

Proportions

1. Two slices of bacon contain 85 calories. How many calories are there in twelve slices of bacon?
2. Three ounces of liver contain 22 grams of protein. How many ounces of liver provide 121 grams of protein?
3. If 6 gallons of premium unleaded gasoline cost \$9.72, how much would 9 gallons cost?
4. The sales tax on a \$24 headset radio is \$1.68. How much would the sales tax be on a pair of binoculars that cost \$36?
5. The distance between Singapore and Tokyo is 3,300 mi. On a certain wall map, this distance is represented by 11 in. The actual distance between Mexico City and Cairo is 7,700 mi. How far apart are they on the same map?
6. The distance between Kansas City, Missouri, and Denver is 600 mi. On a certain wall map, this is represented by a length of 2.4 ft. On the map, how many feet would there be between Memphis and Philadelphia, two cities that are actually 1,000 mi apart?
7. Biologists tagged 250 fish in Willow Lake on October 5. On a later date they found 7 tagged fish in a sample of 350. Estimate the total number of fish in Willow Lake to the nearest hundred.
8. On May 13, researchers at Argyle Lake tagged 420 fish. When they returned a few weeks later, their sample of 500 fish contained 9 that were tagged. Give approximation of fish population in Argyle Lake to the nearest hundred.

Percents

9. How much pure alcohol is in 50 ml of a 20% alcohol solution?
10. How much pure acid is in 30 liters of a 55% acid solution?
11. If \$5,000 is invested for one year at 6% simple interest, how much interest is earned?
12. If \$20,000 is invested for one year at 5% simple interest, how much interest is earned?
13. What is the monetary value of 54 nickels (20¢ coins)?
14. What is the monetary value of 29 half-dollars?
15. Express the amount (in liters) of alcohol in r liters of pure water.
16. Express the amount of alcohol in k liters of pure alcohol.

Mixtures

17. Five liters of a 4% acid solution must be mixed with a 10% solution to get a 6% solution. How many liters of the 10% solution are needed?
18. How many liters of a 14% alcohol solution must be mixed with 20 liters of a 50% solution to get a 20% solution?
19. In a chemistry class, 6 liters of a 12% alcohol solution must be mixed with a 20% solution to get a 14% solution. How many liters of the 20% solution are needed?
20. How many liters of a 10% alcohol solution must be mixed with 40 liters of a 50% solution to get a 20% solution?

21. Minoxidil is a drug that has recently proven to be effective in treating male pattern baldness. A pharmacist wishes to mix a solution that is 2% minoxidil. She has on hand 50 ml of a 1% solution, and she wishes to add some 4% solution to it to obtain the desired 2% solution. How much 4% solution should she add?
22. Water must be added to 20 ml of a 4% minoxidil solution to dilute it to a 2% solution. How many milliliters of water should be used?
23. A medicated first aid spray on the market is 78% alcohol by volume. If the manufacturer has 50 liters of the spray containing 70% alcohol, how much pure alcohol should be added so that the final mixture is the required 78% alcohol?
24. How much water must be added to 3 gal of a 4% insecticide solution to reduce the concentration to 3%?
25. Peter Glovin invested some money at 18%, and \$3,000 less than that amount at 20%. The two investments produce a total of \$3,200 per year interest. How much is deposited at 18%?
26. Donald Cole inherited a sum of money from a relative. He deposits some of the money at 16%, and \$4,000 more than this amount at 12%. He earns \$3,840 in interest per year. Find the amount he has invested at 16%.
27. Cecilia Lause invested some money at 10%, and invested \$5,000 more than this at 14%. Her total annual income from these investments is \$3,100. How much has she invested at each rate?
28. Tonya Briggs has two investments that produce an annual interest income of \$4,200. The amount invested at 14% is \$6,000 less than the amount invested at 10%. Find the amount invested at each rate.
29. Pat Kelley earned \$12,000 last year by giving golf lessons. He invested part at 8% simple interest and the rest at 9%. He made an annual total of \$1,050 in interest. How much did he invest at each rate?
30. Elizabeth Linton won \$60,000 on a slot machine in Las Vegas. She invested part at 8% simple interest and the rest at 12%. She earned an annual total of \$6,200 in interest. How much was invested at each rate?
31. Melissa Martin invested some money at 8% simple interest and \$1,000 less than twice this amount at 14%. Her total annual income from the interest was \$580. How much was invested at each rate?
32. John Mathews invested some money at 9% simple interest, and \$5,000 more than 3 times this amount at 10%. He earned \$2,840 in annual interest. How much did he invest at each rate?

Motion Problems

33. Atlanta and Cincinnati are 440 mi apart. John leaves Cincinnati, driving toward Atlanta at an average speed of 60 mph. Pat leaves Atlanta at the same time, driving toward Cincinnati in her antique auto, averaging 28 mph. How long will it take them to meet?
34. St. Louis and Portland are 2,060 mi apart. A small plane leaves Portland, traveling toward St. Louis at an average speed of 90 mph. Another plane leaves St. Louis at the same time, traveling toward Portland, averaging 116 mph. How long will it take them to meet?

35. From a point on a straight road, Luke and Maria ride bicycles in opposite directions. Luke rides at 10 mph and Maria at 12 mph. In how many hours will they be 55 mi apart?
36. At a given hour, two steamboats leave a city in the same direction on a straight canal. One travels at 18 mph, and the other travels at 25 mph. In how many hours will the boats be 35 mi apart?
37. Carl leaves his house on his bicycle at 9:30 a.m. and averages 5 mph. His wife, Karen, leaves at 10:00 a.m., following the same path and averaging 8 mph. How long will it take for Karen to catch up with Carl?
38. Joey and Liz commute to work, traveling in opposite directions. Joey leaves the house at 7:00 a.m. and averages 35 mph. Liz leaves at 7:15 a.m. and averages 40 mph. At what time will they be 65 miles apart?
39. Maria Gutierrez can get to school in $\frac{1}{4}$ hr if she rides a bike. It takes her $\frac{3}{4}$ hr if she walks. Her speed when walking is 10 mph slower than her speed when riding. What is her speed when she rides?
40. On an automobile trip, Susan Hessney maintained a steady speed for the first two hours. Rush hour traffic slowed her speed by 25 mph for the least part of the trip. The entire trip, a distance of 150 mi, took $2\frac{1}{2}$ hr. What was her speed during the first part of the trip?
41. When Donnie drives his truck to school, the trip takes $\frac{1}{2}$ hr. When he rides the bus, it takes $\frac{3}{4}$ hr. The average speed of the bus is 12 mph less than his speed when driving. Find the distance he travels to school.

Work/Rate Problems

42. If Ann can sweep the leaves from the yard in 6 minutes and Grace can do it in 8 minutes, how much can they get done working together for 3 minutes?
43. Fred can sweep snow from a sidewalk in 4 minutes while Sarah can do it in 3 minutes. Working together, how long will it take them to sweep the sidewalk?
44. Joan can paint a house in 6 days. Tom can paint a house in 9 days. If Joan works alone for 2 days and then is joined by Tom, how long would it take to paint the house?
45. Tom can process a batch of bills in 8 hours. It takes Bill 10 hrs to do the same job. How long will it take them together to complete the job?
46. Sam can plow his field with a tractor in 4 days. It takes his neighbor 12 days to plow the same field. How long will it take Sam if his neighbor helps him?
47. Ruth can mow the lawn with her mower in 20 minutes, and Jane can mow it with hers in 30 minutes. How long would it take if they did this work together?
48. If one pipe can fill a tank in 3 hrs, a second pipe in 4 hrs, and a third pipe in 5 hrs, how long will it take if all pipes are being used?
49. Sue, working alone, can paint a house in 12 days. If Clyde helps, it takes only 4 days. How long will it take Clyde alone?
50. Art can do a job alone in 8 days. After he has been working alone for 2 days, he is joined by Pete. They finish the job together in 2 more days. How long would it take Pete to do the work alone?

51. Ellen can drive her car over a route in 4 hrs, and Lila can drive her car over the same route in $3\frac{1}{2}$ hrs. How long will it take them to meet if they start at opposite ends at the same time?
52. A large pipe can fill a tank in 5 hrs and a smaller pipe can fill it in 8 hrs. A third pipe can empty the tank in 10 hrs. How long would it take to fill the tank if all three pipes are open?

Linear Inequalities

53. Clare has scores of 98, 86, and 88 on her first three tests in algebra. If she wants an average of at least 90 after her fourth test, what possible scores can she make on her fourth test?
54. Timothy has grades of 75 and 82 on his first two computer science tests. What possible scores on a third test would give him an average of at least 80?
55. Gareth earned \$200 at odd jobs during July, \$300 during August, and \$225 during September. If his average salary for the four months from July through October is to be at least \$250, what possible amounts could he earn during October?
56. In order to qualify for a company pension plan, an employee must average at least \$1,000 per month in earnings. During the first four months of the year, an employee made \$900, \$1,200, \$1040, and \$760. What possible amounts earned during the fifth month will qualify the employee?
57. The formula for converting from Fahrenheit to Celsius temperature is $C = \frac{5}{9}(F-32)$. What temperature range in degrees Fahrenheit corresponds to 0° to 35° Celsius? (Hint: Write a three-part inequality.)
58. Rewrite the formula from the previous exercise for converting from Celsius to Fahrenheit temperature. What temperature range in degrees Celsius corresponds to 41° to 113° Fahrenheit?
59. A product will break even or produce a profit only if the revenue R from selling the product is at least the cost C of producing it. Suppose that the cost to produce x units of carpet is $C=50x+5,000$ while the revenue is $R=60x$. For what values of x is R at least equal to C ?
60. Refer to Exercise 49. Suppose that the cost to produce x units of books is $C=100x+6,000$ while the revenue is $R=500x$. For what values of x is R at least equal to C ?
61. A couple wishes to rent a car for one day while on vacation. Ford Automobile Rental wants \$15.00 per day and 14¢ per mi, while Chevrolet-For-A-Day wants \$14.00 per day and 16¢ per mi. After how many miles would the price to rent the Chevrolet exceed the price to rent a Ford?
62. Jane and Terry went to Long Island for a week. They needed to rent a car, so they checked out two rental firms. Avis wanted \$28 per day, with no mileage fee. Downtown Toyota wanted \$108 per week and 14¢ per mi. How many miles would they have to drive before the Avis price is less than the Toyota price?

Selected Answers

- | | | | | | |
|-----------|--------------------|-----------|----------------------------------|-----------|----------------------------|
| 1 | 510 cal | 23 | $18\frac{2}{11}$ l | 45 | $4\frac{4}{9}$ hr |
| 3 | \$14.58 | 25 | \$10,000 | 47 | 12 min |
| 5 | $25\frac{2}{3}$ in | 27 | \$10,000 at 10%; \$15,000 at 14% | 49 | 6 days |
| 7 | 12,500 fish | 29 | \$3,000 at 8%; \$9,000 at 9% | 51 | $1\frac{13}{15}$ hr |
| 9 | 10 ml | 31 | \$2,000 at 8%; \$3,000 at 14% | 53 | at least 88 |
| 11 | \$300 | 33 | 5 hr | 55 | at least \$275 |
| 13 | \$2.70 | 35 | $2\frac{1}{2}$ hr | 57 | 32° to 95° F |
| 15 | 0 l | 37 | $\frac{5}{6}$ hr | 59 | at least 500 |
| 17 | $2\frac{1}{2}$ l | 39 | 15 mph | 61 | after 50 mi |
| 19 | 2 l | 41 | 18 mi | | |
| 21 | 25 ml | 43 | $1\frac{5}{7}$ min | | |