Contents

Chapter 1

1.2 Determining the Slope of a Line

Key Ideas

The slope is the measure of the steepness of a line. It is the ratio of the vertical distance (also called the rise) and the horizontal distance (also called the run) between two points on the line. The vertical distance is the difference of the two points' *y*-values and the horizontal distance is the difference of their *x*-values. The slope of a line is commonly denoted by m.
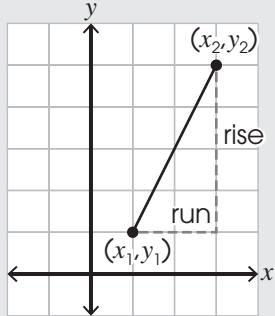

Slope of a Line

$$m = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$$

Examples

Find the slopes of the lines.
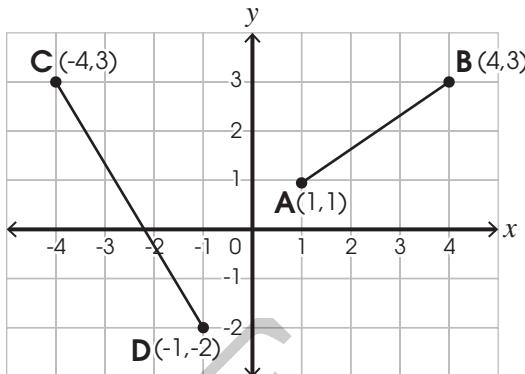
- Slope of line segment AB:

$$m = \frac{3 - 1}{4 - 1}$$ ← $y_2 - y_1$ (difference in *y*-values)
← $x_2 - x_1$ (difference in *x*-values)

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

- Slope of line segment CD:

$$m = \frac{(-2) - 3}{(-1) - (-4)} = -\frac{5}{3}$$

Find the slopes of the line segments.

Try these!

① Line AB

$$m = \frac{7 - \boxed{}}{1 - \boxed{}}$$ ← $y_2 - y_1$
← $x_2 - x_1$

$$= \frac{\boxed{}}{\boxed{}}$$

② Line CD

$$m = \frac{4 - \boxed{}}{7 - \boxed{}}$$

$$= -\frac{\boxed{}}{\boxed{}}$$

③ Line EF

$$m = \frac{3 - \boxed{}}{\boxed{} - \boxed{}}$$

$$= \frac{\boxed{}}{\boxed{}}$$

④ Line GH

$$m = \frac{0 - \boxed{}}{\boxed{} - \boxed{}}$$

$$= -\frac{\boxed{}}{\boxed{}}$$

Find the slopes of the line segments with the given points on the grid.

⑤

Hint

To find the slope, it does not matter which is the first point and which is the second point, but they must be in the same order in both the numerator and denominator.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{y_1 - y_2}{x_1 - x_2}$$ same order ✓

$$m = \frac{y_2 - y_1}{x_1 - x_2}$$ different order ✗
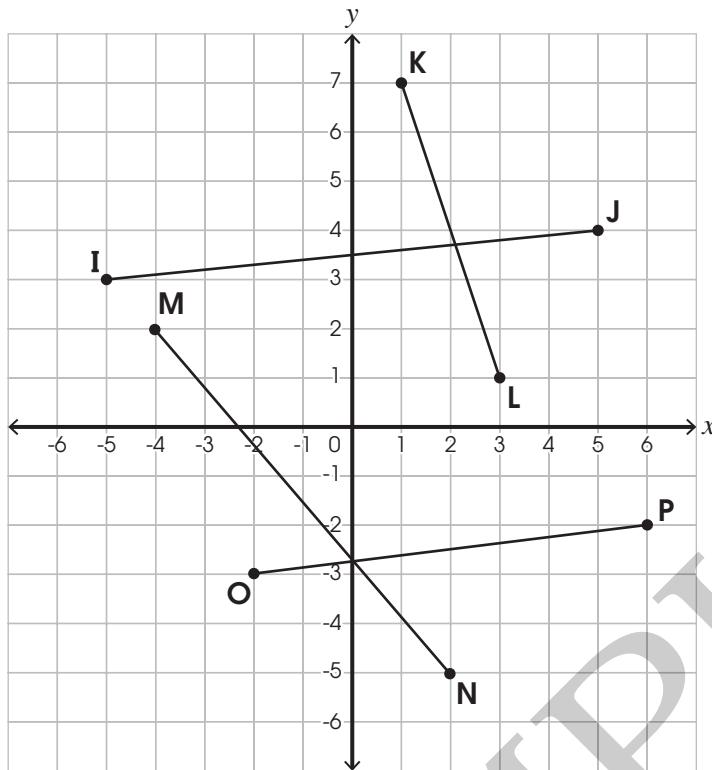
a. Line IJ   b. Line KL   c. Line MN   d. Line OP

$$m = \frac{\boxed{} - \boxed{}}{\boxed{} - \boxed{}}$$

$$= \frac{}{}$$

Find the slopes of the line segments with the given points. Show your work.

⑥ (2,0) (4,9)

⑦ (-1,3) (4,5)

⑧ (6,-3) (4,-1)

⑨ (-2,-4) (3,-1)

⑩ (4,1) (5,-6)

⑪ (0,-3) (-2,2)

Forms of Linear Equations

2.1 Slope-intercept Form: $y = mx + b$ (1)

Key Ideas

An equation of a line relates the x-coordinate and y-coordinate of any point that lies on the line. A linear equation is an equation of a straight line. It can be written in the slope-intercept form: $y = mx + b$, where m is the slope and b is the y-intercept of the line.

slope y-intercept

$$y = \boxed{m}x + \boxed{b}$$

coordinates of any point on the line
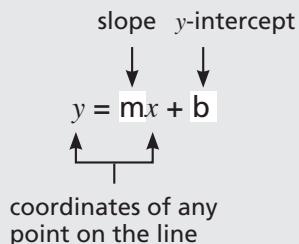
Examples

$$y = 2x + 1$$

m = 2 y-intercept = 1

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

m = $-\frac{2}{3}$ y-intercept = -3

$y = 2x + 1$

$m = \dfrac{\text{rise}}{\text{run}} = \dfrac{2}{1}$

y-intercept: 1

y-intercept: -3

$m = -\dfrac{2}{3}$
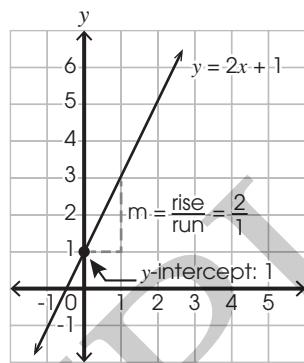
$y = -\dfrac{2}{3}x - 3$
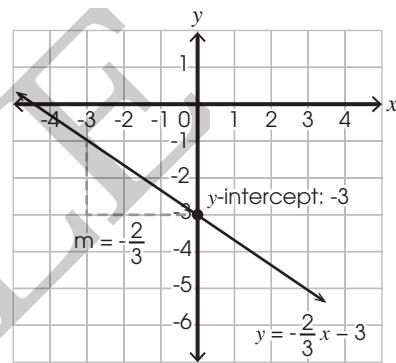
For each linear equation in the slope-intercept form, identify its slope and y-intercept. Then match it with its graph.

**Try these!**

① $y = 2x + 3$

   m = ☐ y-intercept = ☐
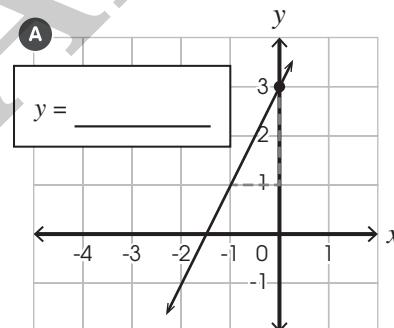
② $y = \dfrac{1}{2}x + 2$

   m = ☐ y-intercept = ☐
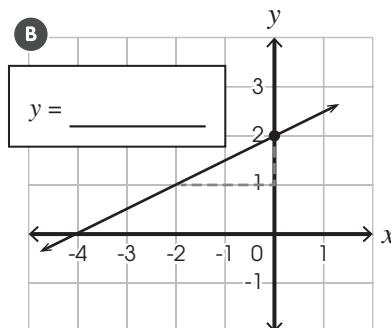
③ $y = -3x - 1$

   m = ☐ y-intercept = ☐
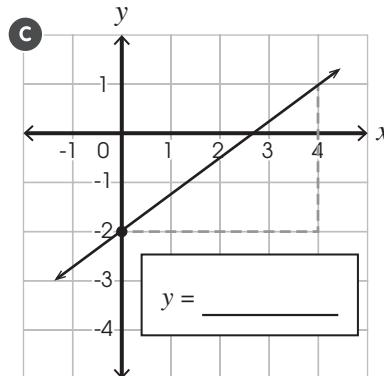
④ $y = \dfrac{3}{4}x - 2$

   m = ☐ y-intercept = ☐

A

$y = $ _____

B

$y = $ _____

C

$y = $ _____

D

$y = $ _____
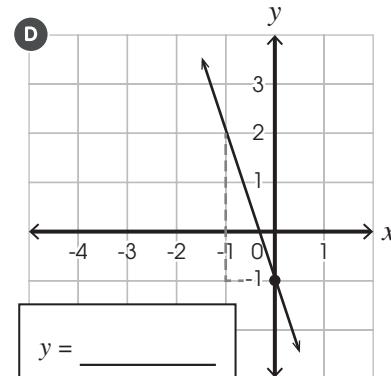
Use the slope and *y*-intercept of each linear equation to graph it.

⑤ $y = \dfrac{1}{3}x + 2$ m = _____ *y*-intercept = _____
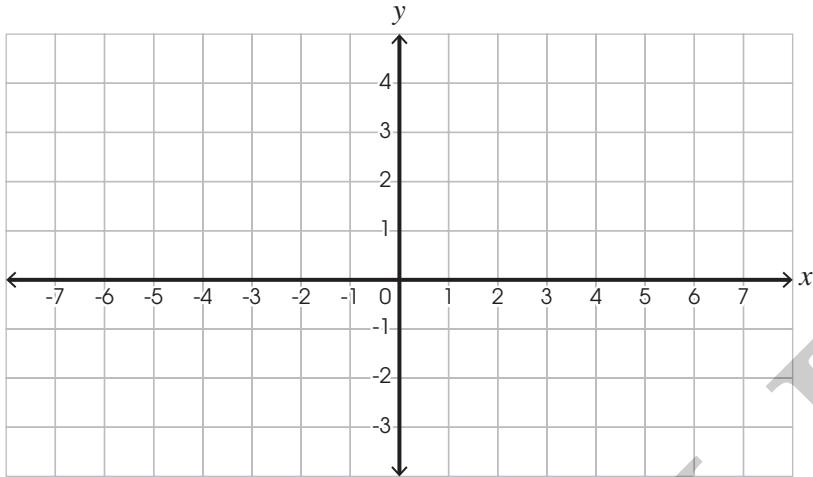
⑥ $y = \dfrac{3}{4}x - 1$ m = _____ *y*-intercept = _____
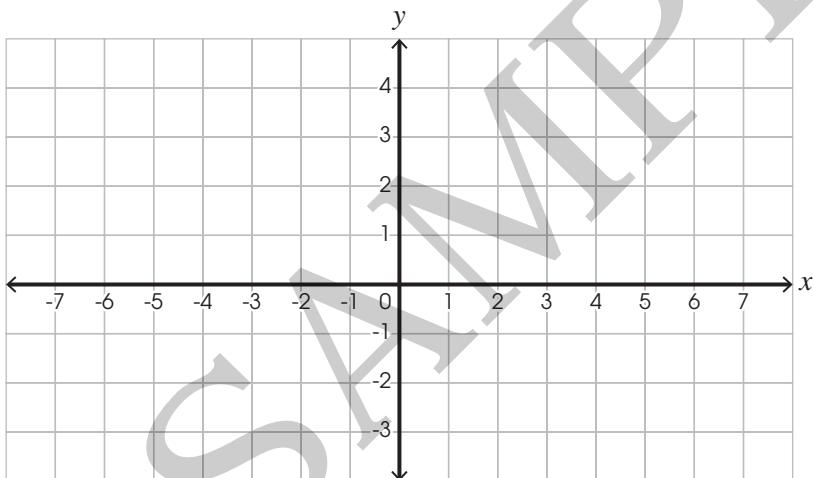
⑦ $y = -\dfrac{2}{3}x + 3$ m = _____ *y*-intercept = _____
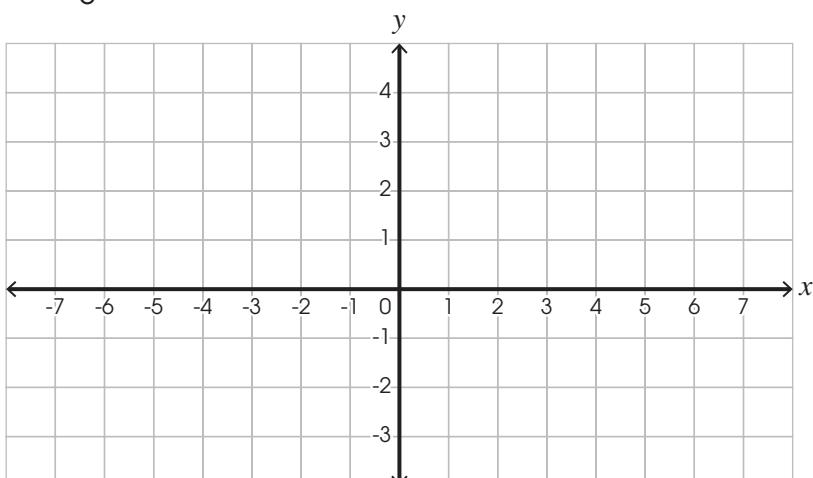

Hint

To graph a linear equation, follow the steps below.

e.g. $y = \dfrac{2}{3}x + 1$

slope   *y*-intercept

❶ Mark the *y*-intercept.
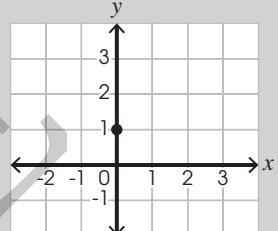
❷ Consider m = $\dfrac{\text{rise}}{\text{run}}$. If m > 0, move up from the *y*-intercept; if m < 0, move down from it.

rise (2 units)
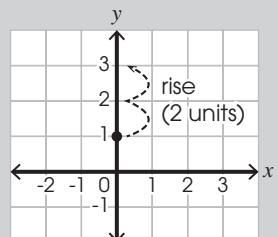
Then move to the right. Mark the point.

run (3 units)
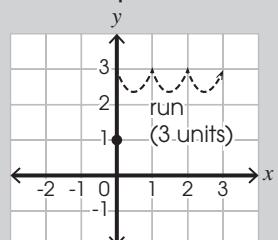
❸ Connect the *y*-intercept and the point to form a line.

$y = \dfrac{2}{3}x + 1$