Exercise Set 1.3

Practice Exercises

Use the five-step strategy for solving word problems to find the number or numbers described in Exercises 1–10.

1. When five times a number is decreased by 4, the result is 26. What is the number?
2. When two times a number is decreased by 3, the result is 11. What is the number?
3. When a number is decreased by 20% of itself, the result is 20. What is the number?
4. When a number is decreased by 30% of itself, the result is 28. What is the number?
5. When 60% of a number is added to the number, the result is 192. What is the number?
6. When 80% of a number is added to the number, the result is 252. What is the number?
7. 70% of what number is 224?
8. 70% of what number is 252?
9. One number exceeds another by 26. The sum of the numbers is 64. What are the numbers?
10. One number exceeds another by 24. The sum of the numbers is 58. What are the numbers?

Practice Plus

In Exercises 11–18, find all values of x satisfying the given conditions.

11. $y_1 = 13x - 4$, $y_2 = 5x + 10$, and y_1 exceeds y_2 by 2.
12. $y_1 = 10x + 6$, $y_2 = 12x - 7$, and y_1 exceeds y_2 by 3.
13. $y_1 = 10(2x - 1)$, $y_2 = 2x + 1$, and y_1 is 14 more than 8 times y_2.
14. $y_1 = 9(3x - 5)$, $y_2 = 3x - 1$, and y_1 is 51 less than 12 times y_2.
15. $y_1 = 2x + 6$, $y_2 = x + 8$, $y_3 = x$, and the difference between 3 times y_1 and 5 times y_2 is 22 less than y_3.
16. $y_1 = 2.5$, $y_2 = 2x + 1$, $y_3 = x$, and the difference between 2 times y_1 and 3 times y_2 is 8 less than 4 times y_3.
17. $y_1 = \dfrac{1}{x}$, $y_2 = \dfrac{1}{2x}$, $y_3 = \dfrac{1}{x - 1}$, and the sum of 3 times y_1 and 4 times y_2 is the product of 4 and y_3.
18. $y_1 = \dfrac{1}{x}$, $y_2 = \dfrac{1}{x^2 - x}$, $y_3 = \dfrac{1}{x - 1}$, and the difference between 6 times y_1 and 3 times y_2 is the product of 7 and y_3.

Application Exercises

19. The bar graph shows the time Americans spent using various media in 2007.

Average Number of Hours Americans Used Various Media in 2007
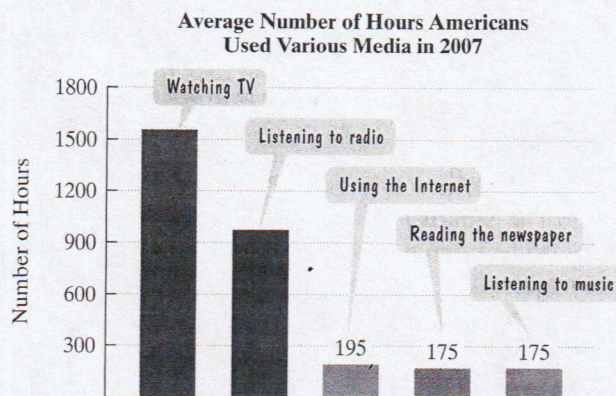
Source: Communication Industry Forecast and Report

Time spent watching TV exceeded time spent listening to the radio by 581 hours. The combined time devoted to these two media was 2529 hours. In 2007, how many hours did Americans spend listening to the radio and how many hours were spent watching TV?

20. Compared with Europeans, American employees use less vacation time.

**Average Vacation Time for Europeans and Americans**
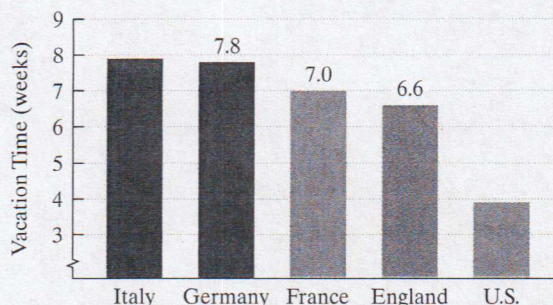
Source: The State of Working America 2006/2007

The average time Italians spend on vacation exceeds the average American vacation time by 4 weeks. The combined average vacation time for Americans and Italians is 11.8 weeks. On average, how many weeks do Americans spend on vacation and how many weeks do Italians spend on vacation?

Exercises 21–22 involve the average salaries represented by the bar graph.

Average Salaries for Various Jobs
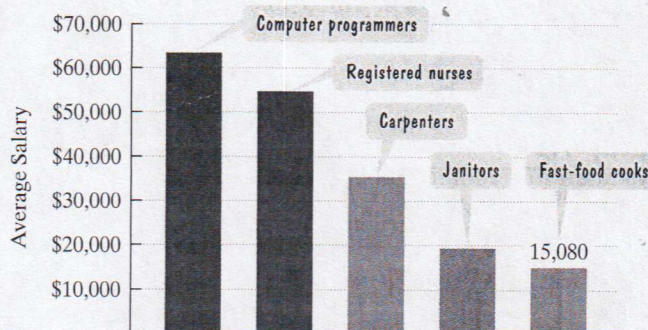
Source: 2007 data from salary.com

21. The average salary for computer programmers is $7740 less than twice the average salary for carpenters. Combined, their average salaries are $99,000. Determine the average salary for each of these jobs.

22. The average salary for registered nurses is $3500 less than three times the average salary for janitors. Combined, their average salaries are $74,060. Determine the average salary for each of these jobs.

The bar graph indicates that American attitudes have become more tolerant over two decades on a variety of issues. Exercises 23–24 are based on the data displayed by the graph.

Changing Attitudes in the United States
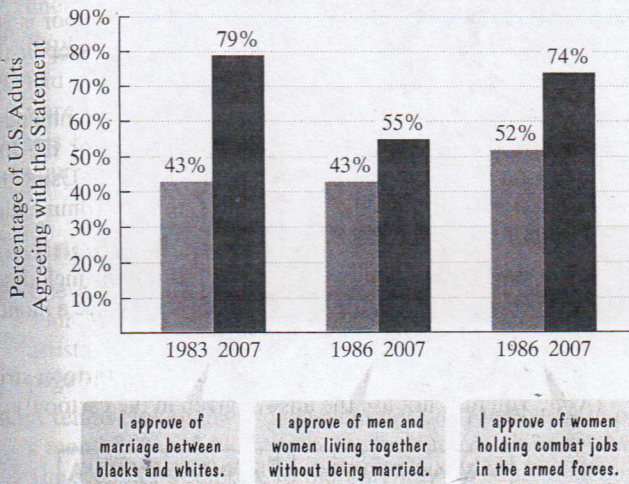
Source: USA Today

23. In 1983, 43% of U.S. adults approved of marriage between blacks and whites. For the period from 1983 through 2007, the percentage approving of interracial marriage increased on average by 1.5 each year. If this trend continues, by which year will all American adults approve of interracial marriage?

24. In 1986, 43% of U.S. adults approved of men and women living together without being married. For the period from 1986 through 2007, the percentage approving of cohabitation increased on average by approximately 0.6 each year. If this trend continues, by which year will 61% of all American adults approve of cohabitation?

25. A new car worth $24,000 is depreciating in value by $3000 per year.

a. Write a formula that models the car's value, y, in dollars, after x years.

b. Use the formula from part (a) to determine after how many years the car's value will be $9000.

c. Graph the formula from part (a) in the first quadrant of a rectangular coordinate system. Then show your solution to part (b) on the graph.

26. A new car worth $45,000 is depreciating in value by $5000 per year.

a. Write a formula that models the car's value, y, in dollars, after x years.

b. Use the formula from part (a) to determine after how many years the car's value will be $10,000.

c. Graph the formula from part (a) in the first quadrant of a rectangular coordinate system. Then show your solution to part (b) on the graph.

27. You are choosing between two health clubs. Club A offers membership for a fee of $40 plus a monthly fee of $25. Club B offers membership for a fee of $15 plus a monthly fee of $30. After how many months will the total cost at each health club be the same? What will be the total cost for each club?

28. Video Store A charges $9 to rent a video game for one week. Although only members can rent from the store, membership is free. Video Store B charges only $4 to rent a video game for one week. Only members can rent from the store and membership is $50 per year. After how many video-game rentals will the total amount spent at each store be the same? What will be the total amount spent at each store?

29. The bus fare in a city is $1.25. People who use the bus have the option of purchasing a monthly discount pass for $15.00. With the discount pass, the fare is reduced to $0.75. Determine the number of times in a month the bus must be used so that the total monthly cost without the discount pass is the same as the total monthly cost with the discount pass.

30. A discount pass for a bridge costs $30 per month. The toll for the bridge is normally $5.00, but it is reduced to $3.50 for people who have purchased the discount pass. Determine the number of times in a month the bridge must be crossed so that the total monthly cost without the discount pass is the same as the total monthly cost with the discount pass.

31. In 2005, there were 13,300 students at college A, with a projected enrollment increase of 1000 students per year. In the same year, there were 26,800 students at college B, with a projected enrollment decline of 500 students per year.

a. According to these projections, when will the colleges have the same enrollment? What will be the enrollment in each college at that time?

b. Use the following table to numerically check your work in part (a). What equations were entered for Y_1 and Y_2 to obtain this table?

| X	Y1	Y2
7	20300	23300
8	21300	22800
9	22300	22300
10	23300	21800
11	24300	21300
12	25300	20800
13	26300	20300

X=7

32. In 2000, the population of Greece was 10,600,000, with projections of a population decrease of 28,000 people per year. In the same year, the population of Belgium was 10,200,000, with projections of a population decrease of 12,000 people per year. (*Source*: United Nations) According to these projections, when will the two countries have the same population? What will be the population at that time?

33. After a 20% reduction, you purchase a television for $336. What was the television's price before the reduction?

34. After a 30% reduction, you purchase a dictionary for $30.80. What was the dictionary's price before the reduction?

35. Including 8% sales tax, an inn charges $162 per night. Find the inn's nightly cost before the tax is added.

36. Including 5% sales tax, an inn charges $252 per night. Find the inn's nightly cost before the tax is added.

Exercises 37–38 involve markup, the amount added to the dealer's cost of an item to arrive at the selling price of that item.

37. The selling price of a refrigerator is $584. If the markup is 25% of the dealer's cost, what is the dealer's cost of the refrigerator?

38. The selling price of a scientific calculator is $15. If the markup is 25% of the dealer's cost, what is the dealer's cost of the calculator?

39. You invested $7000 in two accounts paying 6% and 8% annual interest. If the total interest earned for the year was $520, how much was invested at each rate?

40. You invested $11,000 in two accounts paying 5% and 8% annual interest. If the total interest earned for the year was $730, how much was invested at each rate?

41. Things did not go quite as planned. You invested $8000, part of it in stock that paid 12% annual interest. However, the rest of the money suffered a 5% loss. If the total annual income from both investments was $620, how much was invested at each rate?

42. Things did not go quite as planned. You invested $12,000, part of it in stock that paid 14% annual interest. However, the rest of the money suffered a 6% loss. If the total annual income from both investments was $680, how much was invested at each rate?

43. A rectangular soccer field is twice as long as it is wide. If the perimeter of the soccer field is 300 yards, what are its dimensions?

44. A rectangular swimming pool is three times as long as it is wide. If the perimeter of the pool is 320 feet, what are its dimensions?

45. The length of the rectangular tennis court at Wimbledon is 6 feet longer than twice the width. If the court's perimeter is 228 feet, what are the court's dimensions?

46. The length of a rectangular pool is 6 meters less than twice the width. If the pool's perimeter is 126 meters, what are its dimensions?

47. The rectangular painting in the figure shown measures 12 inches by 16 inches and is surrounded by a frame of uniform width around the four edges. The perimeter of the rectangle formed by the painting and its frame is 72 inches. Determine the width of the frame.
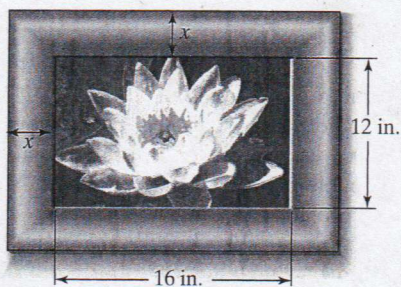
48. The rectangular swimming pool in the figure shown measures 40 feet by 60 feet and is surrounded by a path of uniform width around the four edges. The perimeter of the rectangle formed by the pool and the surrounding path is 248 feet. Determine the width of the path.
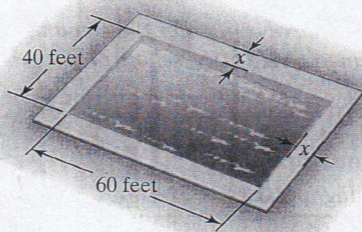
49. An automobile repair shop charged a customer $448, listing $63 for parts and the remainder for labor. If the cost of labor is $35 per hour, how many hours of labor did it take to repair the car?

50. A repair bill on a sailboat came to $1603, including $532 for parts and the remainder for labor. If the cost of labor is $63 per hour, how many hours of labor did it take to repair the sailboat?

51. An HMO pamphlet contains the following recommended weight for women: "Give yourself 100 pounds for the first 5 feet plus 5 pounds for every inch over 5 feet tall." Using this description, what height corresponds to a recommended weight of 135 pounds?

52. A job pays an annual salary of $33,150, which includes a holiday bonus of $750. If paychecks are issued twice a month, what is the gross amount for each paycheck?

53. Answer the question in the following *Peanuts* cartoon strip. (*Note:* You may not use the answer given in the cartoon!)

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54. The rate for a particular international person-to-person telephone call is $0.43 for the first minute, $0.32 for each additional minute, and a $2.10 service charge. If the cost of a call is $5.73, how long did the person talk?

In Exercises 55–74, solve each formula for the specified variable. Do you recognize the formula? If so, what does it describe?

55. $A = lw$ for w

56. $D = RT$ for R

57. $A = \frac{1}{2}bh$ for b

58. $V = \frac{1}{3}Bh$ for B

59. $I = Prt$ for P

60. $C = 2\pi r$ for r

61. $E = mc^2$ for m

62. $V = \pi r^2 h$ for h

63. $T = D + pm$ for p

64. $P = C + MC$ for M

65. $A = \frac{1}{2}h(a + b)$ for a

66. $A = \frac{1}{2}h(a + b)$ for b

67. $S = P + Prt$ for r

68. $S = P + Prt$ for t

69. $B = \dfrac{F}{S - V}$ for S

70. $S = \dfrac{C}{1 - r}$ for r

71. $IR + Ir = E$ for I

72. $A = 2lw + 2lh + 2wh$ for h

73. $\dfrac{1}{p} + \dfrac{1}{q} = \dfrac{1}{f}$ for f

74. $\dfrac{1}{R} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$ for R_1