Unit 8: Coordinate Plane (including x/y tables), Proportional Reasoning, and Slope

2016-17

Name____

Teacher ____________________________

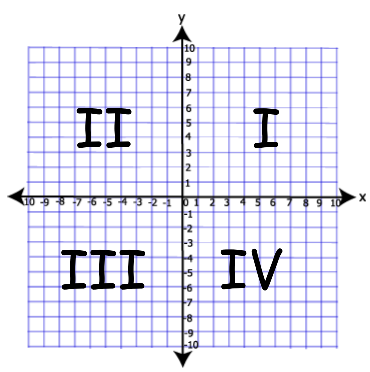
Projected Test Date_______________________________

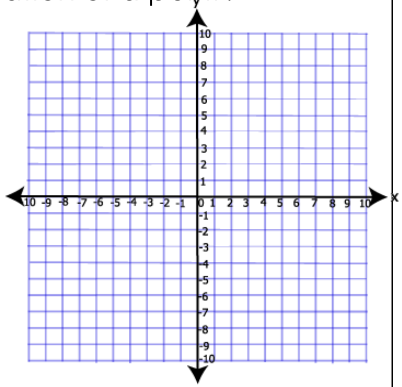
Unit 9 Vocabulary

coordinate plane	a plane formed by the intersection of the x-axis and the y-axis
x-axis	the horizontal number line
y-axis	the vertical number line
quadrants	the x- and y-axes divide the coordinate plane into four regions. Each region is called a quadrant.
origin	the point where the x-axis and y-axis intersect on the coordinate plane
ordered pairs	a pair of numbers that can be used to locate a point on a coordinate plane
x-coordinate	the first number in an ordered pair; it tells the distance to move right or left from the origin
y-coordinate	the second number in an ordered pair; it tells the distance to move up or down from the origin
integers	the set of whole numbers and their opposites
opposites	two numbers that are equal distance from zero on the number line
absolute value	the distance of a number from zero on a number line; shown by the symbol: $\mid \; \mid$
number line diagram	a diagram of the number line used to represent numbers and support reasoning about them
tape diagram	a drawing that looks like a segment of tape, used to illustrate number relationships. Also known as a strip diagram, bar model, fraction strip, or length model.
rate	a ratio comparing two quantities often measured in different units
unit rate	a rate in which the second quantity in the comparison is one unit
ratio	a comparison of two quantities
equivalent Ratios	two ratios that have the same value when simplified
proportion	a statement of equality between two ratios
constant of proportionality	the constant unit rate associated with the different pairs of measurements in a proportional relationship
proportion	a statement of equality between two ratios
congruent	sides or angles with the same measures

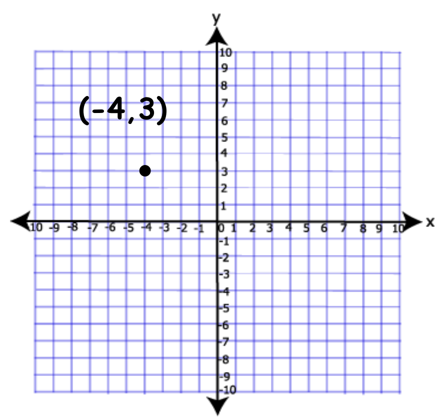
corresponding	sides or angles that lie in the same location on different figures
similar figures	figures whose corresponding sides are proportional and corresponding angles are congruent
indirect measurement	a method of determining length or distance without measuring directly
scale	the ratio between two sets of measurements. Scales can use the same units or different units.
scale drawing	enlarged or reduced drawing that is similar to an actual object or place
scale factor	the ratio used to enlarge or reduce similar figures. The scale factor comes from simplifying the ratio between two corresponding parts
scale model	a proportional model of a three-dimensional object. The model's dimensions are related to the dimensions of the actual object by a ratio called the scale factor.
slope	a number used to describe the steepness, incline, gradient, or grade of a straight line; the ratio of the "rise" (vertical change) to the "run" (horizontal change) of any two points on the line.
rate of change	the relationship between two quantities that are changing. The rate of change is also called slope.
y-intercept	the y-value of the point where the graph intercepts the y-axis
slope-intercept form	$y = mx + b$ where m is the slope and b is the y-intercept of the line
coefficient	a number or symbol multiplied with a variable or an unknown quantity in an algebraic term
vertical	a line which runs up-to-down across a coordinate plane
horizontal	a line which runs left-to-right across a coordinate plane

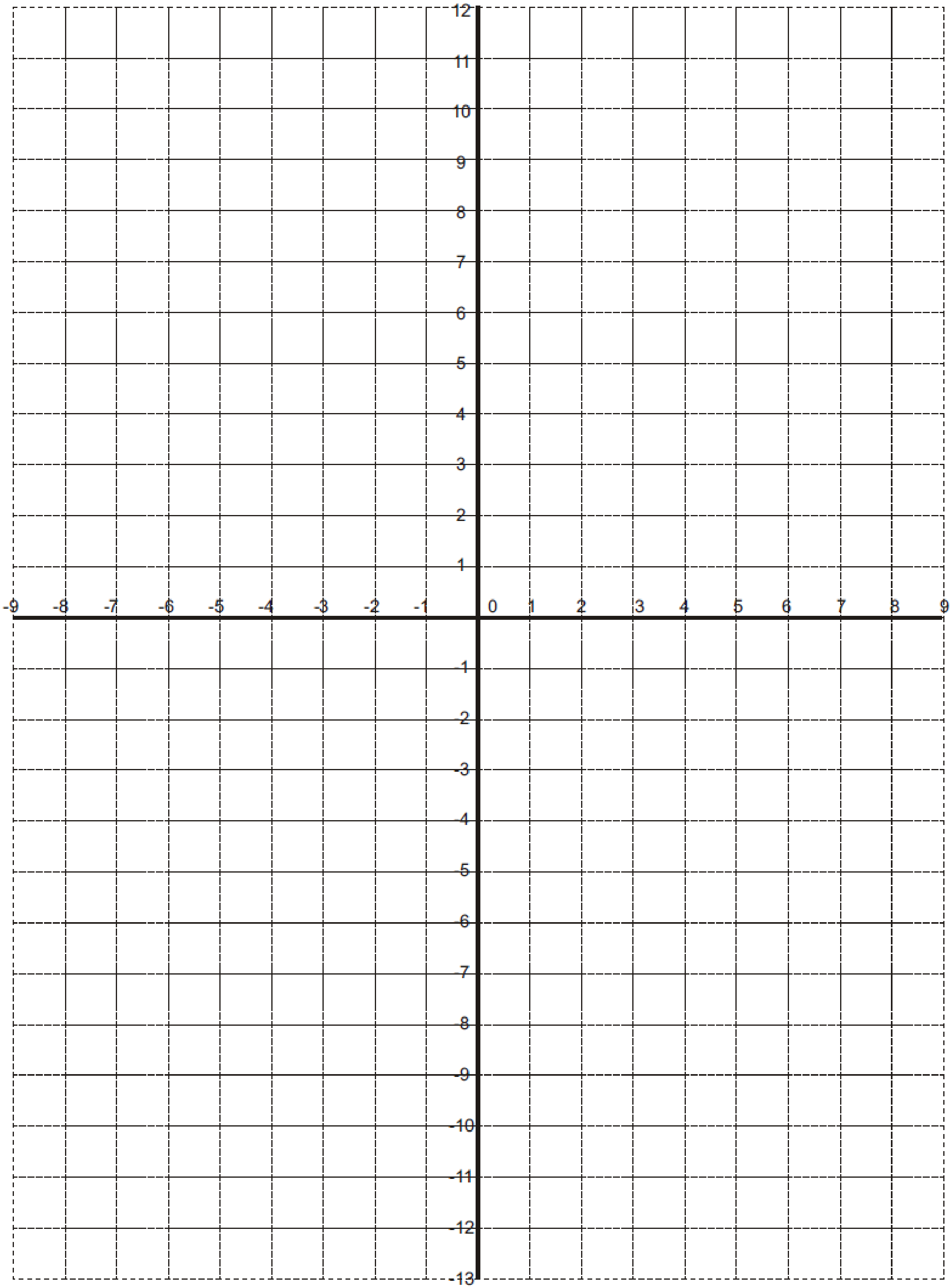
Review of Graphing in the Coordinate Plane

Question	Answer
What is a **coordinate plane**?	Formed by a horizontal axis and a vertical axis and is used to locate points.
What is the **x-axis**?	The horizontal axis on a coordinate plane.
What is the **y-axis**?	The vertical axis on a coordinate plane.
What is the **Origin**?	The zero point; where the x- and y- axis intersect. (0,0)
What is an **Ordered Pair**?	Two points, one for the x-axis and one for the y-axis, used to locate an exact location. (x- axis, y- axis) (5 , 7)
What is a **Quadrant**?	The x- and y-axes divide the coordinate plane into four regions.
What are the **4 Quadrants** of a coordinate plane?	 * Starting in the upper right hand corner, the quadrants are numbered I - IV going COUNTER CLOCKWISE. * We use Roman Numerals to identify each quadrant

How do I identify the exact location of a point? 	1.) Go across the x-axis until you reach the line that the point is located; record the number from the x-axis. 2.) Then go up/down the y-axis until you read the line that the point is located, record the number from the y-axis. 3.) You have just found your ordered pair. ** Remember, you must find the x-value first (**x** comes before ***y*** in the alphabet)

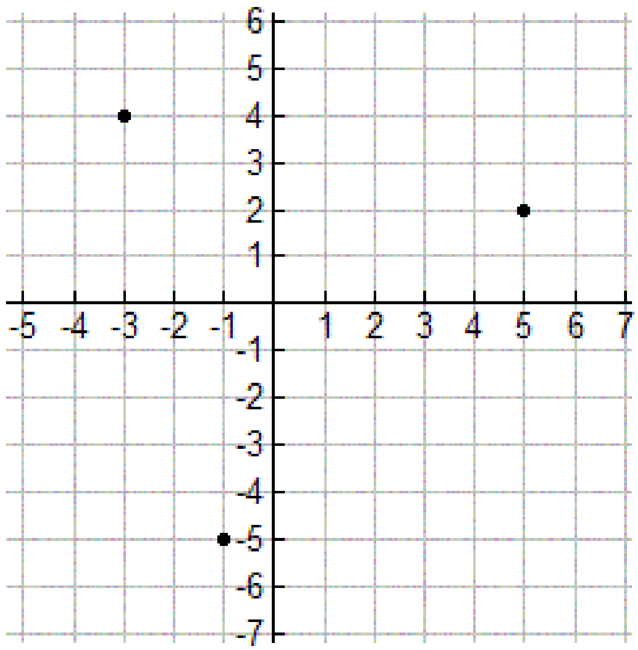
More Practice with Coordinate Planes: Plotting Points

Questions	**Answers**
How do I plot an ordered pair?	* Using the ordered pair—the first number in an ordered pair is the coordinate for the X axis (horizontal); the second number in an ordered pair is the coordinate for the Y axis (vertical.) **x-axis** **y-axis** Example: (-4, 3)  **Remember, x comes before y!
Practice:	Plot and label the following on a coordinate plane next page: A(5,6) B(4,10) C(0,0) D(-4, 8) E(-3, -6) F(-8, 5) G(8, -5) H(1, -2) I(7, -4) J(5, 2)



ID# 0031 4-quadrant graph paper www.mrmaisonet.com

Coordinate Plane



What is the ordered pair for point A?

What is the ordered pair for point B?

What is the ordered pair for point C?

Plot the points and determine the quadrant number.

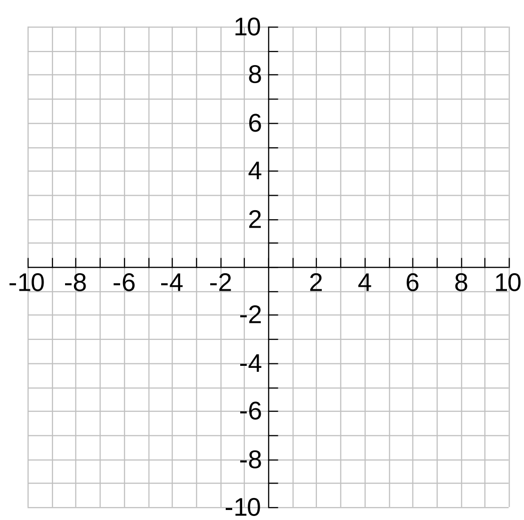
A (2, 1)

B (-3, 5)

C (-2, -2)

D (4, 6)

E (4, -6)



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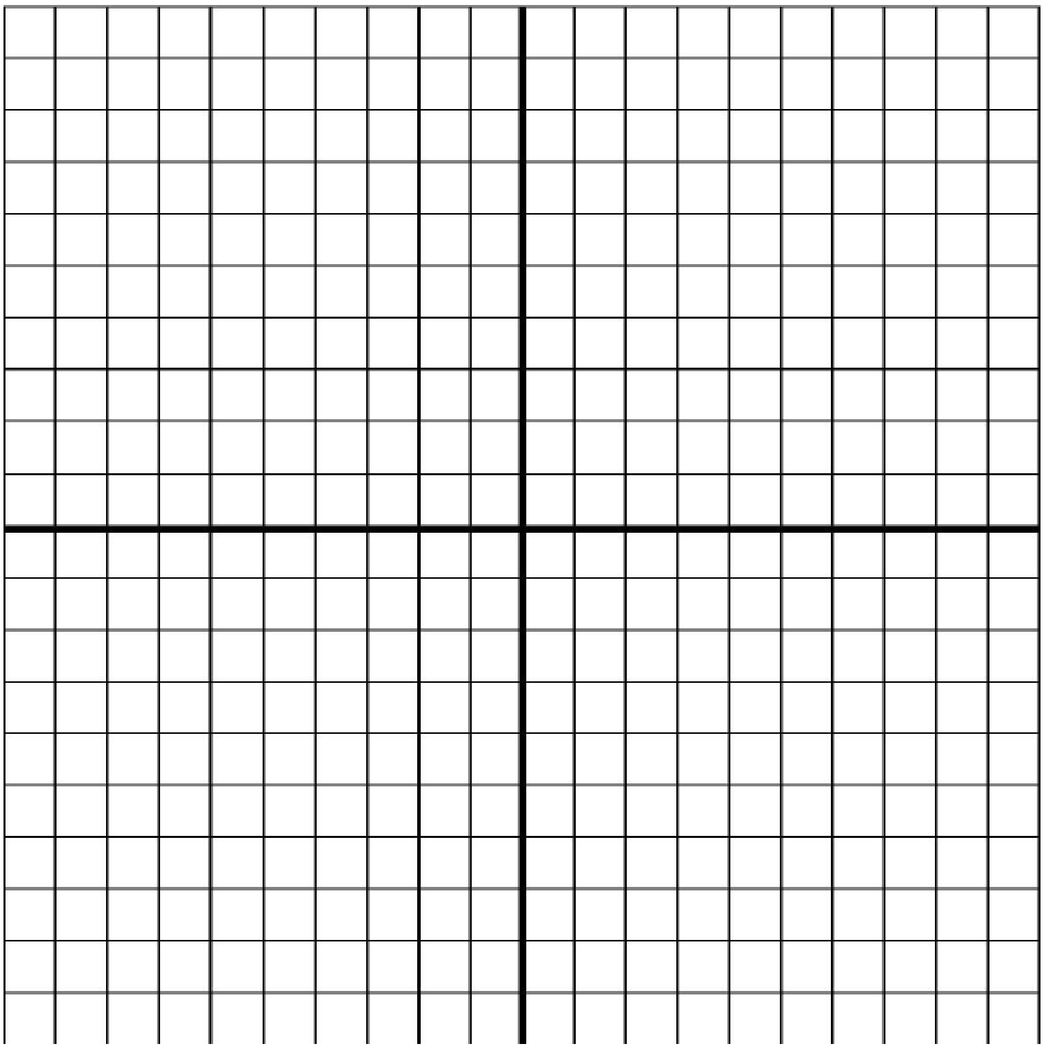
Work It Out: The Cartesian Plane and Coordinates



1. A coordinate is written in the form: (_____ , _____)

2. Graph the following coordinates on the plane above:
A. (-6, 2) B. (0, 8) C. (-10, 5) D. (3, -7) E. (9, 3) F. (4,0) G. (9, -9) H. (-2, -8)

3. Label the quadrants.

4. Label the origin - the ordered pari is (_____ , _____)

Absolute Value Inquiry Question

Look at the two ordered pairs below, how would you figure out the distance between them?

(8, 6) and (8, -6)

Work with a partner to come up with your solution. Be ready to explain or demonstrate your findings.

Now try these: (9, 5) and (6, 5)

BIG IDEAS:

When finding distance between points, first ask yourself if they are in the same or different quadrants…

If same quadrant: __________________________________

If different quadrants: ____________________________________

Absolute Value Review

What is the definition of absolute value?

Why would you use the absolute value of a number?

Complete the following problems:

What is the opposite of 4?

What is the absolute value of 4?

Find the absolute value of the following numbers:

$|6|$ $|-7|$ $|-10|$

Challenge:

$-|-8|$

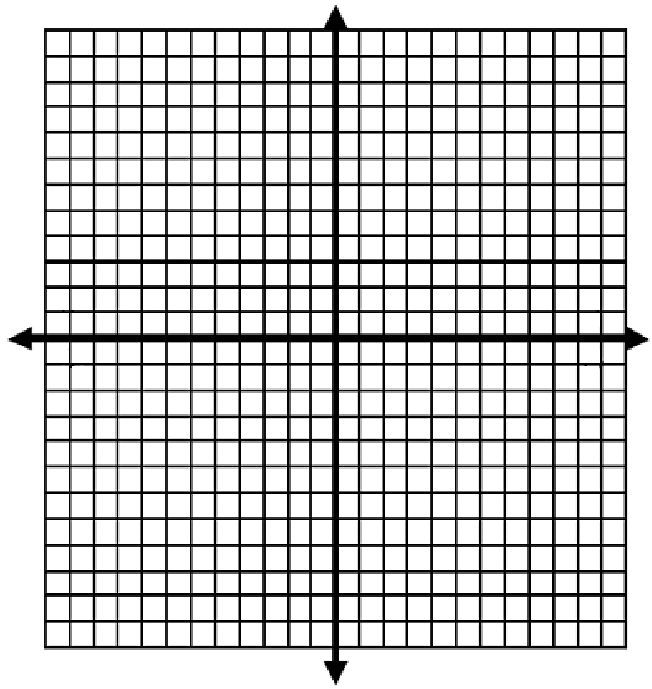
Explain the difference between opposite and absolute value in the space below.

Distance Between Points

Use the graph below to help solve the following problems.

Find the distance between the following points:

1. (4, 5) and (4, -8)
2. (10, -7) and (10, 3)
3. (-9, 6) and (4, 6)
4. (-2, 5) and (-3, 5)



Find the distance without using the graph.

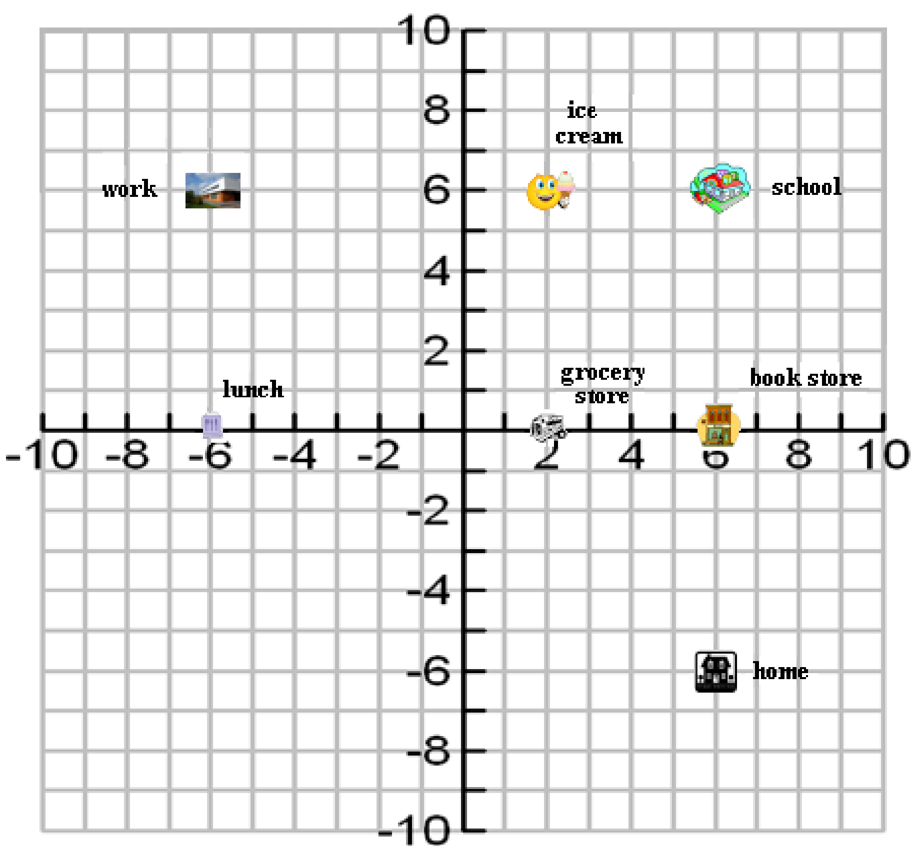
1. (9, 5) and (9, -2)
2. (-6, 3) and (-7, 3)
3. $(8, -4\frac{1}{4})$ and $(8, 3\frac{1}{2})$
4. $(8\frac{2}{3}, 4)$ and $(-6\frac{1}{4}, 4)$
5. Tammy started at home at (4, 5) and then went to the store at (4, 2). She decided to then stop for gas at (4, -3) and then to pick up her printed photos at (4, -5). She then went home. What was Tammy's total distance?

An Exhausting Day

Tammy had an exhausting day. She left the house early one morning and stopped several places throughout the day. Here is her journey.

- Started at home
- 1st stop was dropping her child at school
- 2nd stop work
- 3rd she went out to lunch
- 4th went back to work
- 5th picked up her child from school
- 6th took him out for ice cream for a special treat
- 7th stopped at the grocery store to get something for dinner
- 8th stopped at the book store
- 9th went home!
- **Note: the middle of the picture represents the ordered pair; for example the book store is located at (6,0)**

What was her total distance for the day? ________________________________



Are they proportional?

Look at each graph and select 2 ordered pairs (not including the origin) and make a table that corresponds to the graph. Decide if the graph is proportional or not. (Graphs are on next 3 pages)

Graph #1

Money spent on stamps	Total number of stamps

Proportional? _____

Graph #2

Months	Total books read

Proportional? _____

Graph #3

Number of seed packets	Number of flowers

Proportional? _____

Graph #4

Sticks of butter	Number of cakes

Proportional? _____

Graph #5

Cups sold	Earnings

Proportional? _____

Graph #6

Time	Height

Proportional? _____

Graph #7

Attendees	Cost

Proportional? _____

Graph #8

Weight	Cost

Proportional? _____

Graph #9

Practices	Distance

Proportional? _____

Graph #10

Cups of sugar	Number of pies

Proportional? _____

Graph #11

Taxable amount	Amount of tax

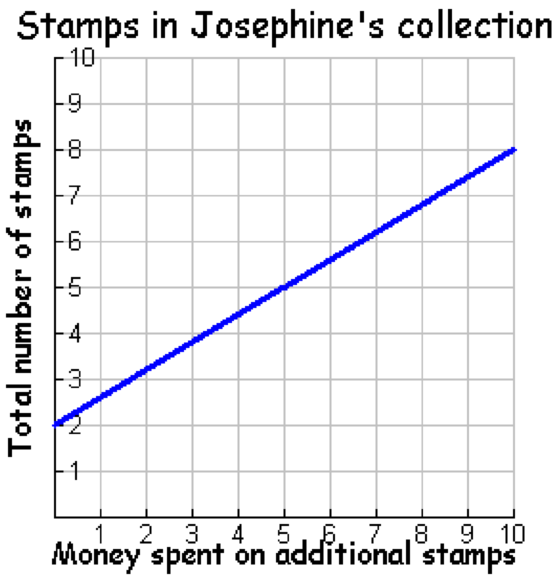
Proportional? _____

Graph #12

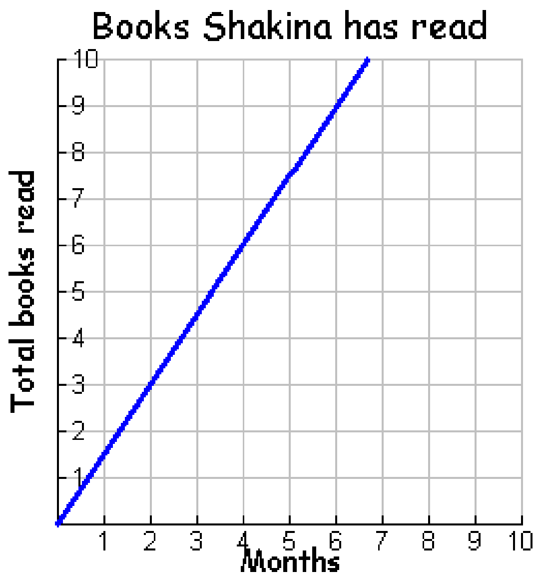
Time in class	Number of pages

Proportional? _____

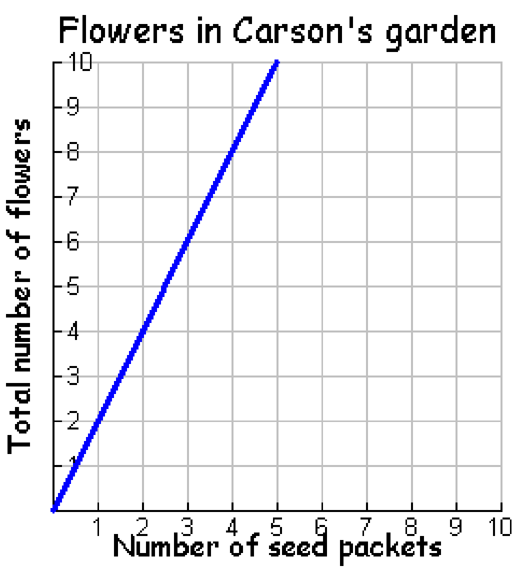
Graph #1



Graph #2

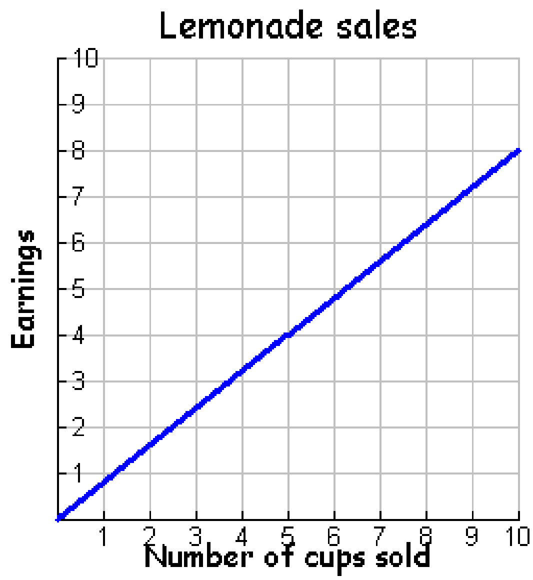


Graph #3

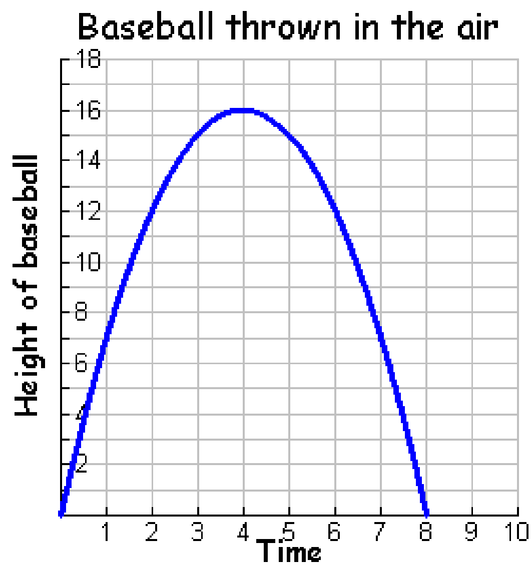


Graph #4

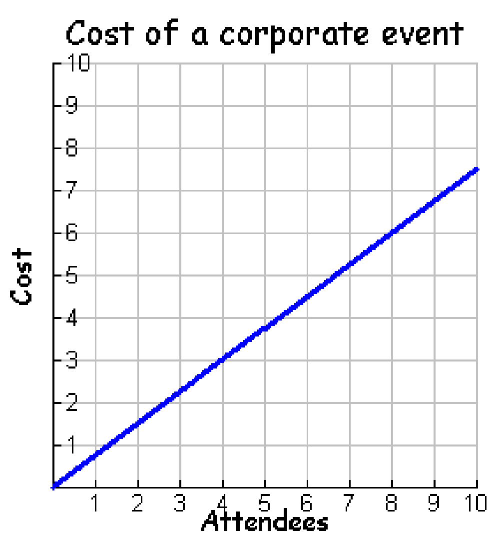
Graph #5



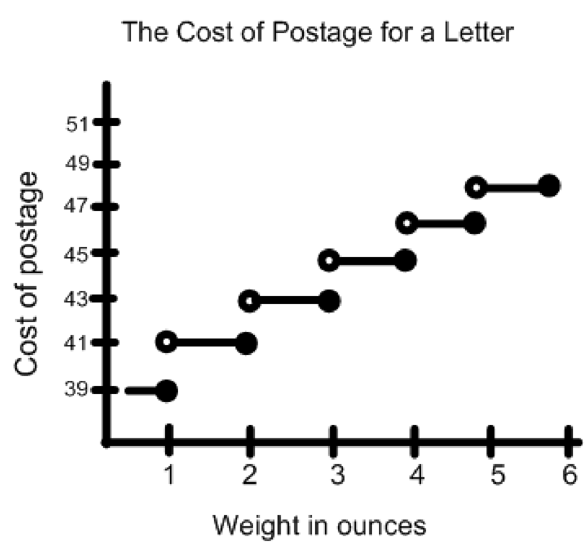
Graph #6



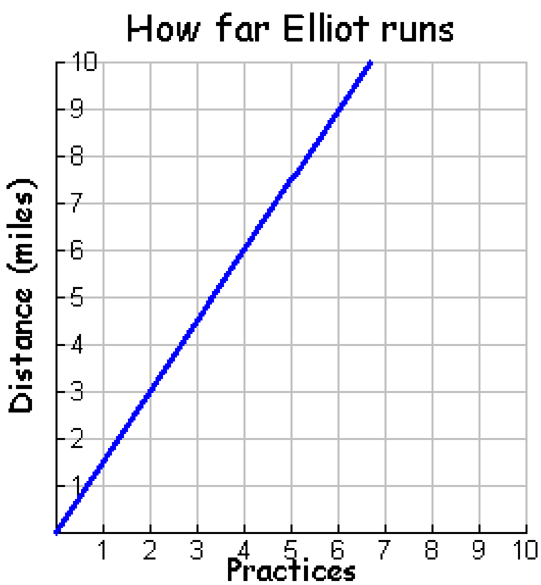
Graph #7



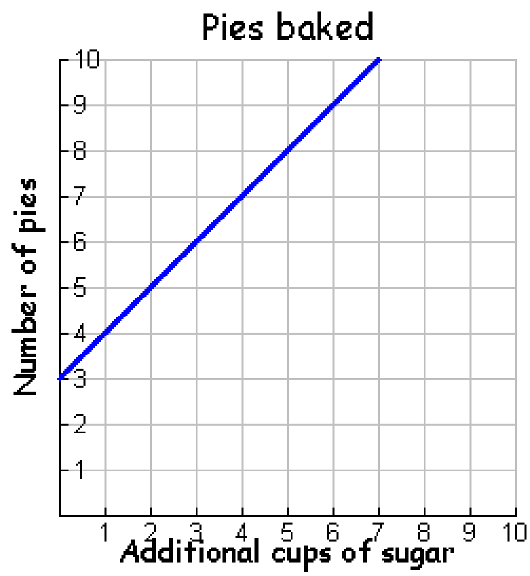
Graph #8



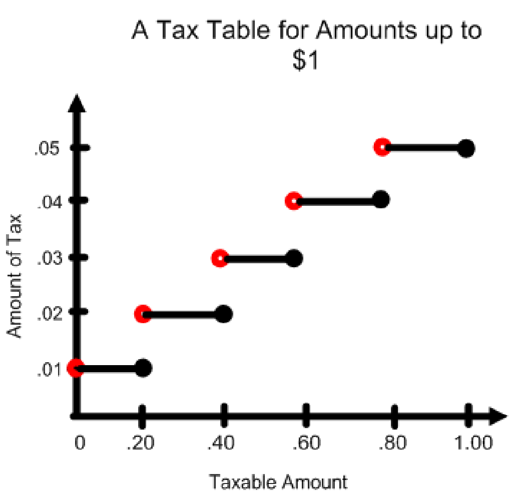
Graph #9



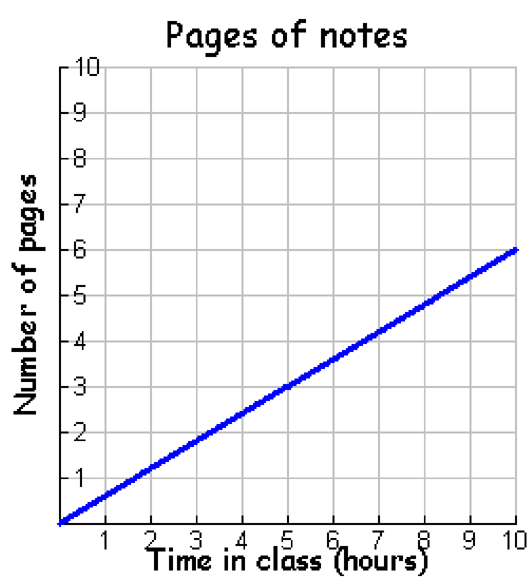
Graph #10



Graph #11



Graph #12



Let's say you are asked to *tap your pencil at a rate of 12 taps per minute*. Could a linear function represent this motion? Let's find out…

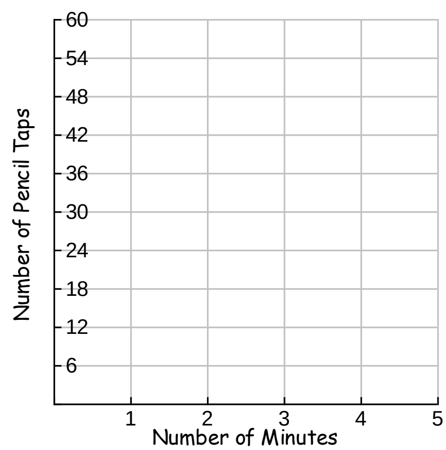
1) Fill in the table based on the information given above.

Number of minutes	Number of taps
1 minute	12 taps
2 minutes	
3 minutes	
4 minutes	
5 minutes	

2) Is there a constant rate of change in the table?

3) Is the relationship between minutes and taps a linear one?

4) Graph the data from your table to confirm or deny your answer to #3.

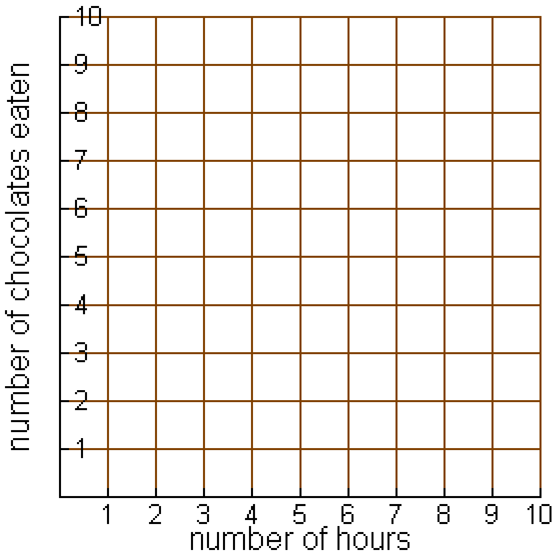


5) Is there an equation that could represent this relationship?

Constant Rate of Change

$$y = 2x$$

x	2x	y

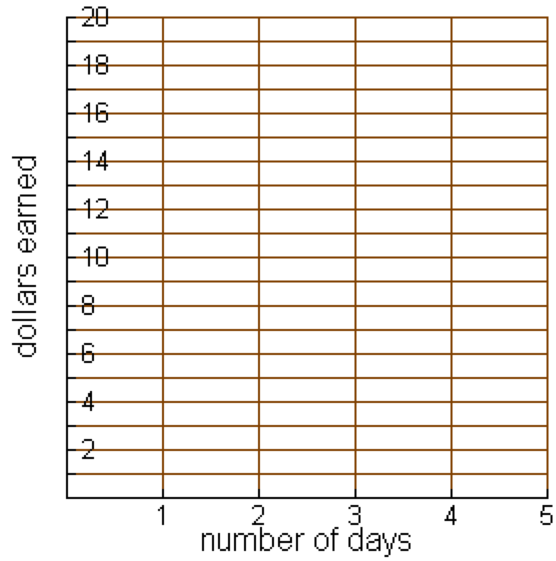


What is the constant rate of change?

How did you know?

$$y = 4x$$

x	4x	y

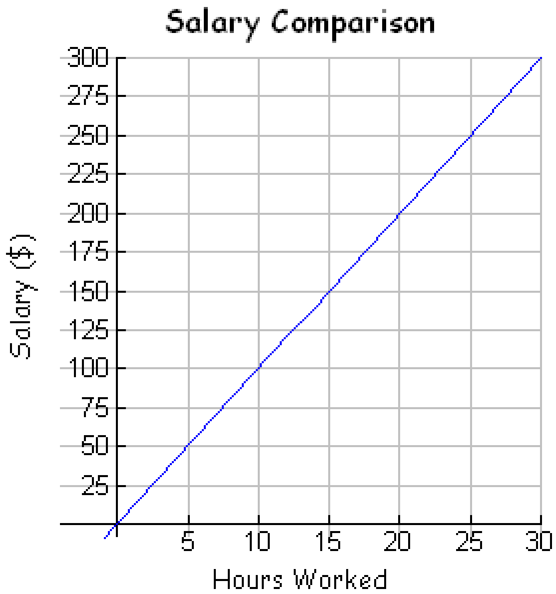


What is the constant rate of change?

How did you know?

Graphs versus Equations

1. Pilar has two job offers and wants to take the job with the highest pay. The pay scale for company A is shown in the graph. The pay scale for Company B is given by the boxed equation where P is the pay, and h represents the number of hours worked.



$\boxed{P = 9h}$

1. Based on the graph, how much did Pilar make after working 15 hours? 20 hours?

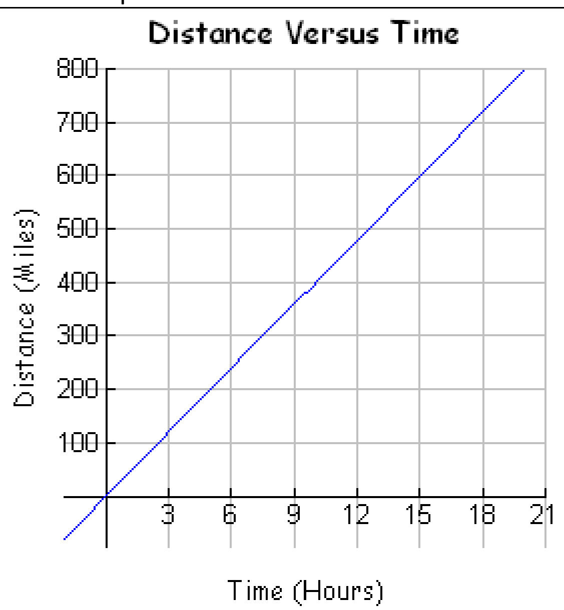
Hours	Salary
15	
20	

2. Can you use the table above to determine the constant of proportionality? What is the constant and how did you find it?

3. What is the equation that is represented by the graph?

4. Which company offers the highest pay, and what is the hourly rate for that company?

2. Kelsey recorded the speed of two storms by mapping how long they took to move certain distances. The speed of Storm A is shown in the graph. Storm B's speed is given by the boxed equation where D is the distance in miles, and h represents the time in hours.



$\boxed{D = 25h}$

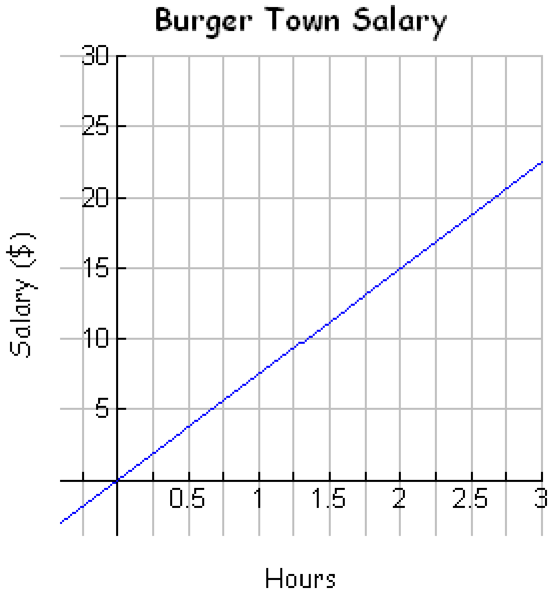
1. Can you find an ordered pair that goes through two whole number values?

2. Use that point to help you determine the constant of proportionality. (What do you have to do to x to get to y?)

3. What is the equation that is represented by the graph?

4. Which storm is moving faster? What is the speed of that storm in miles per hour?

3. Paco has two job offers at Burger Town and wants to take the job with the highest pay. The pay scale for cook is shown in the graph. The pay scale for taking customer orders is given by the boxed equation where P is the pay, and h represents the number of hours worked.

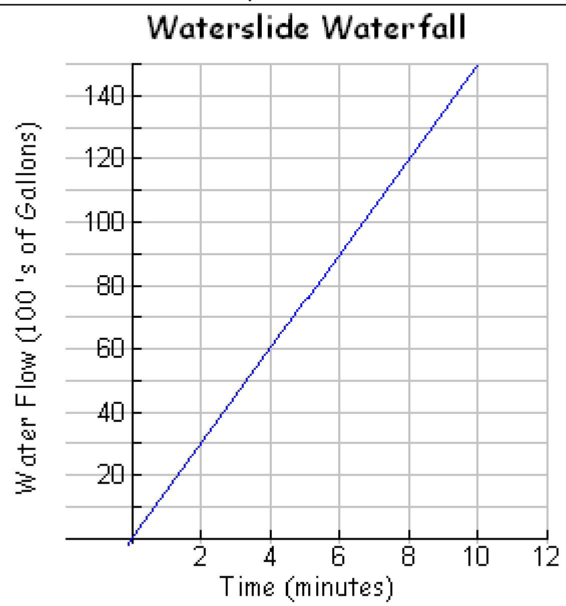


$\boxed{S = 8h}$

1. What is the equation that is represented by the graph? How do you know? Use complete sentences to prove how you determined your answer.

2. Which job offers the highest pay, and what is the hourly rate for that job?

4. Waterslides at WaterRapids Water Park pump different amounts of water through the slides. Slide of Terror is shown in the graph. The amount of water pumped through Waterfall Alley is in the boxed equation where W is the water pumped, and m represents the number of minutes.



$\boxed{W = 2000m}$

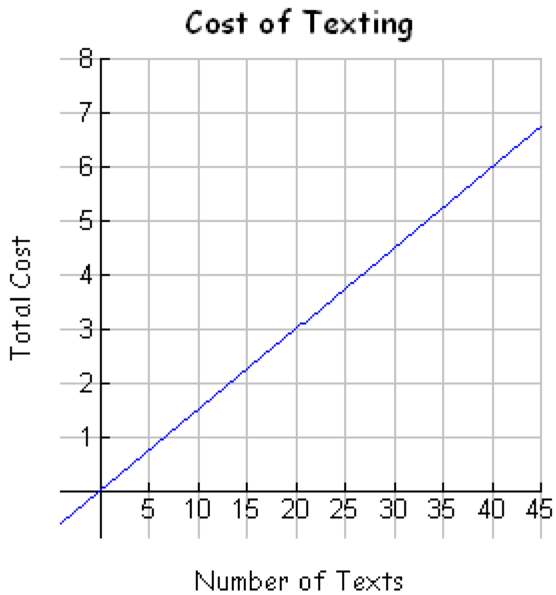
1. How many gallons of water did Slide of Terror pump through after 6 minutes? How do you know?

2. What is the constant of proportionality?

3. What is the equation that is represented by the graph?

3. If you were afraid of fast rides, which waterslide would you enjoy more? What is the rate of water speed for that water slide?

5. Megan's parents are allowing her to get a cell phone, but she must pay for the text message plan. Text Plan A is shown in the graph. The text plan cost for Text Plan B is given by the boxed equation where C is the cost, and n represents the number of texts sent and received.



$$\boxed{C = .20n}$$

1. How much would Megan pay to send or receive 20 texts? What about 40 texts?

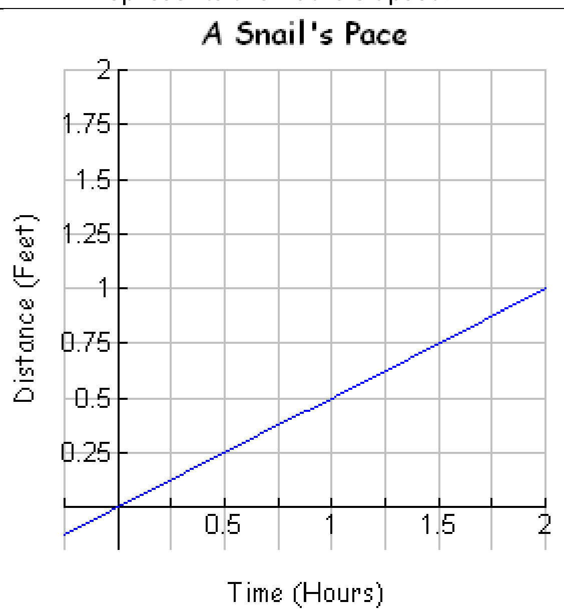
Texts	Cost ($)
20	
40	

2. Can you use the table above to determine the constant of proportionality? What is the constant and how did you find it?

3. What is the equation that is represented by the graph?

4. Which text plan would Megan select to ensure that she is saving the most money? How much is she paying for each text sent or received?

6. For her science project, Georgia recorded the speed of two snails. Snail Bert is shown in the graph. The speed of Snail Ernie is given by the boxed equation where D is the distance, and h represents the hours elapsed.



$$\boxed{D = .75h}$$

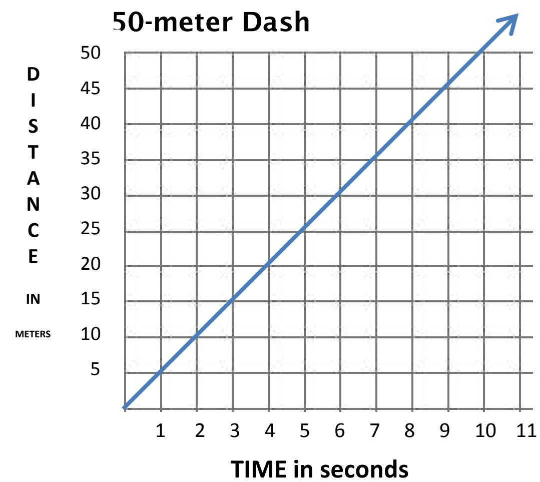
1. What is the equation that is represented by the graph? How do you know? Use complete sentences to prove how you determined your answer.

2. Which snail moves at a faster rate? What is the speed of each snail per hour?

Interpreting From Graphs

A relationship between two quantities is proportional if the ratio between the quantities is always the same unit rate. Proportional relationships can be represented by the equation $y = kx$, where k represents a constant. The graph of any proportional relationship will be a straight line through the origin.

Ramon raced Angel and Carlos in a 50-meter dash.

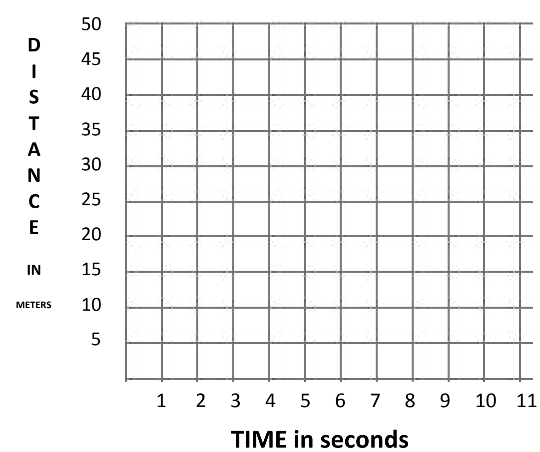


A. Ramon's results are shown on the graph.
   1. What does the shape of the graph tell you about Ramon's speed during the race?
   2. Explain how you can use the graph to find the unit rate for Ramon's speed.

B. Angel's data during the race can be described using the equation y = 4.5x. Explain how you can find the unit rate for Angel's speed from the equation.

C. Carlos ran the race at a constant speed. The table shows the distances Carlos traveled during different times in the race.

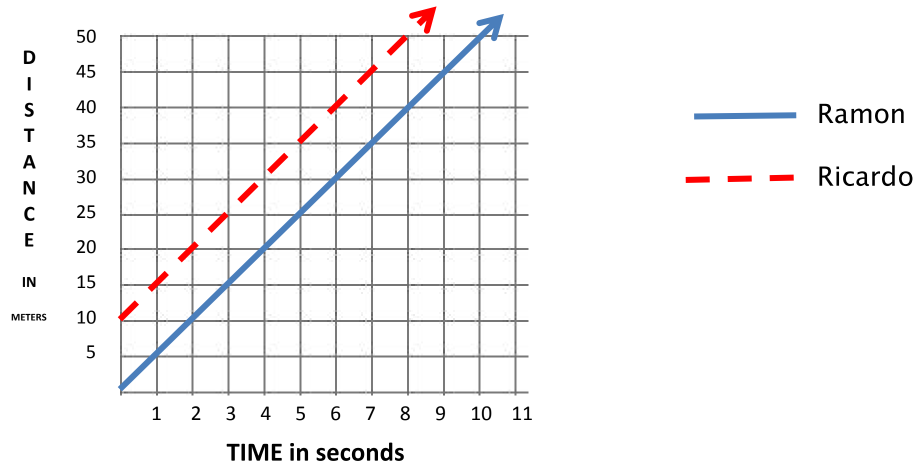
Time (in seconds)	2	4	6	8
Distance (in meters)	9.5	19	28.5	38



   1. Plot the data on the graph to show Carlos's speed during the race.
   2. Explain how you can use the graph to find the unit rate for Carlos's speed.

D. Who won the race? Explain how you know.

E. Suppose Ramon's twin brother, Ricardo, also runs in the race. Ramon gives Ricardo a 10-m head start in the race, and they run at the same speed. The graph below shows the results.



1. Write an equation to represent Ramon's position.

2. What do the points (0, 0) and (0, 10) on the graph represent?

3. Are the lines parallel? How do you know?

4. Ricardo runs at a constant rate of 5 m/sec and has a head start of 10 m. Write an equation of the line that represents Ricardo.

5. What is the unit rate for Ramon? Ricardo? Compare and make a statement.

Comparing Functions Problem

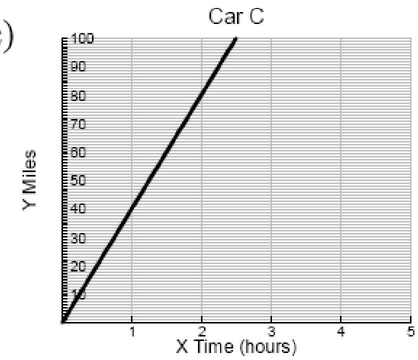
Put the cars in order from fastest to slowest.

a) $y=35x$

b)

Hours	Miles
3	102
5	170

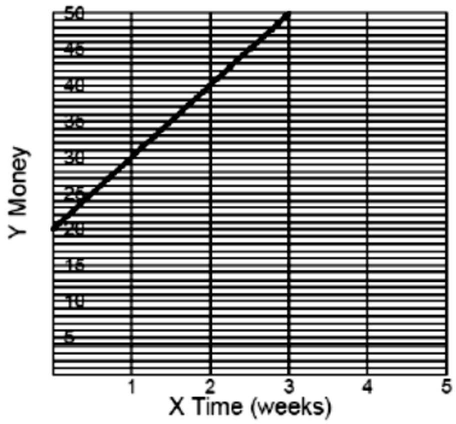
c)



d) The Andersons completed the 24 mile trip to Salt Lake City in 30 minutes.

Comparing Rates of Change

1) George had \$20 and was saving \$15 every week. Mark also started with \$20. His savings are shown on the graph below. Who will have \$1,000 first?



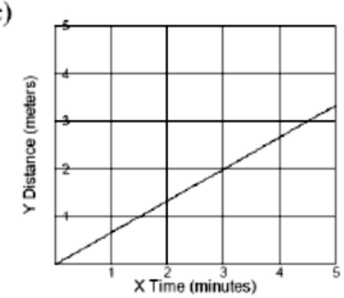
2) Put the cyclists in order from slowest to fastest. x represents time in minutes and y represents meters traveled.

a)

Time	Meters
2	1
4	2
6	3

b) $y = \frac{1}{3}x$

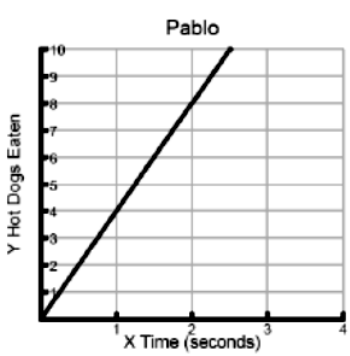
c)



d) Bob has cycled 12 meters in the past 6 minutes.

3) Based on the information below, who will win the hot dog eating contest? Why?

a)



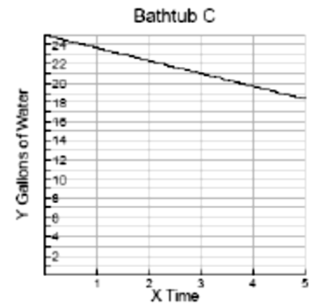
b) Helga has eaten 18 hot dogs in 5 minutes.

4) Based on the information below, which bathtub will be empty first? Why?

a) Bathtub A starts with 25 gallons and is draining 1.5 gallons a minute.

b)

Minutes	Gallon
{…} 0	s 25
3	20
5	15



5) Write equations for the following situations:

a) A cab charges $2.00 per ride and $1.25 per mile.

b) Hong has $350 in her checking account and is spending $17 every week.

c) A plumber charges $50 for a house call and $35 per hour.

d) Make up a story and have a neighbor write the equation.

e) What does the constant rate of change represent in a-d?

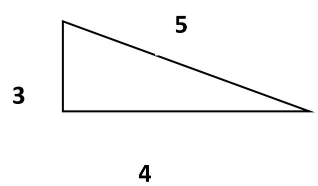
Similar Figures NOTES

Similar Figures:

Corresponding Sides and Angles:

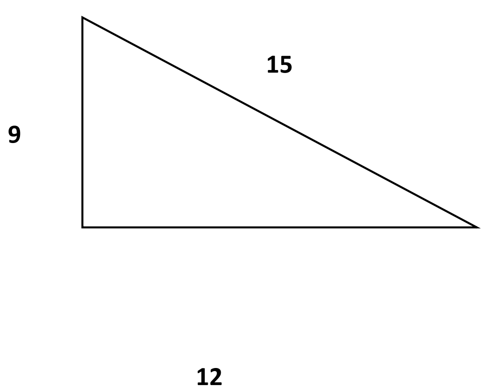
Proportional:

In the triangle below, the ratios or relationship between the sides can be described as follows:

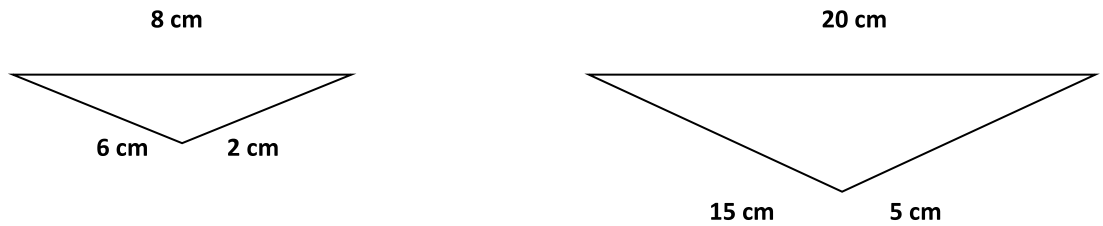


3 : 4 : 5

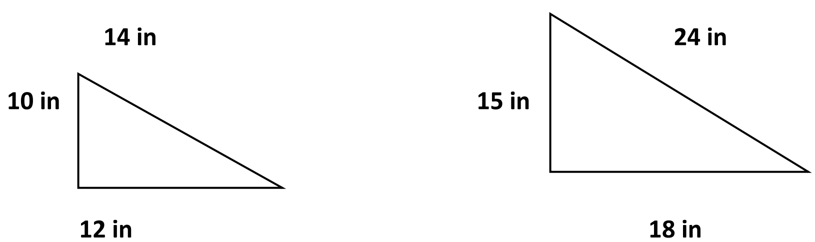
In order for another triangle to be proportional to this one, its sides would have to maintain the same relationship. For example look at the following triangle. If I set up the relationship for this triangle and then reduce it by a common factor, what happens?



EXAMPLE 1: Compare the sides below and prove or disprove if these triangles are similar using the side relationships.



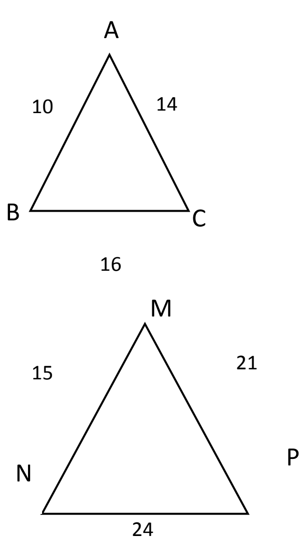
EXAMPLE 2: Compare the triangles below and prove or disprove if these triangles are similar using the side relationships.



Another way we could look at these triangles is to compare corresponding sides between the triangles. The triangles below have corresponding angles that are congruent too. Complete the following statements about triangle ABC and triangle MNP.

$\overline{AB}$ corresponds to ______ $\overline{NP}$ corresponds to ______

$\overline{CB}$ corresponds to ______ $\overline{MP}$ corresponds to _______



So the corresponding ratios between these triangles would be:

As cross-products:

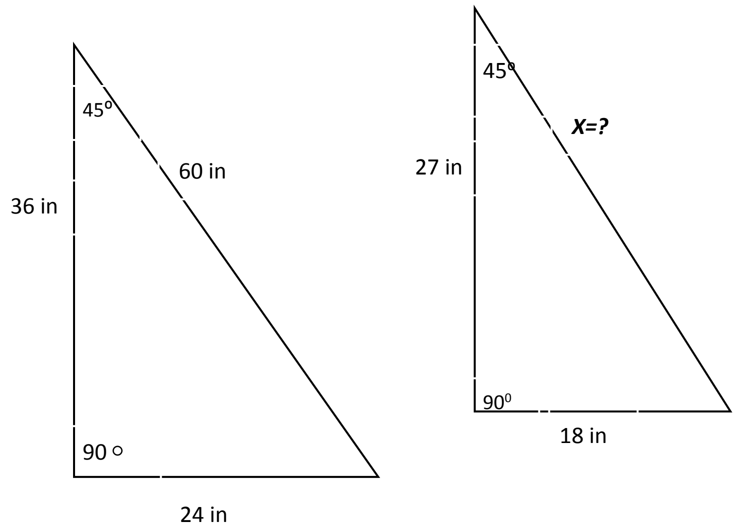
$\frac{10}{15}$ **and** $\frac{?}{21}$ **; Written as** $\frac{10}{15} = \frac{14}{21}$ **; 10 x 21 = 14 x 15; 210 = 210**

So you can also use this method to prove if two shapes are similar.

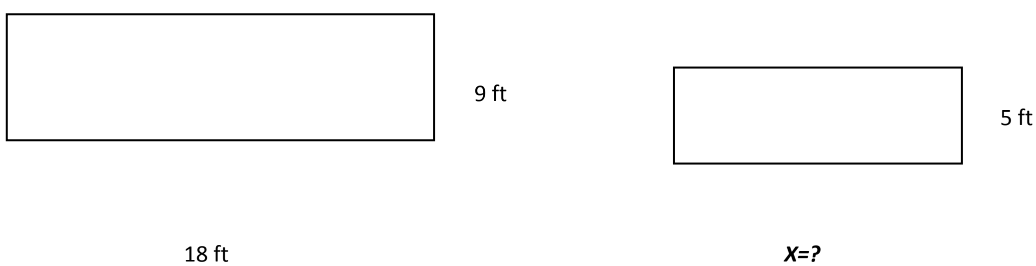
*REMEMBER that two shapes are simliar if their corresponding sides are proportional.

We can use this same technique to find the missing side when we are told that two shapes are similar. Try to find the missing pieces in the figures below:

Triangle ABC is similar to triangle XYZ. Can you find the value of *x*?



The two rectangles are similar. Find the missing side. Can you find more than one way to find the missing side?

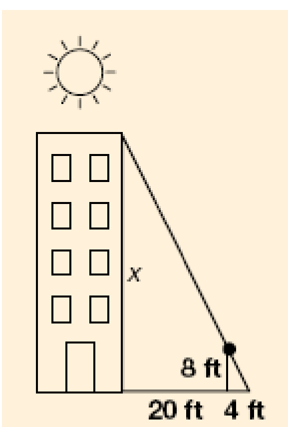


Application of Similar Figures

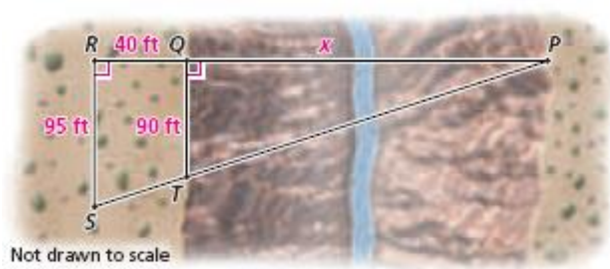
1. At any given time of day, if you are standing outside, the shadow you cast will be proportional to the shadows of other objects. So…if we want to know the height of a very tall tree (without climbing it) we can find that height using other measures. Draw a picture of the situation.

2. You measure the mailbox in front of the school and find that it stands 3.5 ft tall and is casting a shadow of 2 ft. You want to find the height of the flagpole which is casting a shadow of 12 ft. Find the height of the flagpole. Draw a picture creating similar figures and label then solve.

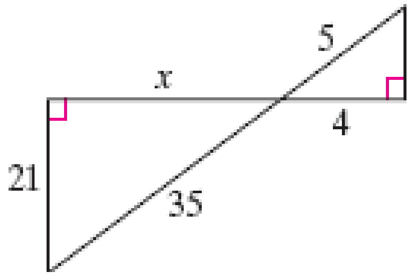
3: What is the height of the building?



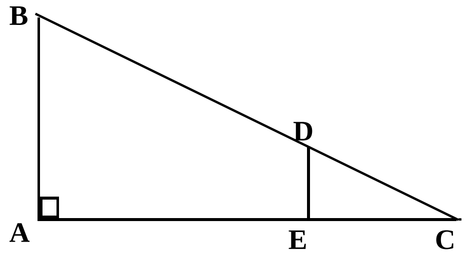
4: Solve for x.



5:

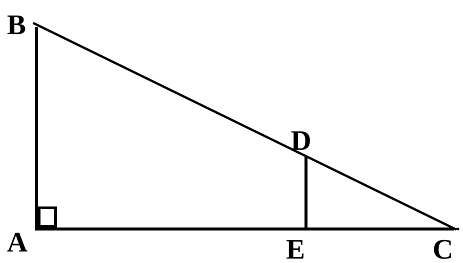


6: Triangle ABC is similar to Triangle EDC. *AB* = 18 cm. *DE* = 6 cm. Segment *EC=16 cm.* Find the length of AC.

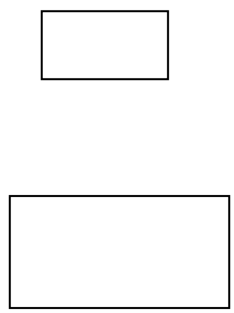
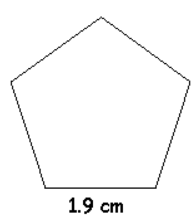


7: Triangle ABC is similar to Triangle EDC.

If AB = 14 , AC = 31.5, and DE = 4, what is the length of AE? *HINT: Find EC first.*



Scale and Scale Factor Notes

Scale-	**Scale Factor**-
Ex. On a map of Florida, the distance between two cities is 10.5 cm. What is the actual distance between them if the scale is 3cm = 80 mi?	Ex. A model house is 16 centimeters wide. If it was built with a scale of 4 cm : 15 feet, then how wide is the actual house?
Ex. Johnny used a map to get to his Grandma's house that used a scale of 2 cm : 85 miles. If Johnny actually drove 637.5 miles, how far apart was Johnny's house from his Grandma's house on the map?	Ex. A photograph was enlarged and made into a poster using a scale factor of 5. The photograph is 5 inches by 11 inches. What will the *perimeter* of the poster be? 
Ex. A car that is 15 feet long is going to be reduced by a scale factor of 60 to produce a model toy car. What is the length of the model toy car?	Ex. In the scale drawing below, **each side** is 1.9 cm long. If the drawing is going to be enlarged by a scale factor of 20, what is the *perimeter* of the enlarged object? 

Exploring Similar Figures

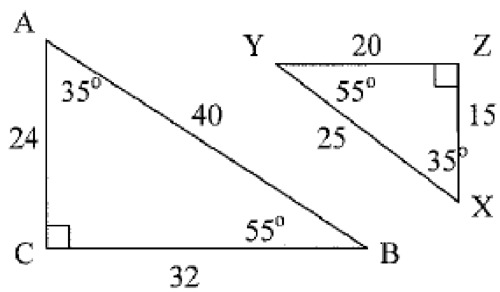
Similar Figures – Polygons that have the same shape, but different size.

Corresponding – Having the same position.

Two polygons are similar if:

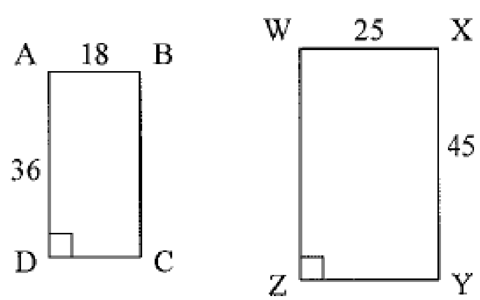
1. corresponding angles are congruent **AND**
2. the lengths of corresponding sides are in proportion, called the **scale factor**.

Show if the triangles below are similar or not.

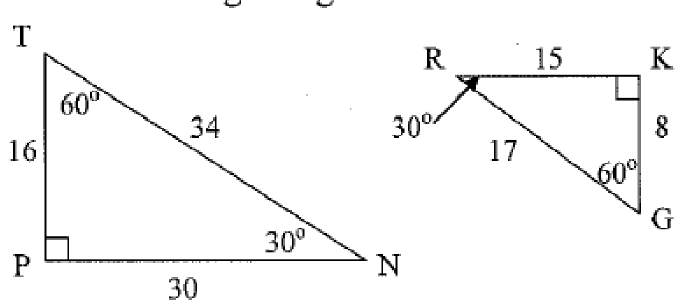


When two polygons are similar, we can write a similarity statement using the symbol "~".

1. Are the following rectangles similar?



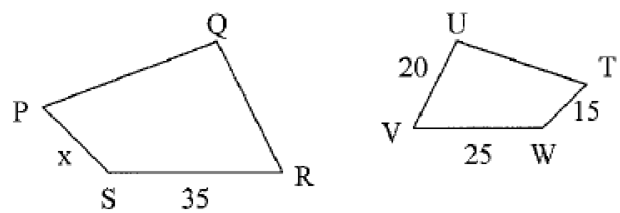
2. Are the following triangles similar?



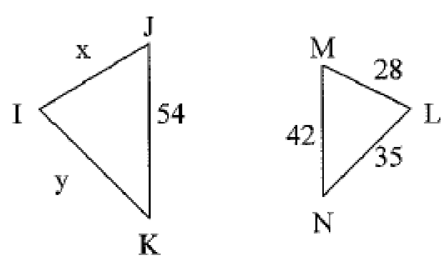
Similar Figures

Given two figures are similar, corresponding sides must be in proportion. Therefore, we can write a proportion to find the missing side length of one of the figures.

1. Given quadrilateral PQRS ~ TUVW, write a proportion to find the length of $\overline{PS}$.



2. Given $\Delta IJK \sim \Delta LMN$, Find the length of $\overline{IJ}$ and then the length of $\overline{IK}$.

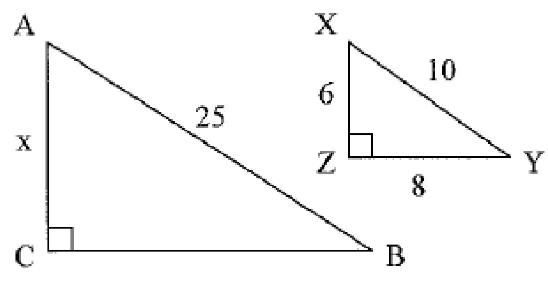


3. If a 36-inch yardstick casts a 21-foot shadow, how tall is a building whose shadow is 168 feet? (Draw a picture with two similar polygons.)

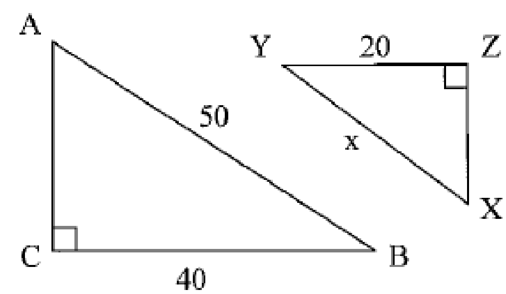
4. Sam wants to enlarge a triangle with sides 3, 6 and 6 inches. If the shortest side of the new triangle is 13 inches, how long will the other two sides be?

Find the missing side lengths in each pair of similar figures.

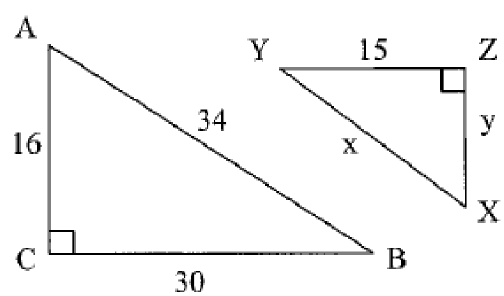
1. $\Delta ABC \sim \Delta XYZ$



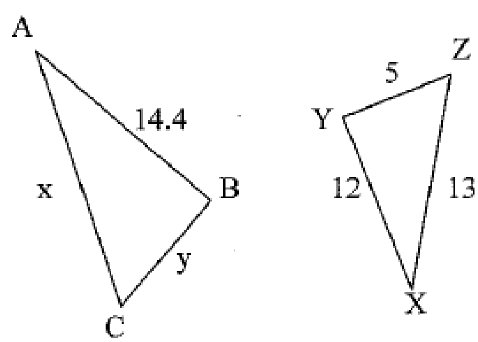
2. $\Delta ABC \sim \Delta XYZ$



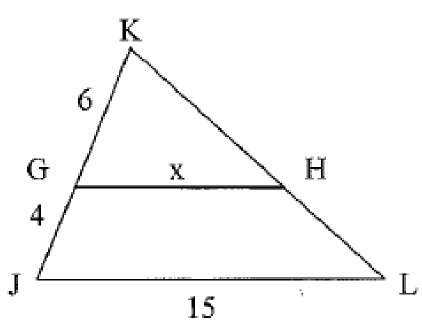
3. $\Delta ABC \sim \Delta XYZ$



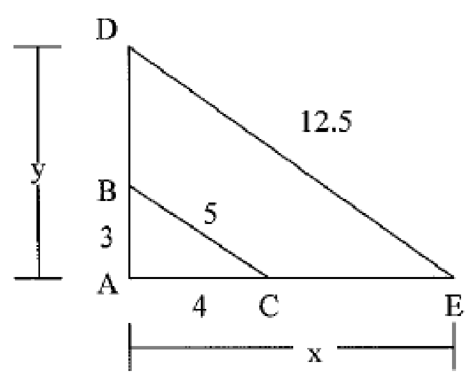
4. $\Delta ABC \sim \Delta XYZ$



5. $\Delta JKL \sim \Delta GKH$



6. $\Delta ABC \sim \Delta ADE$



Use similar triangles to find the missing information.

7. A giraffe is 18 feet tall and casts a shadow of 12 feet. Corry casts a shadow of 4 feet. How tall is Corry?

8. When a Ferris wheel casts a 20-meter shadow, a man 1.8 meters tall casts a 2.4-meter shadow. How tall is the Ferris wheel?

9. A flagpole casts a shadow 28 feet long. A person standing nearby casts a shadow eight feet long. If the person is six feet tall, how tall is the flagpole?

10. A photograph measuring four inches wide and five inches long is enlarged to make a wall mural. If the mural is 120 inches wide, how long is the mural?

11. A 9-foot ladder leans against a building six feet above the ground. At what height would a 15-foot ladder touch the building if both ladders form the same angle with the ground?

12. Chris wants to reduce a triangular pattern with sides 16, 16 and 20 centimeters. If the longest side of the new pattern is to be 15 cm, how long should the other two sides be?

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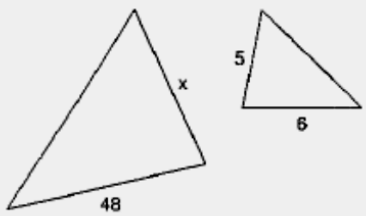
Similar Figures

Each pair of figures is similar. Find the missing side.

9)



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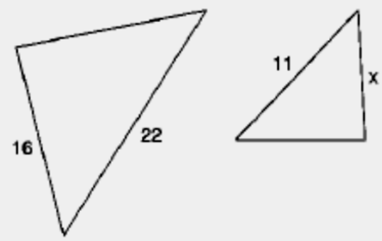

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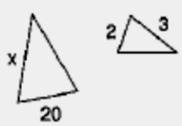

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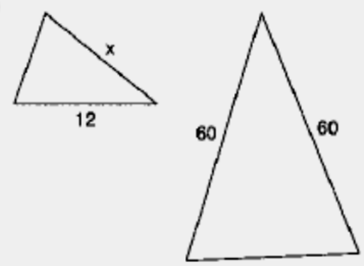

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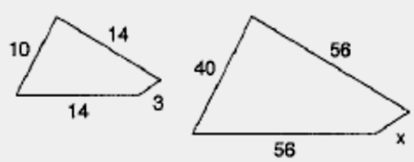

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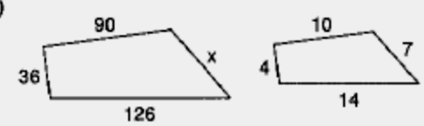

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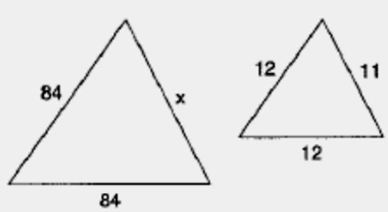

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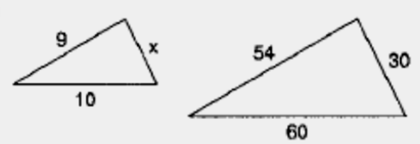

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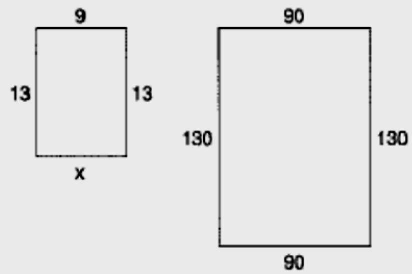

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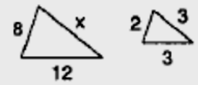

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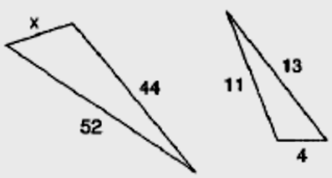

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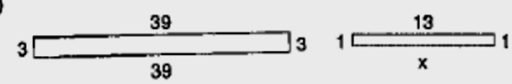

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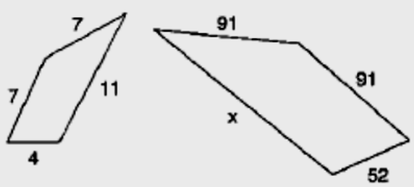

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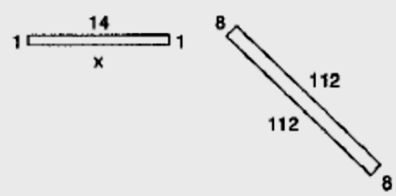

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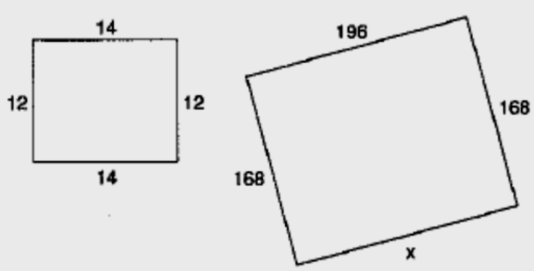

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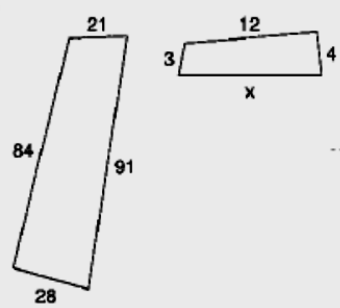
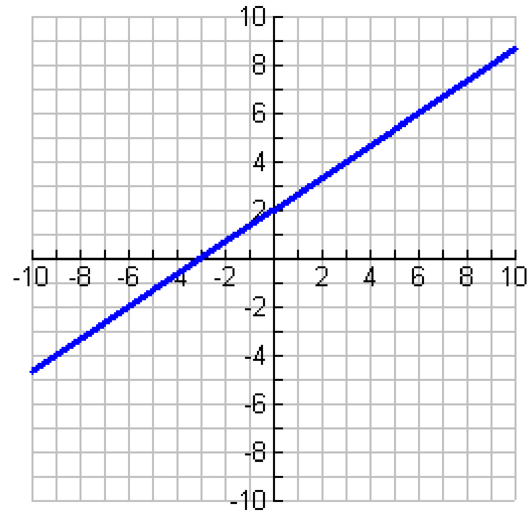


Exploration Triangles and Slope

Exploration 1. Refer to the graph at the right and points below.



Points: Set 1 (0, 2), (0, 4), (3, 4)

Set 2 (3, 4), (3, 8), (9, 8)

Set 3 (3, 4), (3, 6), (6, 6)

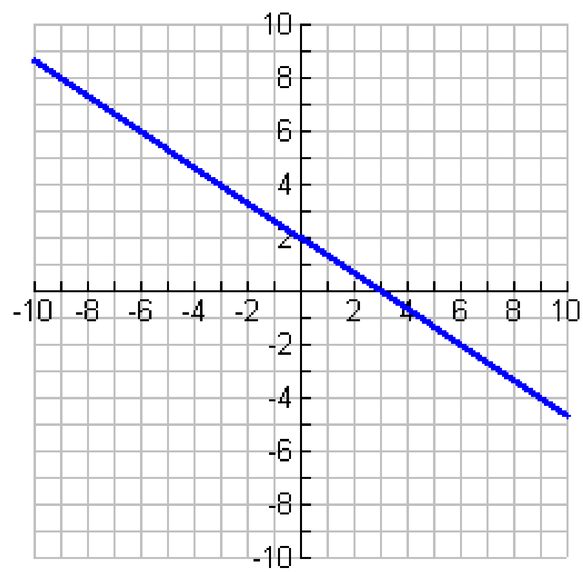
Set 4 (-3, 0), (-3, 4), (3, 4)

1. Choose two sets of points and connect the points from each set.

2. What geometric figures are formed by connecting the points?

3. How are these two figures related? How do you know?

Exploration 2. Use the graph at the right.



4. Following the process from above, pick any points to make two right triangles.

5. Determine the ratio of the side lengths for each triangle. Are the two triangles similar? How do you know?

6. What is similar about this line and side length ratio and the results you found in Exploration 1? What is different about the lines?

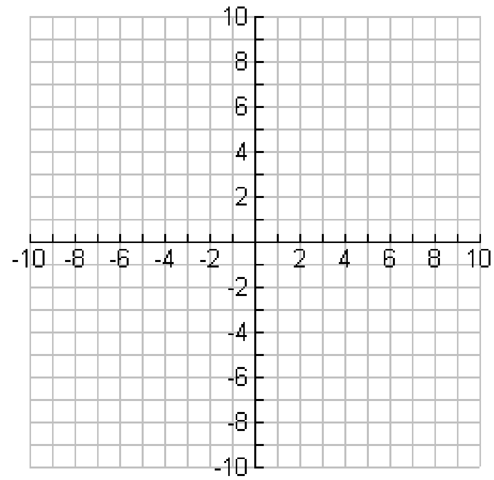
****Slope is the ratio of the vertical side length to the horizontal side length of your triangles. $slope = \frac{\Delta y}{\Delta x}$

7. What is the slope of the line in Exploration 1? ______

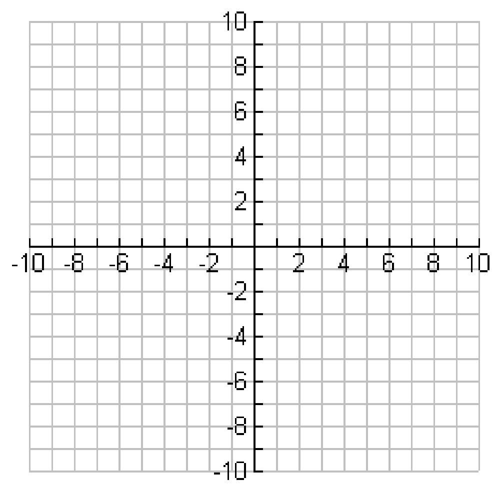
8. What is the slope of the line in Exploration 2? ______

Tying it together…

9. If the ratio of the vertical side length to the horizontal side length of each triangle formed by a line is $\frac{1}{5}$, find three possible points on the line. Justify your answer.



10. How could you create a slope of $\frac{-1}{2}$?



BIG IDEAS…

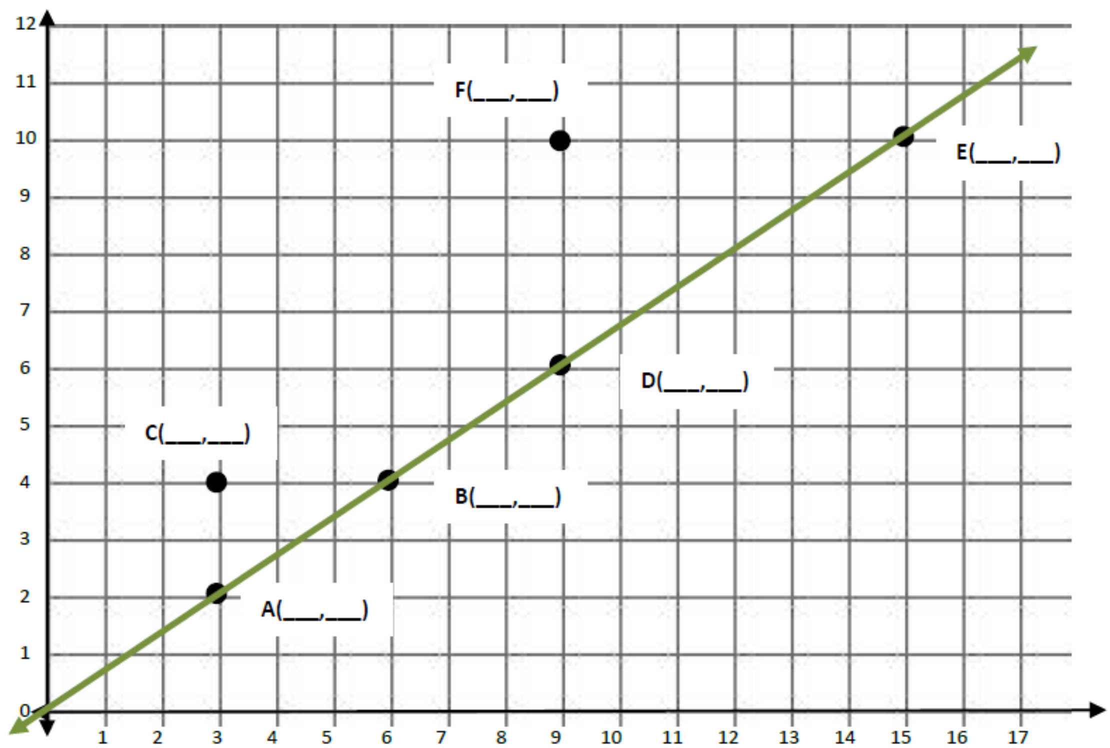
Slopes that are negative:

Slopes that are positive:

Slope and Similar Triangles

Part 1:

Label the points with their coordinates. Connect point C to points A and B and connect point F to points D and E to form right triangles.



A. Compare ΔABC to ΔDEF. Are the triangles similar? How do you know?

B. For each triangle, find the original ratio and simplified ratio of the length of the vertical leg to the length of the horizontal leg by comparing vertical change to horizontal change.

TRIANGLE ABC: $\frac{vertical-leg}{horizontal-leg}=\frac{AC}{BC}=\frac{?}{?}$ Final Solution: ——

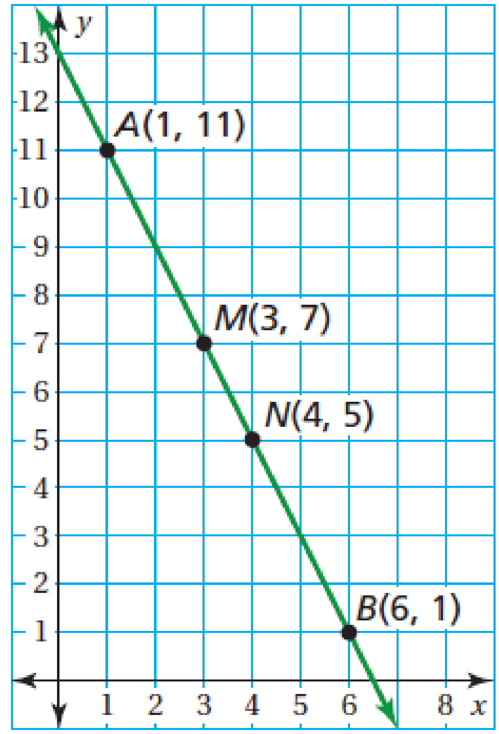
TRIANGLE DEF: $\frac{vertical-leg}{horizontal-leg}=\frac{DF}{FE}=\frac{?}{?}$ Final Solution: —— = ——

C. Compare the two ratios. What do you notice?

D. Both ratios that you found describe the ________ of the line. Although they are different ratios originally, they both simplify to the same ratio. Therefore, the slope, or steepness, of a line is the

____.

Part 2: Consider the line shown on the graph.



1. Given the points below, plot the point and create a right triangle with the two points on the line.

   C (1, 1) – Connect to points A & B

   D (4, 7) – Connect to points M & N

   E (4, 11) – Connect to points A & N

   F (3, 1) – Connect to points M & B.

2. Use the triangles created by your points to find the slope of each given line segment.

Moving UP or RIGHT = _______________

Moving DOWN or LEFT = _______________

Slope = $\dfrac{\text{vertical change}}{\text{horizontal change}} = \dfrac{\text{rise}}{\text{run}}$

Slope of $\overline{AB}$ = $\dfrac{\text{vertical change}}{\text{horizontal change}} = \dfrac{\quad}{\quad} =$ _____

Slope of $\overline{MN}$ = $\dfrac{\text{vertical change}}{\text{horizontal change}} = \dfrac{\quad}{\quad} =$ _____

Slope of $\overline{AN}$ = $\dfrac{\text{vertical change}}{\text{horizontal change}} = \dfrac{\quad}{\quad} =$ _____

Slope of $\overline{MB}$ = $\dfrac{\text{vertical change}}{\text{horizontal change}} = \dfrac{\quad}{\quad} =$ _____

3. Compare these ratios or *slopes*.

4. You drew triangles that showed the slope of a line using two points. Then you drew another triangle that showed the slope using a different pair of points on the line. Explain how you know the two triangles you drew were similar.
5. Explain (in complete sentences) how you can find the slope of a line using any two points on the line.

Adapted from BigIdeasMath.com

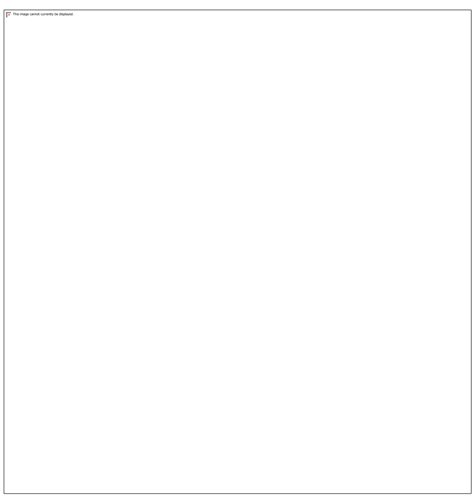
The Slope of Four Types of Lines

The graph of a linear equation will form a line that travels one of the following ways:

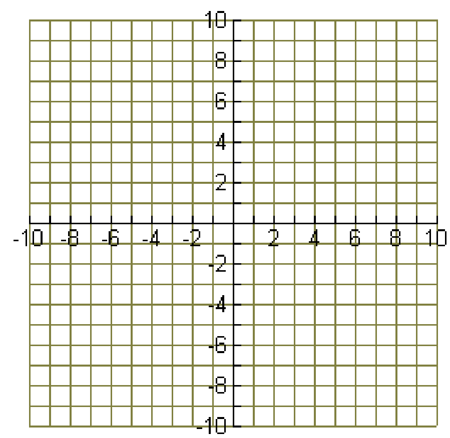
1.
2.
3.
4.

Directions: **For each pair of points, plot the ordered pairs and draw a straight line through them. Then calculate the slope of the line. Label the line as one of the four types shown above.**

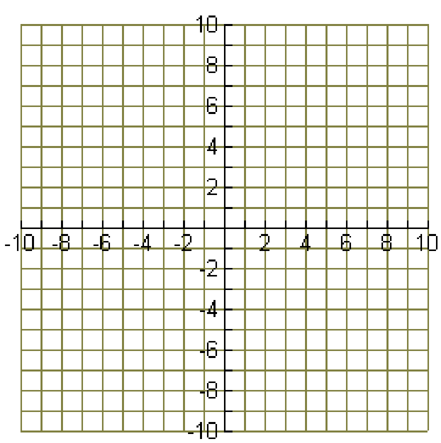
1. (-1, 1) and (4, 3)



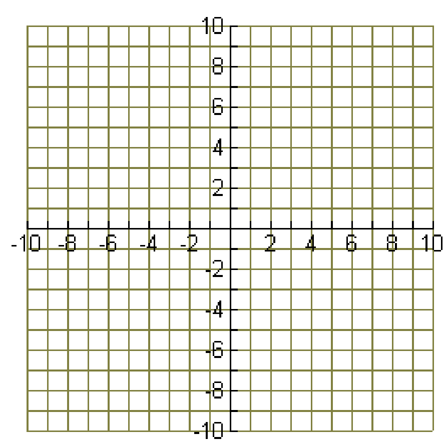
2. (-2, 1) and (3, 4)



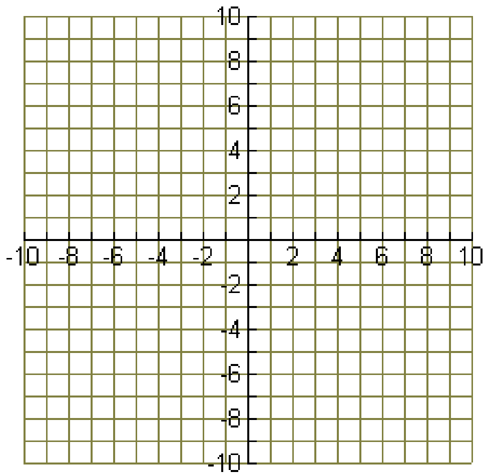
3. (-1, 5) and (2, 2)



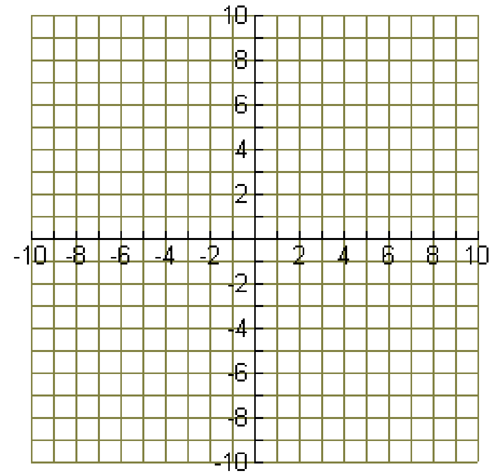
4. (0, 4) and (2, 1)



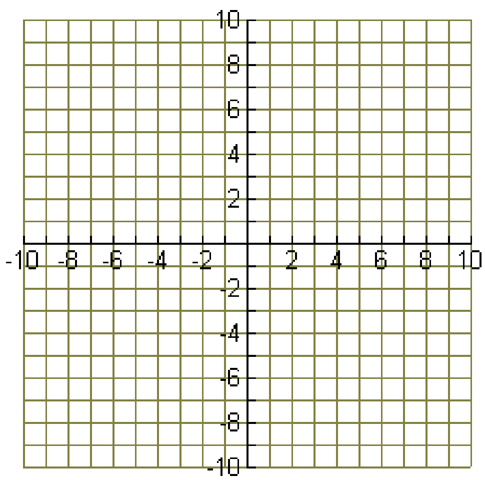
5. (-5, 2) and (6, 2)



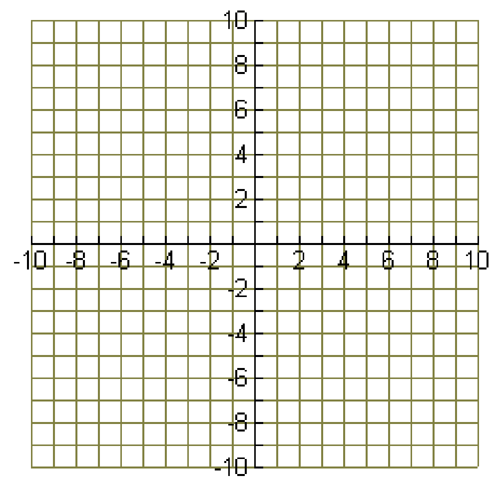
6. (7, -5) and (-4, -5)



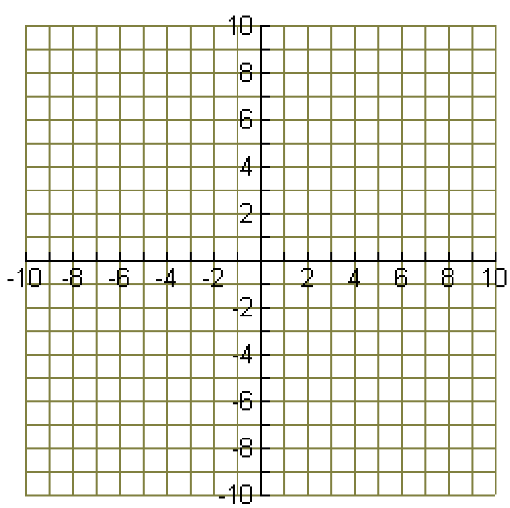
7. (4, 4) and (0, 4)



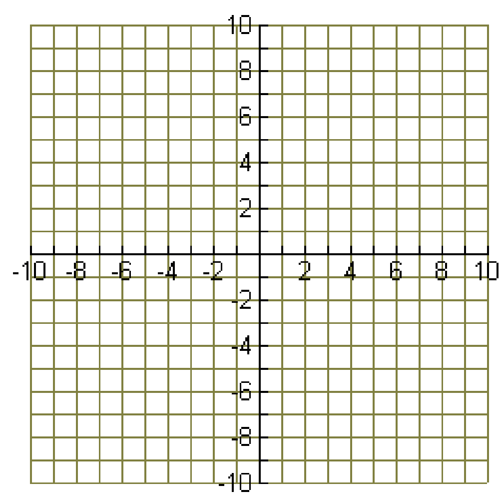
8. (4, 2) and (4, -6)



9. (7, 1) and (7, 8)



10. (-7, -4) and (-7, 8)



Follow-Up Questions

Questions 1 and 2
11. What do the lines have in common? What do you notice about the direction of each line from left to right and the value of each line's slope?
12. What do you think is true about the direction of all lines with positive slope?
Questions 3 and 4
13. What do the lines for **Questions 3 and 4** have in common? What do you notice about the direction of their slopes and the value of each slope?
14. What do you think is true about the direction of all lines with negative slope?
Questions 5 – 7
15. What do the lines for **Questions 5-7** have in common?
16. What do you think is the RISE of each line for **Questions 5 – 7**?
17. What is the value of zero divided by any number?

Questions 8 – 10
18. What do the lines for **Questions 8-10** have in common?
19. What do you think is the RUN of each line for questions 8 – 10?
20. What is the value of any number divided by zero?

Conclusion

A. **If the graph of a line slants upward from left to right, then the slope of the line is _______________________.**

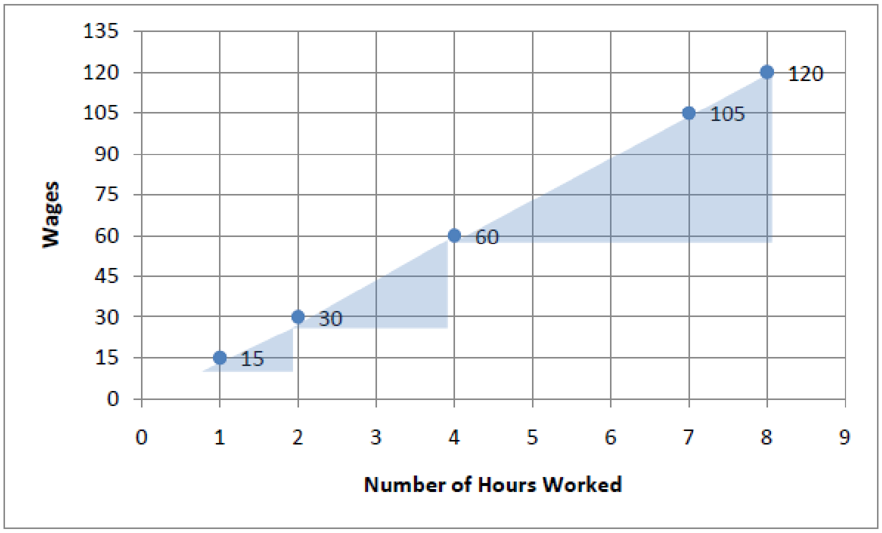
B. **If the graph of a line slants downward from left to right, then the slope of the line is _______________________.**

C. **If the graph of a line is horizontal, then the slope of the line is _________.**

D. **If the graph of a line vertical, then the slope of the line is said to be _______________________.**

Homework-Triangles Task

The data shown in the graph below reflects average wages earned by machinists across the nation.



1. What hourly rate is indicated by the graph? Explain how you determined your answer.

2. What is the *ratio of the height to the base* of the small, medium and large triangles? Make sure to consider the scale of the graph.

small = —— medium = —— large = ——

What patterns do you observe?

3. What is the slope of the line formed by the data points in the graph? Explain how you know.

4. What is the unit rate for the proportional relationship represented by the graph? How does this relate to the slope?

5. According to the graph, in a 40-hour week, how much will the average machinist earn? How do you know?

Unit Rate Leading to Slope

Nana likes her milk "just right". This means that for every 2 cups of milk, you must mix in 8 scoops of chocolate powder. Fill in the missing values in the table, being sure to maintain a proportional relationship.

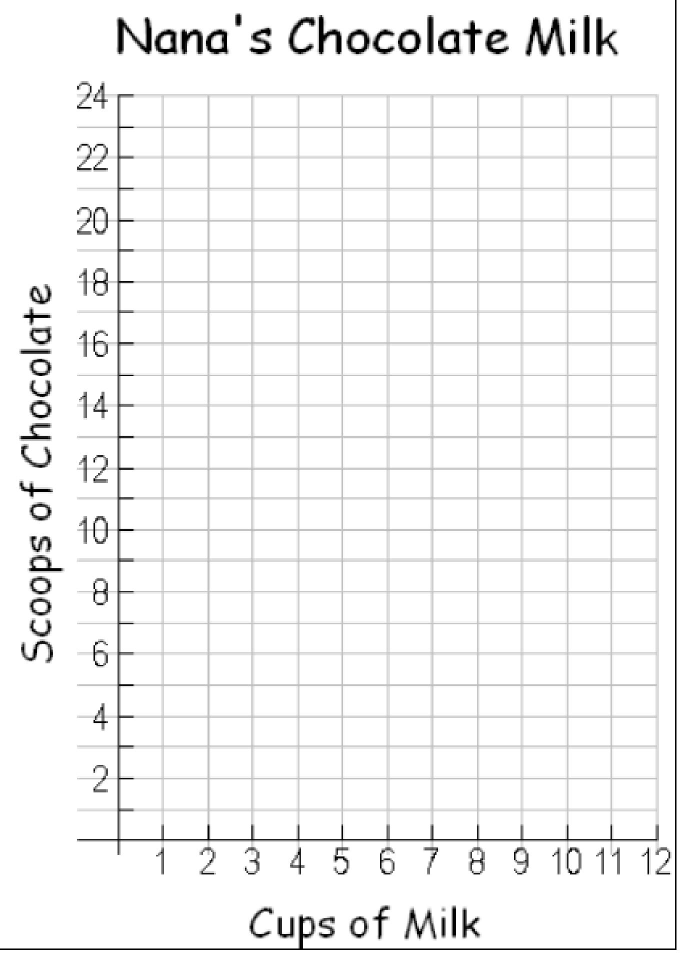
Cups of Milk (x)	Scoops of Chocolate
2	8
6	
	20
3	
1	
	16

Use the ordered pairs from the table to create a graphical representation of the relationship.

What is the unit rate? What does it mean?

What is the constant of proportionality?

What is the equation (y = kx) of the relationship?



Slope: ______________________________

Slope = $\dfrac{\text{\_\_\_\_\_\_\_\_ change}}{\text{\_\_\_\_\_\_\_\_ change}}$ = ________

Find the $\frac{\text{rise}}{\text{run}}$ between each set of points on the graph by counting vertical and horizontal change.

Between (0, 0) and (1,4)	Between (0, 0) and (3,12)	Between (1, 4) and (5,20)	Between (2, 8) and (6,24)
$\frac{\text{rise}}{\text{run}} =$	$\frac{\text{rise}}{\text{run}} =$	$\frac{\text{rise}}{\text{run}} =$	$\frac{\text{rise}}{\text{run}} =$

The slope equals ______. What else had this value?

Suppose my favorite lemonade recipe calls for 8 lemons to 12 cups of sugar water. Fill in the missing values in the table, being sure to maintain a proportional relationship.

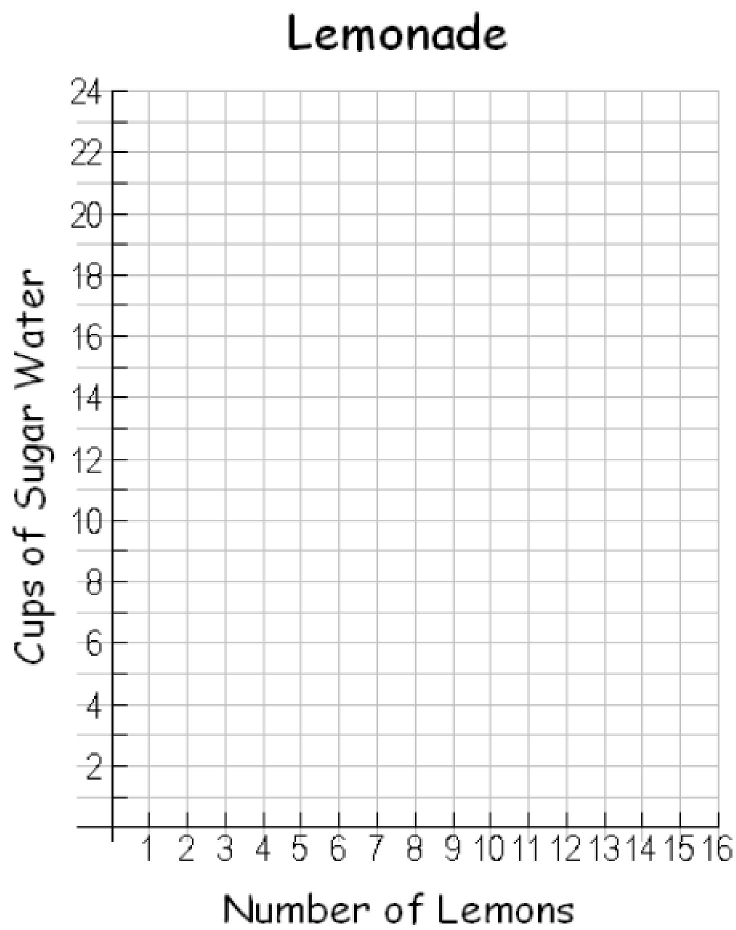
Number of Lemons (x)	Sugar Water (cups)
8	12
16	
	6
2	
	$\frac{3}{2}$
	1

Use the ordered pairs from the table to create a graphical representation of the relationship.

What is the unit rate? What does it mean? (write as an improper fraction)

What is the constant of proportionality? (write as an improper fraction)

What is the equation (y = kx) of the relationship?



Find the $\frac{\text{rise}}{\text{run}}$ between each set of points on the graph by counting vertical and horizontal change. Simplify each answer, but leave fractions improper if applicable.

Between (0, 0) and (2,3)	Between (0,0) and (16,24)	Between (2,3) and (16,24)	Between (4,6) and (8,12)
$\frac{\text{rise}}{\text{run}} =$	$\frac{\text{rise}}{\text{run}} =$	$\frac{\text{rise}}{\text{run}} =$	$\frac{\text{rise}}{\text{run}} =$

What is the slope of the line between any two points on the graph?

In which ordered pair do you see this in the table? What special ordered pair is this?

Where do you see the slope in the equation?

Kuta Software - Infinite Algebra 1

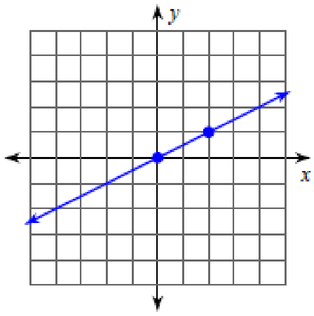
Name_______________________

Finding Slope From a Graph

Date________________ Period____

Find the slope of each line.

1)



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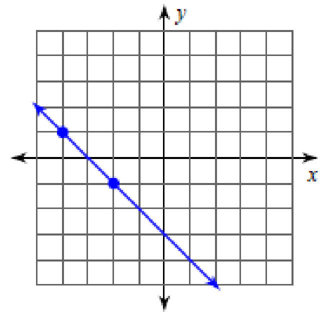

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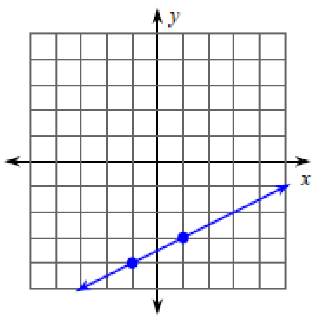

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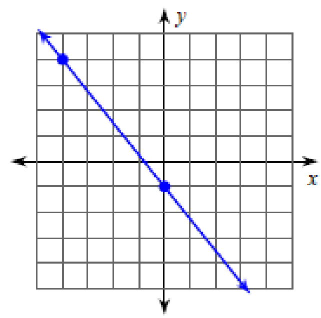

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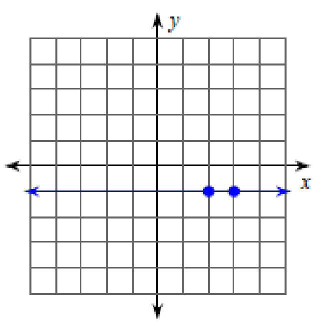

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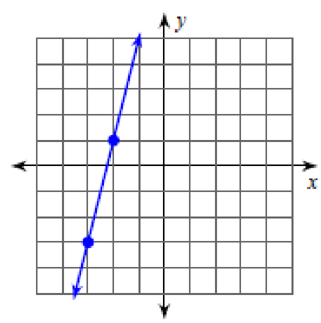

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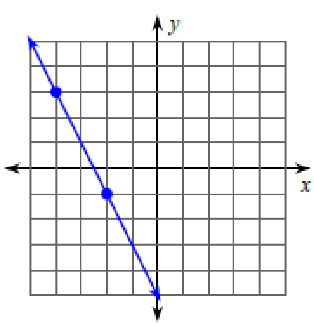

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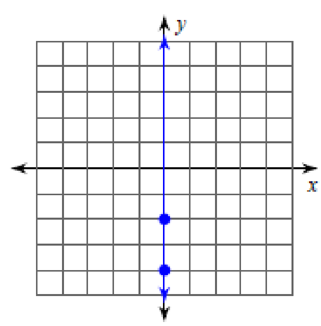

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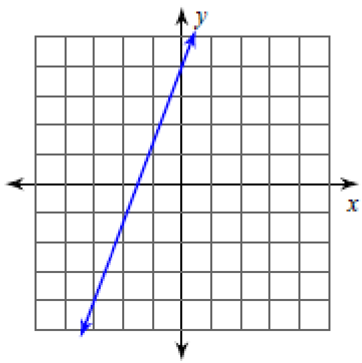

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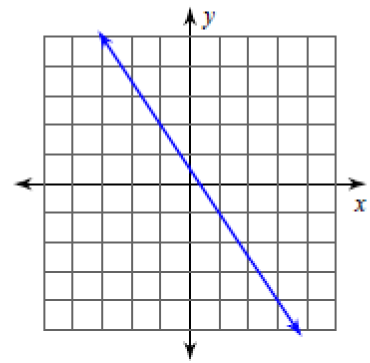
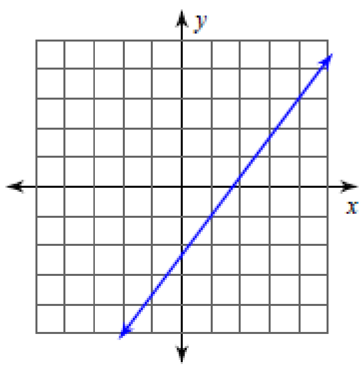
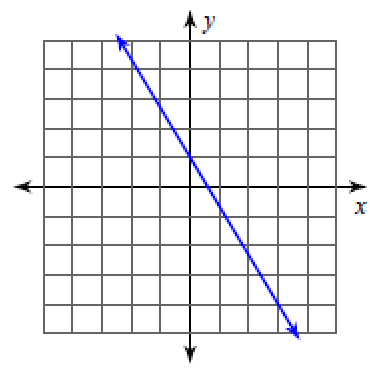


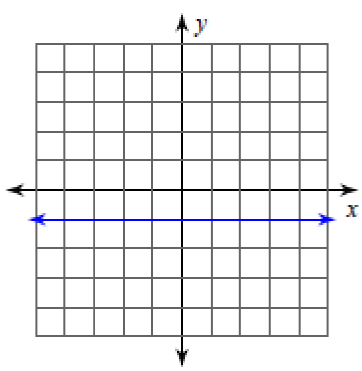
11)



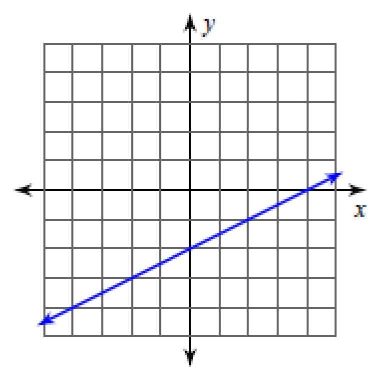
12)



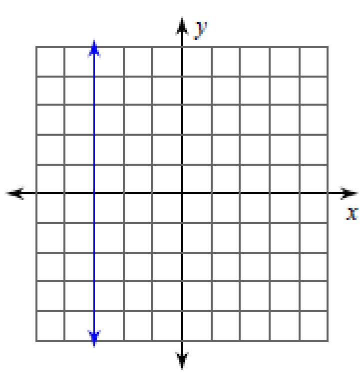
13)



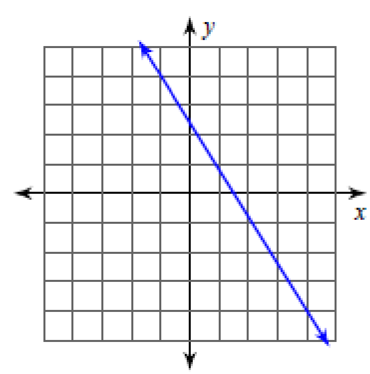
14)



15)



16)

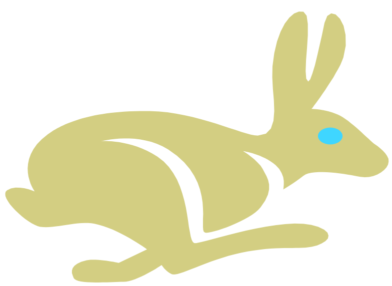


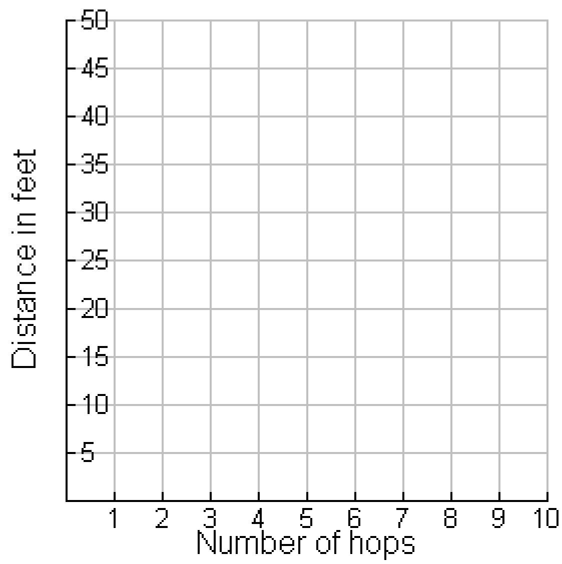
Warm Up

The data in the table below is taken from a jackrabbit's number of hops and distance covered.

Number of hops	Distance covered (ft)
2	10
4	20
6	30
8	40
10	50

1. Plot the jackrabbit's data on the graph provided below.





2. Does this graph go through the origin? Why does this make sense for this scenario?

3. How would the graph look different if the jackrabbit hopped a shorter distance each hop?

4. What equation could be written to represent this data?

5. What does the *coefficient* represent in your equation?

6. What do you notice about the ratio of distance to hops?

SASCURRICULUMPATHWAYS QL#5003 SLOPE AS EQUATION

Once again, go to SASCurriculumPathways.com
Username: martinmiddle
No password
Go to QL 5003 (top right box) and complete the lesson.

Print the Practice Results or have a parent sign here: ____

THE SLOPE EQUATION: y = mx + b

where…X = the x-coordinate of any point on the line

y = its matching y-coordinate

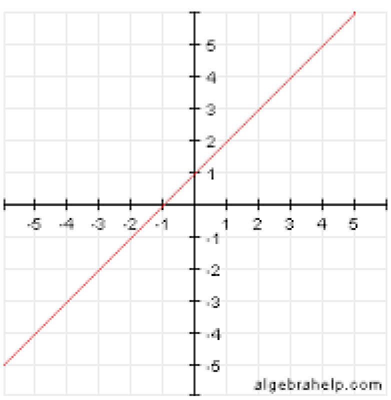
m = ________________________________

b = ________________________________

From the equations below, name the slope (m) and the y-intercept (b):

a) y = 2x – 4 **b) y = $\frac{2}{3}x + 2$** **c) y = -4x**

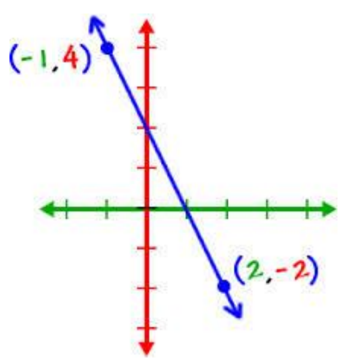
From the graphs below, can you find the slope from 2 points and find the y-intercept from the graph?



What is the slope? m = ______________

What is the y-intercept? b = _____________

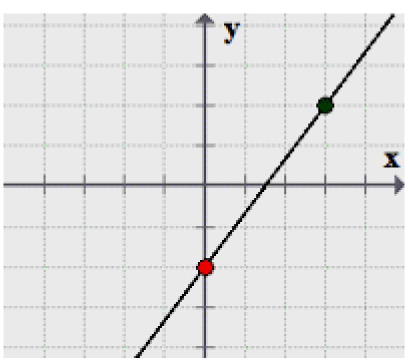
If you know both m and b, what is the equation for this line?



m = ____

b = _____

Equation:



m = _____

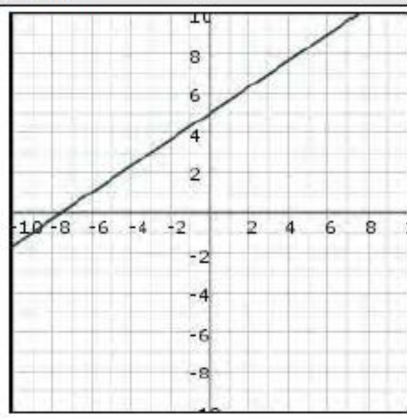
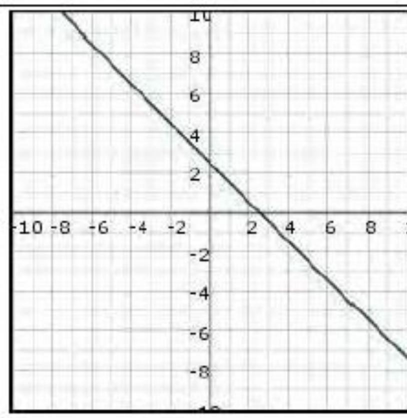
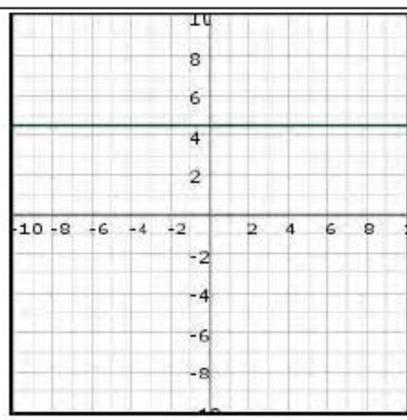
b = ______

Equation:

Exploring Graphs of Linear Equations: *Example Set*

Before making an assignment, you are encouraged to review the tool examples, which vary in type, difficulty, and purpose.

The equations in Examples 1 – 5 begin in slope-intercept form. Their alternate form is standard form.

Example	Graph	Additional Information
1. $y = \frac{2}{3}x + 5$		alternate form: $2x - 3y = -15$ slope: $m = \frac{2}{3}$ y-intercept: (0, 5)
2. $y = -x + \frac{5}{2}$		alternate form: $2x + 2y = 5$ slope: $m = -1$ y-intercept: $\left(0, \frac{5}{2}\right)$
3. $y = 4.5$		alternate form: $10y = 45$ slope: $m = 0$ y-intercept: (0, 4.5)

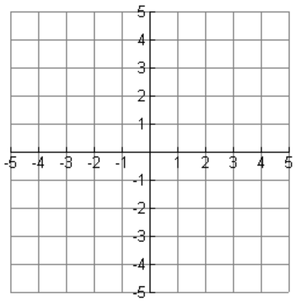
Graphing Linear Equations

For each line, state the slope and where the line crosses the y-axis (y – intercept). Then, graph the line.

1. y = 3x

m = ___

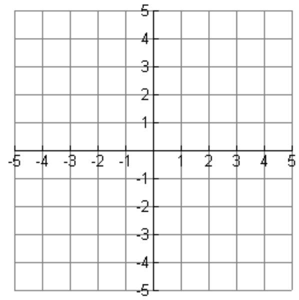
y-intercept: (0,)



y = 3x + 2

m = ___

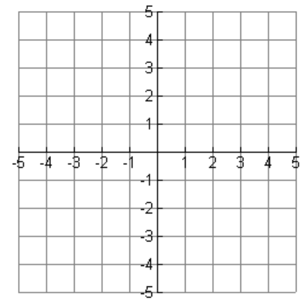
y-intercept: (0,)



y = 3x – 1

m = ___

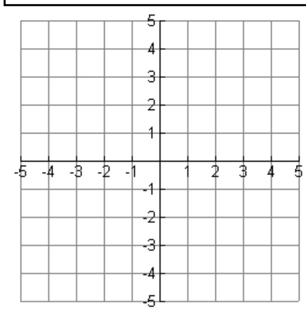
y-intercept: (0,)



2. y = -2x

m = ___

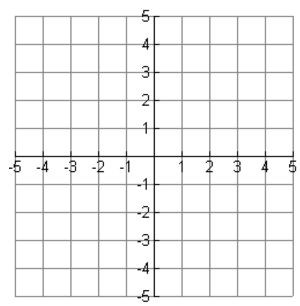
y-intercept: (0,)



y = -2x – 3

m = ___

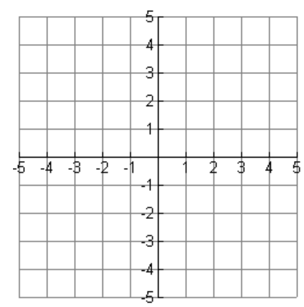
y-intercept: (0,)



y = -2x + 4

m = ___

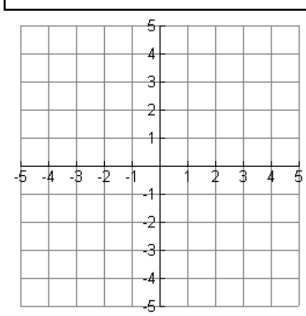
y-intercept: (0,)



3. y = x + 1

m = ___

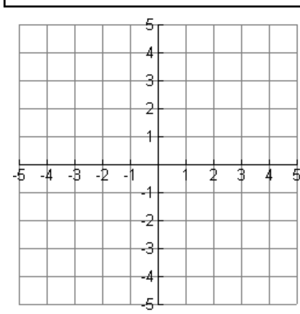
y-intercept: (0,)



4. y = -3x – 2

m = ___

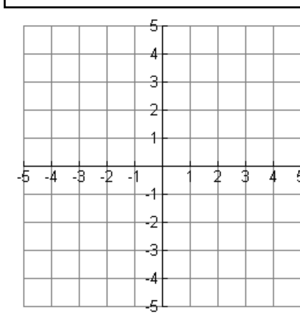
y-intercept: (0,)



5. y = 2x + 3

m = ___

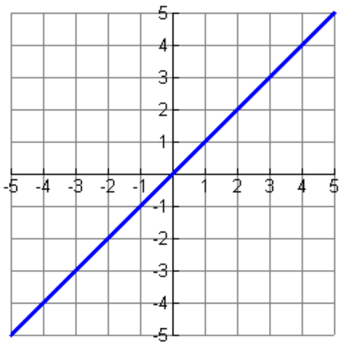
y-intercept: (0,)



Writing Equations of Lines

For each line, state the slope and where the line crosses the y-axis (y – intercept). Then, write the equation of the line.

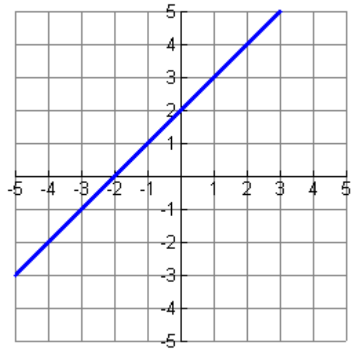
1.



m = ____

y-intercept: (0,   )

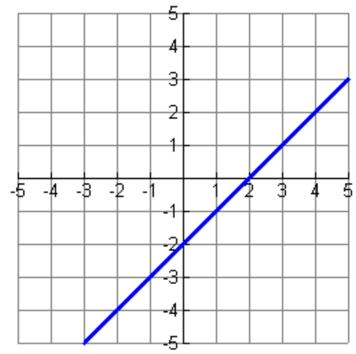
Eqn: ______________



m = ____

y-intercept: (0,   )

Eqn: ______________

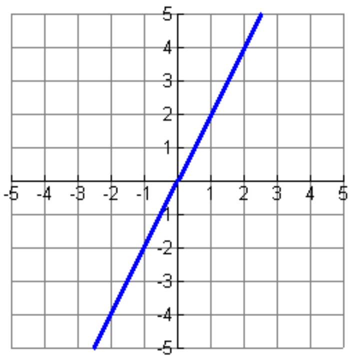


m = ____

y-intercept: (0,   )

Eqn: ______________

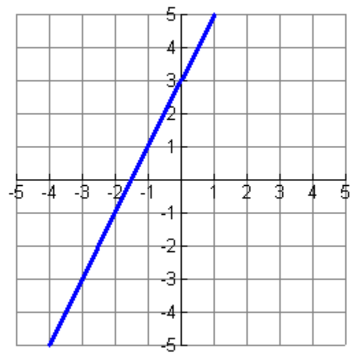
2.



m = ____

y-intercept: (0,   )

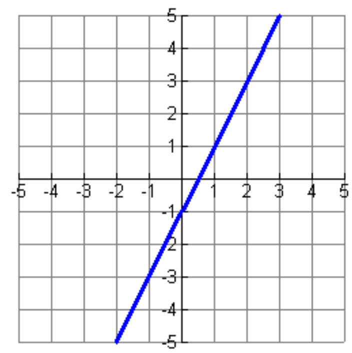
Eqn: ______________



m = ____

y-intercept: (0,   )

Eqn: ______________

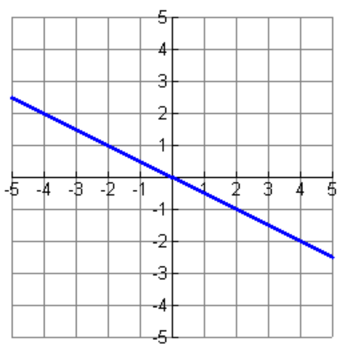


m = ____

y-intercept: (0,   )

Eqn: ______________

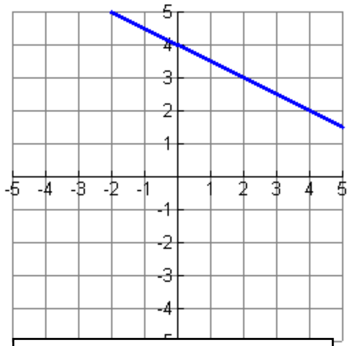
3.



m = ____

y-intercept: (0,   )

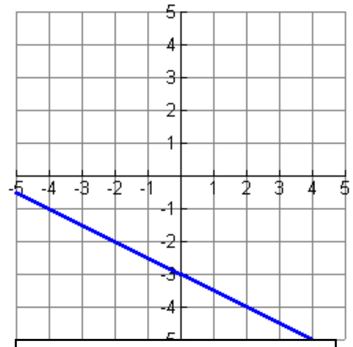
Eqn: ______________



m = ____

y-intercept: (0,   )

Eqn: ______________

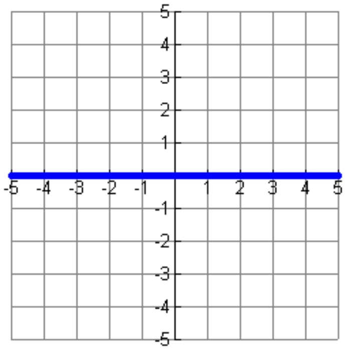


m = ____

y-intercept: (0,   )

Eqn: ______________

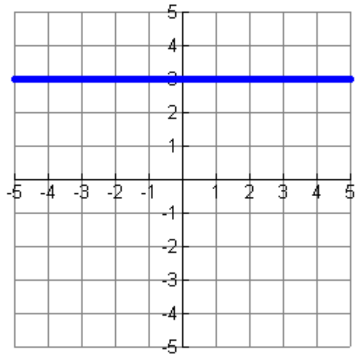
4.



m = ____

y-intercept: (0,)

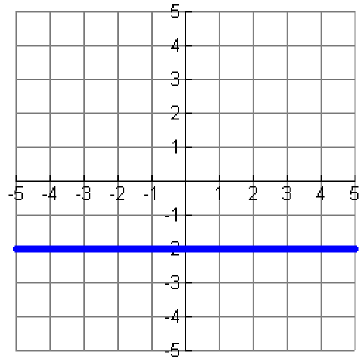
Eqn: ______________



m = ____

y-intercept: (0,)

Eqn: ______________

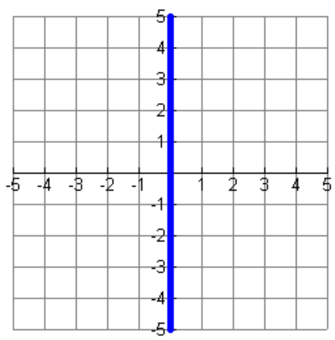


m = ____

y-intercept: (0,)

Eqn: ______________

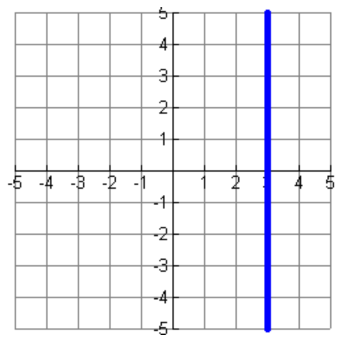
5.



m = ____

y-intercept: (0,)

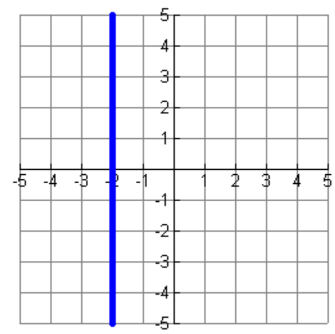
Eqn: ______________



m = ____

y-intercept: (0,)

Eqn: ______________

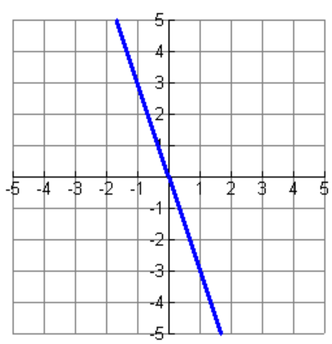


m = ____

y-intercept: (0,)

Eqn: ______________

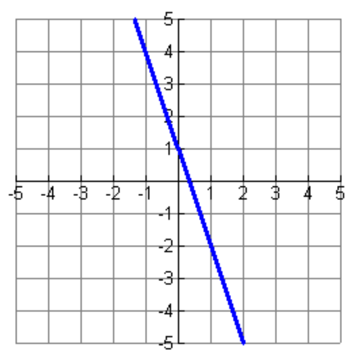
6.



m = ____

y-intercept: (0,)

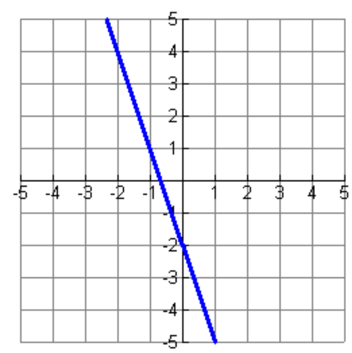
Eqn: ______________



m = ____

y-intercept: (0,)

Eqn: ______________



m = ____

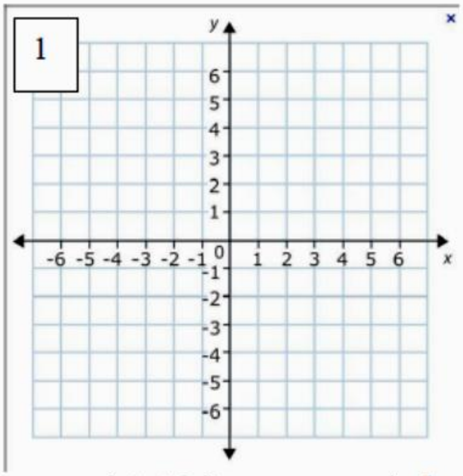
y-intercept: (0,)

Eqn: ______________

STUDY GUIDE CCM6Plus7Plus Unit 9 – Calculator Active

Please show all work and circle your final answer

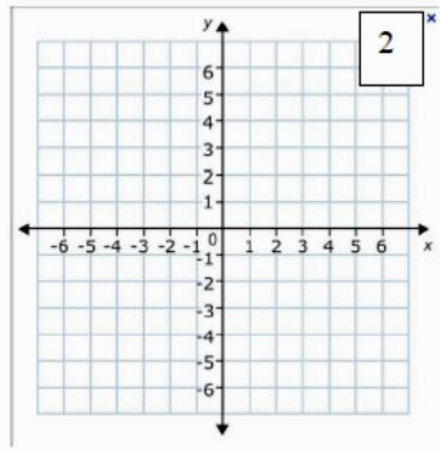
1



1. Plot and connect the points A (6, 5), B (2, 5), C (4, 1).

2. Plot and connect the points A (-2, 5), B (-5, 5), C (-5, 1), D (-3, 1)

2



Find the distance between the following points. Write your answer in the answer strip on the left.

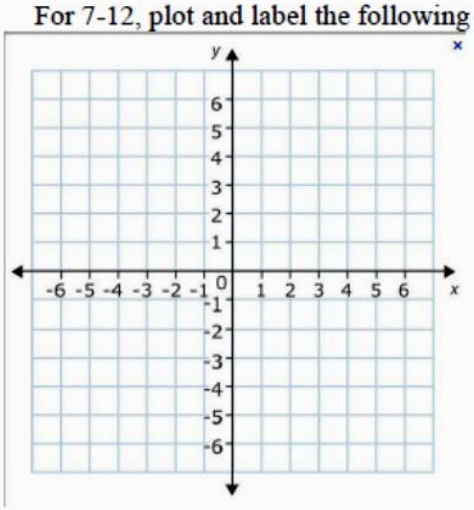
3
4

3. (-4, 6) and (-4, -10)
4. (-9, 5) and (-1, 5)

5. On a coordinate plane map, the soccer stadium is located at (-1, 8). The bus stop is located at (6, 8). If each unit represents one block, how far will Renata have to walk from the bus stop to the stadium?

6. Each unit on a coordinate plane represents one kilometer. One end of a street starts at (-30, -5). The street ends at (10, -5). How long is the street?

For 7-12, plot and label the following points on the graph to the left and in the box write the quadrant of each point. Be careful there may be a few tricks.



7. A (5, -5)
8. B (-2, 4)
9. C (-3, -5)
10. D (0, -3)
11. E (3, 1)
12. F (-5, 0)

7
8
9
10
11
12

13. Lena paid $18.96 for 3 pounds of coffee.

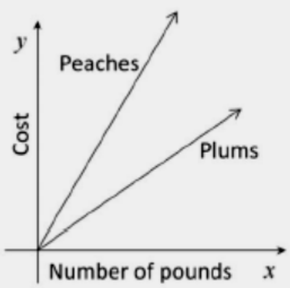
    a. What is the cost per pound for this coffee?

    b. How many pounds of coffee could she buy for $1.00?

    c. Draw a graph in the coordinate plane of the relationship between the number of pounds of coffee and the total cost.

    d. In this situation, what is the meaning of the slope of the line you drew in part (c)?

14. The graphs below show the cost y of buying x pounds of fruit. One graph shows the cost of buying x pounds of peaches, and the other shows the cost of buying x pounds of plums.

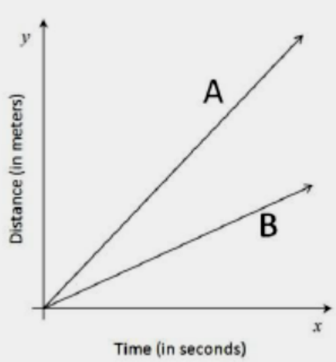


a. Which kind of fruit costs more per pound? Explain.

b. Bananas cost less per pound than peaches or plums. Draw a line alongside the other graphs that might represent the cost y of buying x pounds of bananas.

15. The graphs below show the distance two cars have traveled along the freeway over a period of several seconds. Car A is traveling 30 meters per second.

Which equation from those shown below is the best choice for describing the distance traveled by car B after x seconds? Explain.



a. $y=85x$
b. $y=60x$
c. $y=30x$
d. $y=15x$

16. Kelli works at an after-school program at an elementary school. The table below shows how much money he earned every day last week.

	Monday	Wednesday	Friday
Time worked	1.5 hours	2.5 hours	4 hours
Money earned	$12.60	$21.00	$33.60

Mariko has a job mowing lawns that pays $7 per hour.

a. Who would make more money for working 10 hours? Explain or show work.

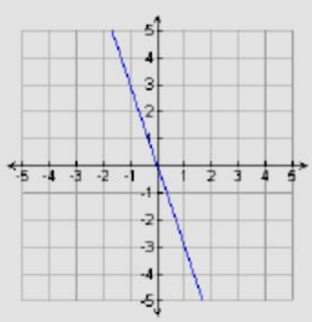
b. Draw a graph that represents y, the amount of money Kelli would make for working x hours, assuming he made the same hourly rate he was making last week.

c. Using the same coordinate axes, draw a graph that represents y, the amount of money Mariko would make for working x hours.

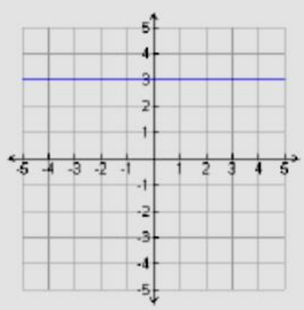
d. How can you see who makes more per hour just by looking at the graphs? Explain.

Determine if the following graphs are lines with positive, negative, zero, or undefined slopes.

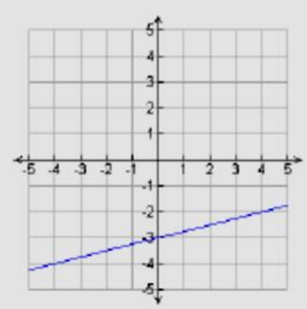
17.



18.

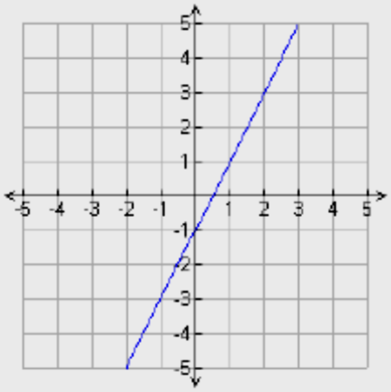


19.

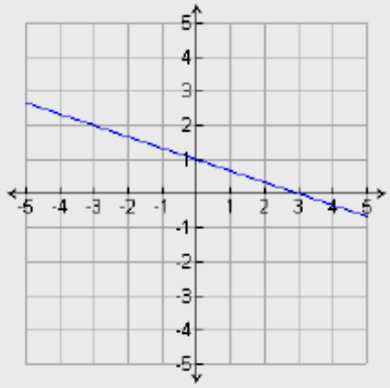


Use the graph of each line to determine its slope and write the equation of the line.

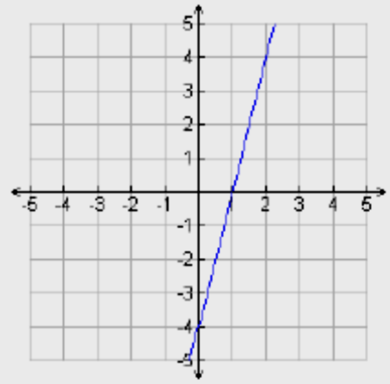
20. slope = y =



21. slope = y =



22. slope = y =



Find the slope of the line passing through each pair of points.

23. (1, 0), (2, 4)	**24.** (6, 2), (2, –2)	**25.** (–1, 1), (4, 4)	**26.** (6, –8), (6, –10)

27. The equation for the line in #20 is ______________________________________.

28. The equation for the line in #21 is ______________________________________.

29. The equation for the line in #22 is ______________________________________.

30. Challenge: The equation for the line in #23 is ______________________________________.

Hint: Graph it! Use the slope to help you find b!

31. Go to SASCurriculumPathways.com (login: martinmiddle and no password) and complete QL#5005. Print the Practice Results Page or have a parent sign here: ____________________________________.

32. Review Similar Figures/Scale Drawings on pages 29-40 and make sure you understand.