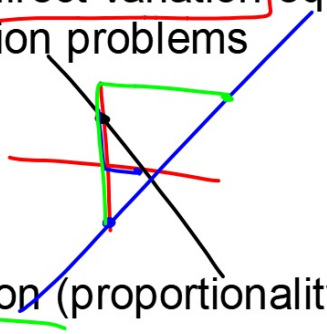
Algebra 1 3.4

Write and graph direct variation equations

Solve direct variation problems



y-intercept

slope m $\frac{\text{rise}}{\text{run}}$

direct variation

constant of variation (proportionality) k

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COV comes from equation k

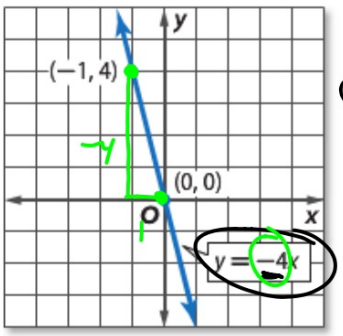
Slope from ordered pairs m

$y = k \cdot x$

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.

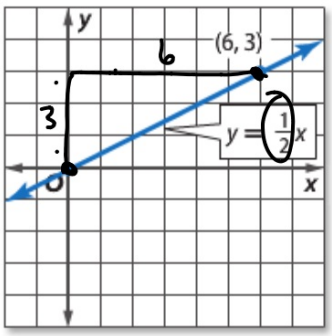
a.



C.O.V. $= -4$

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

b.



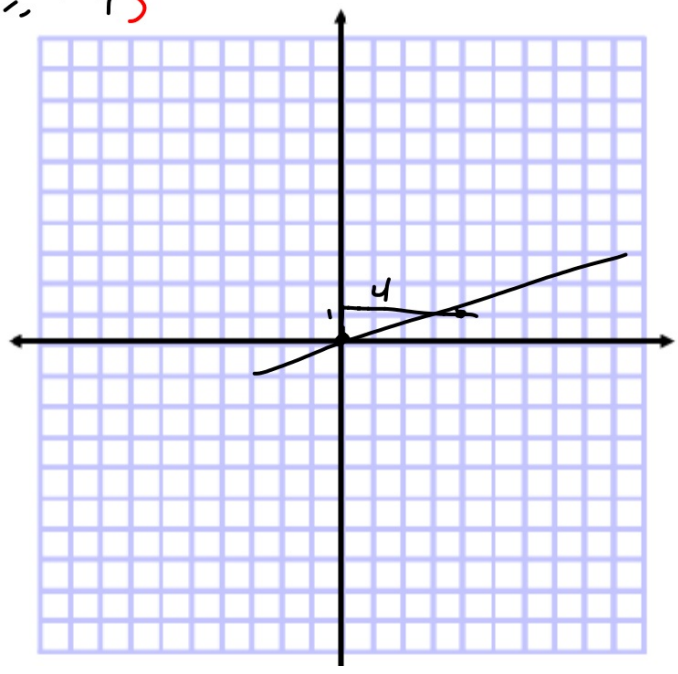
C.O.V. $= \frac{1}{2}$

$m = \frac{3}{6} = \frac{1}{2}$

GuidedPractice

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.

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.



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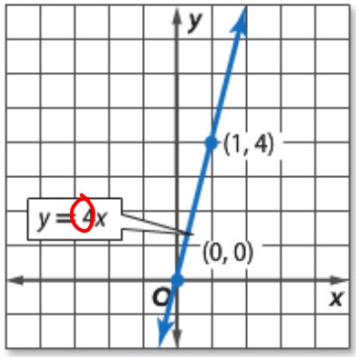
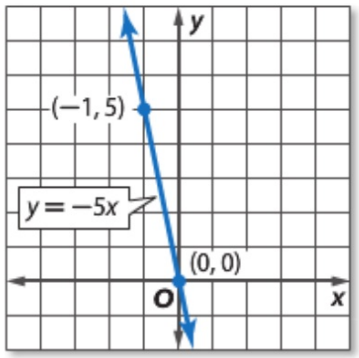
Name the constant of variation for each equation. Then find the slope of the line that passes through each pair of points.

10.



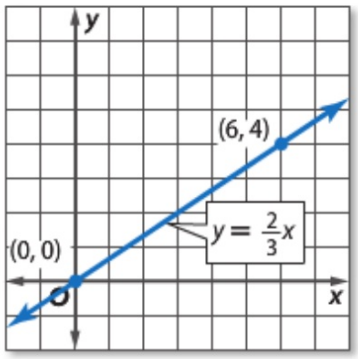
COV = 4
$m = \frac{4}{1}$

11



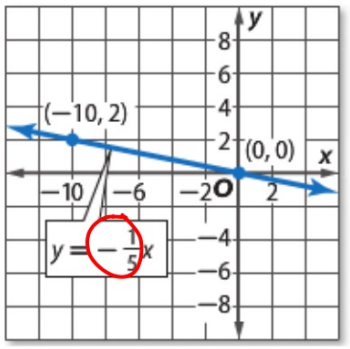
COV = −5
$m = \frac{-5}{1}$

12.



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

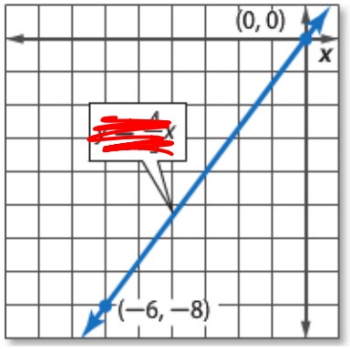
13.



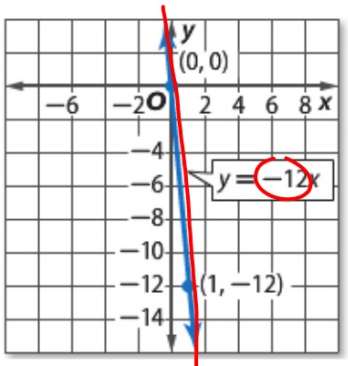
COV = $-\frac{1}{5}$

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

14.



15.



COV = −12

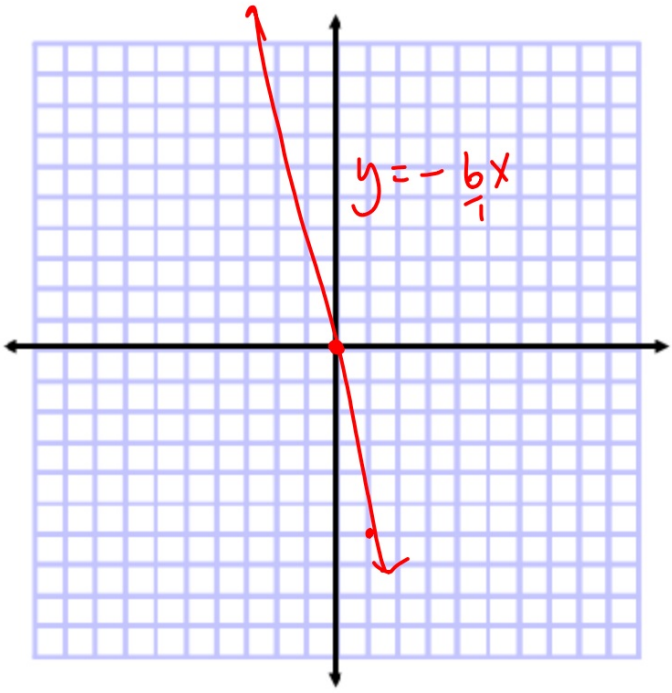
$m = \frac{-12}{1}$

$y = k \cdot x$

Example 2 Graph a Direct Variation

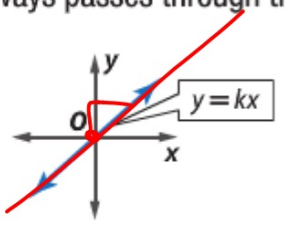
Graph $y = -6x$.

$(0, 0)$

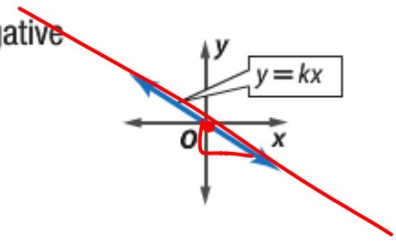


ConceptSummary Direct Variation Graphs

- 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 $k > 0$.



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



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2A. $y = 6x$

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

2C. $y = -5x$

2D. $y = -\frac{3}{4}x$

$\frac{-3}{-4} = \frac{3}{4}$

Example 3 Write and Solve a Direct Variation Equation

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

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

$y = kx$ $(8, 72)$

$\frac{72}{8} = \frac{k \cdot 8}{8}$ $y = 9x$

$9 = k$

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

?

$y = 9x$

$\frac{63}{9} = \frac{9 \cdot x}{9}$ $x = 7$

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

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 $x = -4$.

$(14, 98)$? x

$y = kx$

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

$7 = k$

$y = 7x$

$y = 7 \cdot -4$

$y = -28$

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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 $x = 19$.

(1.6, 3.2)

$y = kx$

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

$2 = k$

$y = 2x$

$y = 2 \cdot 19$

$y = 38$

31. If $y = 15$ when $x = \frac{3}{4}$, 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
- combined