CHAPTER 5

Ratios, Rates, and Proportions

Directions: Answer the following questions. For multiple-choice questions, choose the best answer. For other questions, write your answer in the space provided or the space below the question. Answers begin on page 94.

1. Which answer expresses the ratio *10 feet to 12 feet* as a fraction in lowest terms?

   A. $\frac{10}{12}$

   B. $\frac{12}{10}$

   C. $\frac{5}{6}$

   D. $\frac{6}{5}$

2. Write the ratio *21 students to 28 students* as a fraction in lowest terms.

3. Which answer expresses the rate *24 miles per 36 minutes* as a fraction in lowest terms?

   A. $\frac{24}{36}$

   B. $\frac{2}{3}$

   C. $\frac{3 \text{ minutes}}{2 \text{ miles}}$

   D. $\frac{2 \text{ miles}}{3 \text{ minutes}}$

4. Write the rate *20 leaves to 8 twigs* as a fraction in lowest terms.

5. Which answer expresses the rate *200 miles per 4 hours* as a unit rate?

   A. $\frac{200 \text{ miles}}{4 \text{ hours}}$

   B. $50\frac{\text{miles}}{\text{hours}}$

   C. $\frac{1 \text{ hour}}{50 \text{ miles}}$

   D. $\frac{4 \text{ hours}}{200 \text{ miles}}$

6. Write the rate *42 ounces per 5 mugs* as a unit rate. Write your answer as a decimal number.

7. In the first paragraph of an essay, Carmen wrote 70 words in 6 sentences. Which answer expresses this as a unit rate?

   A. $11\frac{2}{3}\frac{\text{words}}{\text{sentence}}$

   B. $\frac{35 \text{ words}}{3 \text{ sentences}}$

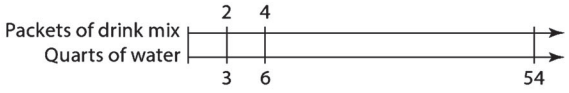
   C. $\frac{3 \text{ sentences}}{35 \text{ words}}$

   D. $11\frac{2}{3}\frac{\text{sentences}}{\text{word}}$

8. Bud earned $750 for a 40-hour week. What is Bud's rate of pay? Write your answer as a decimal.

9. Jakob built $\frac{3}{4}$ of a model in $\frac{1}{2}$ of a week. At what rate did Jakob build the model? Express your answer as a mixed number.

10. 2 packets of drink mix should be mixed with 3 quarts of water. Use the double number line to find how many packets of drink mix to mix with 54 quarts of water.



A. 30 packets
B. 33 packets
C. 36 packets
D. 39 packets

11. A hot dog vendor at a ballpark prepares for selling many hot dogs at the same time by preparing a table of costs per number of hot dogs. Help the vendor complete the table.

Hot dogs	1	2	3	4
Costs	1.50	3.00	4.50	6.00

Hot dogs	5	6	7	8	9
Costs					

12. Maria takes 7 minutes to clear a stack of 12 books for resale at the student bookstore. How long will it take her to clear a stack of 28 books?

A. $15\frac{2}{3}$ minutes
B. $16\frac{1}{3}$ minutes
C. $16\frac{2}{3}$ minutes
D. $17\frac{1}{3}$ minutes

13. Tinytown has all of its 132 citizens living on the 40 square miles within its town limits. What is the population density of Tinytown in persons per square mile?

A. 3.1 persons per square mile
B. 3.2 persons per square mile
C. 3.3 persons per square mile
D. 3.4 persons per square mile

14. Marty, a letter carrier, has noticed that the time it takes him to complete his route is proportional to the weight of his mailbag when he leaves the post office. If it takes him 3 hours to deliver 8 pounds of mail, how long does it take him to deliver 10 pounds of mail?

A. $3\frac{1}{4}$ hours
B. $3\frac{1}{3}$ hours
C. $3\frac{2}{3}$ hours
D. $3\frac{3}{4}$ hours

15. Johnny Jalopy drove 240 miles from Dallas to Houston in 3.5 hours. What was his rate of speed? Express your answer to the nearest mile per hour.

16. 127 millimeters is exactly 5 inches. How many millimeters is 8 inches?

A. 203 millimeters
B. 203.2 millimeters
C. 2.6 millimeters
D. 206.4 millimeters

17. A piece of wood has a mass of 20 grams and a volume of 25 cm^3. What is the density of the wood in grams per cm^3?

A. 0.8 g/cm^3
B. 0.9 g/cm^3
C. 1.2 g/cm^3
D. 1.3 g/cm^3

18. Celia bought 24 bottles of orange juice for her daughter's birthday party for a total price of $30. What was the unit price of each bottle of orange juice?

19. Jack drew $\frac{5}{8}$ of a picture in $\frac{5}{12}$ of an hour. What is Jack's picture-drawing rate in pictures/hour?

    A. $\frac{2}{3}$ picture/hour

    B. $\frac{3}{4}$ picture/hour

    C. $1\frac{1}{2}$ pictures/hour

    D. $1\frac{3}{4}$ pictures/hour

20. The scale on a map of Ohio says that on the map, 2 inches equals 35 miles. What is the distance between Cleveland and Cincinnati, which are 14 inches apart on the map?

    A. 140 miles
    B. 175 miles
    C. 210 miles
    D. 245 miles

21. On the plans for a building, the drawing of a wall measures $3\frac{1}{3}$ inches tall by $9\frac{1}{2}$ inches wide. The scale says that 1 inch equals 6 feet. What will be the dimensions of the wall once it is built?

    A. 19 feet tall by 55 feet wide
    B. 19 feet tall by 57 feet wide
    C. 20 feet tall by 55 feet wide
    D. 20 feet tall by 57 feet wide

22. A large-screen television has an aspect ratio of 16:9. How tall is the screen if it is 96 centimeters wide?

    A. 48 centimeters
    B. 54 centimeters
    C. 56 centimeters
    D. 60 centimeters

23. Dosage information for a drug specifies that 2.5 milliliters should be administered for every 20 kilograms of a patient's mass. How much of the drug should be given to a patient whose mass is 90 kilograms?

    A. 11.25 milliliters
    B. 11.5 milliliters
    C. 11.75 milliliters
    D. 12 milliliters

24. A recipe that serves 4 people calls for $3\frac{1}{2}$ cups of flour. Suzy plans to serve this dish to 10 friends and relatives at Thanksgiving. How much flour does she need?

    A. 8 cups

    B. $8\frac{1}{4}$ cups

    C. $8\frac{1}{2}$ cups

    D. $8\frac{3}{4}$ cups

25. Henri put 12.4 gallons of gas in his car to fill it up. Having reset his trip odometer on his previous visit to the gas station, during which he filled up the tank, he noticed that he has driven 298.9 miles. What is his mileage?

    A. 23.9 miles per gallon
    B. 24.1 miles per gallon
    C. 24.3 miles per gallon
    D. 24.5 miles per gallon

26. A plastic model company sells a model of a battleship at a $\frac{1}{288}$ scale. The battleship is 864 feet long. How long is the model?

    A. 2 feet
    B. 2.5 feet
    C. 3 feet
    D. 3.5 feet

27. Fran drives 27 miles on her paper route in 45 minutes. It takes her 2 hours to drive the entire route at the same rate. How long is Fran's paper route?

    A. 72 miles
    B. 74 miles
    C. 76 miles
    D. 78 miles

28. A scale drawing with a scale of 1 inch = 3 feet is redrawn so that 1 inch = 5 feet. What is the new length of the side of a square that was 2 inches on the old drawing?

    A. 0.8 inch
    B. 0.9 inch
    C. 1.1 inches
    D. 1.2 inches

29. A photo that measures 2 inches wide by 3 inches tall is blown up so that it is 8 inches wide. How tall is the new photo?

    A. 11 inches
    B. 12 inches
    C. 13 inches
    D. 14 inches

30. A parade starts in a stadium with a lap around a football field, then continues through the city for an additional 3 miles. If a marching band takes 12 minutes to march the $\frac{1}{4}$-mile track around the field, how long will it take to march the entire route, at the same rate?

    A. 2 hours 12 minutes
    B. 2 hours 24 minutes
    C. 2 hours 36 minutes
    D. 2 hours 48 minutes

31. Julio walks 264 feet per minute. What is his rate in miles per hour? (Hint: 1 mile = 5280 feet.)

    A. 3 miles per hour
    B. 3.5 miles per hour
    C. 4 miles per hour
    D. 4.5 miles per hour

32. A box of a dozen granola bars costs $3.60. What is the unit cost?

    A. $0.27 per bar
    B. $0.30 per bar
    C. $0.32 per bar
    D. $0.33 per bar

33. Brad burns 4.5 gallons of gas driving 99 miles. How far can he drive with a full tank of 16 gallons?

    A. 340 miles
    B. 348 miles
    C. 352 miles
    D. 360 miles

34. Are the ratios 14:21 and 48:72 in proportion?

    Check _____ Yes or _____ No.

35. Gasoline costs $3.15 per gallon. Which equation shows the total cost C of buying g gallons of gasoline?

    A. $C = \frac{g}{3.15}$
    B. $g = 3.15C$
    C. $g = \frac{3.15}{C}$
    D. $C = 3.15g$

36. What is the unit rate in the table?

Crates	1	2	3	4	5	6	7	8	9
Pounds	40	80	120	160	200	240	280	320	360

A. 40 crates per pound
B. 40 pounds per crate
C. $\frac{1}{40}$ pounds per crate
D. $\frac{1}{80}$ crates per pound

37. Marvin's pay is modeled by the equation $P = 13.25t$. What is the unit rate in the equation?

38. Fill in the empty cells in the tables to determine which ratio is smaller, $\frac{3}{5}$ or $\frac{5}{8}$.

Number	3	
Price	5	40

Number	5	
Price	8	40

39. Dennis drove 300 miles in 5 hours. Write an equation, using Dennis' unit rate, that expresses the relationship between the time t he drives and the distance D he covers.

A. $t = \frac{60}{D}$
B. $D = \frac{60}{t}$
C. $t = 60D$
D. $D = 60t$

40. Are the ratios 18:81 and 34:154 in proportion?

41. Jimmy earned $48.75 washing cars for 5 hours. Johnny earned $58.32 mowing lawn for 6 hours. Who had the higher rate of pay?

42. A bookstore is having a sale, offering a discount on all books in the store. A book with a regular price of $12.95 is on sale for $7.77. At the same discount rate, what is the selling price of a book with a regular price of $18.50?

43. Last year, the manager of a baseball team bought the season's supply of 60 baseballs from a sporting goods store for $1620. This year he is buying baseballs from the same store at the same price, but he hasn't decided how many to buy. Write an equation giving the total price T of n baseballs.

44. A city is planning to place a 22-foot-high statue in a local park. The artist who earned the commission is working from a model that is 18 inches high. A feature on the model measure 3 inches across. How large will the feature on the completed statue be?

45. How far does a car travel in 1 minute at the rate of 75 miles per hour?

46. The chef at a restaurant gets 20 bowls of soup from a 5-quart pot. How much more soup could he get from a 9-quart pot?

47. According to the 2010 U.S. Census, San Francisco has a population of 805,000 living in a land area of 47 square miles, while Poplar Hills, Kentucky, has 362 citizens occupying 0.02 square miles of land. Which has the higher population density?

48. Jeanine keeps careful records on the performance of her automobile. The table shows the amount of fuel she recorded for trips of different lengths:

Distance (miles)	72	144	192	288	336	360
Fuel (gallons)	3	6	8	12	14	15

Write an equation relating the trip distance (D) to the amount of fuel used (f). What does the multiplier represent?

49. The speed of light is roughly 186,000 miles per second. How many minutes does it take for light to arrive from the sun, which is 93,000,000 miles away?

50. Bulk flour costs $1.79 per pound. How many pounds of flour can be purchased for $17.37?

CHAPTER 6

Percents and Applications

Directions: Answer the following questions. For multiple-choice questions, choose the best answer. For other questions, write your answer in the space next to or below the question. Answers begin on page 97.

Express each decimal number as a percent.

1. 0.175

2. 0.8

3. 6.605

4. 15.20

5. 0.0017

Express each fraction or mixed number as a percent rounded to the nearest hundredth.

6. $\frac{6}{10}$

7. $\frac{2}{3}$

8. $\frac{7}{5}$

9. 3

10. $2\frac{7}{8}$

Express each percent as a fraction or mixed number reduced to lowest terms.

11. 32.5%

12. 60%

13. 6%

14. 185%

15. 0.35%

Express each percent as a decimal number.

16. 11%

17. 4%

18. 2756%

19. $7\frac{3}{16}\%$

20. 0.0076%

21. A pair of gloves retails for $17.89. If the sales tax is $8\frac{1}{2}\%$, what is the total cost of the gloves?

22. A game console that lists for $159.95 is on sale at a discount of 15%. If there is a $5\frac{1}{4}\%$ sales tax, how much will Jane pay for the console? (Round up to a whole cent.)

23. A bag of Spot's dog food usually costs $36.99. It is on sale today at 20% off. In addition, his owner has a coupon good for 10% off any purchase. What is the cost of the dog food before sales tax?

24. Susan unloaded 168 boxes of books from a shipment of 1052. What percentage of the shipment is left to unload? (Round to a whole number.)

25. Rufus owes $9250 in no-interest student loans. After paying off 32% of what he owes, how much will he still have to pay?

    A. $6290
    B. $2960
    C. $7215
    D. $3046

26. Imelda bought a guitar with no money down and has a loan for $1150 at 6% per year. If she pays off the loan after 4 months, what is the total cost of the guitar?

27. Sydney buys her textbooks online and spends $1147. The sales tax in her town is $5\frac{3}{4}\%$, but the bookseller does not charge tax on Internet sales. Before she pays for shipping, how much has she saved by not paying sales tax? (Round to the nearest cent.)

28. Ashanti's Bike Store makes a profit of 17.5% on sales. If this month's profit is $2175, how much did the store sell this month? (Round to the nearest cent.)

29. After paying a $6\frac{1}{4}\%$ sales tax, Jerome paid $135.20 for a set of Blu-ray discs that listed for $149.70 but was on sale at a discount. To the nearest whole percent, what was the discount on the set before sales tax?

30. To be considered a periodical under the post office's rules, a magazine must have no more than 25% advertising content. The present issue of the magazine that Aram manages has 172 pages but is 28.5% ads. How many pages must Aram convert from ads to non-advertising content to meet the post office's requirement?

31. There are about 150 million registered voters in the United States. Pollsters question 2056 of them to get an accurate prediction of an upcoming vote, to a plus or minus 4% accuracy. Approximately what percent of the voters is this?

    A. 0.0014%
    B. 0.014%
    C. 0.14%
    D. 1.4%

32. Bill's Bikes has sold $3036.00 worth of merchandise this month. That is a 15% increase over last month. And last month saw a 10% increase over the month before. How much merchandise did Bill's Bikes sell two months ago?

33. There are 207,634,000 Americans who are eligible to vote, but only 150 million are registered to vote. In the 2012 presidential election, only 57% of registered voters participated. What percentage of eligible voters does this represent?

34. Salome is looking at a watch that costs $9.99, and she has $10.00 to spend. But sales tax is 6%. How much of a discount, expressed as a percentage, must the store offer for Salome to be able to buy it?

35. The number of traffic accidents in our city has dropped by 17% this year. If last year's total was 475, what is this year's total?

    A. 281
    B. 394
    C. 400
    D. 600

36. A fully fueled AeroTrans 474 passenger jet airplane weighs 987,000 pounds at takeoff. It carries 422,000 pounds of fuel. What percent of the aircraft's takeoff weight is fuel?

37. Levi paid $180.00 for a set of dishes listed at $225.00. What was the discount, to the nearest percent?

38. For telephone and Internet service, Jerry pays $63.70 a month, including 7.95% in various taxes. What is the cost of the telephone and Internet service before tax?

    A. $68.76
    B. $61.95
    C. $59.00
    D. $35.48

39. If Leda pays her bill for duck food early, she can get a 1.5% discount. How much can she save on a bill of $3720?

40. Tonya gets a 15% discount on merchandise she buys at work. If she pays $170 for some merchandise, what would it have cost her without the discount?

    A. $113.30
    B. $165.00
    C. $200.00
    D. $225.45

41. Tom buys an investment. Its value drops by 50% one month. The next month, though, its value increases by 50%. What is the result at the end of the second month?

    A. The value has not changed.
    B. The value has increased by 50%.
    C. The value has decreased by 25%.
    D. The value has decreased by 50%.

42. Federal tax on airline tickets is 7.5%. How much does a ticket for a round trip to Orlando from Chicago, listed at $269, cost after taxes?

    A. $289.18
    B. $299.22
    C. $314.29
    D. $370.75

43. Last year 1,320,000 people visited the state fair. This year 1,544,400 visited. What percentage increase or decrease was this, to the nearest whole percent?

44. Yaakov paid one month's interest of $76.00 on a $5000 loan. What was the interest rate on the loan, expressed as a percentage, per year?

    A. 1.52%
    B. 15.2%
    C. 1.82%
    D. 18.2%

45. Elita bought a scarf on sale for $14.49 after a 16% discount. What was the scarf's original price?

    A. $17.25
    B. $17.34
    C. $12.88
    D. $14.95

46. Sal made an investment that performed as shown in the chart below. What was the net gain or loss of the investment at the end of four months?

Month	Percent change from prior month
1	+10%
2	–5%
3	+2%
4	–7%

47. Salem pays 6.2% Social Security tax, 1.45% Medicare, and 14% federal income tax withholding each pay period. How much is left after taxes from a paycheck of $718.15?

48. Joe, a plumber, buys a part on sale at 25% off. In addition, he gets 15% off his entire order. If the part's list price is $555.00, what is its cost after the discounts?

    A. $194.25
    B. $208.13
    C. $333.00
    D. $353.81

49. Tara makes a batch of tortilla dough with 100 pounds flour, 9 pounds of shortening, and 3 pounds of baking soda. What percent of the batch is shortening?

    A. 8%
    B. 9%
    C. 3%
    D. 12%

50. Ishmael sells yachts and sold $90,000 worth of yachts this month. That is an increase of 20% over last month's sales. But last month was 20% less than the month before. What were Ishmael's sales two months ago?

ANSWERS AND SOLUTIONS

47. **6.0478×10^{24}**

$7.36 \times 10^{22} = 0.0736 \times 10^{24}$

$0.0736 \times 10^{24} + 5.9742 \times 10^{24} = 6.0478 \times 10^{24}$

48. **0.00006022**

49. **6.12 miles** 17.35 – 11.23 = 6.12 miles

50. **15 trips** 5.7 + 8.6 = 14.3 miles each way, or 28.6 miles per round trip

13.5 gallons × 32.5 miles per gallon = 438.75 miles

438.75 miles ÷ 28.6 miles per trip = 15.34 trips

He would run out of gas on the 16th trip.

Chapter 5 Ratios, Rates, and Proportions

1. **C** 10 feet to 12 feet =

$$\frac{10 \text{ feet}}{12 \text{ feet}} = \frac{10}{12} = \frac{5}{6}$$

2. **$\frac{3}{4}$** 21 students to 28 students =

$$\frac{21 \text{ students}}{28 \text{ students}} = \frac{21}{28} = \frac{3}{4}$$

3. **D** 24 miles to 36 minutes =

$$\frac{24 \text{ miles}}{36 \text{ minutes}} = \frac{2 \text{ miles}}{3 \text{ minutes}}$$

4. **$\frac{5 \text{ leaves}}{2 \text{ twigs}}$** 20 leaves to 8 twigs =

$$\frac{20 \text{ leaves}}{8 \text{ twigs}} = \frac{5 \text{ leaves}}{2 \text{ twigs}}$$

5. **B** 200 miles per 4 hours =

$$\frac{200 \text{ miles}}{4 \text{ hours}} = \frac{50 \text{ miles}}{1 \text{ hour}} = 50 \frac{\text{miles}}{\text{hour}}$$

6. **$8.4 \frac{\text{ounces}}{\text{mug}}$** 42 ounces for 5 mugs =

$$\frac{42 \text{ ounces}}{5 \text{ mug}} = \frac{8.4 \text{ ounces}}{1 \text{ mug}} =$$

$$8.4 \frac{\text{ounces}}{\text{mug}}$$

7. **A** 70 words in 6 sentences =

$$\frac{70 \text{ words}}{6 \text{ sentences}} = \frac{35 \text{ words}}{3 \text{ sentences}} =$$

$$11\frac{2}{3} \frac{\text{words}}{\text{sentence}}$$

8. **$18.75/hour**

$\$750 \text{ for } 40 \text{ hours} = \frac{\$750}{40 \text{ hours}} = \frac{\$75}{4 \text{ hours}} =$

$\frac{\$18.75}{1 \text{ hour}} = \$18.75/\text{hour}$

9. **$1\frac{1}{2} \frac{\text{model}}{\text{week}}$** $\frac{3}{4}$ of a model in $\frac{1}{2}$ of a week =

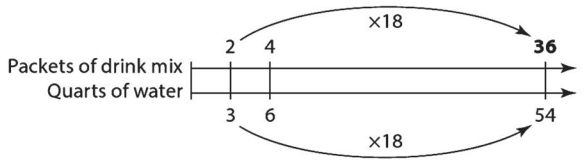
$$\frac{\frac{3}{4} \text{ model}}{\frac{1}{2} \text{ week}} =$$

$$\frac{3}{4} \cdot \frac{2}{1} \frac{\text{model}}{\text{week}} = \frac{3}{2} \cdot \frac{1}{1} \frac{\text{model}}{\text{week}} =$$

$$\frac{3}{2} \frac{\text{model}}{\text{week}} = 1\frac{1}{2} \frac{\text{model}}{\text{week}}$$

ANSWERS AND SOLUTIONS

10. **C**



11.

5	6	7	8	9
7.50	9.00	10.50	12.00	13.50

Each hot dog costs $1.50.

12. **B** $\frac{7}{12} = \frac{x}{28} \rightarrow 28 \cdot \frac{7}{12} = 28 \cdot \frac{x}{28} \rightarrow$

$\frac{28 \cdot 7}{12} = x \rightarrow \frac{7 \cdot 7}{3} = x \rightarrow$

$\frac{49}{3} = x \rightarrow 16\frac{1}{3} = x$

13. **C** $\frac{132 \text{ persons}}{40 \text{ square miles}} =$

$\frac{132}{40}$ persons per square mile =

3.3 persons per square mile

$40\overline{)132.0}$ (3.3)

14. **D** $\frac{3}{8} = \frac{x}{10} \rightarrow 10 \cdot \frac{3}{8} = 10 \cdot \frac{x}{10} \rightarrow \frac{15}{4} =$

$x \rightarrow 3\frac{3}{4} = x$

15. **69 miles per hour**

$\frac{240 \text{ miles}}{3.5 \text{ hours}} = 68.5$ miles per hour

$35\overline{)2400.0}$ (68.5)

16. **B** $\frac{127}{5} = \frac{x}{8} \rightarrow 8 \cdot \frac{127}{5} = 8 \cdot \frac{x}{8} \rightarrow$

$\frac{1016}{5} = x \rightarrow 203.2 = x$

17. **A** $\frac{20 \text{ g}}{25 \text{ cm}^3} = \frac{4}{5} \text{ g/cm}^3 = 0.8 \text{ g/cm}^3$

18. **$1.25 per bottle**

$\frac{\$30}{24 \text{ bottles}} = \frac{\$5}{4 \text{ bottles}} = \frac{\$1.25}{1 \text{ bottle}} =$

$1.25 per bottle

19. **C** $\frac{\frac{5}{8} \text{ picture}}{\frac{5}{12} \text{ hour}} = \frac{5}{8} \cdot \frac{12}{5} \frac{\text{picture}}{\text{hour}} =$

$\frac{1}{2} \cdot \frac{3}{1} \frac{\text{picture}}{\text{hour}} = \frac{3}{2} \frac{\text{picture}}{\text{hour}} = 1\frac{1}{2}$ pictures/hour

20. **D** $\frac{35}{2} = \frac{x}{14} \rightarrow 14 \cdot \frac{35}{2} = 14 \cdot \frac{x}{14} \rightarrow$

$7 \cdot 35 = x \rightarrow 245 = x$

21. **D** $\frac{6}{1} = \frac{x}{3\frac{1}{3}} \rightarrow 3\frac{1}{3} \cdot \frac{6}{1} = 3\frac{1}{3} \cdot \frac{x}{3\frac{1}{3}} \rightarrow \frac{10}{3} \cdot \frac{6}{1} = x$

$\rightarrow 10 \cdot 2 = x \rightarrow 20 = x$

$\frac{6}{1} = \frac{x}{9\frac{1}{2}} \rightarrow 9\frac{1}{2} \cdot \frac{6}{1} = 9\frac{1}{2} \cdot \frac{x}{9\frac{1}{2}} \rightarrow \frac{19}{2} \cdot \frac{6}{1} = x$

$\rightarrow 19 \cdot 3 = x \rightarrow 57 = x$

22. **B** $\frac{9}{16} = \frac{x}{96} \rightarrow 96 \cdot \frac{9}{16} = 96 \cdot \frac{x}{96} \rightarrow 6 \cdot 9 = x$

$\rightarrow 54 = x$

23. **A** $\frac{2.5}{20} = \frac{x}{90} \rightarrow 90 \cdot \frac{2.5}{20} = 90 \cdot \frac{x}{90}$

$\rightarrow \frac{9 \cdot 2.5}{2} = x \rightarrow 11.25 = x$

24. **D** $\frac{3\frac{1}{2}}{4} = \frac{x}{10} \rightarrow 10 \cdot \frac{3\frac{1}{2}}{4} = 10 \cdot \frac{x}{10} \rightarrow \frac{5}{2} \cdot \frac{7}{2} = x$

$\rightarrow \frac{35}{4} = x \rightarrow 8\frac{3}{4} = x$

25. **B** $\frac{298.9 \text{ miles}}{12.4 \text{ gallons}} = 24.1$ miles per gallon

$12.4\overline{)298.9}$ (24.1)

ANSWERS AND SOLUTIONS

26. **C** $\frac{1}{288} = \frac{x}{864} \rightarrow 864 \cdot \frac{1}{288} =$

$864 \cdot \frac{x}{864} \rightarrow 3 = x$

27. **A** $\frac{27}{45} = \frac{x}{120} \rightarrow 120 \cdot \frac{27}{45} =$

$120 \cdot \frac{x}{120} \rightarrow 120 \cdot \frac{3}{5} = x \rightarrow$

$\frac{24}{1} \cdot \frac{3}{1} = x \rightarrow 72 = x$

28. **D** The real-world square is 6 feet.

$\frac{1}{5} = \frac{x}{6} \rightarrow 6 \cdot \frac{1}{5} = 6 \cdot \frac{x}{6} \rightarrow \frac{6}{5} = x$

$5\overline{)6.0}^{1.2}$

29. **B** $\frac{3}{2} = \frac{x}{8} \rightarrow 8 \cdot \frac{3}{2} = 8 \cdot \frac{x}{8} \rightarrow$

$4 \cdot 3 = x \rightarrow 12 = x$

30. **C** $\frac{12}{\frac{1}{4}} = \frac{x}{3\frac{1}{4}} \rightarrow 3\frac{1}{4} \cdot \frac{12}{\frac{1}{4}} =$

$3\frac{1}{4} \cdot \frac{x}{3\frac{1}{4}} \rightarrow \frac{13}{4} \cdot \frac{4}{1} \cdot \frac{12}{1} = x$

$\rightarrow 13 \cdot 12 = x \rightarrow 156 = x$

156 minutes – 2 hours = 156 minutes – 120 minutes = 36 minutes

x = 2 hours 36 minutes

31. **A** $\frac{264 \text{ feet}}{1 \text{ min}} = \frac{264 \cdot \frac{1}{5280} \text{ mile}}{\frac{1}{60} \text{ hour}} =$

$\frac{264}{1} \cdot \frac{1}{5280} \cdot \frac{60}{1} \frac{\text{mile}}{\text{hour}} =$

$\frac{15,840}{5280}$ miles per hour =

3 miles per hour

$5280\overline{)15,840}^{3}$

32. **B** $\frac{\$3.60}{12 \text{ bars}} = \$0.30$ per bar

$12\overline{)3.60}^{0.30}$

33. **C** $\frac{99}{4.5} = \frac{x}{16} \rightarrow 16 \cdot \frac{99}{4.5} = 16 \cdot \frac{x}{16} \rightarrow$

$\frac{1584}{4.5} = x \rightarrow 352 = x$

34. **Yes** Write $\frac{14}{21} = \frac{48}{72}$ and cross-multiply:

$14 \cdot 72 = 1008 = 21 \cdot 48$

35. **D** The unit cost of gasoline should be multiplied by the quantity of gasoline to get the total cost.

36. **B** Each crate weighs 40 pounds, so the unit rate is 40 pounds per crate. ($\frac{1}{40}$ crates per pound conveys the same relationship, but unit rates are typically concerned with quantity per item, not items per quantity.)

37. **$13.25 per hour**

The unit rate connects the amount of time worked and the amount of pay earned.

38. **$\frac{3}{5}$ is the smaller ratio**

Number	3	24
Price	5	40

Number	5	25
Price	8	40

39. **D** $5\overline{)300}^{60}$

Dennis's unit rate is $60\frac{\text{miles}}{\text{hour}}$.

Multiplying this by time in hours will cancel the hours and leave miles, or distance.

$D = 60t$

40. **No** Write $\frac{18}{81} = \frac{34}{154}$ and cross-multiply:

$18 \cdot 154 = 2772$, but $81 \cdot 34 = 2754$

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41. **Jimmy** $\frac{\$48.75}{5 \text{ hours}} = \$9.75/\text{hour}$

$\frac{\$58.32}{6 \text{ hours}} = \$9.72/\text{hour}$

42. **$11.10** $\frac{7.77}{12.95} = \frac{p}{18.50} \rightarrow 18.50 \cdot \frac{7.77}{12.95} =$

$18.50 \cdot \frac{p}{18.50} \rightarrow 11.10 = p$

43. ***T* = 27*n*** unit price $= \frac{\$1620}{60 \text{ baseballs}} =$

$27 per baseball

44. **$3\frac{2}{3}$ feet** $\frac{22}{18} = \frac{d}{3} \rightarrow 3 \cdot \frac{22}{18} = 3 \cdot \frac{d}{3} \rightarrow$

$\frac{11}{3} = d \rightarrow 3\frac{2}{3} = d$

45. **$1\frac{1}{4}$ miles** $\frac{75 \text{ miles}}{\text{hour}} \cdot \frac{1 \text{ hour}}{60 \text{ minutes}} \cdot \frac{1 \text{ minute}}{1} =$

$\frac{5 \text{ miles}}{4} = 1\frac{1}{4} \text{ miles}$

46. **16 bowls** $\frac{20 \text{ bowls}}{5 \text{ quarts}} = \frac{n}{9 \text{ quarts}} \rightarrow$

$9 \text{ quarts} \cdot \frac{20 \text{ bowls}}{5 \text{ quarts}} =$

$9 \text{ quarts} \cdot \frac{n}{9 \text{ quarts}} \rightarrow$

$9 \cdot 4 \text{ bowls} = n \rightarrow 36 \text{ bowls} = n$

$36 \text{ bowls} - 20 \text{ bowls} = 16 \text{ bowls}$

47. **Poplar Hills**

Poplar Hills: $\frac{362 \text{ persons}}{0.02 \text{ square mile}} =$

8,100 persons per square mile

San Francisco: $\frac{805{,}000 \text{ persons}}{47 \text{ square miles}} =$

17,128 persons per square mile

48. ***D* = 24*f*** $\frac{72}{3} = \frac{144}{6} = \frac{192}{8} = \frac{288}{12}$, the mileage in miles per gallon

49. **$8\frac{1}{3}$ minutes**

$\frac{93{,}000{,}000 \text{ miles}}{186{,}000 \frac{\text{miles}}{\text{second}}} =$

$\frac{93{,}000 \text{ miles}}{1} \cdot \frac{1 \text{ second}}{186 \text{ miles}} = 500 \text{ seconds}$

$\frac{500 \text{ seconds}}{1} \cdot \frac{1 \text{ minute}}{60 \text{ seconds}} = \frac{25}{3} \text{minutes} =$

$8\frac{1}{3} \text{ minutes}$

50. **9.7 pounds**

$\frac{\$17.37}{\frac{\$1.79}{\text{pound}}} = \frac{\$17.37}{1} \cdot \frac{1 \text{ pound}}{\$1.79} =$

$\frac{17.37}{1.79} \text{ pounds} = 9.7 \text{ pounds}$

Chapter 6 Percents and Applications

1. **17.5%**
2. **80%**
3. **660.5%**
4. **1520%**
5. **0.17%**

Questions 1–5 are solved by multiplying by 100, moving the decimal two places right, and adding the percent sign.

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6. **60%** 7. **66.67%** 8. **140%**

9. **300%** 10. **287.5%**

Questions 6–10 are solved by converting the fraction into a decimal, moving the decimal two places right, and adding the percent sign.

11. $\mathbf{\frac{13}{40}}$ 12. $\mathbf{\frac{3}{5}}$ 13. $\mathbf{\frac{3}{50}}$

14. $\mathbf{1\frac{17}{20}}$ 15. $\mathbf{\frac{7}{2000}}$

Questions 11–15 are solved by dividing the percents by 100, clearing decimals by additional multiplications as necessary, and reducing the fractions to lowest terms.

16. **0.11** 17. **0.04** 18. **27.56**

19. **0.071875** 20. **0.000076**

Questions 16–20 are solved by dividing the percents by 100 or moving the decimal point two places to the left.

21. **$19.41** $\$17.89 \times 1.085 \cong \$19.41$

22. **$143.10** $\$159.95 \times 0.85$ (net from discount) $\times$ 1.0525 (sales tax) = $143.10

23. **$26.63** $\$36.99 \times 0.8 \times 0.9 = \$26.63$

24. **84%** $\frac{168}{1052} = 16\%$ = boxes unloaded by Susan

100% – 16% = 84% = remaining boxes to unload

25. **A** Either $\$9250 \times 0.68$, or $\$9250 - (\$9250 \times 0.32) = \$6290$.

26. **$1173** $\$1150 \times 0.06 = \$69$, but the loan is only for $\frac{1}{3}$ of a year, so interest is $\frac{1}{3}$ that, or $23.

$1150 + 23 = $1173

27. **$65.95** $\$1147 \times 0.0575 = \$65.95$

28. **$12,428.57.** $\frac{\$2175}{0.175} = \$12,428.571 \cong \$12,428.57$

29. **15%** $\frac{\$135.20}{1.0625} = \$127.25$, which is the sale price.

$149.70 – $127.25 = $22.45 discount

$\frac{\$22.45}{\$149.70} = 14.99\% \cong 15\%$

30. **6 pages** 172 pages $\times$ 0.285 = 49 pages of ads. 172 $\times$ 0.25 gives 43 pages as a maximum for 25% ads. The difference is 6 pages.

31. **A** $\frac{2056}{150,000,000} = 0.0000137 =$

0.00137% $\cong$ 0.0014%

32. **$2400** This month's sales are 115% of last month's, so $\frac{\$3036}{1.15} = \$2640$. Last month's sales were 110% of the month before, and $\frac{\$2640}{1.10} = \$2400$.

33. **41%** $150,000,000 \times 0.57 = 85,500,000$

$\frac{85,500,000}{207,634,000} = 0.041 = 41\%$

34. **5.6%** A 6% tax means she must get a price of $\frac{\$10.00}{1.06} = \$9.43$ This is the most she can spend if she uses all $10.00.

$9.99 – $9.43 = $0.56

$\frac{0.56}{9.99} \cong 0.056 = 5.6\%$ on the original $9.99 price.

35. **B** This year's total is 83% of last year's.

$475 \times 0.83 = 394$

36. **43%** $\frac{422,000}{987,000} = 0.4275 \cong 43\%$

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37. **20%** $\$225 - \$180 = \$45$

$$\frac{\$45}{\$225} = 0.20 = 20\%$$

38. **C** The total, $63.70, is 107.95% of the cost.

$$\frac{\$63.70}{1.0795} = \$59$$

39. **$55.80** $\$3720 \times 0.015 = \$55.80$

40. **C** A 15% discount means she pays only 85% of the cost.

$$\frac{\$170.00}{0.85} = \$200$$

41. **C** Let us say Tom invests $100. He loses 50%, which leaves $50. A 50% increase of $50 is only $25, which raises his investment value to $75—a 25% loss overall.

42. **A** $269 \times 1.075 \cong \$289.18$, or $269 \times 0.075 + \$269 \cong \$289.18$

43. **+17%** 1,544,400 – 1,320,000 = 224,400 increase.

$$\frac{224{,}000}{1{,}320{,}000} = 0.169 \cong 17\%$$

44. **D** $76 for one month means $76 × 12, or $912, interest per year.

$$\frac{\$912}{\$5000} = 0.1824 \cong 18.2\%$$

45. **A**

$$\frac{\$14.49}{0.84} = \$17.25$$

46. **–0.87%** Suppose Sal invested $100. $100 \times 1.10 \times 0.95 \times 1.02 \times 0.93 \cong 99.13$, so Sal lost $0.87, an overall decrease of 0.87%.

47. **$562.67** 6.2% + 1.45% + 14%= 21.65% reduction

100% – 21.65% = 78.35% net take-home

$0.7835 \times \$718.15 \cong \$562.67$

48. **D** $\$555.00 \times 0.75 \times 0.85 = \$353.81$

49. **A** The total weight of a batch is 112 pounds.

$$\frac{9}{112} = 0.080 = 8\%$$

50. **$93,750** This month is 120% of last month. $\frac{90{,}000}{1.20} = \$75{,}000 =$ last month's sales. $75,000 is 80% of the previous month's sales. $\frac{\$75{,}000}{0.80} = \$93{,}750 =$ sales two months ago.

Chapter 7 Probability and Statistics

1. **B** The numbers are roughly proportional, with a proportionality constant of 7.
2. **D** $Y = 7X$
3. **C** The most probable source of the "noise" in the data is random effects.
4. **B** A straight line passing through the origin represents a relationship that never needs a constant.
5. **28.5**