EXAMPLE 2 Approximate a real-world solution

POPULATION The United States population P (in millions) can be modeled by the function $P = 2.683t + 213.1$ where t is the number of years since 1975. In approximately what year will the population be 350 million?

Solution

Substitute 350 for P in the linear model. You can answer the question by solving the resulting linear equation $350 = 2.683t + 213.1$.

STEP 1 **Write** the equation in the form $ax + b = 0$.

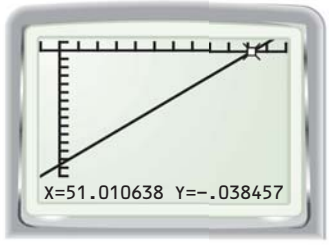
$350 = 2.683t + 213.1$ **Write equation.**

$0 = 2.683t - 136.9$ **Subtract 350 from each side.**

$0 = 2.683x - 136.9$ **Substitute *x* for *t*.**

STEP 2 **Write** the related function: $y = 2.683x - 136.9$.

STEP 3 **Graph** the related function on a graphing calculator. Use the *trace* feature to approximate the x-intercept. You will know that you've crossed the x-axis when the y-values change from negative to positive. The x-intercept is about 51.



▶ Because x is the number of years since 1975, you can estimate that the population will be 350 million about 51 years after 1975, or in 2026.

SET THE WINDOW
Use the following viewing window for Example 2.
Xmin=−5
Xmax=60
Xscl=5
Ymin=−150
Ymax=10
Yscl=10

PRACTICE

EXAMPLE 1 on p. 251 for Exs. 1–6

Solve the equation graphically. Then check your solution algebraically.

1. $6x + 5 = -7$

2. $-7x + 18 = -3$

3. $2x - 4 = 3x$

4. $\frac{1}{2}x - 3 = 2x$

5. $-4 + 9x = -3x + 2$

6. $10x - 18x = 4x - 6$

EXAMPLE 2 on p. 252 for Exs. 7–9

7. CABLE TELEVISION The number s (in millions) of cable television subscribers can be modeled by the function $s = 1.79t + 51.1$ where t is the number of years since 1990. Use a graphing calculator to approximate the year when the number of subscribers was 70 million.

8. EDUCATION The number b (in thousands) of bachelor's degrees in Spanish earned in the U.S. can be modeled by the function $b = 0.281t + 4.26$ where t is the number of years since 1990. Use a graphing calculator to approximate the year when the number of degrees will be 9000.

9. TRAVEL The number of miles m (in billions) traveled by vehicles in New York can be modeled by $m = 2.56t + 113$ where t is the number of years since 1994. Use a graphing calculator to approximate the year in which the number of vehicle miles of travel in New York was 130 billion.