Writing Exercises

1. Write an example of a ratio in an applied situation.
2. What's the difference between a ratio and a proportion?
3. Write an example of two quantities that vary directly in an applied situation.
4. Write an example of two quantities that vary inversely in an applied situation.
5. Describe the procedure for solving a proportion.
6. What is the constant of proportionality in a variation problem?

Computational Exercises

For Exercises 7–16, write each ratio statement as a fraction and reduce to lowest terms if possible.

7. 18 to 28
8. 5 to 12
9. 14:32
10. 40:75
11. 12 cents to 15 cents
12. 18 inches to 42 inches
13. 3 weeks to 8 weeks
14. 2 pounds to 12 ounces
15. 5 feet to 30 inches
16. 12 years to 2 decades

For Exercises 17–26, solve each proportion.

17. $\dfrac{3}{x} = \dfrac{14}{45}$

18. $\dfrac{x}{2} = \dfrac{18}{6}$

19. $\dfrac{5}{6} = \dfrac{x}{42}$

20. $\dfrac{9}{8} = \dfrac{45}{x}$

21. $\dfrac{x-6}{12} = \dfrac{1}{3}$

22. $\dfrac{x+3}{5} = \dfrac{35}{25}$

23. $\dfrac{2}{x-3} = \dfrac{5}{x+8}$

24. $\dfrac{4}{x-3} = \dfrac{16}{x-2}$

25. $\dfrac{x-3}{4} = \dfrac{x+6}{20}$

26. $\dfrac{x}{10} = \dfrac{x-2}{20}$

Applications in Our World

27. The Information Resources Institute reports that one out of every five people who buy ice cream buys vanilla ice cream. If a store sells 75 ice cream cones in one day, about how many will be vanilla?
28. The U.S. Department of Agriculture reported that 57 out of every 100 milk drinkers drink skim milk. If a storeowner orders 25 gallons of milk, how many should be skim?
29. Under normal conditions, 1.5 feet of snow will melt into 2 inches of water. After a monster snowstorm, there were 3.5 feet of snow. How many inches of water will there be when the snow melts?
30. The Travel Industry Association of America reports that 4 out of every 35 people who travel do so by air. If there are 180 students who are traveling for spring break, how many of them will fly?
31. A gallon of paint will cover 640 square feet of wall space. If I plan to paint a room whose walls measure 2,560 square feet, how many gallons of paint will I need?

47. Basketball player Lebron James: 6′8″ (Actual weight is 250 lb.)
48. Basketball player Yao Ming: 7′6″ (Actual weight is 310 lb.)
49. Jockey Pat Day: 4′11″ (Actual weight is 105 lb.)
50. Football player Tom Brady: 6′4″ (Actual weight is 225 lb.)
51. Under certain conditions, the pressure of a gas varies inversely with its volume. If a gas with a volume of 20 cubic inches has 36 pounds of pressure, find the amount of pressure 30 cubic inches of gas is under.
52. The strength of a particular beam varies inversely with the square of its length. If a 10-foot beam can support 500 pounds, how many pounds can a 12-foot beam support?
53. In karate, the force needed to break a board varies inversely with the length of the board. If it takes 5 lb of force to break a board that is 3 feet long, how many pounds of force will it take to break a board that is 5 feet long?
54. The weight of a body varies inversely with the square of the distance from the center of the earth. If the radius of the earth is 4,000 miles, how much would a 150-lb woman weigh 500 miles above the surface of the earth?
55. The time to complete a project is inversely proportional to the number of people who are working on the project. A class project can be completed by 3 students in 20 days. In order to finish the project in 5 days, how many more students should the group add?
56. The intensity of sound varies inversely as the square of the distance from the source. A sound with an intensity of 300 watts/m² is heard from 20 feet away from a speaker. What is the intensity of the sound 50 feet away from the same speaker?

32. The American Dietetic Association reported that 31 out of every 100 people want to lose weight. If 384 students were surveyed at random in the student union, how many would want to lose weight?

33. The U.S. Census Bureau reported that 9 out of every 20 joggers are female. On a trail, there were 230 joggers on July 4. Approximately how many were female?

34. Angel took a 2-year lease on a new car and after 8 months of driving, he'd put 6,600 miles on it. The lease allows 10,000 miles per year. If his driving habits stay consistent, will he stay under the allotted mileage for 2 years? By how much?

35. Out of every 80 iPods sold by a discount website, 3 were returned as defective. If the website sold 1,000 iPods this holiday season, how many should they expect will be returned as defective?

36. The American Dietetic Association states that 11 out of every 25 people do not eat breakfast. If there are 175 students in a large lecture hall, about how many of them did not eat breakfast?

37. Mark is interested in measuring the height of a tree in his yard. He measures the length of the tree's shadow at 18 feet at the same time his own shadow is 3 feet 6 inches. If Mark is 5"10", how tall is the tree?

38. An online photo printing service will put any photo you like on a commemorative baseball. The preferred dimensions for photo uploads are 640 × 480 pixels. Quan wants to have her son's little league photo put on a ball. The file she has is 1,100 pixels wide. To what height should she crop it so that the proportions fit the requirements?

39. A small college has 1,200 students and 80 professors. The college is planning to increase enrollment to 1,500 students next year. How many new professors should be hired, assuming they want to maintain the same ratio?

40. The taxes on a house assessed at $64,000 are $1,600 a year. If the assessment is raised to $80,000 and the tax rate did not change, how much would the taxes be now?

41. According to a poll conducted by the Pew Research Center in early 2011, for every 69 people who could correctly identify the religion practiced by the president of the United States, there were 131 who could not. At that time there were about 235 million adult Americans. How many could not identify the president's religion?

42. Based on a combination of worldwide surveys conducted from 2008 to 2010 and reported at gallup. com, for every 29 people who would be happy to stay in the country they live in, 71 would prefer to move to another country. Among those who would prefer to move, 24 of 71 say they would like to move to the United States. The two next-highest proportions were for Canada and Great Britain, each at 7 of 71.

(a) Based on these numbers, if a random sample of 1 million people was chosen from around the globe, how many would like to move to the United States?

(b) How many more would like to move to the United States than Canada and the UK combined?

43. According to a poll conducted by the Gallup Corporation in March 2011, the metropolitan areas with the highest and lowest proportions of obese adults were Evansville, IN-KY, and Boulder, CO, respectively. In Evansville, for every 311 people who were not obese, there were 189 who were. In Boulder, for every 16 obese people, there were 109 who were not obese. At that time, the estimated populations were 358,676 for Evansville and 303,482 for Boulder. How many more obese people were there in the Evansville area than in the Boulder area?

44. A Gallup survey showed that in March 2011, 8 of every 25 employers in the United States were adding more workers to their workforce, 9 of 50 were reducing their workforce, and 1 of 2 were keeping it the same.

(a) If there were 1,250 employers in one metropolitan area, and those who were hiring planned to hire an average of seven new employees, how many new jobs were about to become available?

(b) If the employers who were cutting their workforce in that area were planning on letting go an average of nine workers, what would the net change in jobs for the area be?

45. The amount of simple interest on a specific amount of money varies directly with the time the money is kept in a savings account when the interest rate is constant. Find the amount of interest on a $5,000 savings account, if the interest rate is 6%, and the money has been invested for 4 years.

46. The number of tickets purchased for a prize varies directly with the amount of the prize. For a prize of $1,000, 250 tickets are purchased. Find the approximate number of tickets that will be purchased on a prize worth $5,000.

Use the following information for Exercises 47–50. If everyone had the same body proportions, your weight in pounds would vary directly with the cube of your height in feet. According to Wikipedia, the most recent statistics available in 2012 indicated that the average height and weight for an adult male in the United States is 5 feet 9.4 inches and 191 lb. Use this information to write a variation equation, then use it to find the weight that each of the following famous athletes would be if they had the same body type as the average male.