Algebra 1   3.4
Write and graph direct variation equations
Solve direct variation problems

y-intercept

$$y = mx + B$$

slope m

$$y = mx$$

direct variation
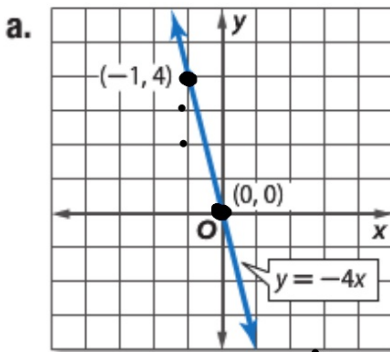constant of variation (proportionality) k
whiteboards

PT

Example 1 Slope and Constant of Variation

Name the constant of variation for each equation. Then find the slope of the line that passes through each pair of points.
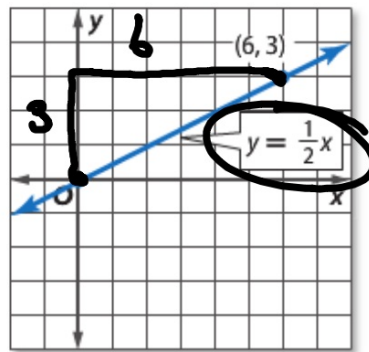
a.

(−1, 4)

(0, 0)

O

$y = -4x$

$$y = \frac{-4x}{1}$$

$$y = -4x + 0$$

$$M = \frac{-4}{1}$$

$$k = COV = -4$$

b.

6

(6, 3)

3

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

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

$$M = \frac{3}{6} = \frac{1}{2}$$
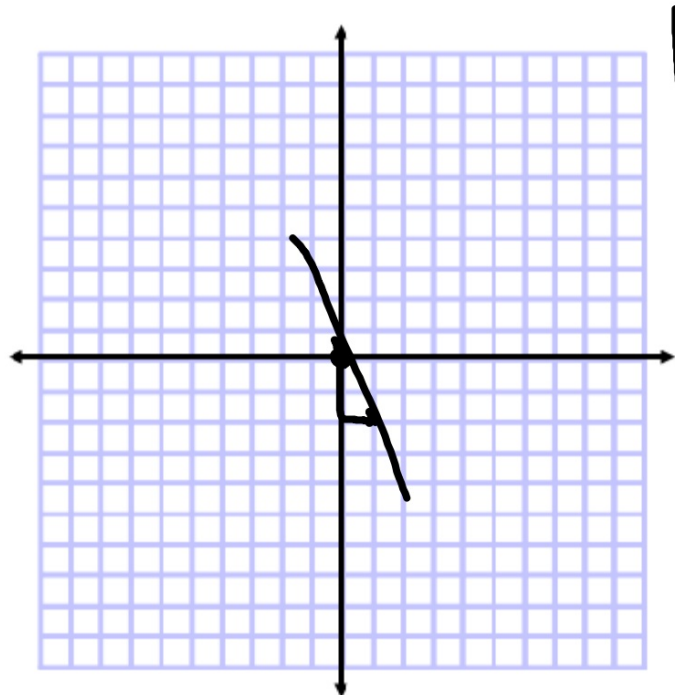
$$C.O.V. = \frac{1}{2}$$

GuidedPractice $C.O.V = \frac{1}{4}$

1A. Name the constant of variation for $y = \frac{1}{4}x$. Then find the slope of the line that passes through $(0, 0)$ and $(4, 1)$, two points on the line. $m = \frac{1}{4}$

1B. Name the constant of variation for $y = -2x$. Then find the slope of the line that passes through $(0, 0)$ and $(1, -2)$, two points on the line.
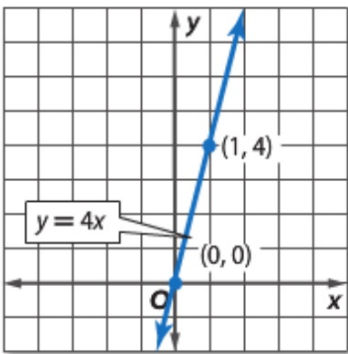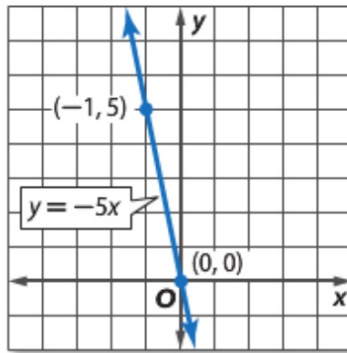
$C.O.V. = -2$

$m = \frac{-2}{1}$

$\frac{2}{3}$

Name the constant of variation for each equation. Then find the slope of the line that passes through each pair of points.

10.

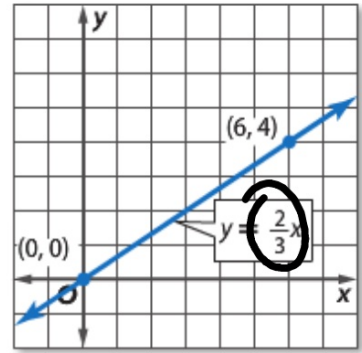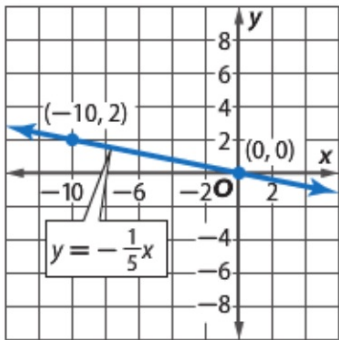$y = 4x$

$(1, 4)$

$(0, 0)$

$COV = 4$

$m = \frac{4}{1}$

11

$(-1, 5)$

$y = -5x$

$(0, 0)$

$COV = -5$

$m = -\frac{5}{1}$

12.

$(6, 4)$

$y = \frac{2}{3}x$

$(0, 0)$

$COV = \frac{2}{3}$

$m = \frac{2}{3}$

13.

Graph with line passing through $(-10, 2)$ and $(0, 0)$, labeled $y = -\frac{1}{5}x$

14.

Graph with line passing through $(0, 0)$ and $(-6, -8)$, labeled $y = \frac{4}{3}x$

15.

Graph with line passing through $(0, 0)$ and $(1, -12)$, labeled $y = -12x$
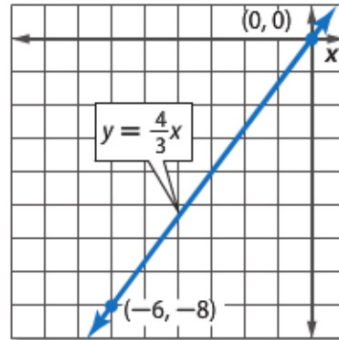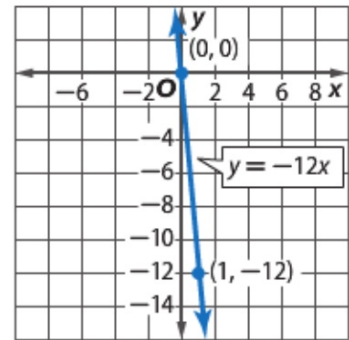
Example 2 Graph a Direct Variation

Graph $y = -6x.$ $\dfrac{-6}{1} + \overline{\bigcirc}$
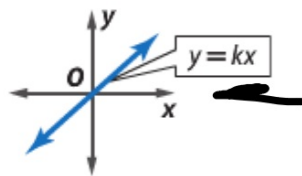
$y = -6x$
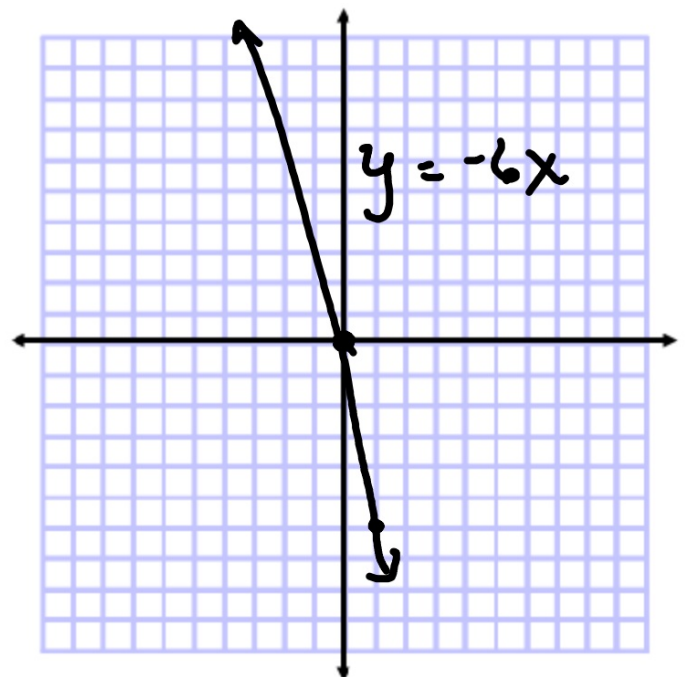
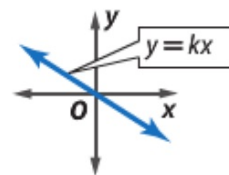## ConceptSummary Direct Variation Graphs

- Direct variation equations are of the form $y = kx$, where $k \neq 0$.

- The graph of $y = kx$ always passes through the origin.

- The slope is positive if $k > 0$.

$y = kx$

- The slope is negative if $k < 0$.

$y = kx$

whiteboards

2A. $y = \frac{6x}{1} + 0$ **2B.** $y = \frac{2}{3}x + 0$

2C. $y = -5x$ **2D.** $y = -\dfrac{3}{4}x$

Example 3 Write and Solve a Direct Variation Equation

1. find the constant
2. write the equation
3. answer the question

Suppose y varies directly as x, and $y = 72$ when $x = 8$.

a. Write a direct variation equation that relates x and y.

$$y = K \cdot x$$

$$\frac{72}{8} = \frac{K \cdot 8}{8}$$

$$(8, 72)$$

$$K = 9$$

$$y = 9x$$

b. Use the direct variation equation to find x when $y = 63$.

$$y = 9x$$

$$\frac{63}{9} = \frac{9x}{9}$$

$$x = 7$$

3. Suppose y varies directly as x, and $y = 98$ when $x = 14$. Write a direct variation equation that relates x and y. Then find y when $x = -4$.

$$y = kx \qquad (14, 98)$$

$$\frac{98}{14} = \frac{k \cdot 14}{14}$$

$$7 = k$$

$$y = 7x$$

$$y = 7 \cdot -4$$

$$y = -28$$

Suppose y varies directly as x. Write a direct variation equation that relates x and y. Then solve.

30. If $y = 3.2$ when $x = 1.6$, find y when $x = 19$.

$$y = KX$$

$$\boxed{y = 2x}$$

$$\frac{3.2}{1.6} = \frac{K \cdot 1.6}{1.6}$$

$$xy = 2 \cdot 19$$

$$K = 2$$

$$y = 38$$

31. If $y = 15$ when $x = \dfrac{3}{4}$, find x when $y = 25$.

32. If $y = 4.5$ when $x = 2.5$, find y when $x = 12$.

There are other kinds of variation:
- inverse
- joint
- (not today)