

3-4 Study Guide and Intervention**Equations of Lines**

Write Equations of Lines You can write an equation of a line if you are given any of the following:

- the slope and the y -intercept,
- the slope and the coordinates of a point on the line, or
- the coordinates of two points on the line.

If m is the slope of a line, b is its y -intercept, and (x_1, y_1) is a point on the line, then:

- the **slope-intercept form** of the equation is $y = mx + b$,
- the **point-slope form** of the equation is $y - y_1 = m(x - x_1)$.

Example 1 Write an equation in slope-intercept form of the line with slope -2 and y -intercept 4 .

$$y = mx + b \quad \text{Slope-intercept form}$$

$$y = -2x + 4 \quad m = -2, b = 4$$

The slope-intercept form of the equation of the line is $y = -2x + 4$.

Example 2 Write an equation in point-slope form of the line with slope $-\frac{3}{4}$ that contains $(8, 1)$.

$$y - y_1 = m(x - x_1) \quad \text{Point-slope form}$$

$$y - 1 = -\frac{3}{4}(x - 8) \quad m = -\frac{3}{4}, (x_1, y_1) = (8, 1)$$

The point-slope form of the equation of the line is $y - 1 = -\frac{3}{4}(x - 8)$.

Exercises

Write an equation in slope-intercept form of the line having the given slope and y -intercept or given points. Then graph the line.

1. $m: 2, b: -3$

2. $m: -\frac{1}{2}, b: 4$

3. $m: \frac{1}{4}, b: 5$

4. $m: 0, b: -2$

5. $m: -\frac{5}{3}, (0, \frac{1}{3})$

6. $m: -3, (1, -11)$

Write an equation in point-slope form of the line having the given slope that contains the given point. Then graph the line.

7. $m = \frac{1}{2}, (3, -1)$

8. $m = -2, (4, -2)$

9. $m = -1, (-1, 3)$

10. $m = \frac{1}{4}, (-3, -2)$

11. $m = -\frac{5}{2}, (0, -3)$

12. $m = 0, (-2, 5)$

3-4 Study Guide and Intervention *(continued)***Equations of Lines**

Write Equations to Solve Problems Many real-world situations can be modeled using linear equations.

Example

Donna offers computer services to small companies in her city. She charges \$55 per month for maintaining a web site and \$45 per hour for each service call.

- a. Write an equation to represent the total monthly cost, C , for maintaining a web site and for h hours of service calls.

For each hour, the cost increases \$45. So the rate of change, or slope, is 45. The y -intercept is located where there are 0 hours, or \$55.

$$\begin{aligned} C &= mh + b \\ &= 45h + 55 \end{aligned}$$

- b. Donna may change her costs to represent them by the equation $C = 25h + 125$, where \$125 is the fixed monthly fee for a web site and the cost per hour is \$25. Compare her new plan to the old one if a company has $5\frac{1}{2}$ hours of service calls. Under which plan would Donna earn more?

First plan

For $5\frac{1}{2}$ hours of service Donna would earn

$$\begin{aligned} C &= 45h + 55 = 45\left(5\frac{1}{2}\right) + 55 \\ &= 247.5 + 55 \text{ or } \$302.50 \end{aligned}$$

Second Plan

For $5\frac{1}{2}$ hours of service Donna would earn

$$\begin{aligned} C &= 25h + 125 = 25(5.5) + 125 \\ &= 137.5 + 125 \text{ or } \$262.50 \end{aligned}$$

Donna would earn more with the first plan.

Exercises

For Exercises 1–4, use the following information.

Jerri's current satellite television service charges a flat rate of \$34.95 per month for the basic channels and an additional \$10 per month for each premium channel. A competing satellite television service charges a flat rate of \$39.99 per month for the basic channels and an additional \$8 per month for each premium channel.

- Write an equation in slope-intercept form that models the total monthly cost for each satellite service, where p is the number of premium channels.
- If Jerri wants to include three premium channels in her package, which service would be less, her current service or the competing service?
- A third satellite company charges a flat rate of \$69 for all channels, including the premium channels. If Jerri wants to add a fourth premium channel, which service would be least expensive?
- Write a description of how the fee for the number of premium channels is reflected in the equation.