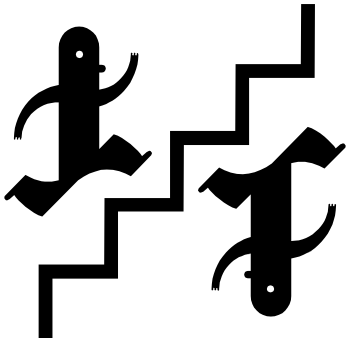
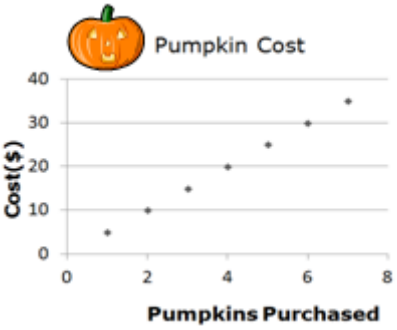
Unit 3
Beaumont Middle School
8th Grade, 2017-2018
Introduction to Algebra

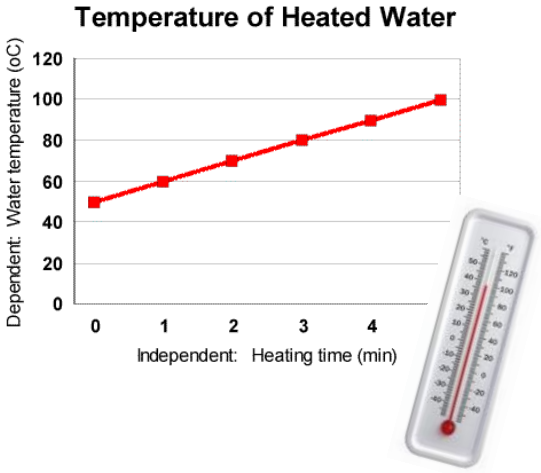
Name: _____

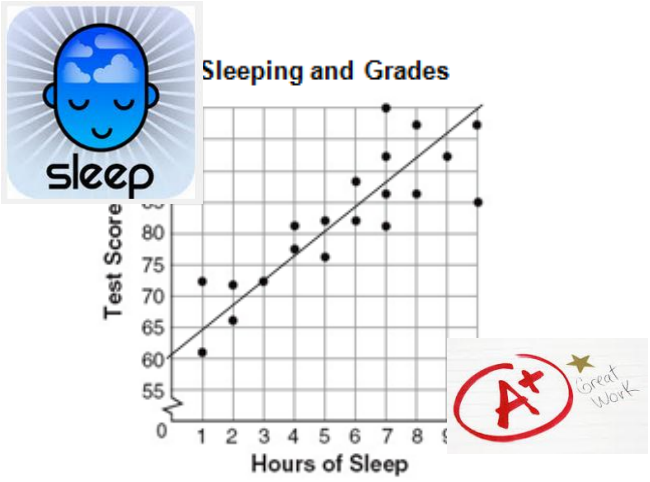
Exploring Linear Relationships





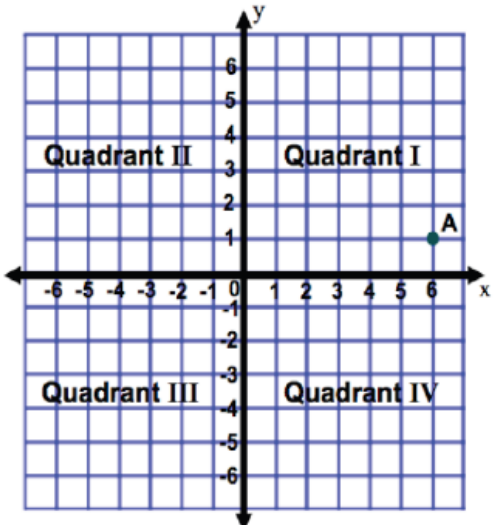
- I can identify a function, the domain and range.
- I can identify a linear relationship from a situation, table, graph and equation (known as the four views of a function).
- I can recognize the rate (slope) and starting point (y-intercept) in all four views.
- Given one of the four views of a linear relationship, I can produce the others.





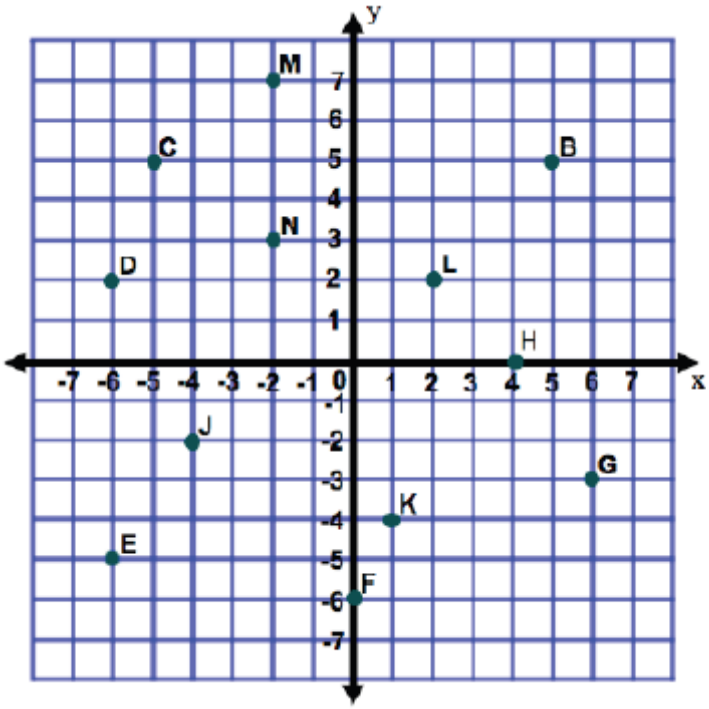
The Coordinate System

The Cartesian coordinate system was developed by the mathematician Descartes during an illness. In 1637. As he lay in bed sick, he saw a fly buzzing around on the ceiling, which was made of square tiles. As he watched he realized that he could describe the position of the fly by the ceiling tile he was on. After this experience he developed the coordinate plane to make it easier to describe the position of objects.



A **Cartesian coordinate plane** has two intersecting number lines that form axes.
The horizontal axis is called the *x*-**axis** and the vertical axis is called the*y*-**axis**.
The axes intersect at the point called the **origin**.
The axes divide the coordinate plane into four **quadrants**.
A point on the plane can be described by its *x* and*y* coordinates. These coordinates are written as an ordered pair: (*x*, *y*) .

- The coordinates of the origin are [0, 0]
- The coordinates of point A are [6,1] where 6 and 1 is and **ordered pair**



1. Name the point that has the coordinates.
a. (2, 2) b(-6, 2) c.(1,-4)
d.(0,-6) e (-4,-2)

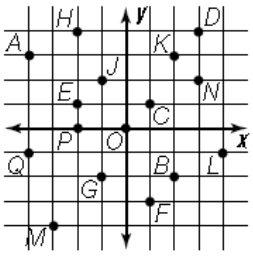
2. Write the coordinates of each point.
a. B b. G c. E
d. N e. H

3. In what quadrant is each point located?
a. C b. J c. L
d. M e. K

4. In which quadrant would the following points be found:
1) (1, 1) **Quadrant:**____ 2) (1, 2) **Quadrant:**____ 3) (2, 1) **Quadrant:**____
4) (-1, 2) **Quadrant:**____ 5) (439, -890) **Quadrant:**___ 6) (-1, -1) **Quadrant:**____

Practice

Name the ordered pair for each point graphed on the coordinate plane.

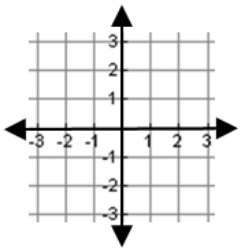


1. H
2. J
3. L
4. G
5. E
6. O
7. B
8. A

What point is located at the following coordinates? Then name the quadrant in which each point is located.

9. $(3, 2)$
10. $(-3, -4)$
11. $(1, -3)$
12. $(-2, 0)$
13. $(-4, -1)$
14. $(1, 1)$
15. $(3, 4)$
16. $(2, 3)$

17. **Standardized Test Practice** In a small town, all streets are east-west or north-south. City Center is at (0, 0). City Hall is 1 block north of City Center at (0, 1). City Hospital is 1 block east of City Center at (1, 0). If City Library is 3 blocks north and 2 blocks west of City Center, which ordered pair describes the location of City Library?

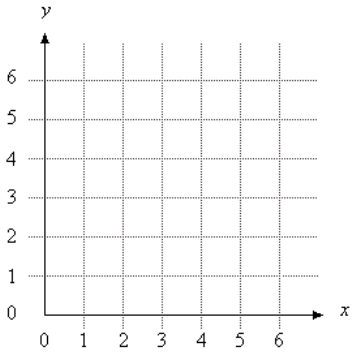


A $(2, 3)$ **B** $(-2, 3)$ **C** $(3, -2)$ **D** $(3, 2)$

18. Plot and label each set of points on a different plane and join them in order to form a quadrilateral. Identify the quadrilateral. (parallelogram, trapezoid, rectangle, square, rhombus)

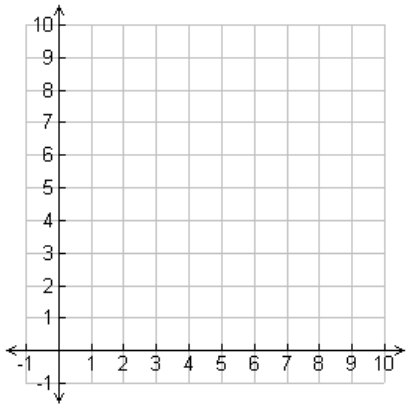
a. A(1, 1), B(1, 5), C(3, 5), D(3, 1).

Quadrilateral:_____



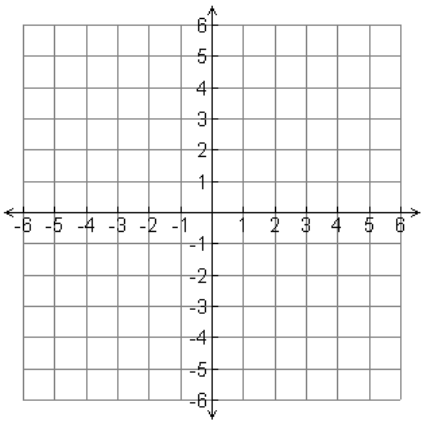
b. J(1, 3), K(5, 1), L(8, 1), M(4, 3).

Quadrilateral:_____



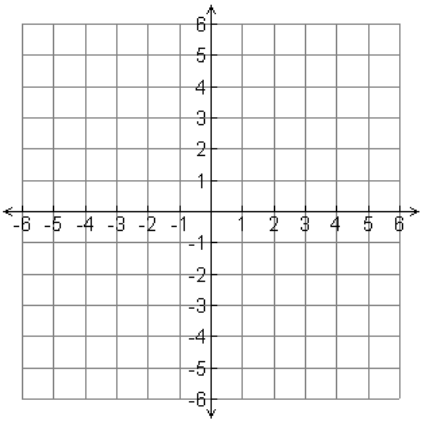
c. P(3, 5), Q(0, 3), R(2, 0), S(5, 2).

Quadrilateral:_____

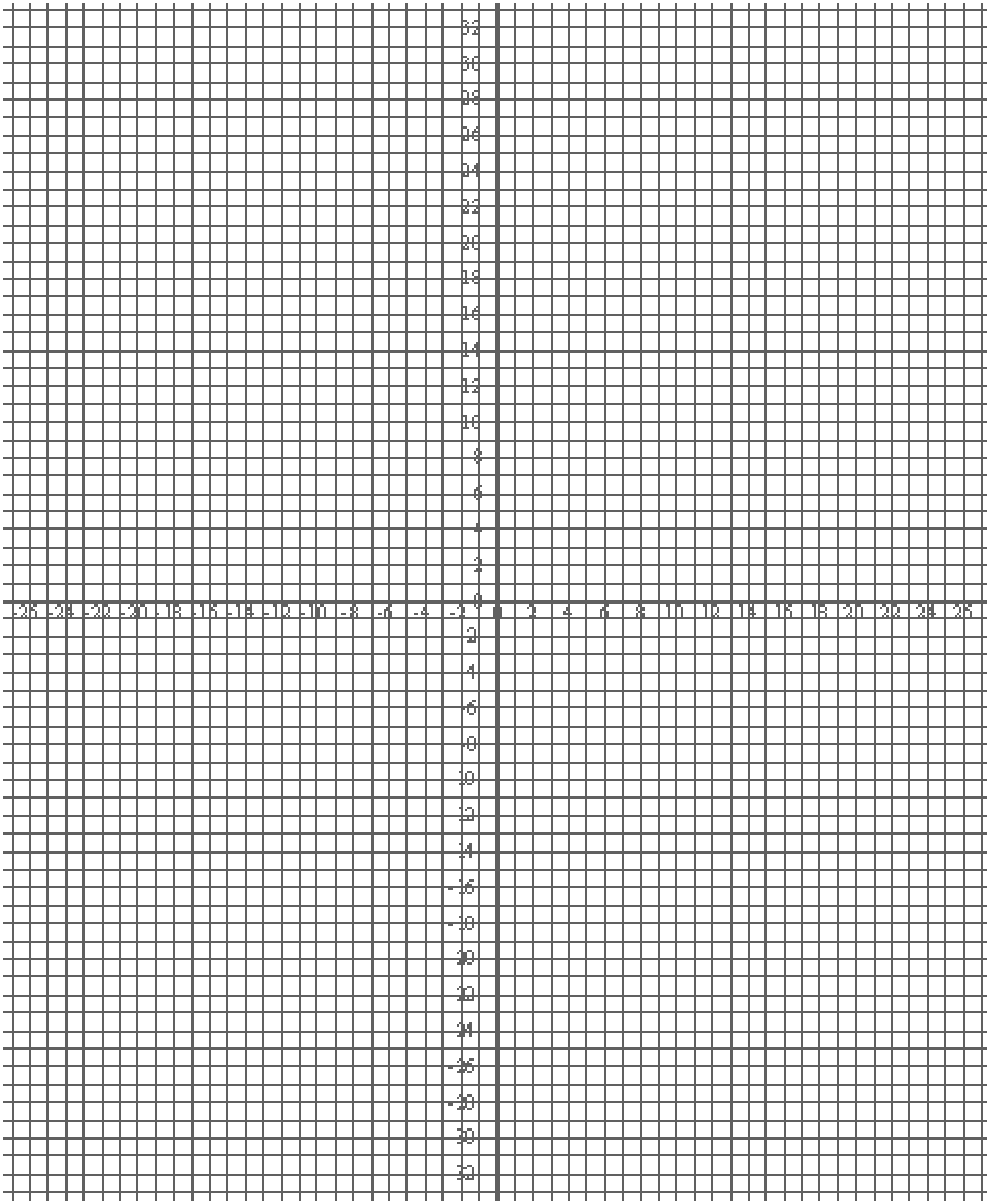


d. W(1, 1), X(4, 1), Y(6, 3), Z(0, 3).

Quadrilateral:_____

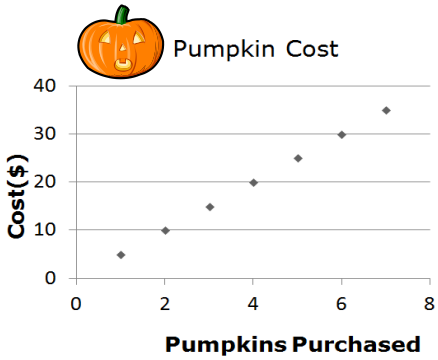


Choose one of the instruction pages. The picture is due on _____.



Discrete vs. Continuous Data

Whenever we collect data, there's a collection of possible values from which we record our observations. If we're flipping a coin, the possible values we can observe are H (heads) or T (tails). Or, occasionally, the very rare E (edge). If we're measuring someone's height in centimeters, the possible values are any positive number of centimeters and fractions thereof. There are two different ways to classify data based on the possible values we can observe.



Data is **discrete** if there is clear separation between the different possible values. Either there will be a finite number of possible values, or we're counting something.

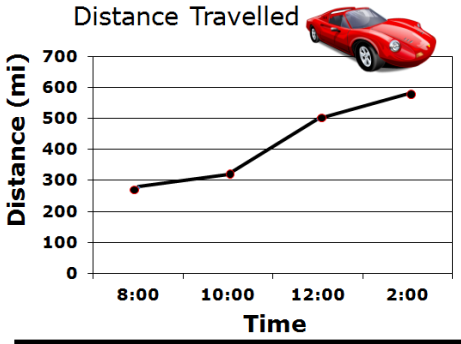
If we flip a coin and record the result there are only two possible values (ignoring that pesky "edge" thing), H and T, so our observations are discrete.

Recording the numbers of coins in different piggy banks would also give us discrete data, since there's a separation of one whole coin between any two numbers we might get. Even a half-dollar is still a whole-coin.

Sets of data that record counts of things are discrete.

Discrete Data

- **Counted**
- Does **NOT** make sense to evaluate in between data
- Do **NOT** connect points when graphing



However, data is **continuous** if there's no clear separation between possible values. Like if two values are still kinda-sorta seeing each other, but haven't really discussed if they're an "item."

If we measure someone's height in centimeters we could get 160 cm, or 160.01 cm, or 160.001 cm (assuming we had a very accurate method of measurement). For any two possible values (say, 160 cm and 161 cm), there's another possible value between them (160.5 cm). Those infuriating numbers can always be broken down into smaller and smaller numbers. It's part of the reason we love them so much. Can't count with them, can't count without them.

Sets of data involving measurements that can have fractions or decimals are generally continuous.

Continuous Data

- **Measured**
- **Does** make sense to evaluate in between data
- **Do** connect points when graphing

Practice

Write **discrete** or **continuous** next to each situation. If you made the graph, would the points be **connected**?

1. A person's height over the school year _____

2. The number of students in a classroom _____

3. A dog's weight during the first year _____

4. The temperature of dinner as it cooks _____

5. How many magazine subscriptions were sold _____

Independent vs. Dependent Variables

Generally speaking, in any given model or equation, variables can be divided into two categories:

- Independent variables are the variables that are changed in a given model or equation. One can also think of them as the 'input' which is then modified by the model to change the 'output' or dependent variable.
- Dependent variables are considered to be functions of the independent variables, changing only as the independent variable does.

Independent Variable

- Input
- Controlled or manipulated
- X-axis

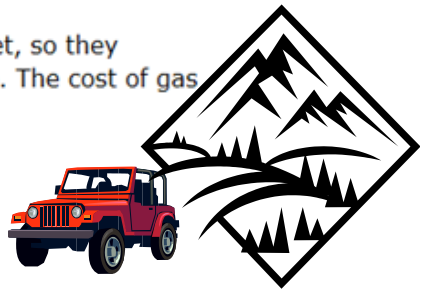
Dependent Variable

- Output
- Affected by the independent variable
- Y-axis

Practice

Write **the appropriate variable** to indicate if it is **independent** or **dependent** in the given situation.

1. Callie and Hajari are going on a road trip together. The have a limited budget, so they consider several different routes and calculate the cost of gas for each route. The cost of gas for each route depends on the length of the route.



g = the cost of gas
r = the length of the route

Independent Variable: _____

Dependent Variable: _____

2. Tyler is training to run a marathon at the end of the month. The more time he has spent training, the longer the distance he is able to cover during one run.

t = the amount of time Tyler has spent training
d = the distance Tyler is able to cover during one run

Independent Variable: _____

Dependent Variable: _____

3. At a deli counter, the price of a customer's order is calculated based on its weight.

p = the price
w = the weight

Independent Variable: _____

Dependent Variable: _____

The Four Views of a Relationship, Introduction

Campgrounds

You and your friends are going camping. The campground charges $10.00 for each campsite. This can be described with the equation $C = 10n$, where C is the cost and n is the number of campsites rented.

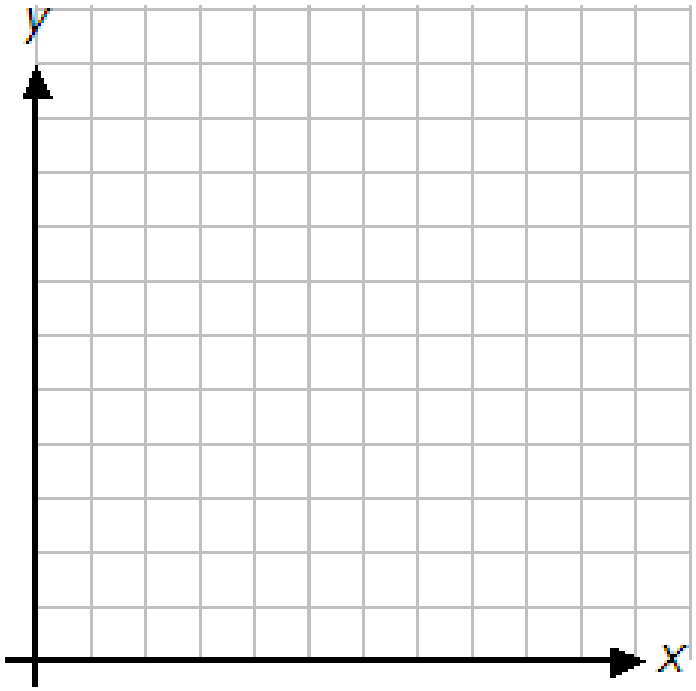
1) Write **independent** or **dependent** next to each variable.

C = the cost _____ n = the number of campsites _____

2) Describe the data as continuous or discrete. Explain your answer. _____

_____

3) Make a table and a graph showing the cost for up to 10 campsites. Use an interval of 1 on the x-axis and 10 on the y-axis.) The graph should have a title and each axis should have a label.



4) If 8 campsites are rented, what is the cost? _____You should be able to get your answer from the equation, the graph or the table.

5) Use your equation to calculate the number of campsites if the cost is $120. _____ (Show work.)

Equation: _____

Substitute: _____

Solve: _____

A Van's Speed

Suppose a van averaged a steady 60 miles per hour on the interstate highway.
The table below shows the relationship between the time traveled and the distance.

Time(hours)	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
Distance (miles)									

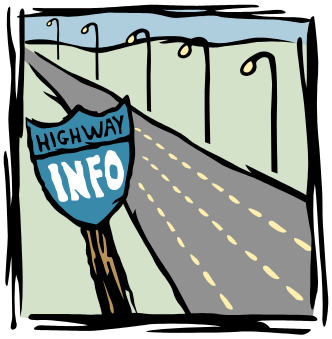
1) Complete the table.

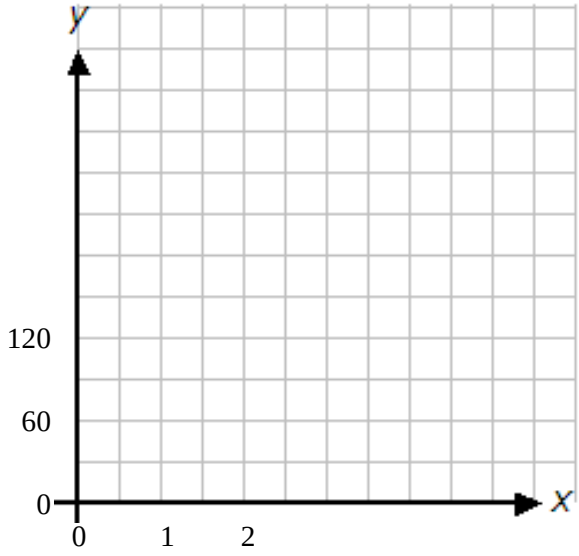
2) Identify the independent variable: _____ Identify the dependent variable: _____

3)Describe the data as continuous or discrete. Explain your answer. _____

_____

4) Make a coordinate graph of the data in the table showing the distance travelled after each hour. Use an interval of 1/2 on the x-axis and 30 on the y-axis. (The intervals have been started for you.) The graph should have a title and each axis should have a label.





5) Write an equation that describes the relationship between distance and time. (Use d for distance and t for time.)

_____

6) Predict the distance traveled in 8 hours. Justify your reasoning._____

_____

7) Predict the time needed to travel 300 miles. Justify your reasoning._____

_____

Soccer T-Shirts

The soccer club makes $5 on each T-shirt they sell. This can be described by the equation $A = 5n$, where A is the amount of money made and n is the number of T-shirts sold.

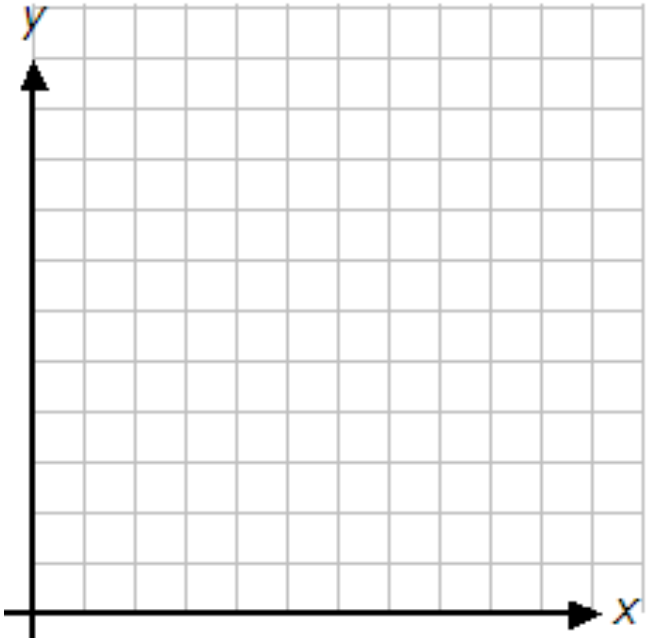
1) Write **independent** or **dependent** next to each variable.

A = the amount of money made _____ n = the number of T-shirts _____

2) Describe the data as continuous or discrete. Explain your answer. _____

_____

3) Make a table and a graph showing the amounts of money made by selling up to 10 T-shirts. Use an interval of 1 on the x-axis and 5 on the y-axis.) The graph should have a title and each axis should have a label.



4) **Write an equation for each situation.**

a) Write an equation that describes the relationship between distance, *d*, and time, *t*.

A motorcycle travels 80 mph. _____

A person walks 1.5 meters per second. _____

b) Write an equation that describes the relationship between cost, *c*, and the number of items, *n*.

A sandwich costs $2.50 _____

Admission is $6 per person _____

c) Write an equation that describes the relationship between number of words, *w*, and time, *t*.

A person types 55 words per minute. _____

Comparing Rates in Tables, Graphs, and Equations

Walking to the Yogurt Shop

Ms. Porter's gym class does an experiment to determine their walking rates. Here are the results for three students.

NAME	WALKING RATE
Terry	1 meter per second
Jade	2 meters per second
Jerome	2.5 meters per second

Jerome wonders how a person's walking rate would affect the amount of time it takes him or her to walk from school to the frozen yogurt shop.

1) If Terry, Jade, and Jerome leave school together and walk toward the frozen yogurt shop at the rates given in the table, how far will each have travelled after 1 minute.

Terry: _____ Jade: _____ Jerome: _____

2) If the yogurt shop is 750 meters from school, how long will it take each student to walk there?

Terry: _____ Jade: _____ Jerome: _____

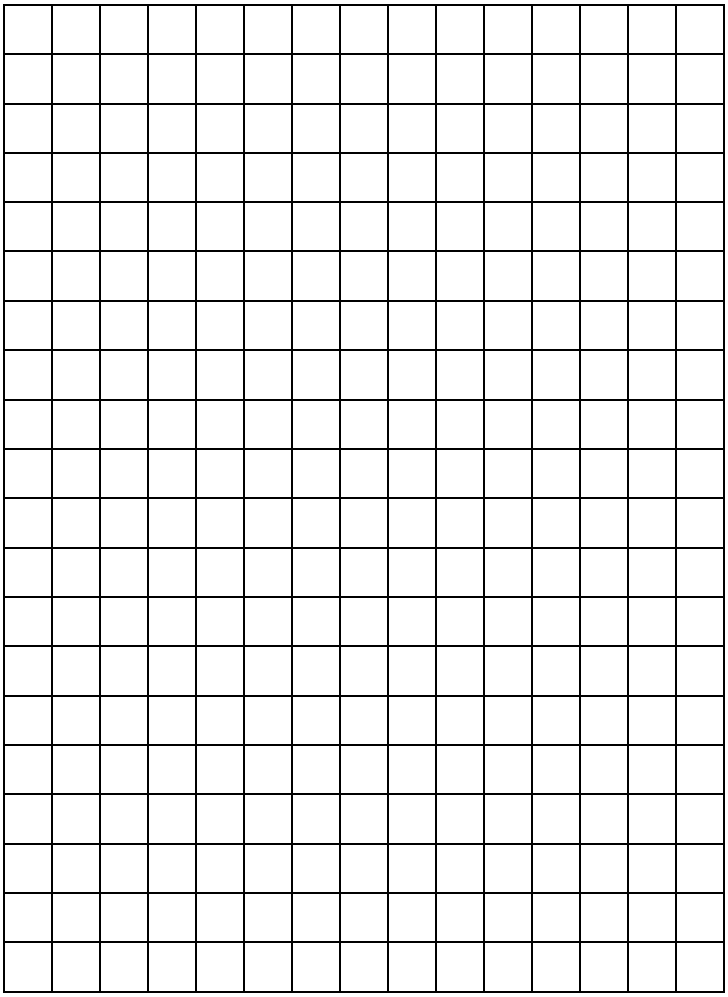
You have seen that a person's walking rate determines the time it takes him or her to walkd a given distance. Now, let's more closely examine the effect that the walking rate has on the relationship between time and distance walked. Your findings will give you some important clues about how to identify linear relationships from ***tables, graphs****, and* ***equations.***

3) Use the walking rates to complete the table showing the distance walked by each student after different numbers of seconds.

Time (seconds)	Distance (meters)		
	Terry	Jade	Jerome

4) How does the walking rate affect the patterns in the tables? _____

5) Graph the time and distance data for the three students o the same coordinate axes. Make a key to distinguish each student's data. Use an interval of 1 on the x-axis and 2 on the y-axis. Your graph should include a title and a label for each axis.



6) How do the walking rates affect the graphs? _____

_____

7) For each student, write an equation that gives the relationship between the time and the distance walked. Let d represent the distance in meters and t represent the time in seconds.

Terry: _____ Jade: _____ Jerome: _____

8) How does the walking rate affect the equations? _____

_____

Review Practice

Write **discrete** or **continuous** next to each situation. If you made the graph, would the points be **connected**?

1. The amount of rainfall during June _____

2. The number of plays in a football game_____

3. Your test grades for a grading period _____

4. The temperature of BMS through the day_____

Write **the appropriate variable** to indicate if it is **independent** or **dependent** in the given situation.

5. Ming Yue and Felix are organizing a car wash to raise money to buy new hockey sticks for their school's hockey team. The more cars they wash, the more hockey sticks they will be able to purchase for the team.

c = the number of cars Ming Yue and Felix wash
s = the number of hockey sticks Ming Yue and Felix will be able to purchase

Independent Variable: _____

Dependent Variable: _____

6. At a coffee shop, the amount of tax due is calculated based on the cost of the customer's order.

t = the amount of tax due
c = the cost of the order

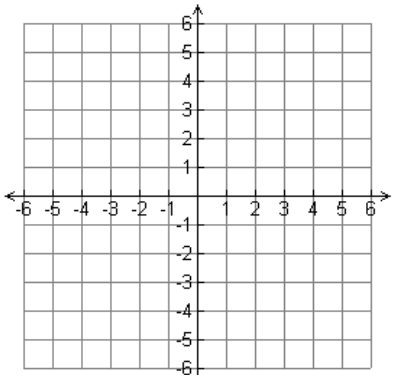
Independent Variable: _____

Dependent Variable: _____

Graph each table. Connect the points and draw a line through the grid

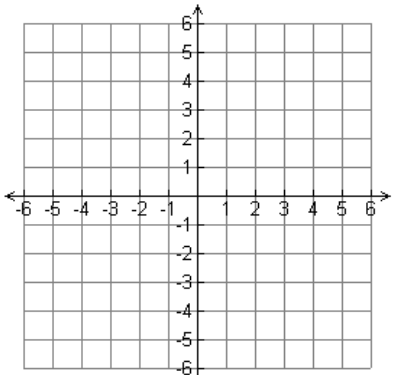
7.

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



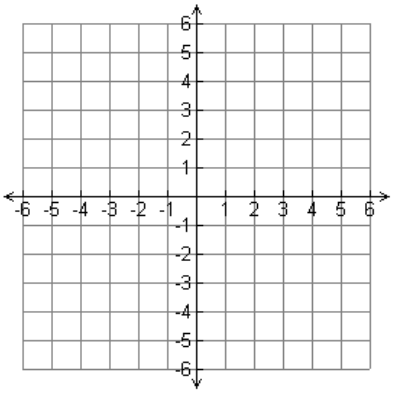
8.

x	y
-6	-2
-3	-1
0	0
3	1
6	2



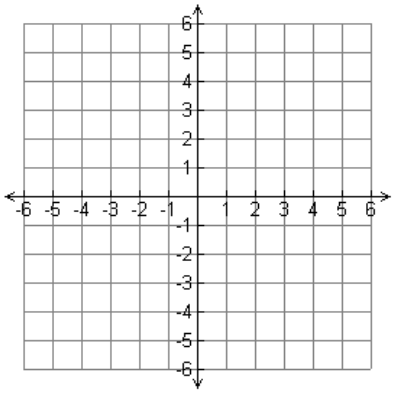
9.

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



10.

x	y
-6	5
-3	3
0	1
3	-1
6	-3



Comparing Rates in Tables, Graphs, and Equations

Cycling with Jose, Maria, and Sheldon

Jose, Maria, and Sheldon went on a weeklong cycling trip. The table below gives the distance each person traveled for the first three hours of the trip. The table shows only the time when the riders were actually biking, not when they stopped to rest, eat, and so on.

Cycling Time (hours)	Distance (miles)		
	Jose	Maria	Sheldon
0	0	0	0
1	5	7	9
2	10	14	18
3	15	21	27

1) a. Complete the table.

b. How fast did each person travel in miles per hour?

Jose: _____ Maria: _____Sheldon: _____

Explain how you got your answers: _____

_____

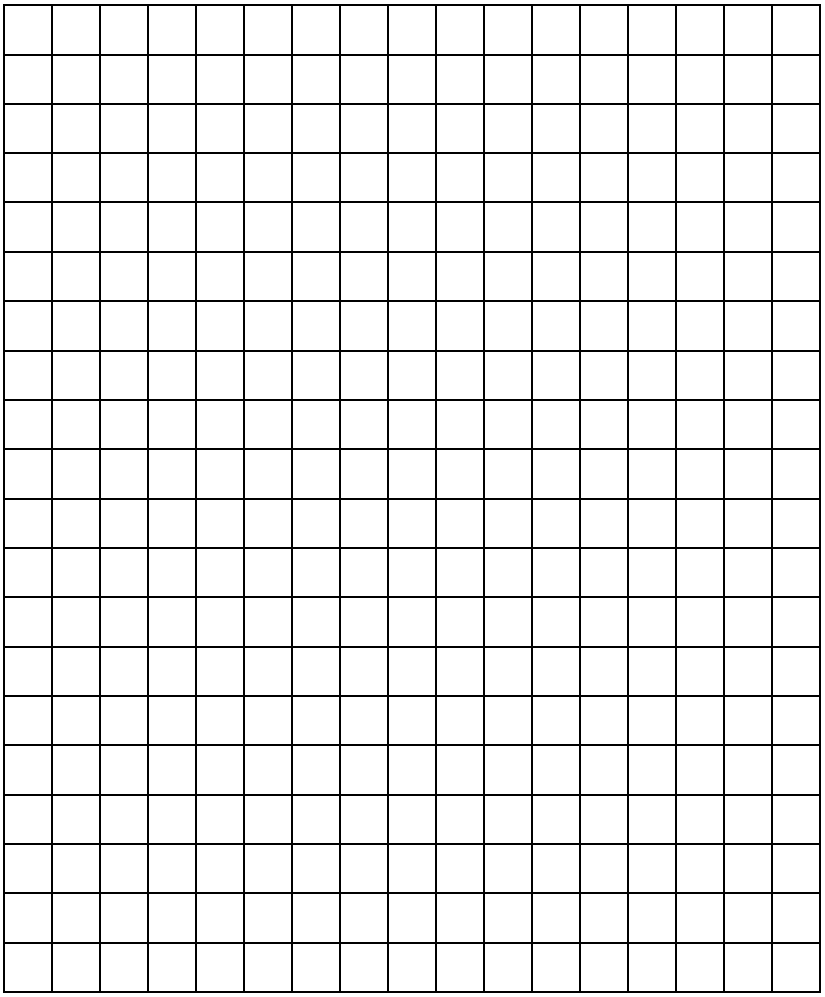
c. Assume that each person continued at this rate. Find the distance each person traveled in 7 hours.

Jose: _____ Maria: _____Sheldon: _____

d. Assume that each person continued at this rate. Find the distance each person traveled in 12 hours.

Jose: _____ Maria: _____Sheldon: _____

2) a. On the next page, graph the time and distance data for the three riders on the same coordinate grid. Make a key to distinguish each person's data. Use an interval of 1 on the x-axis and 5 on the y-axis. Your graph should include a title and a label for each axis.



2) b. Use the graphs to find the distance each person travelled in $6\frac{1}{2}$ hours. Show how you got your answers using dashed lines.

Jose: _____ Maria: _____Sheldon: _____

c. Use the graphs to find the time it took each person to travel 70 miles. Show how you got your answers using dashed lines.

Jose: _____ Maria: _____Sheldon: _____

d. How does the rate at which each person rides affect the graphs? _____

_____

3) a. For each rider, write an equation that can be used to calculate the distance traveled after a given number of hours. Define your own variables.

Distance traveled= _____ Number of hours= _____

Jose: _____ Maria: _____Sheldon: _____

b. How does a person's biking rate affect the equation? _____

_____

c. Use your equations from part a to calculate the distance each person would have traveled in $6\frac{1}{2}$ hours.
(Show all work as indicated.)

	Jose	Maria	Sheldon
Equation ⟹	_____	_____	_____
Substitution ⟹	_____	_____	_____
Solution ⟹	_____	_____	_____

Compare these answers to #2 part b. Did you get close to the same answers? _____ Which method would be more accurate, using the equation or the graph? _____

d. Use your equations from part a to calculate the time it took each person to travel 70 miles.
(Show all work as indicated.)

	Jose	Maria	Sheldon
Equation ⟹	_____	_____	_____
Substitution ⟹	_____	_____	_____
Work ⟹	_____	_____	_____
Solution ⟹	_____	_____	_____

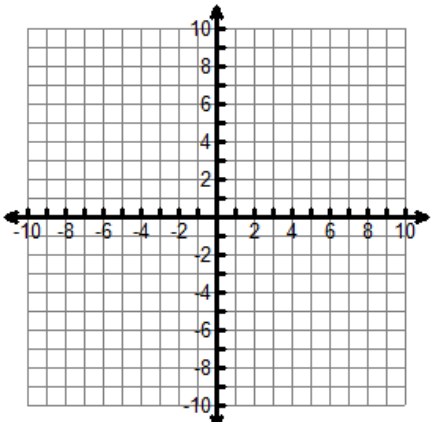
Compare these answers to #2 part c. Did you get close to the same answers? _____ Which method would be easier for very large numbers, using the equation or the graph? _____

Linear Patterns in Tables and Their Graphs

Graph each table. Connect the points and extend them over the coordinate grid.

#1

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



Describe the pattern in the y-column as the x-values increase by 1.

_____

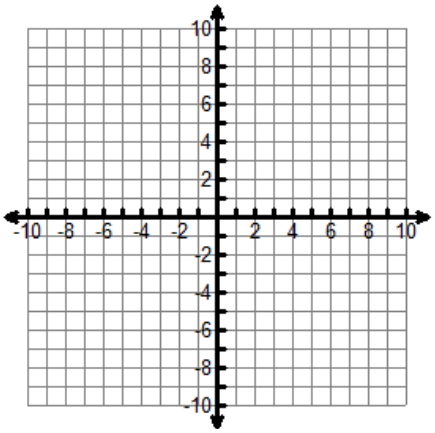
_____

Is the function linear or non-linear?

_____

#2

x	y
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9



Describe the pattern in the y-column as the x-values increase by 1.

_____

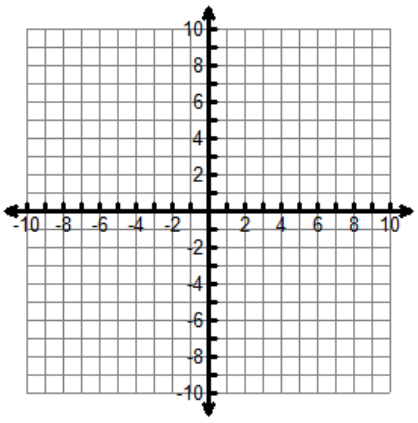
_____

Is the function linear or non-linear?

_____

#3

x	y
-1	-3
0	0
1	3
2	6
3	9



Describe the pattern in the y-column as the x-values increase by 1.

_____

_____

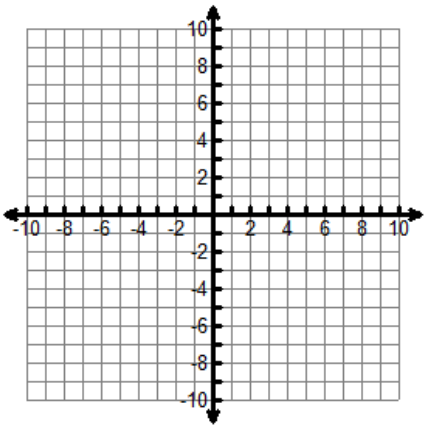
Is the function linear or non-linear?

_____

#4

x	y
0	1
1	2
2	4
3	8
4	16

(You can't graph the last point on the given grid.)



Describe the pattern in the y-column as the x-values increase by 1.

_____

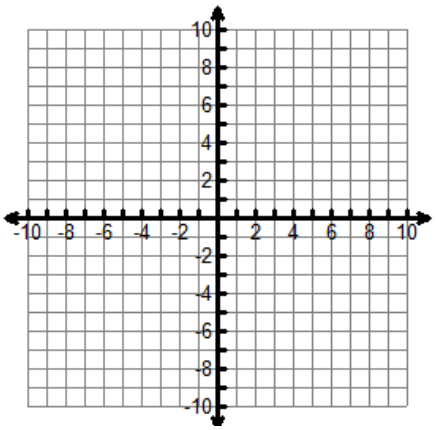
_____

Is the function linear or non-linear?

_____

#5

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



Describe the pattern in the y-column as the x-values increase by 1.

_____

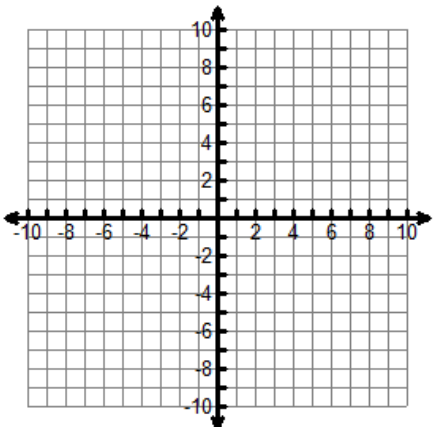
_____

Is the function linear or non-linear?

_____

#6

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



Describe the pattern in the y-column as the x-values increase by 1.

_____

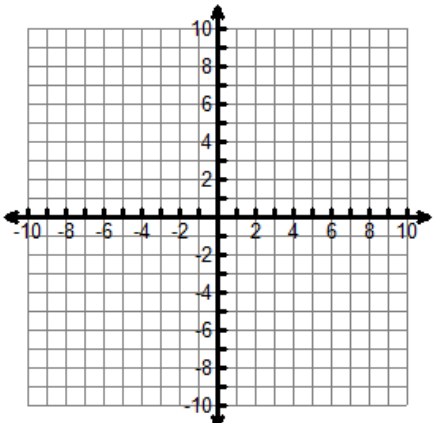
_____

Is the function linear or non-linear?

_____

#7

x	y
-2	8
-1	4
0	2
1	1
2	0.5



Describe the pattern in the y-column as the x-values increase by 1.

_____

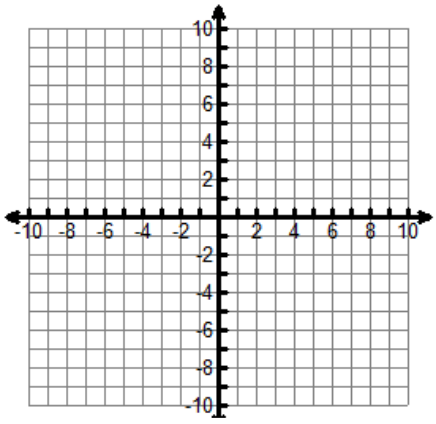
_____

Is the function linear or non-linear?

_____

#8

x	y
0	-10
1	-5
2	0
3	5
4	10



Describe the pattern in the y-column as the x-values increase by 1.

_____

_____

Is the function linear or non-linear?

_____

#9. Put a * next to the patterns that form a linear graph. Make a conjecture about the type of pattern in a table that indicates a linear graph.

_____

#10 Complete each of the following tables of input-output values. Identify the pattern in the y-values and the x-values.

a. $y = 2x$

x	-4	-2	0	2	4	6
y						

Describe the pattern for the x-values
_____
Describe the pattern for the y-values
_____

b. $y = -2x$

x	-3	-2	-1	0	1	2
y						

Describe the pattern for the x-values
_____
Describe the pattern for the y-values
_____

c. $y = -3x$

x	-4	-2	0	2	4	6
y						

Describe the pattern for the x-values
_____
Describe the pattern for the y-values
_____

d. $y = 3x$

x	-3	-2	-1	0	1	2
y						

Describe the pattern for the x-values
_____
Describe the pattern for the y-values
_____

e. $y = 4x$

x	-6	-3	0	3	6	9
y						

Describe the pattern for the x-values
_____
Describe the pattern for the y-values
_____

f. $y = -5x$

x	-6	-4	-2	0	2	4
y						

Describe the pattern for the x-values
_____
Describe the pattern for the y-values
_____

Changing the Starting Point

Walking for Charity

Ms. Porter's class decides to participate in a walkathon to raise money for a local hospital. Each participant in the walkathon must find sponsors to pledge a certain amount of money for each mile the participant walks.

Ms. Porter says that some sponsors might ask the students to suggest a pledge amount. The class wants to agree on how much they will ask for. Leanne says that $1 per mile would be appropriate. Miguel says that $2 per mile would be better because it would bring in more money. Alan points out that if they ask for too much money, not as many people will want to be sponsors. He suggests that they ask each sponsor for a $5 donation plus $0.50 per mile.

In this problem, we will refer to Leanne, Miguel, and Alan's suggestions as pledge plans.

1) a. How much would a sponsor owe for each student if they walked 6 miles? (show your calculations)

Leanne: _____ Miguel: _____Alan: _____

b. Make a table and a graph showing the amount of money a sponsor would owe under each pledge plan if a student walked distances between 0 and 10 miles. Use an interval of 1 on both axes.

Distance (miles)	Money Owed		
	Leanne	Miguel	Alan

c. For each pledge plan, write an equation that can be used to calculate the amount of money a sponsor owes, given the total distance the student walks. (You may look back at your calculations in #1,a to help write the equations.)

Define your variables: Amount Owed = _____ Distance Walked = _____

Leanne: _____ Miguel: _____Alan: _____

2) a. What effect does the amount pledged per mile (rate) have on the table? _____

_____

b. What effect does the amount pledged per mile (rate) have on the graphs? _____

_____

c. What effect does the amount pledged per mile (rate) have on the equations? _____

_____

3) a. If a student walks 8 miles in the walkathon, how much does a sponsor owe under each pledge plan?

Leanne: _____ Miguel: _____Alan: _____

b. Explain how you can find your answers using the table. _____

_____

c. Explain how you can find your answers using the graph. _____

_____

d. Explain how you can find your answers using theequation. _____

_____

4) Alan suggested that each sponsor make a $5 donation and then pledge $0.50 per mile. How is this fixed $5 donation represented…

In the table? _____

In the graph?_____

In the equation? _____

5) On the graph of a pledge plan, the point (2, 6) means that a student who walks 2 miles earns $6 from each sponsor.

a. On which of the graphs is the point (2, 6)? _____

b. On which of the graphs is the point (3, 3)? _____ Explain what the

coordinates mean in reference to the situation. _____

c. On which of the graphs is the point (4, 8)? _____ Explain what the coordinates mean in reference to the situation. _____

d. On which of the graphs is the point (4, 7)? _____ Explain what the coordinates mean in reference to the situation. _____

6) a.Write an equation for a pledge plan whose graph is a steeper line than any of the lines you graphed in the problem.

Equation of a steeper line: _____

b. Write an equation for a pledge plan whose graph is less steep than any of the lines you graphed in the problem.

Equation of a less steep line: _____

7) Complete each of the following tables of input-output values. As the x-values increase by 1, describe the pattern for the y-values.

Pattern

a. $y = 2x + 1$

x	-3	-2	-1	0	1	2
y						

_____

b. $y = 2x + 3$

x	-3	-2	-1	0	1	2
y						

_____

c. $y = -2x + 5$

x	-3	-2	-1	0	1	2
y						

_____

d. $y = x + 5$

x	-3	-2	-1	0	1	2
y						

_____

e. $y = -x + 6$

x	-3	-2	-1	0	1	2
y						

_____

8) Refer to the equations in #7 and the pattern in the table. What do you notice about the coefficient of x in the equations and the pattern stated?

_____

Changing the Starting Point

Henry and Emilio

In Ms. Porter's gym class, Emilio finds out that his walking rate is 2.5 meters per second. When he gets home from school, he times his little brother, Henry, as Henry walks 100 meters. He figures out that Henry's walking rate is 1 meter per second.

Henry challenges Emilio to a walking race. Because Emilio's walking rate is faster, Emilio gives Henry a 45-meter head start.

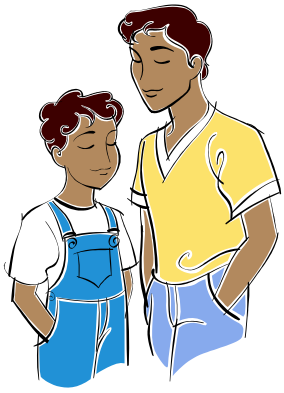
1) Name the independent variable: _____

Name the dependent variable: _____

2) Make a table to show the relationship between the time in seconds and the distance in meters for every 5 seconds.

3) Make a graph of your data. You will need to extend your graph to 35 seconds and 85 meters.

Time (seconds)	Distance (meters)	
	Emilio	Henry
0		
5		
10		
15		



4) Emilio knows his brother would enjoy winning the race, but he does not want to make the race so short that it is obvious his brother will win. What would be a good distance to make the race so that Henry will win in a close race? _____ Explain how you arrived at your answer._____

5) What would be a good distance to choose if Emilio wants to beat his brother but wants the race to be close? _____ Explain. _____

6) Write an equation to calculate the distance, *d*, given any time, *t*, for each brother.

Emilio: _____ Henri: _____

7) Use the equations to calculate how far each brother would travel in one minute. Show your work.

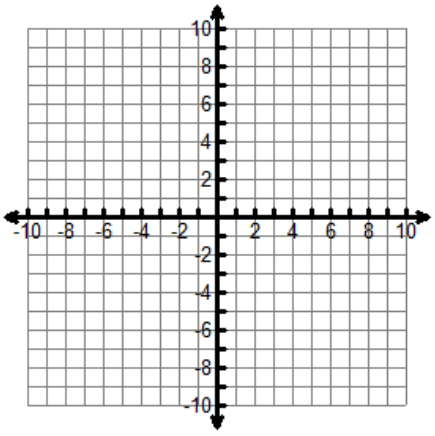
	Emilio	Henri
Equation ⇒	_____	_____
Substitution ⇒	_____	_____
Solution ⇒	_____	_____

7) Use the equations to calculate how long each brother would take to walk 300 meters. Show your work.

Equation ⇒	_____	_____
Substitution ⇒	_____	_____
Work ⇒	_____	_____
Solution ⇒	_____	_____

Complete the following blanks given the table.

x	y
-2	-3
-1	-2
0	-1
1	0
2	1

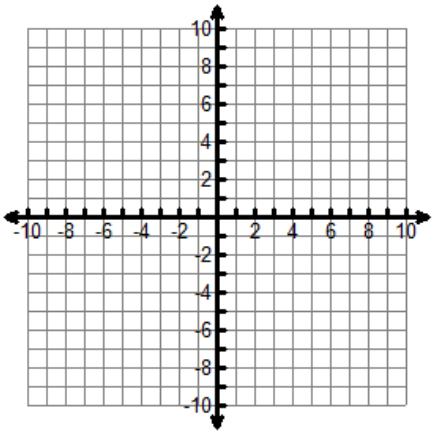


Rate:_____

Starting point: _____
(Starting point is always where x=0)

Equation: _____

x	y
-2	-4
-1	-1
0	2
1	5
2	8



Rate: _____

Starting point: _____

Equation: _____

Slope-Intercept Form of a Linear Equation

Using the Graphing Calculator to Explore Linear Equations

```
WINDOW
 Xmin=-9
 Xmax=9
 Xscl=1
 Ymin=-6
 Ymax=6
 Yscl=1
 Xres=1
```

Graph each of the following equations. Set your calculator to the window to the right →

To turn on grid…. 2nd Format → GridOn

1. $Y_1 = 2x + 0$

2. $Y_1 = -2x + 0$

3. $Y_1 = 5x + 0$

4. $Y_1 = -5x + 0$

5. $Y_1 = 0.5x + 0$

6. $Y_1 = 2x + 5$

7. $Y_1 = 2x + (-3)$

8. $Y_1 = -2x + 4$

9. $Y_1 = -3x + (- 2)$

a. All of these functions are _____ in shape.

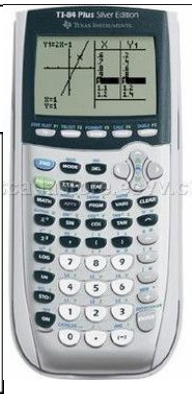
b. If the co-efficient of x is positive, the graph goes in what direction? _____

c. If the co-efficient of x is negative, the graph goes in what direction? _____

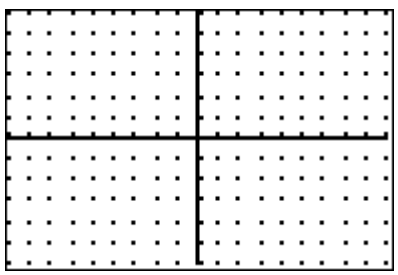
d. If the absolute value of the coefficient of x increases, the graph is _____

e. The constant that is added to the x-term is the _____

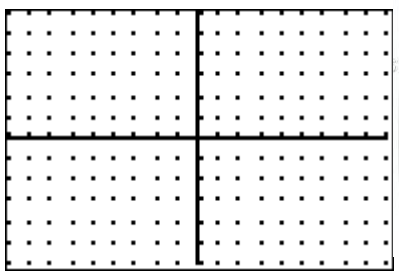
f. Sketch what you think these equations will look like when you graph them. Check using the TI-84.



i. $Y_1 = - 0.5x + 2$



ii. $Y_1 = 3x + (-1)$



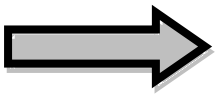
Review

Discrete	**Continuous**
Values or observations that is counted as **distinct and separate** *and can only take particular values. Examples: the number of kittens in a litter; number of threads in a sheet, number of stars given for an energy rating.*	*You can* **measure** *continuous data. Values or observations* **may take on any value** *within a finite or infinite interval. Examples: height, time and temperature.*

Identify each as continuous or discrete.

1. *Number of channels on your TV*
2. *A person's age*
3. *Elements on the Periodic Table*
4. *The time of day*
5. *The day of the week*
6. *Population of a Species*
7. *Number of genes in our DNA*
8. *Length of a piece of rope*
9. *How happy you feel right now*
10. *The speed you are walking*

Examples of Independent and Dependent Variables



DEPENDENT	INDEPENDENT
Cell phone bill	Minutes used
How far you can drive	The amount of gas you have
Your math grade	The number of assignments you turned in
How much money you earn	The hours you work
Cost of a speeding ticket	How many miles you went over the speed limit
Time it takes to drive somewhere	How fast you drive
Result of a football game	Who scores more points
How much air conditioning you use	Temperature
Total calories and fat	Number of cookies
Opportunities for high-paying jobs	How much education you have

Identify the independent and the dependent variable in each scenario.

1) The older John gets, the taller he is.
2) The more gallons of milk I have, the more cups of milk I have.
3) In the United States House of representatives, the number of Representatives from a state is calculated based on its population.
4) The number of seats in a movie theater determines how many tickets can be sold.
5) As a plane descends, the more time that passes, the lower the plane's altitude is.
6) It costs $0.99 for a music download. The more music I download, the more money I spend.
7) The more tickets I sell, the more money I have.
8) Judah brings reusable shopping bags from home whenever he goes to the grocery store. The number of bags he brings is based on how many products are on his shopping list.
9) At a deli counter, the price of a customer's order is based on its weight.
10) Vera and Elizabeth are going hiking and are trying to figure out how many snacks they should bring with them on the hike. The longer they plan to hike, the more snacks they should bring.
11) Amelia is making mushroom tarts for a party. The number of tarts she can make will be determined by how many mushrooms are in the fridge.
12) Taylor's dad is building a case for his trophies. The number of trophies will determine how many shelves the case will have.

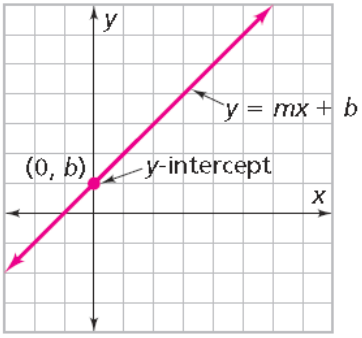
Independent (x)	Dependent (y)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

All of the linear equations we have studied so far can be written in the form $y = mx + b$ or $y = b + mx$. In this equation, y depends on x.

y = mx + b

y-intercept (where x=0)

Rate (steepness or slope)



The **y-intercept** is the point where the line crosses the y-axis, or when $x = 0$. To save time, we sometimes refer to the number b, rather than the coordinates of the point $(0, b)$, as the y-intercept.

A **coefficient** is the number that multiplies a variable in an equation. The m in $y = mx + b$ is the coefficient of x, so mx means m times x.

For each table, tell the rate (m) and coefficient (b). Write an equation for each relationship.

#1

x	y
0	5
1	15
2	25
3	35
4	45
5	55

Rate (slope): _____

Starting point: _____

Equation: _____

#2

x	y
0	0
1	15
2	30
3	45
4	60
5	75

Rate (slope): _____

Starting point: _____

Equation: _____

#3

x	y
0	8
1	15
2	22
3	29
4	36

Rate (slope): _____

Starting point: _____

Equation: _____

#4

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

Rate (slope): _____

Starting point: _____

Equation: _____

#5

x	y
0	-10
1	-6
2	-2
3	2
4	6

Rate (slope): _____

Starting point: _____

Equation: _____

#6

x	y
0	10
1	20
2	30
3	40
4	50

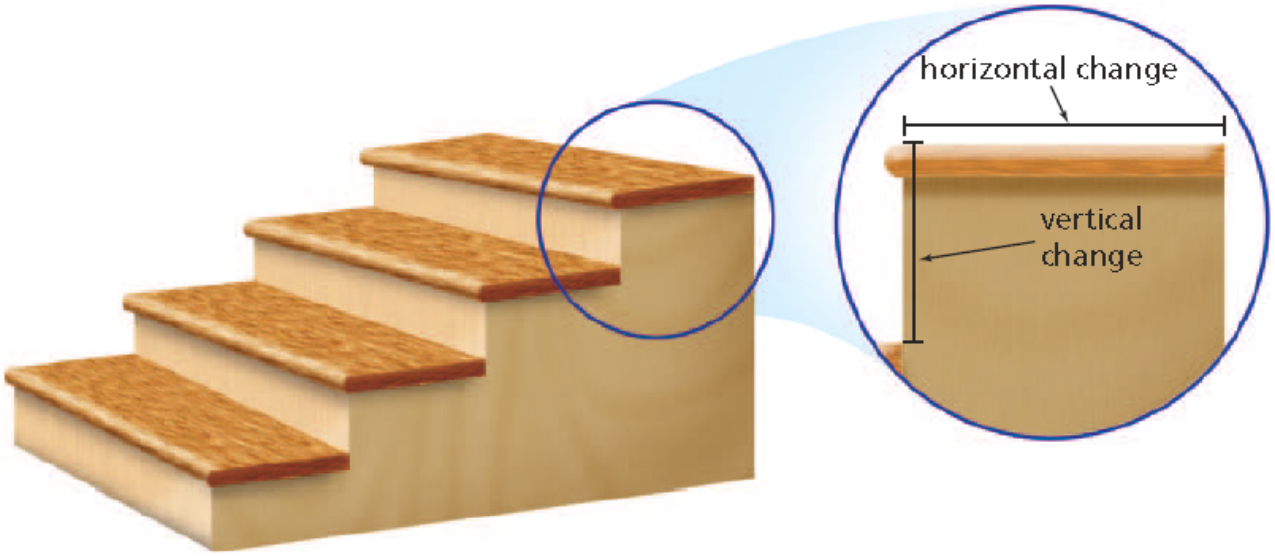
Rate (slope): _____

Starting point: _____

Equation: _____

Finding the Slope of a Line

The method for finding the steepness of stairs suggests a way to find the steepness of a line. A line drawn from the bottom step of a set of stairs to the top step touches each step in one point. The rise and the run of a step are the vertical and the horizontal changes, respectively, between two points on the line.

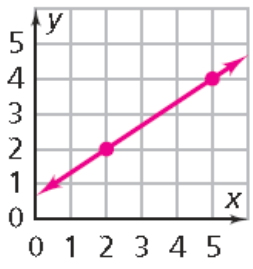


The steepness of the line is the ratio of rise to run, or vertical change to horizontal change, for this step. We call this ratio the **slope** of the line.

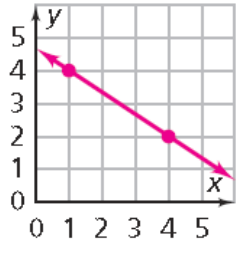
$$\text{slope} = \frac{\text{vertical change}}{\text{horizontal change}} \text{ or } \frac{\text{rise}}{\text{run}}$$

Unlike the steepness of stairs, the slope of a line can be negative. To determine the slope of a line, you need to consider the direction, or sign, of the vertical and horizontal changes from one point to another. If vertical change is negative for positive horizontal change, the slope will be negative. Lines that slant *upward* from left to right have *positive slope*; lines that slant *downward* from left to right have *negative slope*.

Line With Positive Slope



Line With Negative Slope

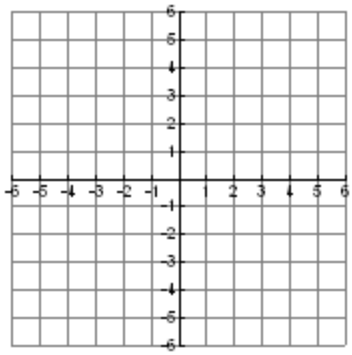


A. Complete each table, then graph each function.

y = 2x

i.

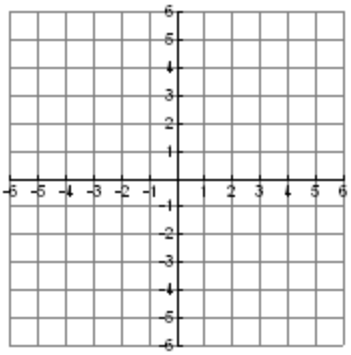
x	y
0	
1	
2	
3	



y = –3x

ii.

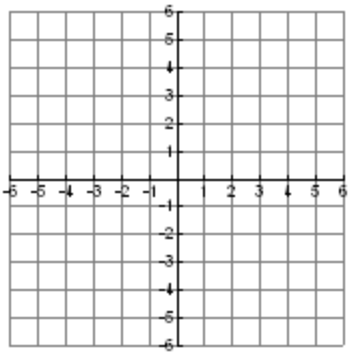
x	y
0	
1	
2	
3	



y = 2x + 5

iii.

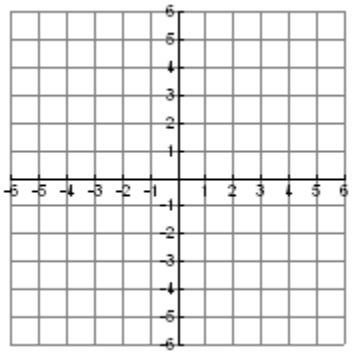
x	y
–2	
–1	
0	
1	



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

iv.

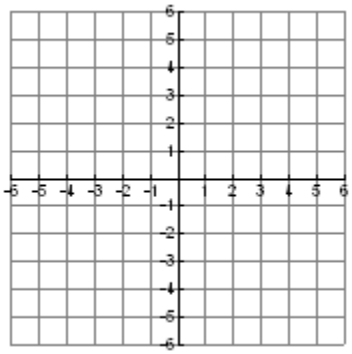
x	y
0	
1	
2	
3	



y = –3x + 2

v.

x	y
0	
1	
2	
3	



b. Draw stair steps for each line graphed above.

c. Show the vertical change and the horizontal change as a ratio:

i. vertical change: _____ horizontal change:

ii. vertical change:_____ horizontal change:

iii. vertical change: _____ horizontal change:

iv. vertical change: _____ horizontal change:

v. vertical change: _____ horizontal change:

d. The ratio that you wrote in part c is the **slope** of the line. How is the slope of the line related to the table of values for the line?

_____

How is the slope of the line related to the equation of the line?

_____

For each equation, give the slope and the y-intercept.

1) $y = -2x + 5$ slope: _____ y-intercept: _____

2) $y = 2x$ slope: _____ y-intercept: _____

3) $y = -3x - 5$ slope: _____ y-intercept: _____

4) $y = 2x - 1$ slope: _____ y-intercept: _____

5) $y = x + 3.5$ slope: _____ y-intercept: _____

Match the equations above with the correct table using the slope and y-intercept.

a.

x	0	1	2	3	4
y	0	2	4	6	8

slope: ____ y-intercept: ____

equation: _____

b.

x	0	1	2	3	4
y	3.5	4.5	5.5	6.5	7.5

slope: ____ y-intercept: ____

equation: _____

c.

x	0	1	2	3	4
y	-1	1	3	5	7

slope: ____ y-intercept: ____

equation: _____

d.

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

slope: ____ y-intercept: ____

equation: _____

e.

x	0	1	2	3	4
y	-5	-8	-11	-14	-17

slope: ____ y-intercept: ____

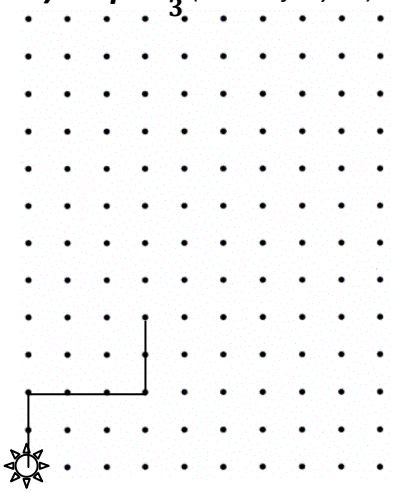
equation: _____

$\frac{\text{Rise}}{\text{Run}}$

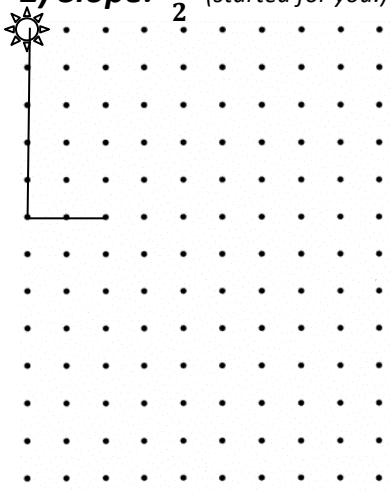
Practice Making Stair Steps

Make a sketch of stair steps with the given steepness. The steepness ratio is **vertical** measure compared to **horizontal** measure. (**rise** over **run**) Start your stair steps at the ☼ . (**Positive** is *up* or *right* while **negative** is *down* or *left.*)

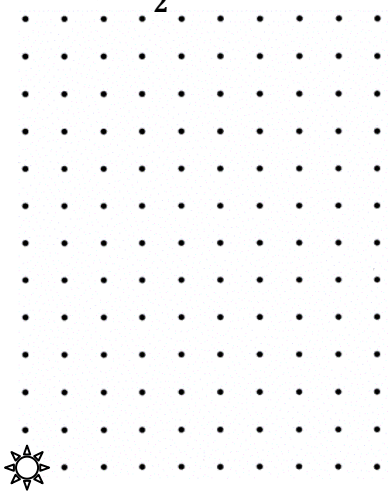
1) Slope: $\frac{2}{3}$ *(started for you.)*



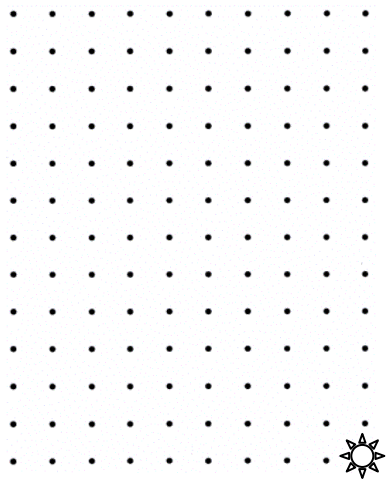
2) Slope: $\frac{-5}{2}$ *(started for you.)*



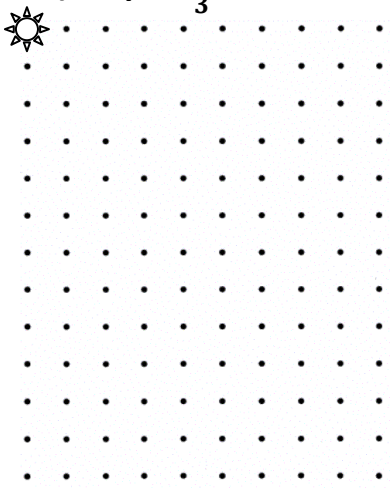
3) Slope: $\frac{5}{2}$



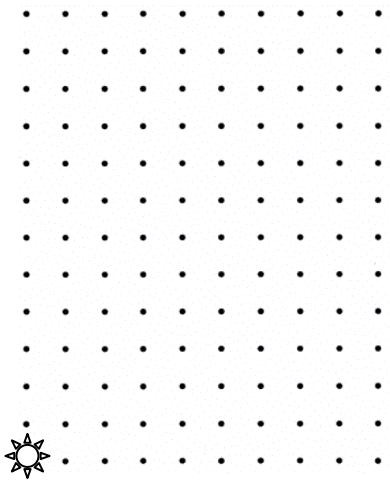
4) Slope: $\frac{2}{-3}$



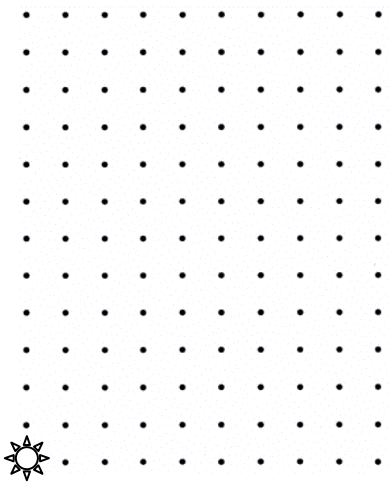
5) Slope: $\frac{-2}{3}$



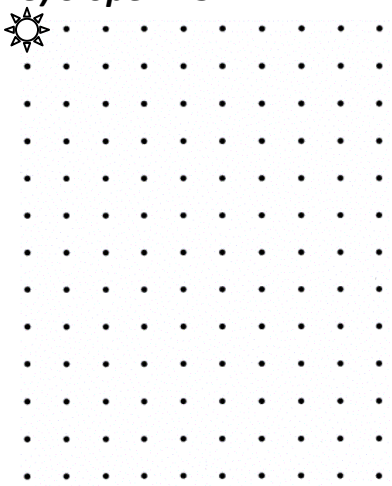
6) Slope: $\frac{1}{2}$



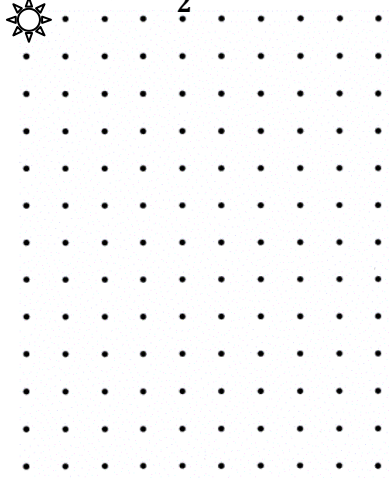
7) Slope: 2 = —



8) Slope: -3



9) Slope: $\frac{-6}{2}$



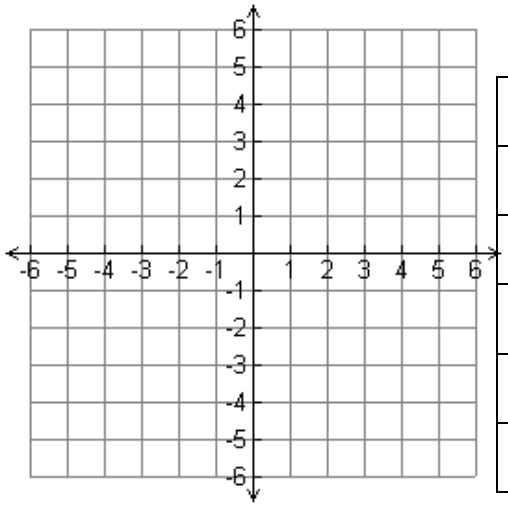
Practice with Slope

For each equation, complete each table, graph, and identify the slope and y-intercept.

1) $y = x + 3$ Slope: _____

y-intercept: _____

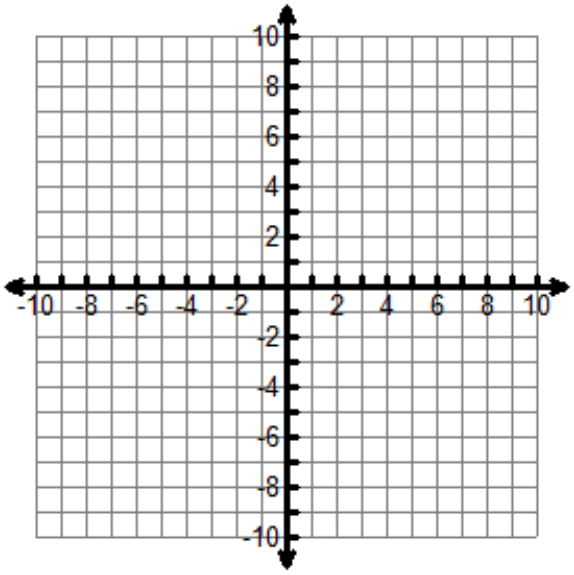
x	y
–2	
–1	
0	
1	
2	



2) $y = -3x + 2$ Slope: _____

y-intercept: _____

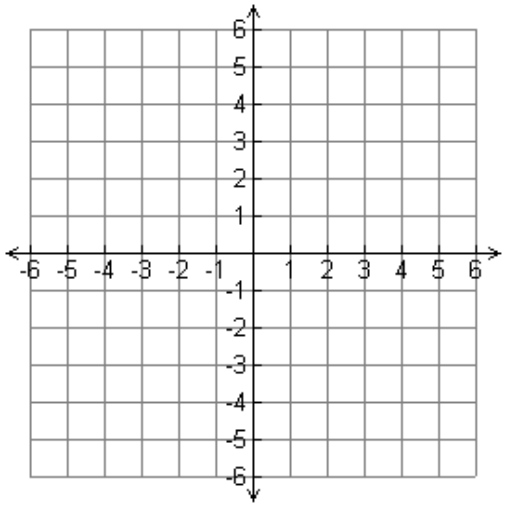
x	y
–2	
–1	
0	
1	
2	



3) $y = -x + -4$ Slope: _____

y-intercept: _____

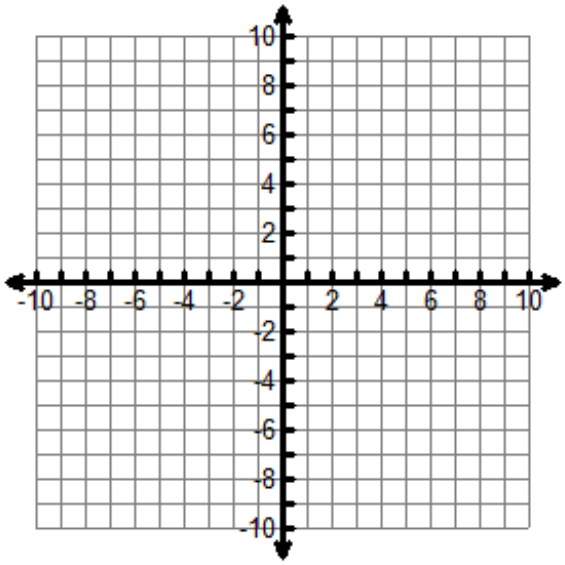
x	y
–2	
–1	
0	
1	
2	



4) $y = 4x - 2$ Slope: _____

y-intercept: _____

x	y
–2	
–1	
0	
1	
2	



5) Explain how you can determine the **slope** from the equation _____

_____, from the table _____

_____, from the graph _____

_____

6) Explain how you can determine the **y-intercept** from the equation _____

_____, from the table _____

_____, from the graph _____

_____

For each table, determine the pattern. Complete the table. Identify the slope and y-intercept. Write the equation. Graph each.

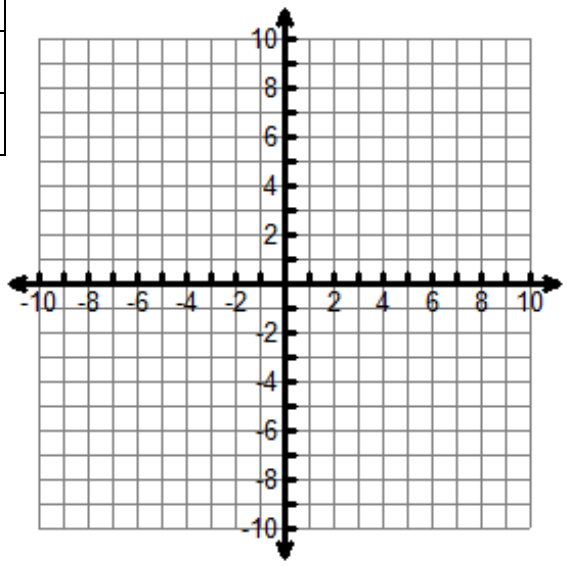
7)

x	y
–2	-8
–1	-4
0	0
1	
2	

Slope: _____

y-intercept: _____

Equation: _____



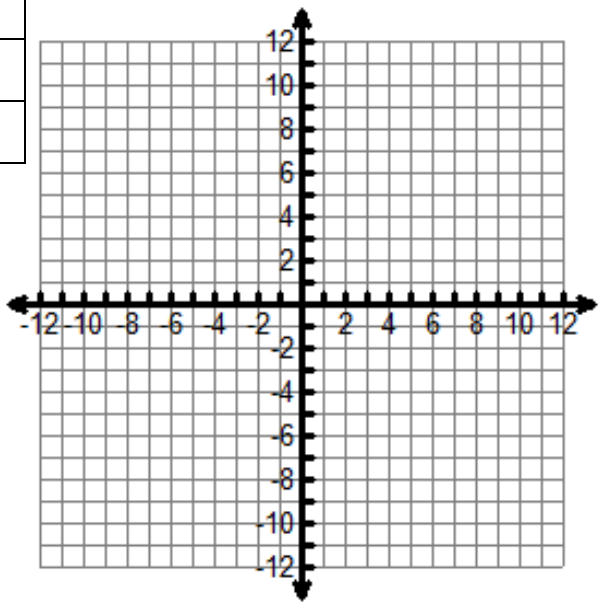
8)

x	y
–2	12
–1	9
0	6
1	
2	

Slope: _____

y-intercept: _____

Equation: _____



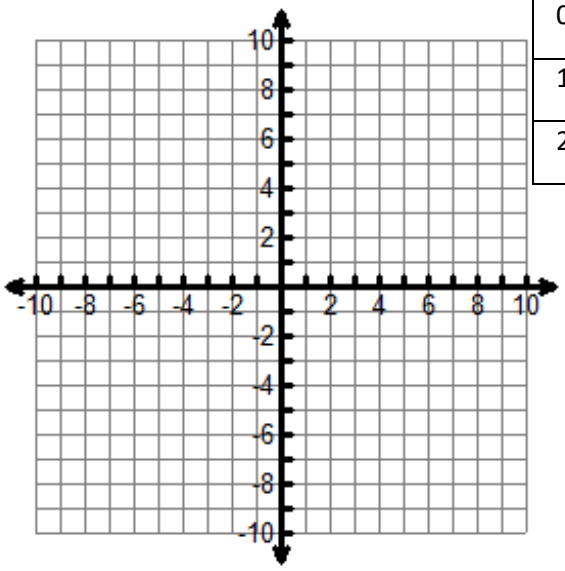
9)

x	y
–2	0
–1	2
0	4
1	
2	

Slope: _____

y-intercept: _____

Equation: _____



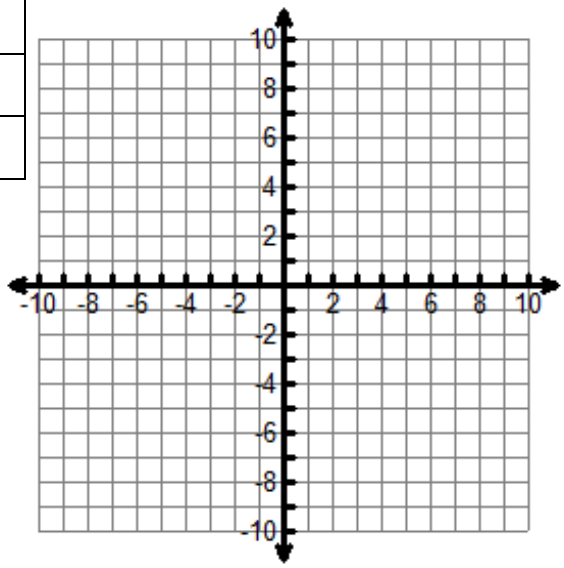
10)

x	y
–2	9
–1	8
0	7
1	
2	

Slope: _____

y-intercept: _____

Equation: _____



Practice Writing Equations Starting with Tables

Complete each table. For each table, tell the slope (rate), the y-intercept (starting point), and write the equation.

1)

x	y
0	0
1	5
2	10
3	15
4	
5	

Slope: _____

y-intercept: _____

Equation: _____

2)

x	y
0	5
1	8
2	11
3	14
4	
5	

Slope: _____

y-intercept: _____

Equation: _____

3)

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

Slope: _____

y-intercept: _____

Equation: _____

4)

x	y
0	
1	
2	4
3	9
4	14
5	19

Slope: _____

y-intercept: _____

Equation: _____

5)

x	y
-2	10
-1	8
0	6
1	4
2	
3	

Slope: _____

y-intercept: _____

Equation: _____

6)

x	y
-2	
-1	
0	
1	7
2	13
3	19

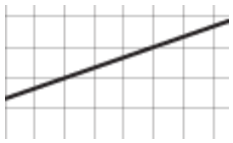
Slope: _____

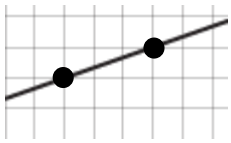
y-intercept: _____

Equation: _____

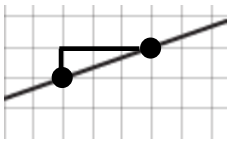
Finding the Slope of a Graphed Line

To find the slope of a graphed line, find two "nice" points on the grid, make the stair-step. The vertical distance is the numerator (rise) and the horizontal distance is the denominator (run).

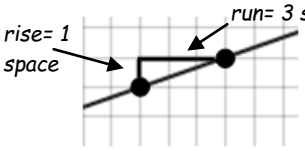




Step1:
Mark 2 "nice" points where the gridlines intersect.



Step2:
Draw a stair-step between your two points.

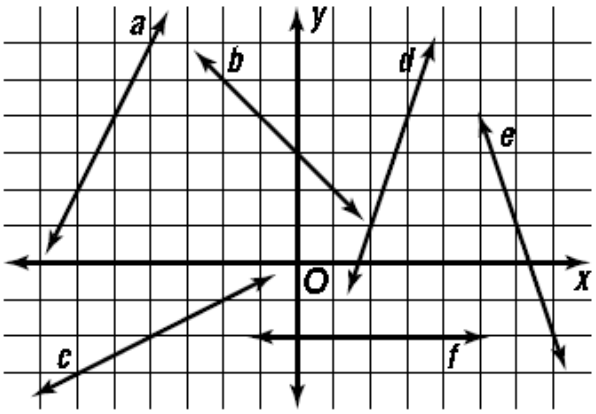


Step3:
Determine the rise and run of the stair step and write these as a ratio.

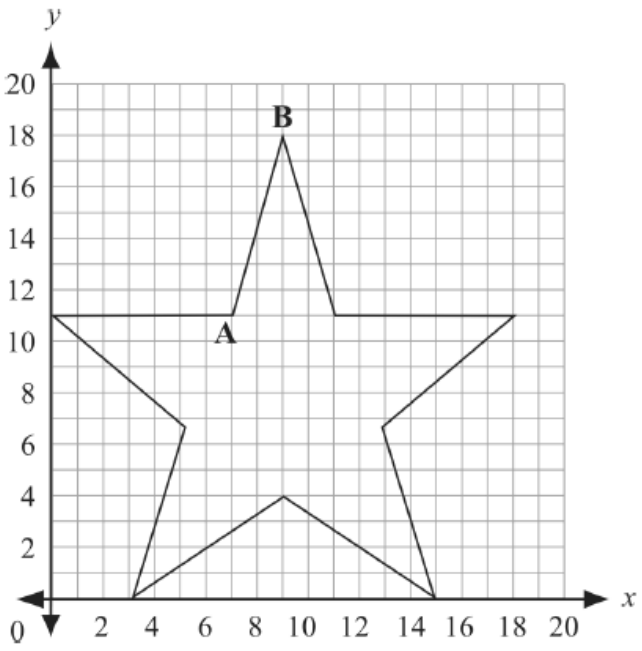
Slope = $\frac{1}{3}$

Determine the slope of each line named below.

1. a
2. b
3. c
4. d
5. e
6. f



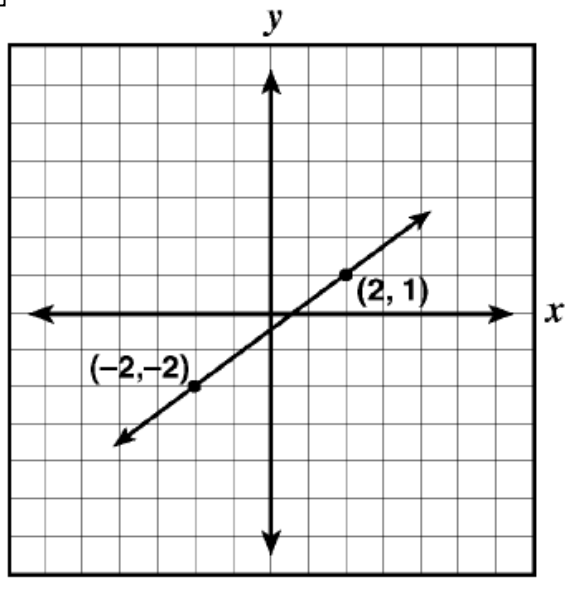
7 Bennie is using this pattern to make stars for an Alaska state flag.



What is the slope of line segment AB in Bennie's pattern?

A. $\frac{2}{7}$ B. $\frac{4}{6}$ C. $\frac{18}{9}$ D. $\frac{7}{2}$

8 What is the slope of this line?



A. $\frac{1}{2}$ B. $\frac{3}{4}$ C. 1 D. $\frac{4}{3}$

$y = mx + b$

m = slope

b = y-intercept

Connecting Points

For any two points, there is exactly one straight line that can be drawn through both points. In this problem, you will be given the coordinates of two points. Your task will be to find information about the line through these points – including its slope, its y-intercept, its equation, and other points on the line.

1) (2, 6) and (0, 4)

a. Plot the points and draw a line through them across the grid.

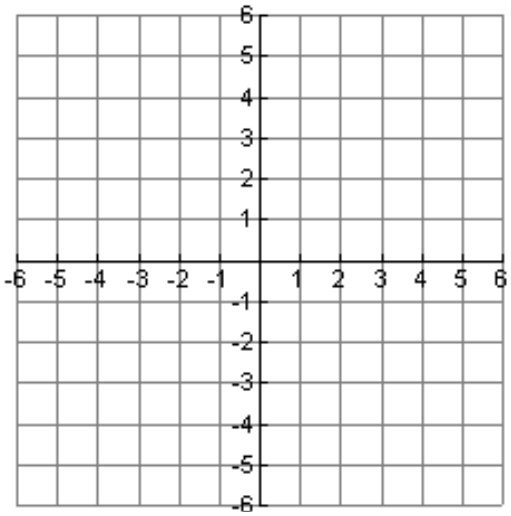
b. Does the graph increase, decrease, or stay the same from left to right?

c. Find the slope of the line. _____

d Find the y-intercept of the line. _____

e. Write the equation of the line. _____

f. What is another point on the line. _____



2) (2, 3) and (4, 6)

a. Plot the points and draw a line through them across the grid.

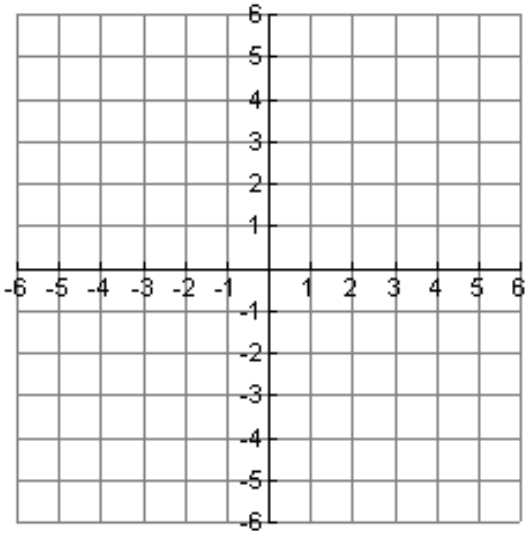
b. Does the graph increase, decrease, or stay the same from left to right?

c. Find the slope of the line. _____

d Find the y-intercept of the line. _____

e. Write the equation of the line. _____

f. What is another point on the line. _____



3) (0, 3) and (-1, 0)

a. Plot the points and draw a line through them across the grid.

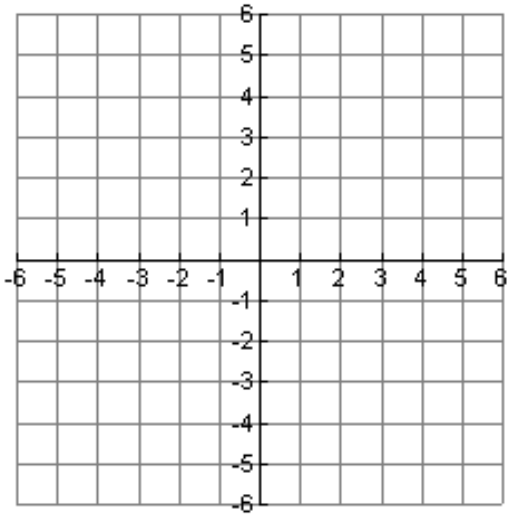
b. Does the graph increase, decrease, or stay the same from left to right?

c. Find the slope of the line. _____

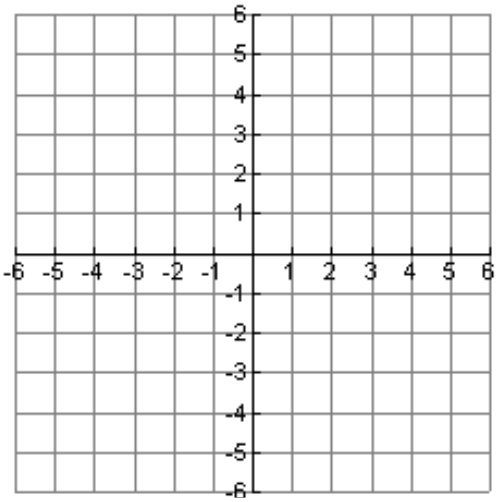
d Find the y-intercept of the line. _____

e. Write the equation of the line. _____

f. What is another point on the line. _____



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



a. Plot the points and draw a line through them across the grid.
b. Does the graph increase, decrease, or stay the same from left to right?

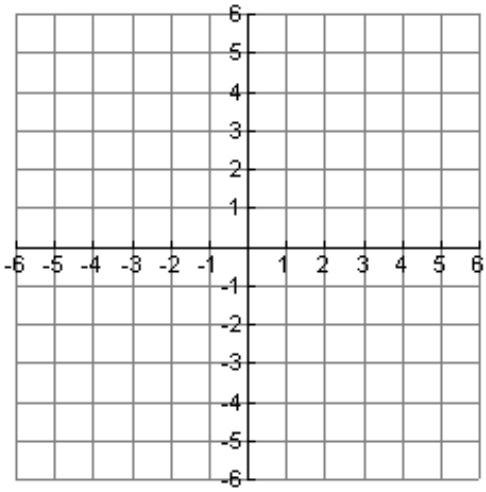
c. Find the slope of the line. _____

d Find the y-intercept of the line. _____

e. Write the equation of the line. _____

f. What is another point on the line. _____

5) (4, 6) and (-4, 2)



a. Plot the points and draw a line through them across the grid.
b. Does the graph increase, decrease, or stay the same from left to right?

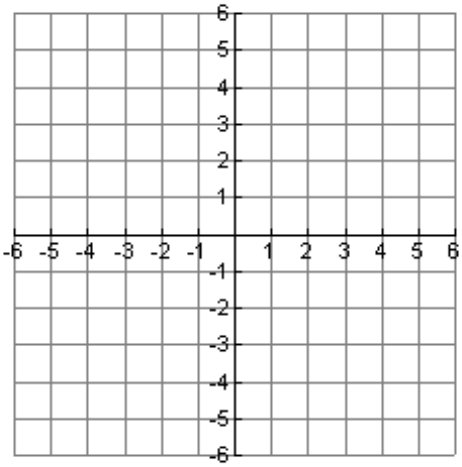
c. Find the slope of the line. _____

d Find the y-intercept of the line. _____

e. Write the equation of the line. _____

f. What is another point on the line. _____

6) (-4, 2) and (4, 0)



a. Plot the points and draw a line through them across the grid.
b. Does the graph increase, decrease, or stay the same from left to right?

c. Find the slope of the line. _____

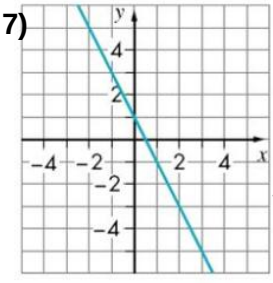
d Find the y-intercept of the line. _____

e. Write the equation of the line. _____

f. What is another point on the line. _____

In #7-9, find the slope of the line, the y-intercept of the line, and write the equation for the line.

7)



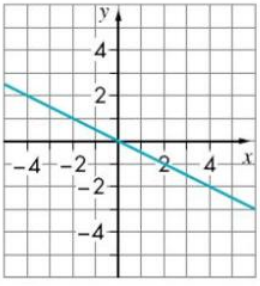
Slope: _____

y-intercept: _____

Equation:

_____

8)



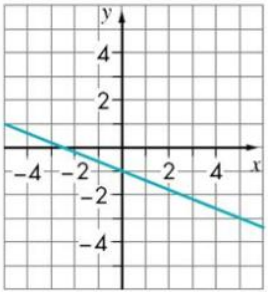
Slope: _____

y-intercept: ____

Equation:

_____

9)



Slope: _____

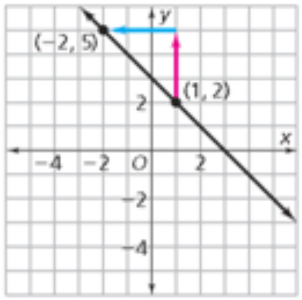
y-intercept: _____

Equation:

_____

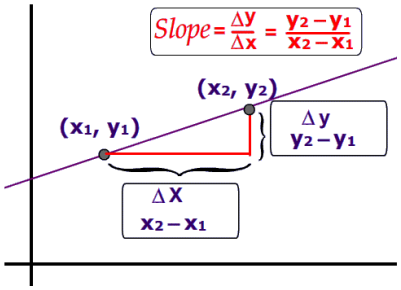
Finding Slope Given Two Points

What is the slope of this line?



We can find the slope of a line through two points without graphing them, using a formula.

$$m = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{\Delta y}{\Delta x}$$



Together, let's use the formula to find the slope of the line that contains (-2, 5) and (1, 2).

Examples: 1) Find the slope of the line that contains the points (-5, 2) and (7, 4).

$$\frac{\text{change in } y}{\text{change in } x} = \frac{\text{2nd y-coordinate} - \text{1st y-coordinate}}{\text{2nd x-coordinate} - \text{1st x-coordinate}}$$

Note that order is important.

$$= \frac{4-2}{7-(-5)}$$

$$= \frac{2}{12} \text{ or } \frac{1}{6}$$

2) Find the slope of the line that passes through (3, 5) and (-1, 4).

Find the slope of the line that contains each pair of points. Show all work using the slope formula.

1) K(3, 9), L(2, 4)

2) A(1, 0), B(-3, 1)

3) M(8, -6), N(8, 4)

4) S(1, -5), T(-3, -4)

5) W(1, 6), Z(2, 6)

6) P(-4, -5), Q(-3, 7)

Multiple Choice:

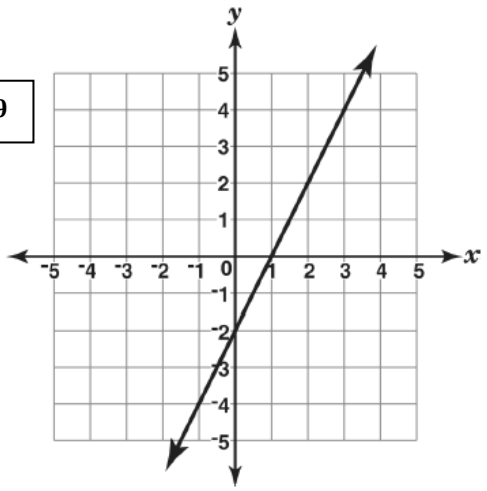
7 What is the slope of the line $y = 3x - 5$?

A. -5 B. $-\frac{5}{3}$ C. $\frac{5}{3}$ D. 3

8 What is the slope of the line that passes through the points $(1, -3)$ and $(4, 2)$?

A. $\frac{5}{3}$ B. $\frac{3}{5}$ C. $\frac{-3}{5}$ D. $\frac{-5}{3}$

9

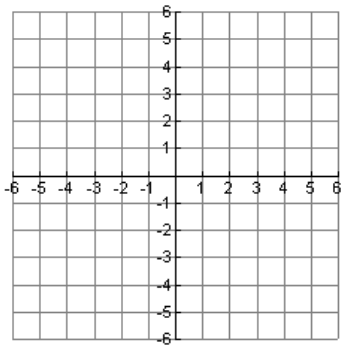


What is the slope of the line?

A. -2 B. $-\frac{1}{2}$ C. $\frac{1}{2}$ D. 2

Slopes and Equations of Special Lines

1) a) Graph the line containing (4, -3) and (-2, -3). b) Find the slope using the slope formula. $m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$

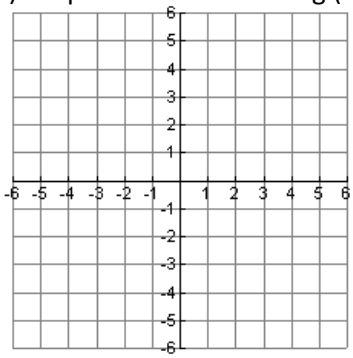


c) What type of line did you graph? _____

d) Can you make a stair-step for your line? _____

e) Write an equation for the line. _____

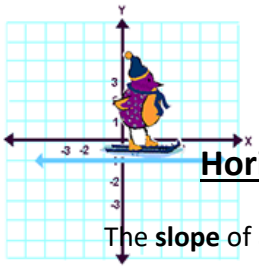
2) a) Graph the line containing (4, -2) and (4, 5). b) Find the slope using the slope formula. $m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$



c) What type of line did you graph? _____

d) Can you make a stair-step for your line? _____

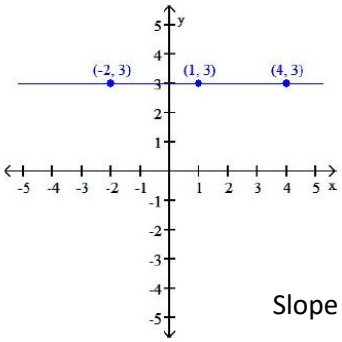
e) Write an equation for the line. _____



Horizontal Lines

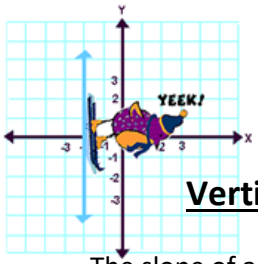
The **slope** of any horizontal line will be ***zero*.**

The **equation** of a horizontal line will be $y = \underline{\text{the } y - \text{intercept}}$



Slope = 0

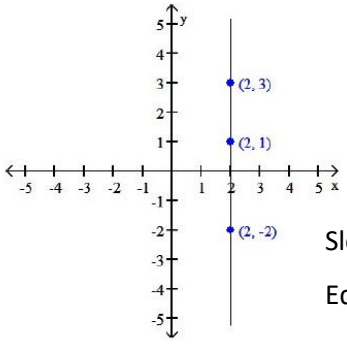
Equation: $y = 3$



Vertical Lines

The slope of any vertical line will be *undefined*.

The equation of a vertical line will be $x = \underline{\text{the } x - \text{intercept}}$



Slope = undefined

Equation: $x = 2$

Multiple Choice Questions about slope

1 Which statement is true?

A. All vertical lines have a slope of zero.

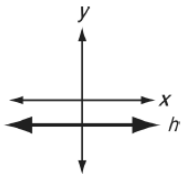
B. All vertical lines have a positive slope.

C. All vertical lines have a negative slope.

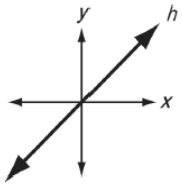
D. All vertical lines have an undefined slope.

2 In which of the following graphs does line h best represent a line with an undefined slope?

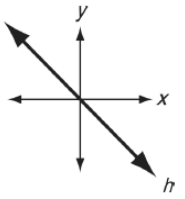
A.



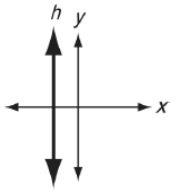
C.



B.



D.

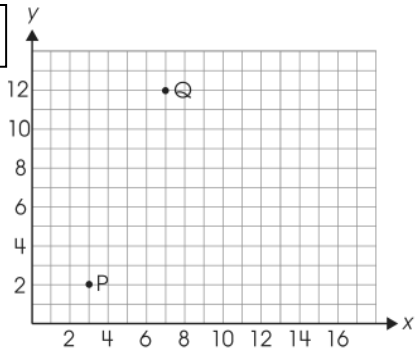


3 What is the slope of the line that passes through the points $(5,-1)$ and $(-3,3)$?

> Helpful Hint
>
> • Slope $= \dfrac{y_2 - y_1}{x_2 - x_1}$

A. -1 B. $-\frac{1}{2}$ C. $\frac{1}{2}$ D. 2

4



What is the slope of the line that goes through points **P** and **Q**?

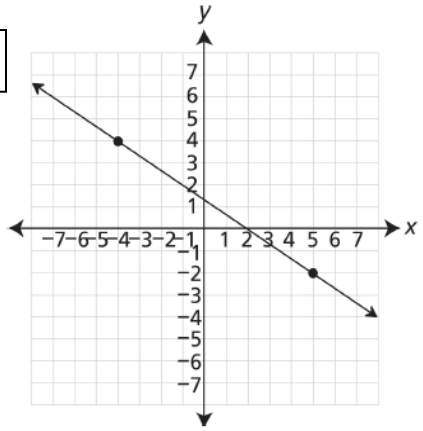
A. $-\frac{5}{2}$ B. $-\frac{2}{3}$ C. $\frac{2}{3}$ D. $\frac{5}{2}$

5 Which of the following describes the slope of a horizontal line on the coordinate plane?

A. zero B. positive

C. negative D. undefined

6



What is the slope of the line?

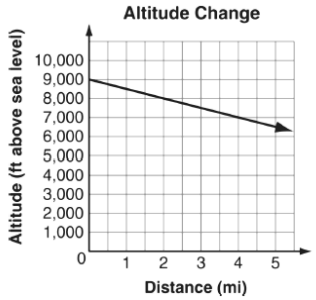
A. $-\frac{3}{2}$ B. $-\frac{2}{3}$ C. $\frac{2}{3}$ D. $\frac{3}{2}$

7 Determine the slope of line with points located at $(-3,2)$ and $(1,2)$.

A. -2 B. 5

C. 0 D. Undefined

8 This graph shows the relationship between the altitude of an airplane and the distance it travels while it is descending.



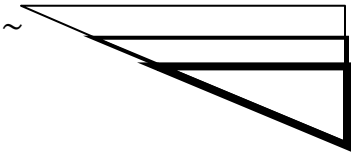
Which statement describes the slope of this line?

A. The altitude decreases by 500 feet every mile.

B. The altitude decreases by 1000 feet every mile.

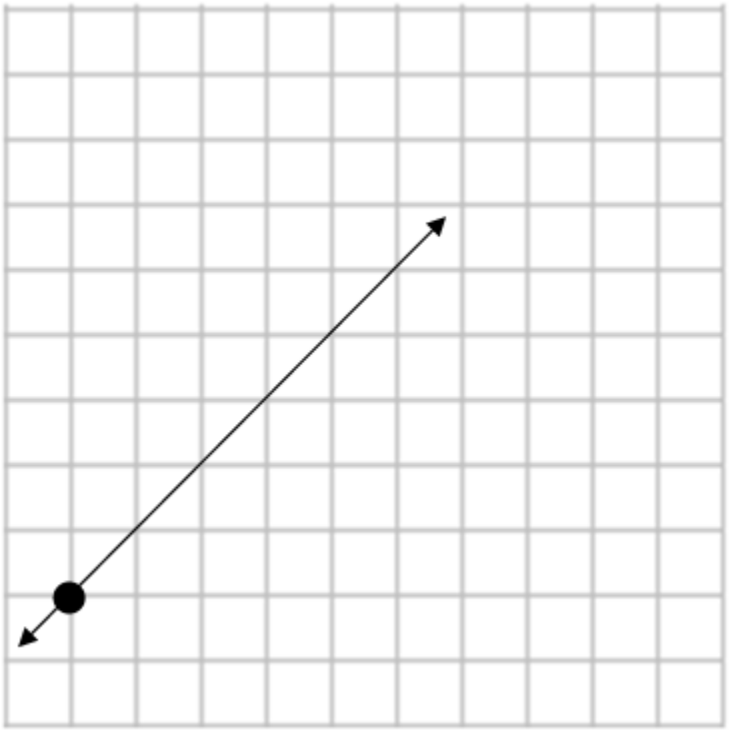
C. The altitude decreases by 1 foot every 500 miles.

D. The altitude decreases by 1 foot every 1000 miles.



Slope and Similar Triangles

1) Make 5 stair steps of different sizes that you can for the line with the point being at the bottom. Find the slope of each stair-step using the rise and run and then simplify.



1) _____ = _____

2) _____ = _____

3) _____ = _____

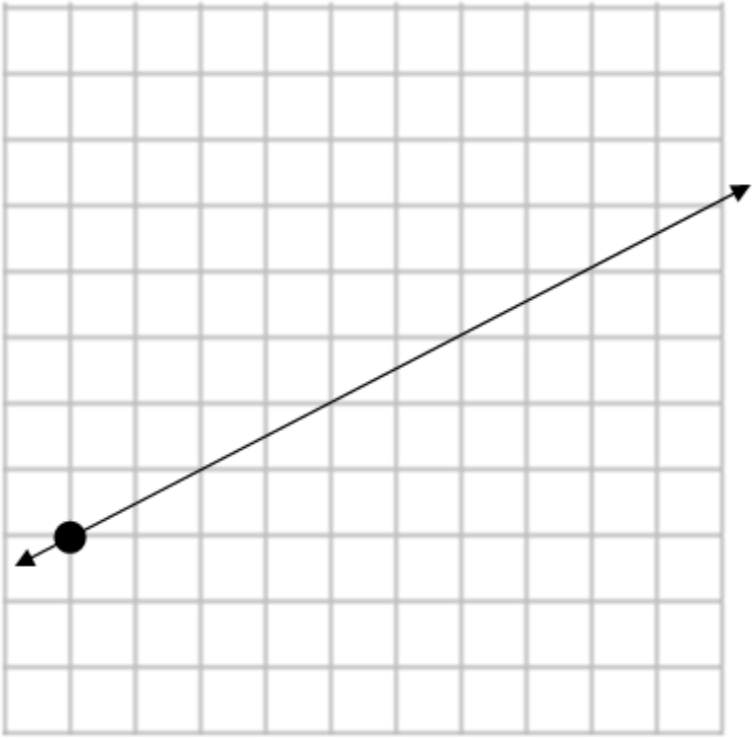
4) _____ = _____

5) _____ = _____

What is true about the ratios?

_____

2) Make 5 stair steps of different sizes that you can for the line with the point being at the bottom. Find the slope of each stair-step using the rise over run and then simplify.



1) _____ = _____

2) _____ = _____

3) _____ = _____

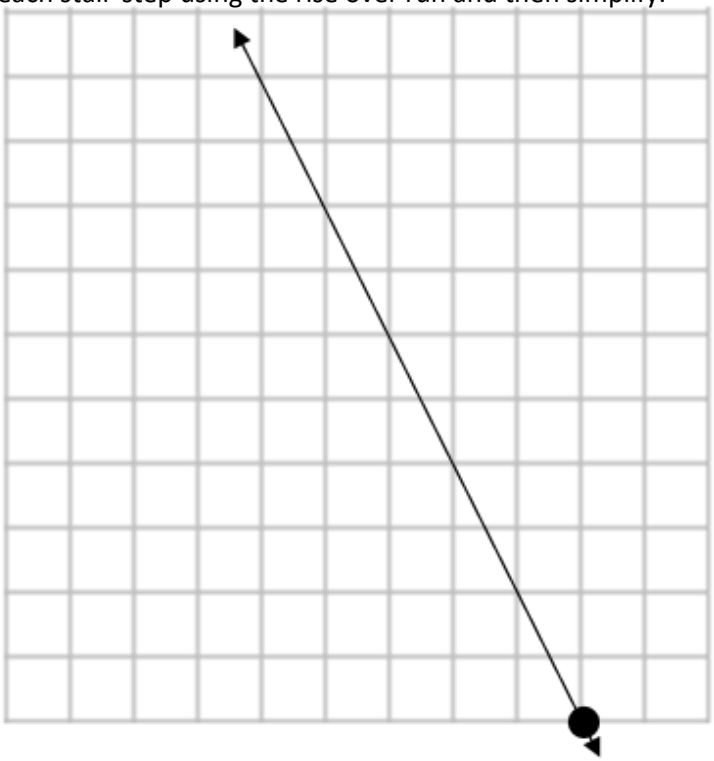
4) _____ = _____

5) _____ = _____

What is true about the ratios?

_____

3) Make 5 stair steps of different sizes that you can for the line with the point being at the bottom. Find the slope of each stair-step using the rise over run and then simplify.



1) _____= _____

2) _____= _____

3) _____= _____

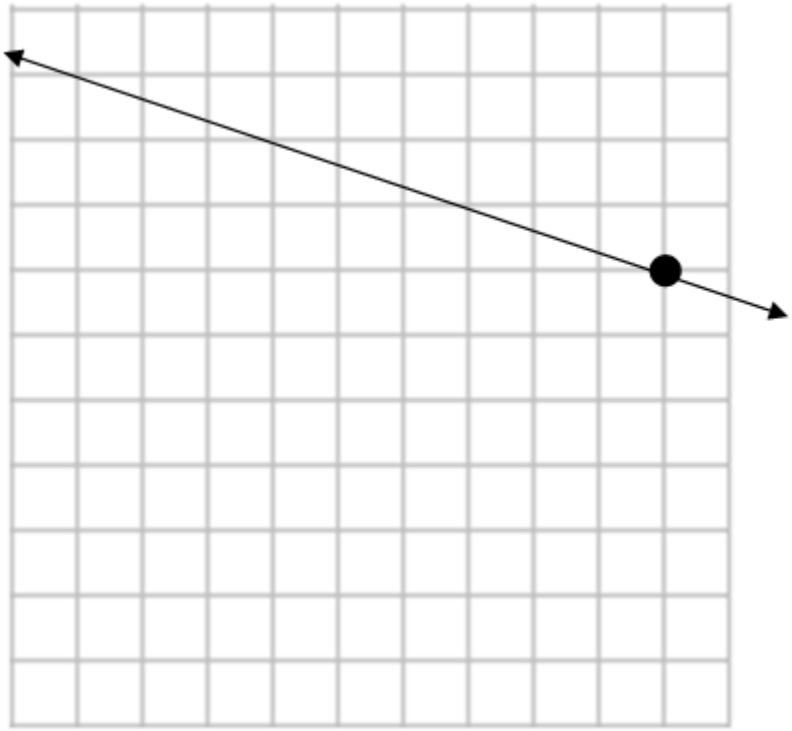
4) _____= _____

5) _____= _____

What is true about the ratios?

_____

4) Make 3 stair steps of different sizes that you can for the line with the point being at the bottom. Find the slope of each stair-step using the rise over run and then simplify.



1) _____= _____

2) _____= _____

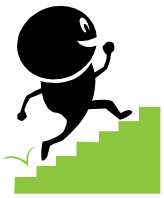
3) _____= _____

What is true about the ratios?

_____

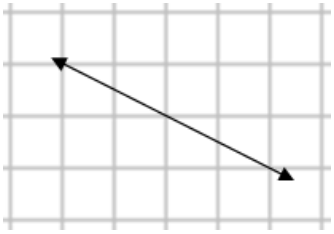
The slope is the same on any given line, no matter how far apart the points are. The stair-steps formed are all similar triangles, they have the same shape, but they are different in size.

Practice with Slope



$$\text{Slope} = \frac{\textit{rise or vertical change}}{\textit{run or horizontal change}}$$

Together: Find the slope .

a)  m = _____

b) $(2, -4) and\ (-3, 1)$

m = _____

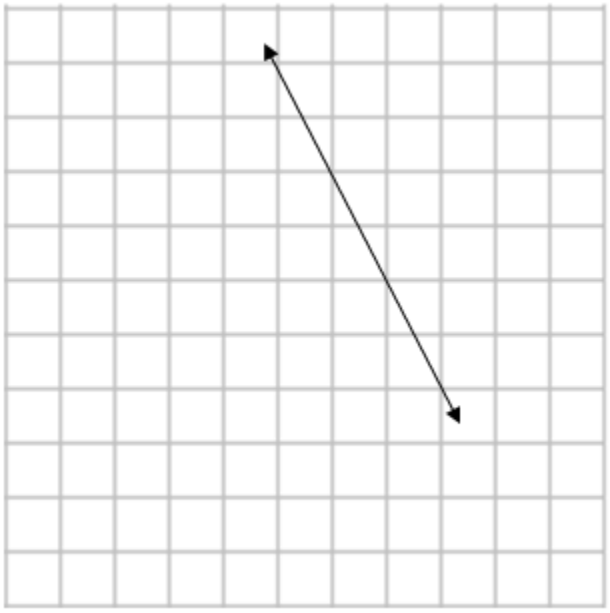
c)

x	y
2	-8
4	-4
6	0

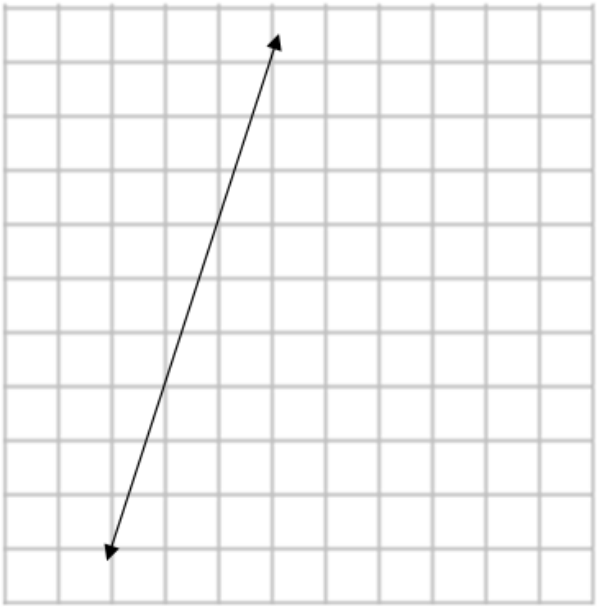
m = _____

Homework: Find the slope of each line.

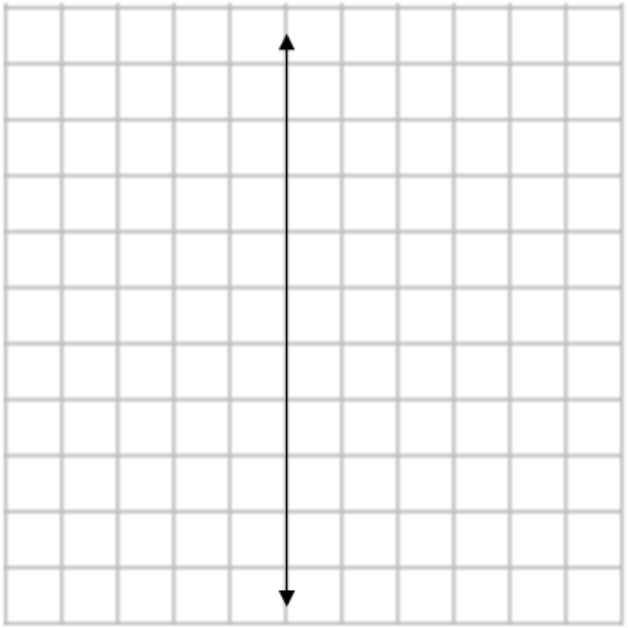
1) m = _____



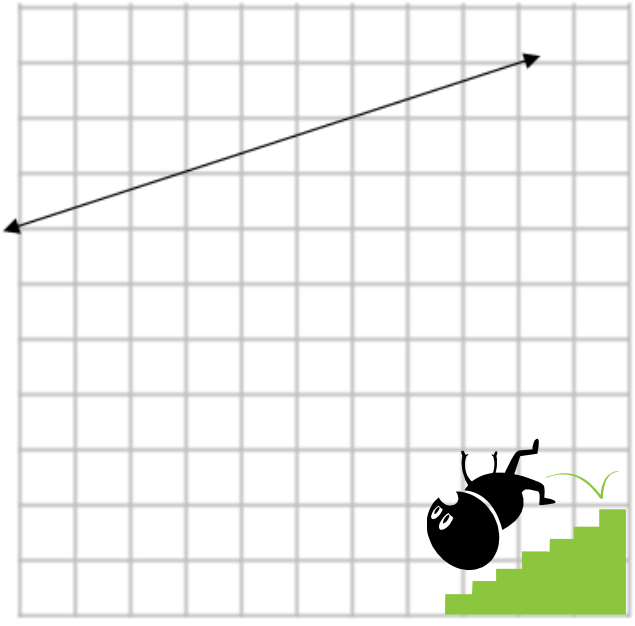
2) m = _____



3) m = _____



4) m = _____



Find the slope between the given points.

5) $(7, -2)\ and\ (9, -1)$ m = _____

6) $(4, 2)\ and\ (-2, 4)$ m = _____

7) $(-1, 10) and\ (-4, 8)$ m = _____

8) $(-1, 8) and\ (-7, 2)$ m = _____

9) $(-9, 4) and\ (-9, 1)$ m = _____

10) $(3, 3) and\ (-6, 6)$ m = _____

Find the slope contained in the following T-tables.

11) m = _____

x	y
-2	-6
0	-3
2	0

12) m = _____

x	y
0	4
4	-4
8	-12

13) m = _____

x	y
0	1
4	2
8	3

14) m = _____

x	y
-6	6
0	-4
6	-14

Ordered Pair and Linear Equations

An ordered pair is just a short way to state the x and y values. Remember, the first value is always equal to x and the second is equal to y.

(x, y)

If an ordered pair is on a line, the x and y values will make a true solution to the equation.

Examples: 1) Is the ordered pair $(5, 8)$ a solution to: $3x - 2y = 1$?

2) Is the ordered pair $(-2, 6)$ a solution to: $-5x - y = 4$?

Homework:

Show all work .

1) Is the ordered pair $(3, -4)$ a solution to: $5x - 2y = 17$?

2) Is the ordered pair $(-2, 8)$ a solution to: $y - 9 = 3x$?

3) Is the ordered pair $(-1, 3)$ a solution to: $-3x + 4y = 15$?

4) Is the ordered pair $(1, -2)$ a solution to: $-5x - 3y = 1$?

5) Is the ordered pair $(-2, 7)$ a solution to: $2y + 6x = 2$?

6) Is the ordered pair $(4, 6)$ a solution to: $2y - 3x = -10$?

7) Is the ordered pair $(9, -3)$ a solution to: $4y - 3x = 45$?

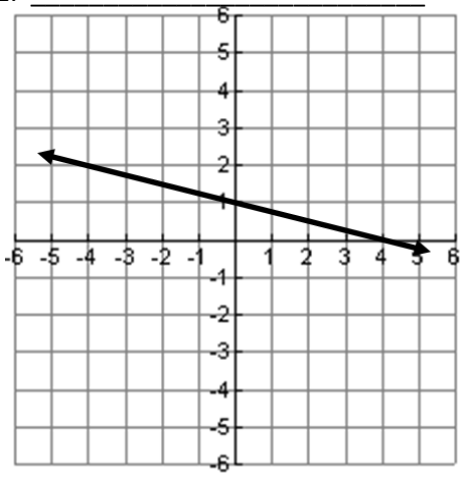
8) Is the ordered pair $(-7, 2)$ a solution to: $19 + 2x = 2y$?

Practice Writing Rules (Equations)

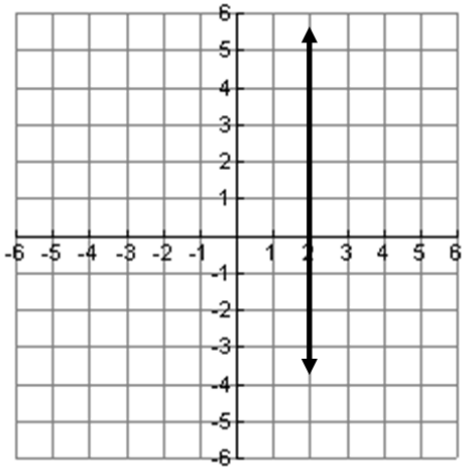
Write a rule (equation) for each.

Find m and b. Use $y = mx + b$.

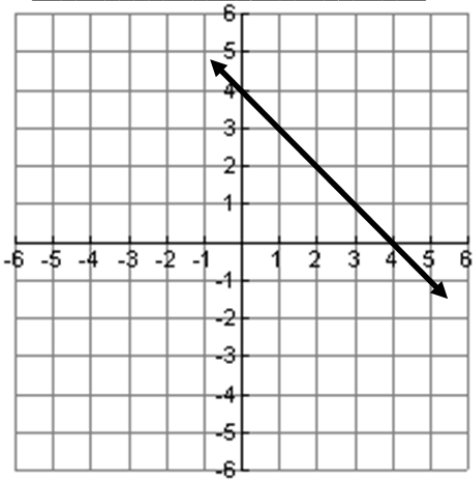
1. _____



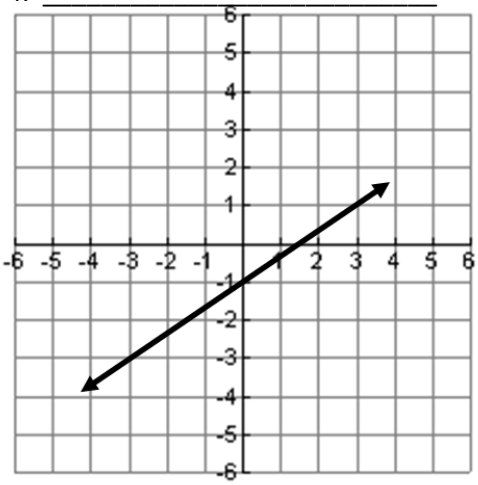
2. _____



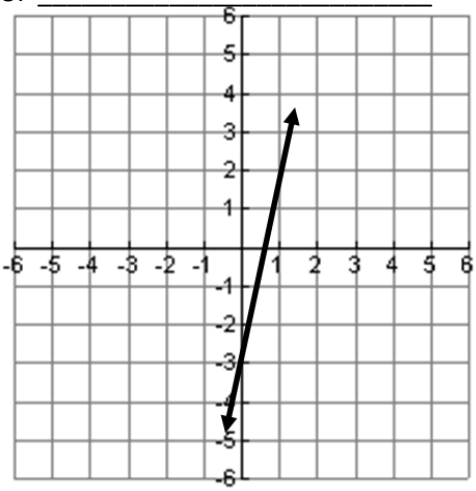
3. _____



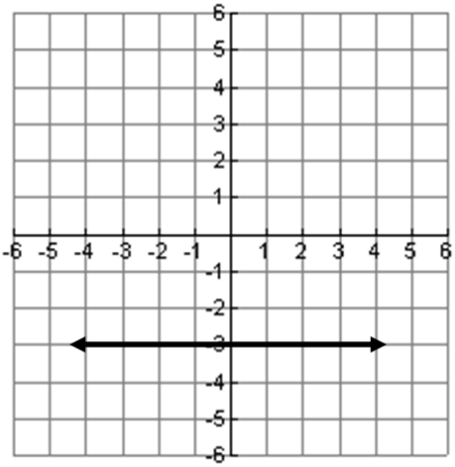
4. _____



5. _____



6. _____



7. _____

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

8. _____

x	y
-3	8
-2	2
-1	-4
0	-10

9. _____

x	y
4	-2
6	-5
8	-8
10	-11

10. _____

x	0	6	12	18
y	-6	3	12	21

11. _____

x	1	2	3	4
y	4	2	0	-2

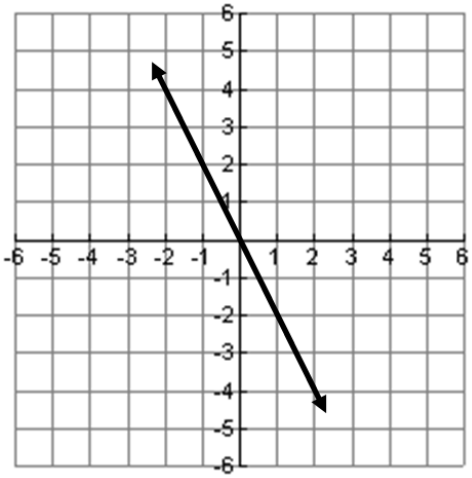
12. _____

x	2	4	6	8
y	-9	-4	1	6

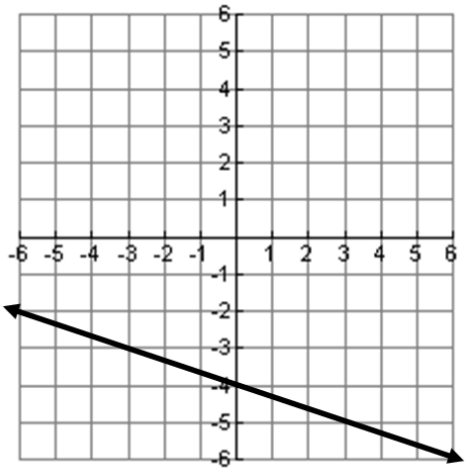
More Practice Writing Linear Equations

Write a rule (equation) for each.

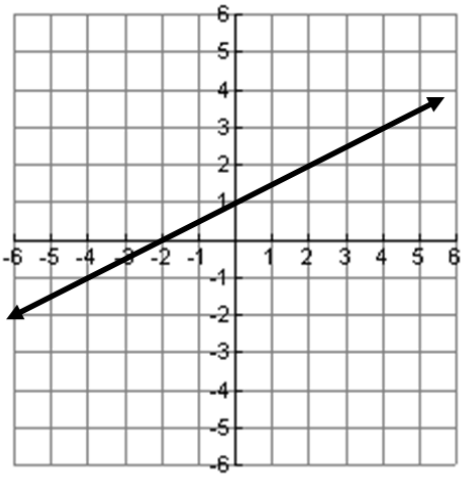
1. _____



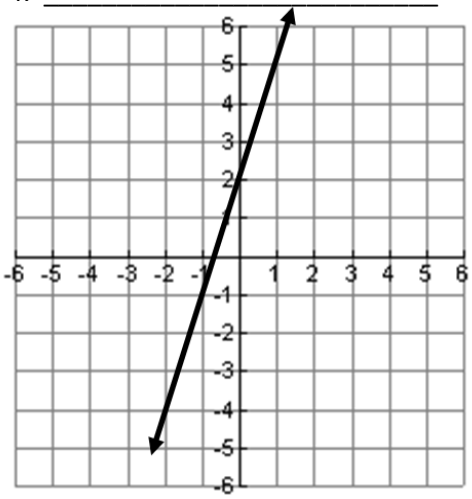
2. _____



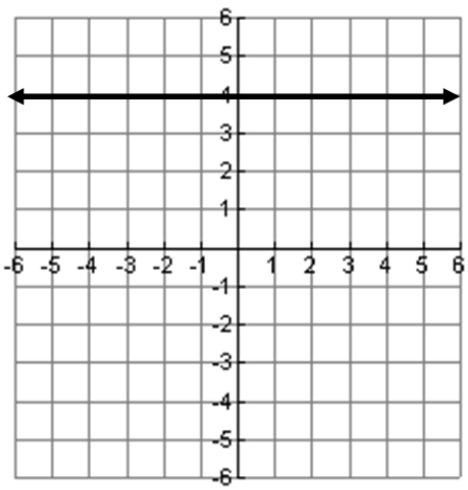
3. _____



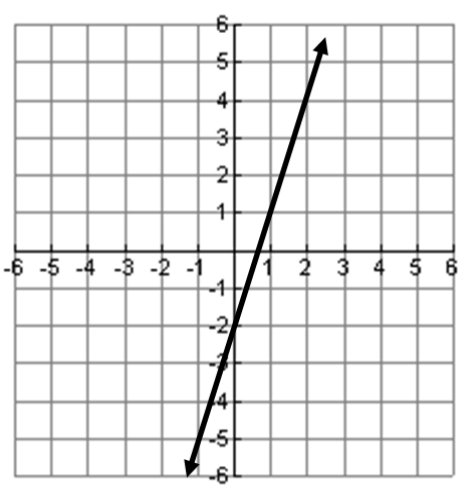
4. _____



5. _____



6. _____



7. _____

x	y
-1	-2
0	3
1	8
2	13

8. _____

x	y
2	5
3	3
4	1
5	-1

9. _____

x	y
-2	7
-1	1
0	-5
1	-11

10. _____

x	4	6	8	10
y	3	0	-3	-6

11. _____

x	0	4	8	12
y	0	-6	-12	-18

12. _____

x	-8	-6	-4	-2
y	3	2	1	0

13. _____

x	-1	0	1	2
y	4	-4	-12	-20

14. _____

x	2	4	6	8
y	-4	-2	0	2

15. _____

x	-4	-3	-2	-1
y	1	4	7	10