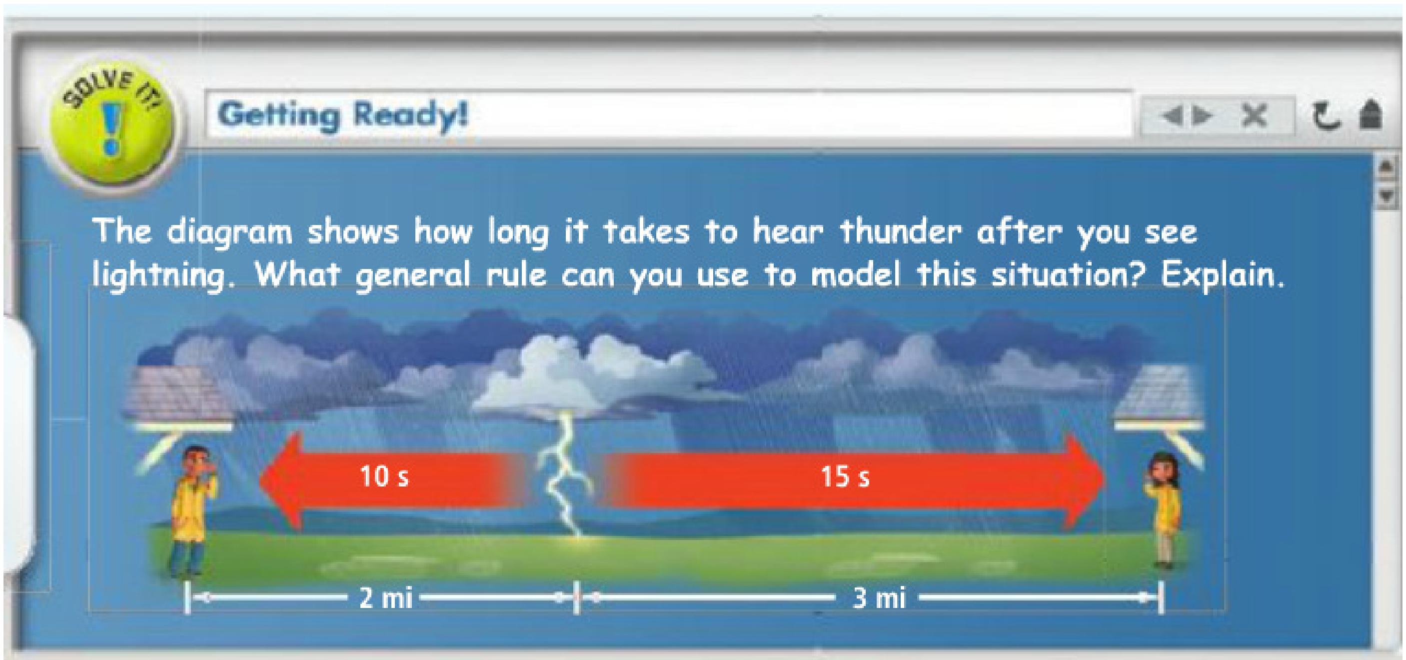
5.2 - Direct Variation

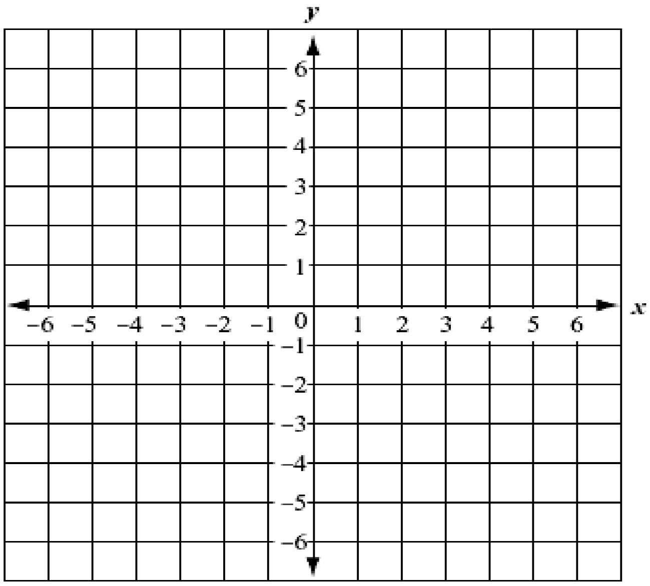


HOT COCOA FOR SALE

Two sisters, Maia and Tess, open up a hot cocoa stand. They decide to sell their drinks for $0.50 per cup. Help them make a chart to indicate how much money they will make if they sell a certain number of drinks.

Cups sold (x)	0	1	2	3	4	5	6	7
Earnings (y)								

Now let's graph this Hot Cocoa data on the coordinate plane below:



The equation for this line is:

_______________.

The earnings depend *directly* on the number of cups sold.

SO, JUST WHAT IS DIRECT VARIATION?

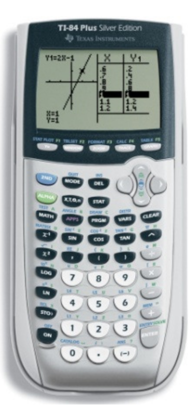
A **direct variation** is described by an equation of the form _______________

where k ≠ 0. We say that *y varies directly with x*, or *x varies directly with y*.

In the equation *y* = *kx*, the variable *k* is the ______________________________.

The *slope* of the line in our hot cocoa example above is ______.

For direct variation, the slope is always $\frac{y}{x}$.

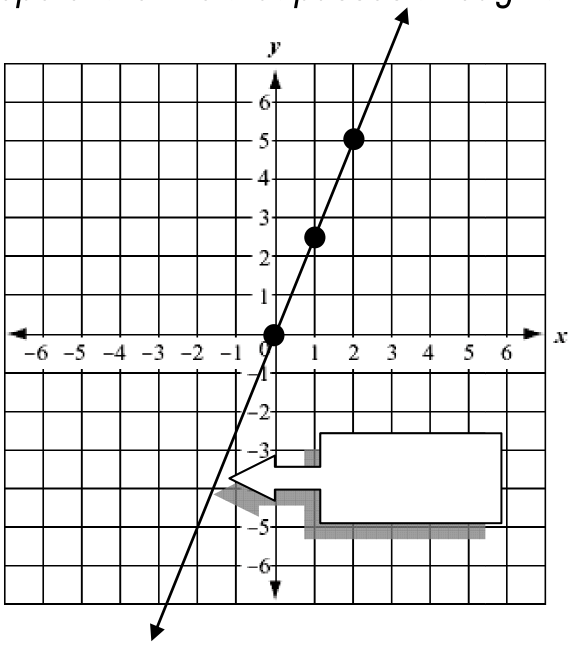


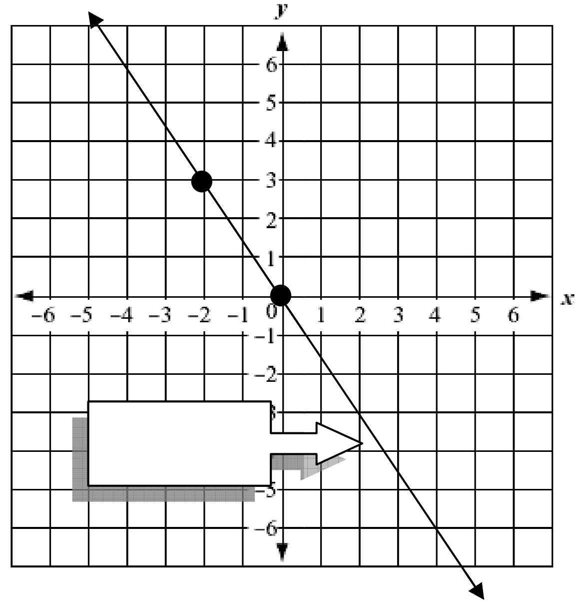
Graph It! Let's use our graphing calculator to see what happens when we change the price of our hot cocoa…

Cost	Equation	Cost	Equation
$0.25 per cup	y =	$1.50 per cup	y =
$0.75 per cup	y =	$2 per cup	y =
$1.00 per cup	y =	- $1.00 per cup!	y =

SLOPE AND CONSTANT VARIATION

For these two graphs, *name the constant of variation for each equation. Then find the slope of the line that passes through the points.*





Slope:

Constant of variation:

Equation:

Slope:

Constant of variation:

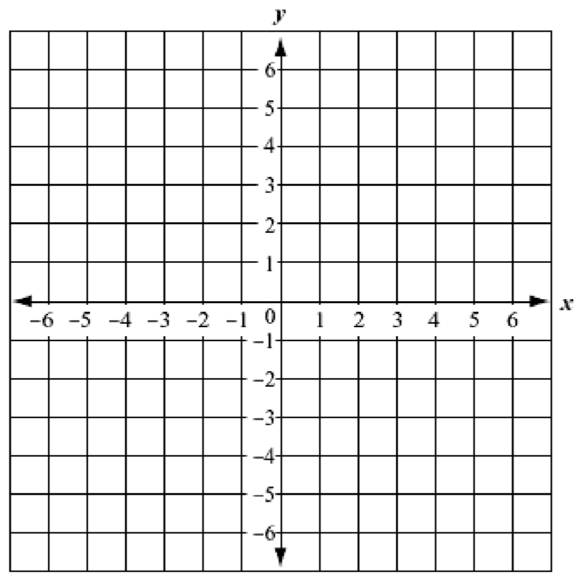
Equation:

FAMILIES OF LINES

On your graphing calculator, graph these three equations:

$y = 1x$ $\qquad$ $y = 2x$ $\qquad$ $y = 4x$

Draw the graph of these equations on the grid to the right and properly label each line.



Now, write an equation whose graph lies *between* the graph for $y = 1x$ and $y = 2x$.

Possible answers: ______________________

Finally, write an equation whose graph points downward, crossing from the 2nd quadrant to the 4th quadrant.

Possible answers: ________________________

What do all of these graphs have in common?

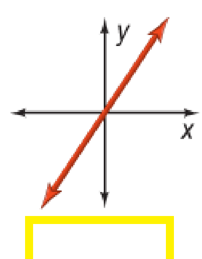
How do they differ?

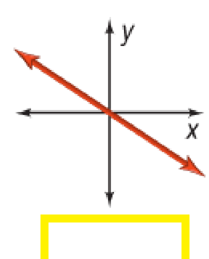
take note

Concept Summary Graphs of Direct Variations

The graph of a direct variation equation $y = kx$ is a line with the following properties.

- The line passes through (0, 0).
- The slope of the line is k.





Writing and Solving a Direct Variation Equation

Example 1: Does y vary directly with x in each of these tables?

A

x	y
4	6
8	12
10	15

B

x	y
−2	3.2
1	2.4
4	1.6

What is the *direct variation equation* that relates x and y for table A?

A. $y = \_\_ x$

In table A, use the direct variation equation to find y when $x = 20$.

A.

Example 2: Suppose y varies directly with x. Now I tell you that $y = 6$ when $x = 3$.

a. What is the direct variation equation that relates x and y?

b. What is the value of y, if x = 10?

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5-2 HW: Do All Exercises

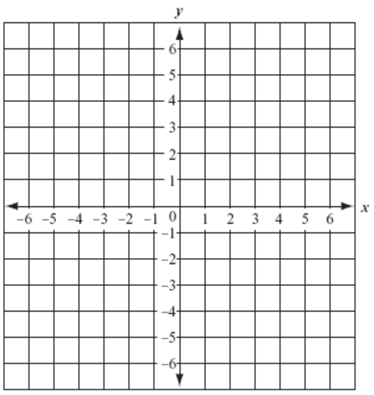
Suppose *y* varies directly with *x*. Write a direct variation equation that relates *x* and *y*. Then find the value of *y* when *x* = 8.

5. $y = 4$ when $x = 8$

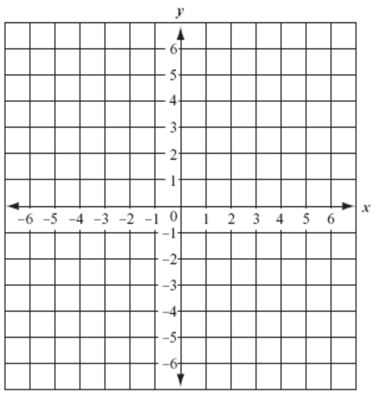
6. $y = 15$ when $x = 5$

Graph each direct variation equation.

9. $y = 3x$



10. $y = –x$



For the data in each table, tell whether *y* varies directly with *x*. If it does, write an equation for the direct variation.

13.

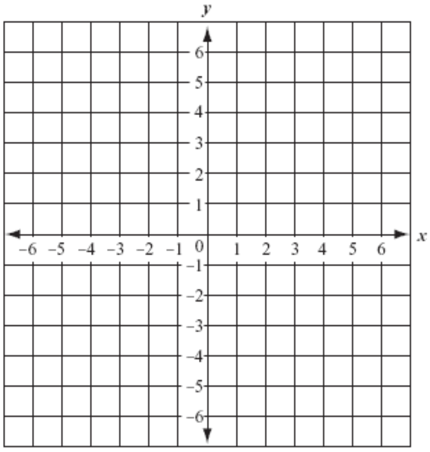
x	y
4	5.4
2	2.7
−2	−2.7

14.

x	y
6	−6.9
10	−11.5
−7	−8.05

Write a direct variation equation that relates *x* and *y*. Then graph the equation.

15. $y = -21$ when $x = 7$



Tell whether the two quantities vary directly. Explain your reasoning.

17. Sara makes $3.50 more per hour than Pasco.
(Make a table to how much Sarah would make if Pasco made $5.00, $6.00, $7.00, $8.00, and $9.00 per hour.)

18. The cafeteria provides three meals per day.
(Make a table to show totals for 1, 2, 3, 4, and 5 days.)

19. Jasmine scores 10 points per game.
(Make a table to show totals for 1, 2, 3, 4, and 5 games.)

20. Reasoning How can you tell, by examining the graph, if a line represents a direct variation?