Name _____ Class _____ Date _____

2-2 Reteaching

Direct Variation

A direct variation is a function of the form,

$$y = kx \text{ or } \frac{y}{x} = k, \text{ where } k \neq 0.$$

Represent the input values as x and represent the output values as y. The ratio of any output-input pair is equal to k, the constant of variation.

Problem

For each function, determine whether y varies directly with x. If so, what is the constant of variation?

Identify direct variation from a table.

a.

x	y
6	9
8	12
10	15

Find $\frac{y}{x}$ for each ordered pair.

$\frac{9}{6} = \frac{3}{2}, \frac{12}{8} = \frac{3}{2}, \frac{15}{10} = \frac{3}{2}$

This is a direct variation. The constant of variation is $\frac{3}{2}$. So, $k = \frac{3}{2}$.

Identify direct variation from an equation

b. $2y = 5x - 3$

Try to put the equation in the form $y = kx$.

$2y = 5x - 3$

$\frac{2y}{2} = \frac{5x}{2} - \frac{3}{2}$ Divide both sides by 2.

$y = \frac{5}{2}x - \frac{3}{2}$ Simplify.

This is not a direct variation because there is a constant left when you try to put it in the form $y = kx$.

Exercises

For each function, determine whether y varies directly with x. If so, find the constant of variation.

1.

x	y
3	6
9	18
12	24

yes; 2

2.

x	y
4	1
6	2
8	3

no

3.

x	y
−2	4
−3	6
−4	8

yes; −2

4. $y = 4x + 1$ no

5. $5y = -4x$ yes; $-\frac{4}{5}$

6. $3y + 4x = 0$ yes; $-\frac{4}{3}$

7. $2y = 4x - 5$ no

8. $3y = 15x$ yes; 5

9. $34y - 17x = 0$ yes; $\frac{1}{2}$

Name _____ Class _____ Date _____

2-2 Reteaching (continued)

Direct Variation

If you know that y varies directly with x and you are given one set of values, you can use the equation for direct variation to find other sets of values.

Problem

What is the missing value in each direct variation?

a. If $y = 5$ when $x = 2$, find y when $x = 7$.

$k = \frac{y}{x} = \frac{5}{2}$ Use $y = 5$, $x = 2$, and $k = \frac{y}{x}$ to find the value of k.

$y = \frac{5}{2}x$ Now use the form $y = kx$ and $k = \frac{5}{2}$ to write the equation of the direct variation.

$y = \frac{5}{2}x = \frac{5}{2}(7) = \frac{35}{2} = 17\frac{1}{2}$ To find the value of y when $x = 7$, replace x with 7 in the direct variation equation and simplify to find y.

b. If $y = 6$ when $x = -3$, find x when $y = -4$.

$k = \frac{y}{x} = \frac{6}{-3} = -2$ Use $y = 6$, $x = -3$, and $k = \frac{y}{x}$ to find the value of k.

$y = -2x$ Now use the form $y = kx$ and $k = -2$ to write the equation of the direct variation.

$-4 = -2x$ To find the value of x when $x = -4$, replace y with -4 in the direct variation equation and solve for x.

$2 = x$

Exercises

Find the missing value for each direct variation.

10. If $y = 8$ when $x = 4$, find y when $x = 6$. 12

11. If $y = 12$ when $x = 3$, find y when $x = 5$. 20

12. If $y = 9$ when $x = 3$, find x when $y = 7$. $\frac{7}{3}$

13. If $y = -6$ when $x = 2$, find x when $y = 9$. -3

14. If $y = \frac{3}{2}$ when $x = \frac{1}{4}$, find y when $x = \frac{2}{3}$. 4

15. If $y = 7$ when $x = 2$, find x when $y = 3$. $\frac{6}{7}$

16. The height of an object varies directly with the length of its shadow. A person 6 ft tall casts an $8\frac{1}{2}$ ft shadow, while a tree casts a 38 ft shadow. How tall is the tree?

$26\frac{14}{17}$ ft