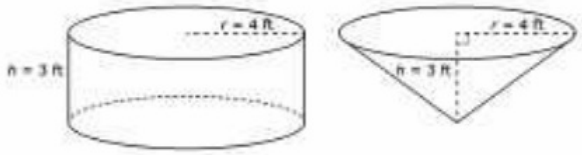
Geometry 8.G.C.9

Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

Solve each problem. You may use a calculator.

1. Use the figures below to solve each problem.

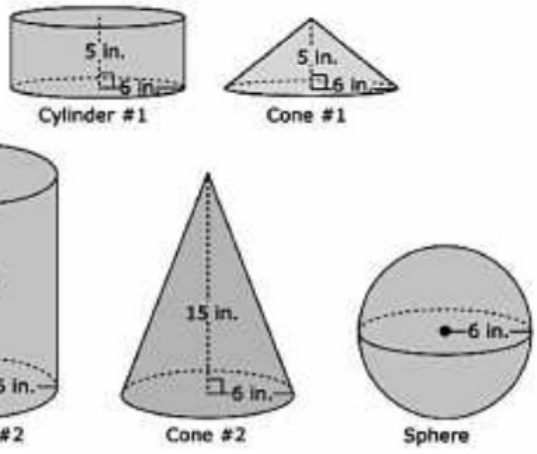
   a. What is the volume of the cone, in cubic feet?



   b. What is the ratio of the cone's volume to the cylinder's volume?

2. Which of the figures below have a volume that is greater than 600 in
   Choose all that apply.

   a. Cylinder #1
   b. Cone #1
   c. Cylinder #2
   d. Cone #2
   e. Sphere

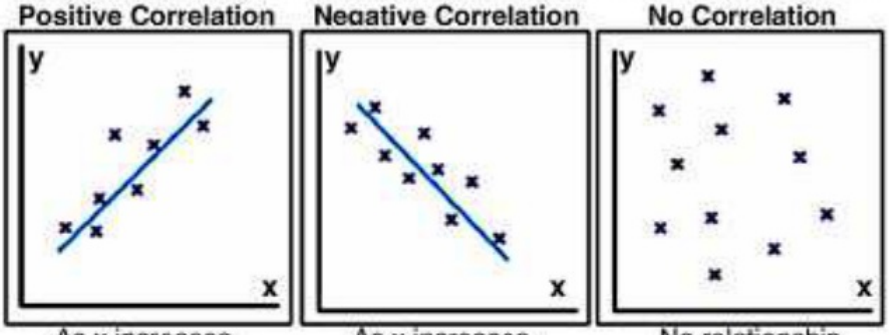


   How many times greater is the volume of the sphere than the volume of Cone #1? Round your answer to the nearest tenth.

Kim Coffield ©2016

Statistics and Probability 8.SP.A.1-4

Investigate patterns of association in bivariate data.



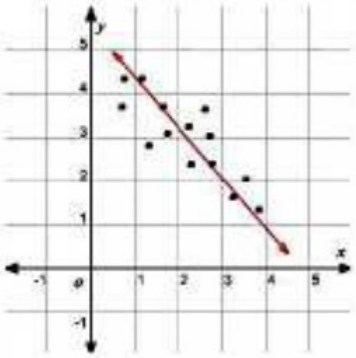
As x increases, y increases.

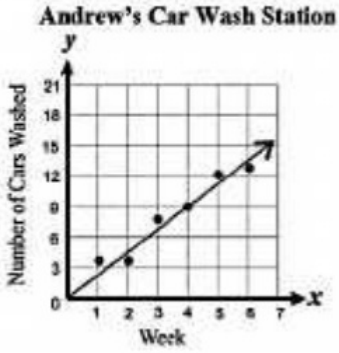
As x increases, y decreases.

No relationship between x and y.

Line of Best Fit

The line of best fit is a straight lines that best represents the data in a scatterplot. It may pass through most of the points, some of the points, or none of the points. It just needs to be through the center of the data. It is also called the "trend" line.





Two-Way Tables

A two-way or contingency table is a statistical table that shows the observed number or frequency for two variables, the rows indicating one category and the columns indicating the other category.

	Allowance	No Allowance	Total
Chores	49	16	65
No Chores	10	26	36
Total	59	42	101

This table shows the number of students who do chores (65) vs. do not do chores (36). You can also see how many students receive allowance (59) vs. no allowance (42). You can also cross-reference the two categories. For example, 10 students do no chores, but still receive allowance!

	Laptop Computer	No Laptop Computer	Total
Desktop Computer			
No Desktop Computer			
Total			

This is an example of a blank 2-way table that you can use to compare what type of computer(s) a person has at home. For example, desktop only, laptop only, both, or neither.

Kim Coffield ©2016

https://www.teacherspayteachers.com/Store/Math-Class-Rocks

Statistics and Probability 8.SP.A.1-4

Investigate patterns of association in bivariate data.

1. What is the association between the age of the motorcycle and the price of the motorcycle? _____

   As the age of the motorcycle increases, the sale price _____.

2. 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 students were in favor of wearing uniforms?

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

Describe the results of the survey. Be specific.

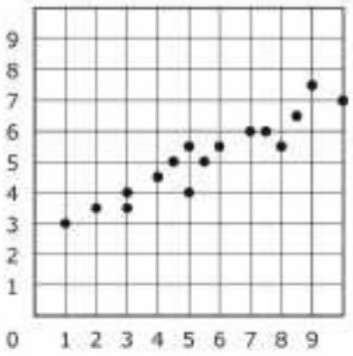
3. Create a 2-way table for the following data:

   Tom surveyed his classmates to find out if they played a sport after school or attended homework club. Fourteen of his classmates played a sport. Of those 14, only 5 attended homework club. Eight students attended homework club and, out of those 8, three did not play sports. There were ten students who did not play a sport nor attend homework club.

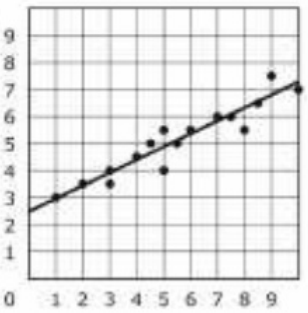
How many students were surveyed? _____
How many students do not attend homework club? _____
How many students do not play sports but do attend homework club? _____

Kim Coffield ©2016

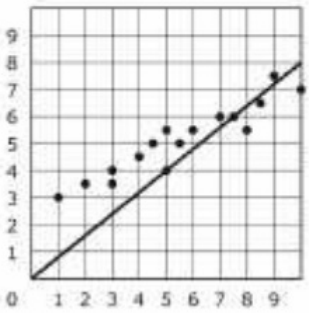
4. Which graph most closely approximates the line of best fit for the scatterplot below?



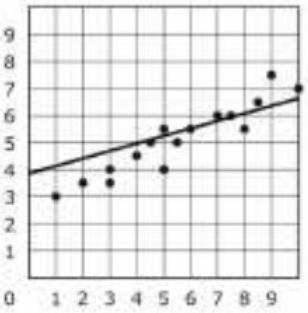
Ⓐ



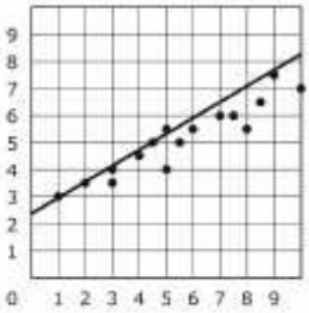
Ⓑ



Ⓒ



Ⓓ



5. The table shows the results of a random survey of students in grade 7 and grade 8. Every student surveyed gave a response. Each student was asked if he or she exercised less than 5 hours last week or 5 or more hours last week.

	Less than 5 hours	5 or more hours
Grade 7 Students	49	63
Grade 8 Students	58	51

Based on the results of the survey, which statements are true? Select all that apply.

A. More grade 8 students were surveyed than grade 7 students.
B. A total of 221 students were surveyed.
C. Less than 50% of the grade 8 students surveyed exercised 5 or more hours last week.
D. More than 50% of the students surveyed exercised less than 5 hours last week.
E. A total of 107 grade 7 students were surveyed.

Kim Coffield ©2016