Direct Variation & Functions
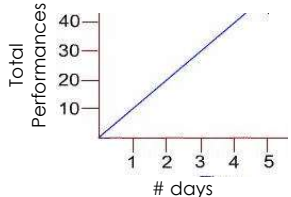
A direct variation equation is used to relate two quantities using a constant of variation.

What?	Meaning	Example
The situation	You have a problem or situation that describes a constant relationship. There is a constant, **k**, that will stay the same.	Bozo performs in 10 circus acts per day. (10 is the constant, **k**, because it stays the same.
The rule	Direct variation can be written as an equation, **y=kx**, where **k** represents the constant.	y=10x x represents the number of days Bozo performs. y represents the # of total circus acts performed.
Table of Ordered Pairs	For every input, **x**, there is one output, **y**. Each (**x,y**) pair gives you an ordered pair that you can graph on a coordinate plane. FYI: The **x** value is the independent variable and the **y** value is the dependent variable. (The **y** value is "*dependent*" on whatever the **x** value is.)	Plug in input values for **x** and get **y** values. In **0** days, Bozo performs **0** acts. In **1** day, Bozo performs **10** acts. In **2** days, Bozo performs **20** acts and so on… You can write this information in a table: <table><tr><td>x</td><td>y</td></tr><tr><td>0</td><td>0</td></tr><tr><td>1</td><td>10</td></tr><tr><td>2</td><td>20</td></tr><tr><td>3</td><td>30</td></tr></table> Each set is an ordered pair to be graphed. Pairs can be written as (0,0), (1,10) etc.
Graph	The ordered pairs can be graphed because **x** and **y** vary proportionally, they will always: 1) Start at (0,0) 2) Form a straight line	**Bozo's Performances**

A table is useful for changing cups to ounces.

Cups	Ounces
1	8
2	16
3	24
4	32
5	40

1) How many ounces are in 1 cup? _____

2) How many ounces are in 3 cups? _____

3) If "6 cups" were added to the table, how many ounces would be listed? _____

An equation shows the relationship between cups and ounces.

$$\text{ounces} = 8 \cdot \text{cups}$$

$$y = 8x$$

You can also write this information in an input/output table.

Input →	**x**	1	2	3	4	5
Output →	**y**	8	16	24	32	40

For every value of **x**, there is one value of **y**. This relationship is called a **function**.

4) Which variable stands for the output value? _____

5) Which variable stands for the input value? _____

6) What is the output value for **x** = 2? _____

Practice with Functions and Tables

Just the Basics ~

Direct variation is the relation between 2 quantities that are proportional (they have the same unit rate).

k represents the "constant of proportionality," or unit rate. As x and y values change, this stays the same.

When one variable increases, the other variable **increases**.

If your y values are smaller than your x values, this means that k must be a **fraction** or a **decimal**.

Using the given rules, find the missing **x** and **y** values.

1) **y = 9x**

x	0	2	3	5	8
y					

2) **y = 12x**

x	1		6		12
y		48		120	

3) **y = 1.25x**

x	0	2	4	6	8
y					

4) **y = $\frac{2}{5}$ x**

x	0	4	9		20
y				4	

Using the given values, determine the equations in terms of *y=kx*

5) Rule: _____

x	0	1	2	3	4
y	0	5	10	15	20

How do you know this rule works?

_____

_____

6) Rule: _____

x	1		6		12
y		48		120	

How do you know this rule works?

_____

_____

Direct Variation Problem Solving

1) Vanessa is purchasing tickets to a Bebe Rexha concert. Tickets cost $35 apiece.

   What is the constant of variation, **k**? _____

   x, the input/ind. variable represents: _____

   y, the output/dep. variable represents: _____

   What direct variation equation represents this situation?

   _____

   Complete the chart below using your equation.

x	0	2	3	4	6
y					

2) TJ is saving up for a new Fortnite skin. He earns $7.50 for each chore he does.

   What is the constant of variation, **k**? _____

   x, the input/ind. variable represents: _____

   y, the output/dep. variable represents: _____

   What direct variation equation represents this situation?

   _____

   Complete the chart below using your equation.

x	0	2	10	15	50
y					

3) There are 37 boys in the drama club. They want to buy new props, so they are all going to pitch in some money. They all want to pitch in the same amount.

What is the constant of variation, **k**? _____

x, the input/ind. variable represents: _____

y, the output/dep. variable represents: _____

What direct variation equation represents this situation?

_____

Complete the chart below using your equation.

x	0	2	3	5	10
y					

4) The students in math class earn one Jolly Rancher for every 3 homework assignments that they complete.

What is the constant of variation, **k**? _____

x, the input/ind. variable represents: _____

y, the output/dep. variable represents: _____

What direct variation equation represents this situation?

_____

Complete the chart below using your equation.

x	0	3	9	18	27
y					

5) The direct variation ALWAYS uses the formula **y = kx**

Therefore, when x = 0, y always equals _____.

Graphing Direct Variation

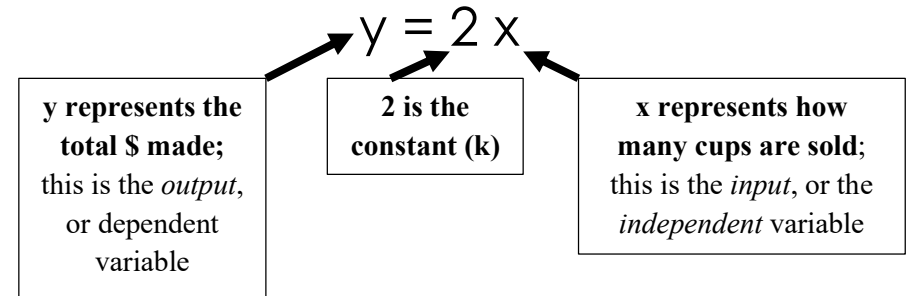In direct variation, your (x,y) data creates ordered pairs that can be graphed.
A direct variation graph will **ALWAYS** begin at the point (**0,0**).
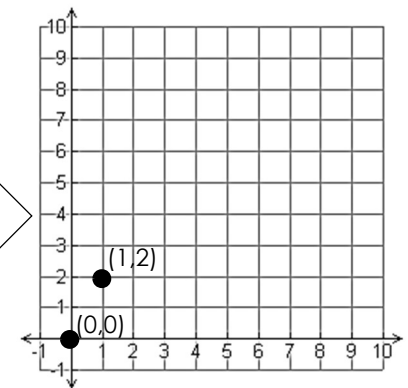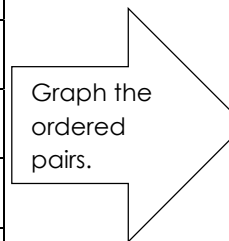A direct variation graph will **ALWAYS** be a **straight line**.

Example:
Anthony is selling lemonade for $2 per cup. Write an equa

$$y = 2x$$

y represents the total $ made; this is the *output*, or dependent variable	**2 is the constant (k)**	**x represents how many cups are sold**; this is the *input*, or the *independent* variable

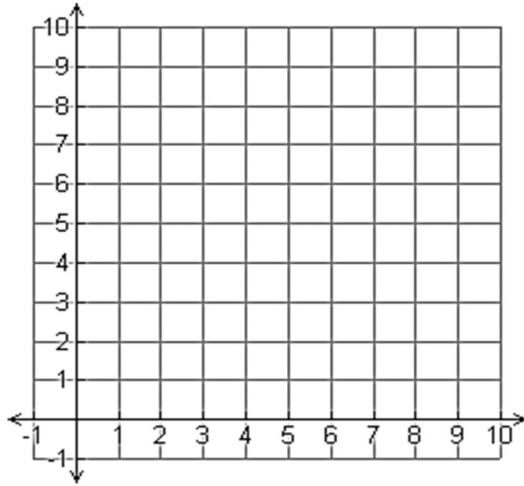| x (cups sold)	y ($)
0	0
1	2
2	
4	

Graph the ordered pairs.

(1,2)
(0,0)

You Try:

Use the direct variation equation to complete the table and then graph the ordered pairs.

1) $y = 3x$

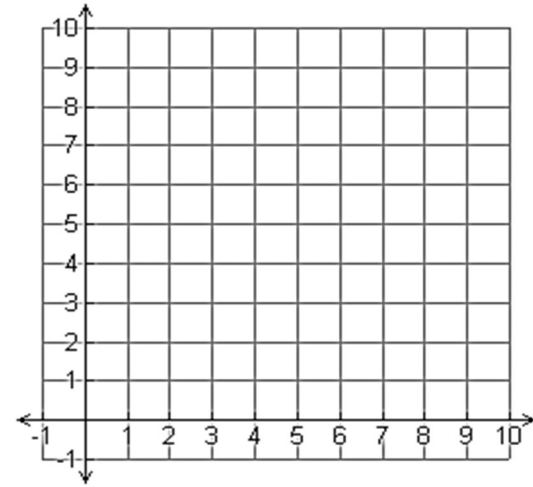| x	0	1	2	3
y				

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

x			2	6	8	
y	0					5
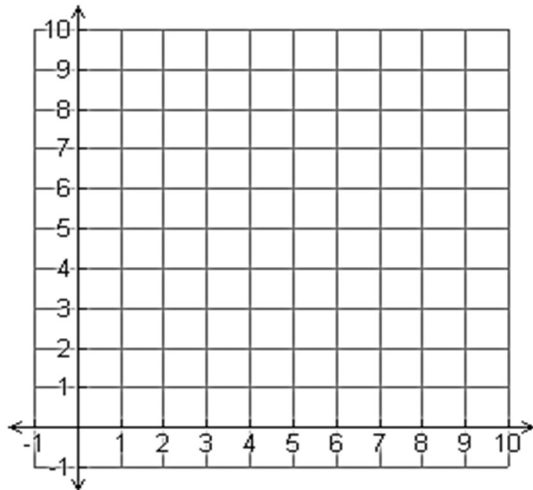
3) $y = 0.8x$

x	0	1	4		
y				4.8	8

4) $y = 2x$

x	0	2	3	4	
y					10
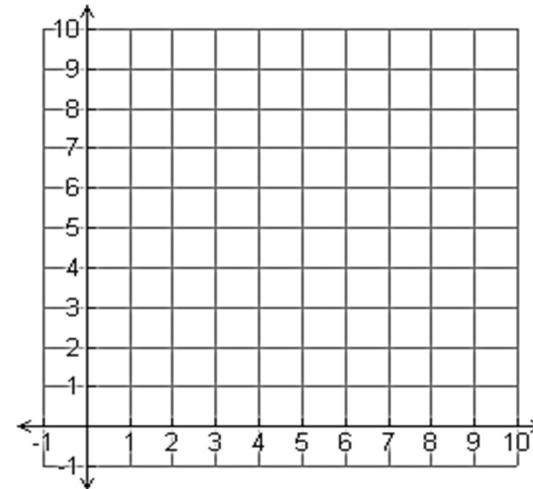
Direct Variation in the REAL World

An iPod Nano can hold up to 16 gigabytes (GB) of data.

1) How many gigabytes can be stored on 0 Nanos? _____

How many on 1 Nano? _____

How many on 5 Nano? _____

How many on 12 Nano? _____

2) If you have enough iPod Nanos to hold 80 GB, how many iPod Nanos do you have? _____

3) Complete the chart:

x (# of iPods)	0	2			25
y (total GB)			64	160	

4) What is the direct variation equation (in terms of y=kx): _____

5) Based on this problem, answer the following:

a) In words, what does the input (x) represent? _____

b) In words, what does the output (y) represent? _____

c) In words, what does the constant (k) represent? _____

6) As the number of iPods increases, the total number of GB _____

7) Look at the values in the table above. Write each set of (x,y) values as an ordered pair

_____ _____ _____ _____ _____

8) Graph the ordered pairs:
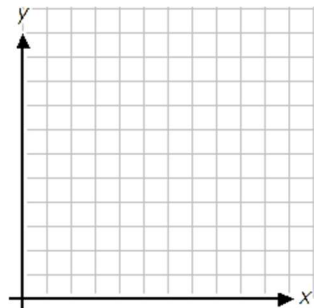
Math 6 – Unit 4: One-Step Equations and Inequalities Review #2

Knowledge and Understanding

1) When solving equations, why is it important to substitute your solution into the equation at the end. _____

_____

2) What is the difference between an open circle and a closed circle in an inequality? _____

_____

_____

Proficiency of Skills

Solve each equation. Remember to show all work!

3) $t - 1 = 11\frac{1}{2}$

4) $\frac{n}{5} = 10$

5) $r + 7 = 49$

Solve and graph the solution to each inequality. Show all work!

6) $k \leq 7$

7) $a > 120$

8) $x \neq 3$