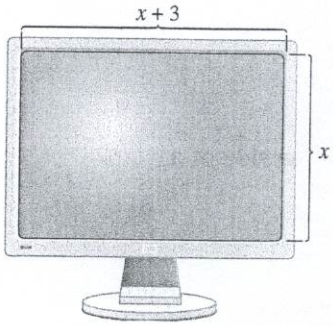
*Solve each problem. Check your answers to be sure they are reasonable. Refer to the formulas on the inside covers. See Example 1.*

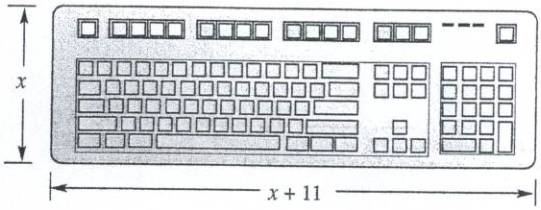
**7.** The length of a standard jewel case is 2 cm more than its width. The area of the rectangular top of the case is 168 $cm^2$. Find the length and width of the jewel case.

**8.** A standard DVD case is 6 cm longer than it is wide. The area of the rectangular top of the case is 247 $cm^2$. Find the length and width of the case.

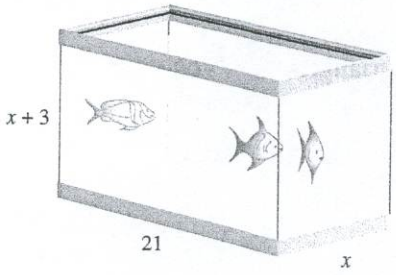
**9.** The dimensions of an HPf1905 flat-panel monitor are such that its length is 3 in. more than its width. If the length were doubled and if the width were decreased by 1 in., the area would be increased by 150 $in.^2$. What are the length and width of the flat panel?




**10.** The keyboard of the computer in Exercise 9 is 11 in. longer than it is wide. If both its length and width are increased by 2 in., the area of the top of the keyboard is increased by 54 $in.^2$. Find the length and width of the keyboard. (*Source:* Author's computer.)

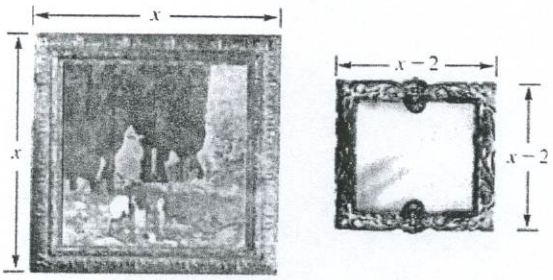



**11.** A 10-gal aquarium is 3 in. higher than it is wide. Its length is 21 in., and its volume is 2730 $in.^3$. What are the height and width of the aquarium?

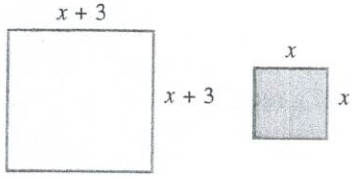



**12.** A toolbox is 2 ft high, and its width is 3 ft less than its length. If its volume is 80 $ft^3$, find the length and width of the box.


**13.** A square mirror has sides measuring 2 ft less than the sides of a square painting. If the difference between their areas is 32 $ft^2$, find the lengths of the sides of the mirror and the painting.




**14.** The sides of one square have length 3 m more than the sides of a second square. If the area of the larger square is subtracted from 4 times the area of the smaller square, the result is 36 $m^2$. What are the lengths of the sides of each square?



*Solve each problem about consecutive integers. See Examples 2 and 3.*

**15.** The product of the numbers on two consecutive volumes of research data is 420. Find the volume numbers.


**16.** The product of the page numbers on two facing pages of a book is 600. Find the page numbers.

**17.** The product of two consecutive integers is 11 more than their sum. Find the integers.

**18.** The product of two consecutive integers is 4 less than four times their sum. Find the integers.

**19.** Find two consecutive odd integers such that their product is 15 more than three times their sum.

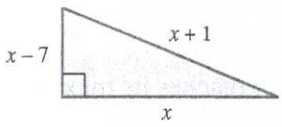
**20.** Find two consecutive odd integers such that five times their sum is 23 less than their product.

**21.** Find three consecutive even integers such that the sum of the squares of the lesser two is equal to the square of the greatest.

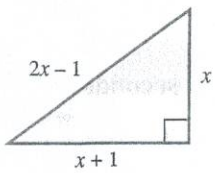
**22.** Find three consecutive even integers such that the square of the sum of the lesser two is equal to twice the greatest.

*Use the Pythagorean formula to solve each problem. See Example 4.*

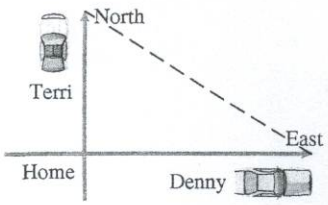
**23.** The hypotenuse of a right triangle is 1 cm longer than the longer leg. The shorter leg is 7 cm shorter than the longer leg. Find the length of the longer leg of the triangle.



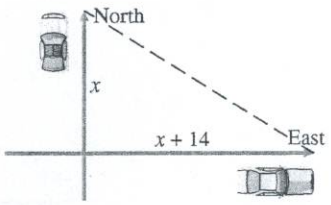

**24.** The longer leg of a right triangle is 1 m longer than the shorter leg. The hypotenuse is 1 m shorter than twice the shorter leg. Find the length of the shorter leg of the triangle.



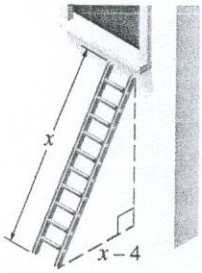

**25.** Terri works due north of home. Her husband Denny works due east. They leave for work at the same time. By the time Terri is 5 mi from home, the distance between them is 1 mi more than Denny's distance from home. How far from home is Denny?



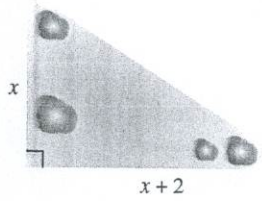

**26.** Two cars left an intersection at the same time. One traveled north. The other traveled 14 mi farther, but to the east. How far apart were they then, if the distance between them was 4 mi more than the distance traveled east?



**27.** A ladder is leaning against a building. The distance from the bottom of the ladder to the building is 4 ft less than the length of the ladder. How high up the side of the building is the top of the ladder if that distance is 2 ft less than the length of the ladder?



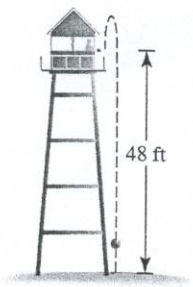

**28.** A lot has the shape of a right triangle with one leg 2 m longer than the other. The hypotenuse is 2 m less than twice the length of the shorter leg. Find the length of the shorter leg.




*Solve each problem. See Examples 5 and 6.*

**29.** An object projected from a height of 48 ft with an initial velocity of 32 ft per sec after $t$ seconds has height

$$h = -16t^2 + 32t + 48.$$




**(a)** After how many seconds is the height 64 ft? (*Hint:* Let $h = 64$ and solve.)

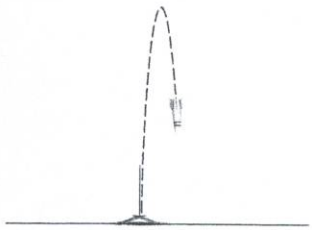
**(b)** After how many seconds is the height 60 ft?

**(c)** After how many seconds does the object hit the ground? (*Hint:* When the object hits the ground, $h = 0$.)

**(d)** The quadratic equation from part (c) has two solutions, yet only one of them is appropriate for answering the question. Why is this so?

**30.** If an object is projected upward from ground level with an initial velocity of 64 ft per sec, its height $h$ in feet $t$ seconds later is

$$h = -16t^2 + 64t.$$



**(a)** After how many seconds is the height 48 ft?

**(b)** The object reaches its maximum height 2 sec after it is projected. What is this maximum height?

**(c)** After how many seconds does the object hit the ground?

**(d)** The quadratic equation from part (c) has two solutions, yet only one of them is appropriate for answering the question. Why is this so?

**31.** The table shows the number of cellular phone subscribers (in millions) in the United States.

| Year | Subscribers (in millions) |
|---|---|
| 1990 | 5 |
| 1992 | 11 |
| 1994 | 24 |
| 1996 | 44 |
| 1998 | 69 |
| 2000 | 109 |
| 2002 | 141 |
| 2004 | 182 |
| 2006 | 233 |

*Source:* CTIA-The Wireless Association.

We used the data to develop the quadratic equation

$$y = 0.734x^2 + 2.62x + 3.37,$$

which models the number of cellular phone subscribers $y$ (in millions) in the year $x$, where $x = 0$ represents 1990, $x = 2$ represents 1992, and so on.

**(a)** Use the model to find the number of cellular phones in 1996 to the nearest million. How does the result compare to the actual data in the table?

**(b)** What value of $x$ corresponds to 2004?

**(c)** Use the model to find the number of cellular phones in 2004 to the nearest million. How does the result compare to the actual data in the table?

**(d)** Assuming that the trend in the data continues, use the quadratic equation to estimate the number of cellular phones in 2009 to the nearest million.

**Relating Concepts (Exercises 32–40)** For Individual or Group Work

*The U.S. trade deficit represents the amount by which exports are less than imports. It provides not only a sign of economic prosperity but also a warning of potential decline. The data in the table shows the U.S. trade deficit in goods and services for 2001 through 2005.*

| Year | Deficit (in billions of dollars) |
|---|---|
| 2001 | 365.1 |
| 2002 | 423.7 |
| 2003 | 496.9 |
| 2004 | 612.1 |
| 2005 | 714.4 |

*Source:* U.S. Census Bureau.

*Use the data to* ***work Exercises 32–40 in order.***

**32.** How much did the trade deficit in goods and services increase from 2001 to 2002? What percent increase is this (to the nearest percent)?

**33.** The U.S. trade deficit might be approximated by the linear equation

$$y = 88.7x + 256,$$

where $y$ is the deficit in billions of dollars. Here $x = 1$ represents 2001, $x = 2$ represents 2002, and so on. Use this equation to approximate the trade deficits in 2003, 2004, and 2005.

**34.** How do your answers from Exercise 33 compare to the actual data in the table?

**35.** The trade deficit $y$ (in billions of dollars) might also be approximated by the quadratic equation

$$y = 9.24x^2 + 33.24x + 321,$$

where $x = 1$ again represents 2001, $x = 2$ represents 2002, and so on. Use this equation to approximate the trade deficits in 2003, 2004, and 2005.

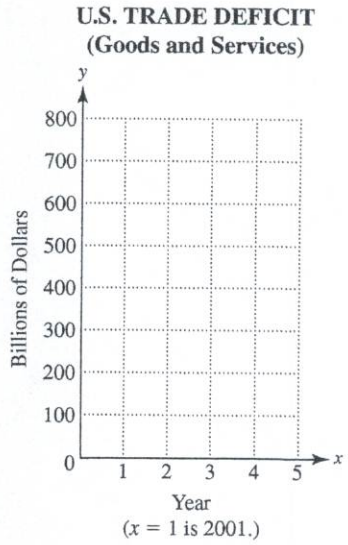
**36.** Compare your answers from Exercise 35 to the actual data in the table. Which equation, the linear one in Exercise 33 or the quadratic one in Exercise 35, models the data better?

**37.** Write the data from the table as a set of ordered pairs $(x, y)$, where $x$ represents the years starting with 2001, such that $x = 1$ for 2001, $x = 2$ for 2002, and so on, and $y$ represents the trade deficit in billions of dollars.

| Year | Deficit (in billions of dollars) |
|---|---|
| 2001 | 365.1 |
| 2002 | 423.7 |
| 2003 | 496.9 |
| 2004 | 612.1 |
| 2005 | 714.4 |

*Source:* U.S. Census Bureau.

**38.** Plot the ordered pairs from Exercise 37 on the graph.




**39.** Assuming that the trend in the data continues, use the quadratic equation from Exercise 35 to estimate the trade deficit for the year 2006.

**40.** The actual trade deficit for 2006 was 758.2 billion dollars.

**(a)** How does the actual deficit for 2006 compare to your estimate from Exercise 39?

**(b)** Should the quadratic equation be used to estimate the U.S. trade deficit for years after 2005? Explain.