

Study Guide

Writing Linear Equations

The form in which you write an equation of a line depends on the information you are given. Given the slope and y -intercept, or given the slope and one point on the line, the **slope-intercept** form can be used to write the equation.

Example 1 Write an equation in slope-intercept form for each line described.

a. a slope of $\frac{2}{3}$ and a y -intercept of -5

Substitute $\frac{2}{3}$ for m and -5 for b in the general slope-intercept form.

$$y = mx + b \rightarrow y = \frac{2}{3}x - 5.$$

The slope-intercept form of the equation of the line is $y = \frac{2}{3}x - 5$.

b. a slope of 4 and passes through the point at $(-2, 3)$

Substitute the slope and coordinates of the point in the general slope-intercept form of a linear equation. Then solve for b .

$$y = mx + b$$

$$3 = 4(-2) + b \quad \text{Substitute } -2 \text{ for } x, 3 \text{ for } y, \text{ and } 4 \text{ for } m.$$

$$11 = b \quad \text{Add } 8 \text{ to both sides of the equation.}$$

The y -intercept is 11. Thus, the equation for the line is $y = 4x + 11$.

When you know the coordinates of two points on a line, you can find the slope of the line. Then the equation of the line can be written using either the slope-intercept or the **point-slope** form, which is $y - y_1 = m(x - x_1)$.

Example 2 Sales In 1998, the average weekly first-quarter sales at Vic's Hardware store were \$9250. In 1999, the average weekly first-quarter sales were \$10,100. Assuming a linear relationship, find the average quarterly rate of increase.

$$\begin{aligned} (1, 9250) \text{ and } (5, 10,100) & \quad \text{Since there are two data points, identify the two} \\ & \quad \text{coordinates to find the slope of the line.} \\ m = \frac{y_2 - y_1}{x_2 - x_1} & \quad \text{Coordinate 1 represents the first quarter of 1998} \\ & \quad \text{and coordinate 5 represents the first quarter of} \\ & \quad \text{1999.} \\ = \frac{10,100 - 9250}{5 - 1} & \\ = \frac{850}{4} \text{ or } 212.5 & \end{aligned}$$

Thus, for each quarter, the average sales increase was \$212.50.

Practice

Writing Linear Equations

Write an equation in slope-intercept form for each line described.

1. slope = -4 , y -intercept = 3
2. slope = 5 , passes through $A(-3, 2)$
3. slope = -4 , passes through $B(3, 8)$
4. slope = $\frac{4}{3}$, passes through $C(-9, 4)$
5. slope = 1 , passes through $D(-6, 6)$
6. slope = -1 , passes through $E(3, -3)$
7. slope = 3 , y -intercept = $\frac{3}{4}$
8. slope = -2 , y -intercept = -7
9. slope = -1 , passes through $F(-1, 7)$
10. slope = 0 , passes through $G(3, 2)$

11. **Aviation** The number of active certified commercial pilots has been declining since 1980, as shown in the table.

a. Find a linear equation that can be used as a model to predict the number of active certified commercial pilots for any year. Assume a steady rate of decline.

b. Use the model to predict the number of pilots in the year 2003.

Number of Active Certified Pilots	
Year	Total
1980	182,097
1985	155,929
1990	149,666
1993	143,014
1994	138,728
1995	133,980
1996	129,187

Source: U. S. Dept. of Transportation