6.1 Ratio

A ratio is a pair of numbers that compares two quantities or describes a rate. A ratio can be written in three ways:

Using the word *to*  
3 to 4

Using a colon  
3:4

Writing a fraction  
\[ \frac{3}{4} \]

These are all read *3 to 4*.

When a ratio is used to compare two different kinds of quantities, such as miles to gallons, it is called a rate.

Equal ratios make the same comparison. To find equal ratios, multiply or divide each term of the given ratio by the same number.
Model Problems

1. In a basket, there are 7 apples and 12 oranges. In three different ways, write the ratio of:
   a. apples to oranges
   b. oranges to apples
   c. apples to pieces of fruit

   **Solution**
   a. apples to oranges 7 to 12 7:12 \( \frac{7}{12} \)
   b. oranges to apples 12 to 7 12:7 \( \frac{12}{7} \)
   c. apples to pieces of fruit 7 to 19 7:19 \( \frac{7}{19} \)

2. Find three ratios equal to \( \frac{10}{12} \).

   **Solution**
   \[
   \frac{10}{12} = \frac{10 \div 2}{12 \div 2} = \frac{5}{6}
   \]
   5 \( \frac{5}{6} \) is the lowest terms fraction for this ratio.
   \[
   \frac{10}{12} = \frac{10 \times 2}{12 \times 2} = \frac{20}{24}
   \]
   \[
   \frac{10}{12} = \frac{10 \times 5}{12 \times 5} = \frac{50}{60}
   \]

Practice

1. Which ratio is different from the others?
   A. 8 to 15
   B. 15:8
   C. 8:15
   D. \( \frac{8}{15} \)

2. In a room, there are 9 boys and 12 girls. The ratio of girls to boys is
   A. 9 to 12
   B. 12 to 21
   C. 12:9
   D. 21:9

3. In the word BALLOONS, the ratio of vowels to consonants is
   A. \( \frac{3}{5} \)
   B. 3 to 8
   C. 5:3
   D. \( \frac{8}{5} \)
4. A pet store has 8 cats, 12 dogs, and 3 rabbits. The ratio 8:23 compares
A. dogs to cats
B. cats to dogs
C. rabbits to cats
D. cats to all animals

5. Which ratio is equal to 15:20?
A. 5 to 10
B. 18:25
C. 21 to 28
D. 24:30

6. Which ratio is equal to $1 \frac{1}{3}:2$?
A. $\frac{2}{3} : \frac{1}{2}$
B. 4:6
C. $3\frac{2}{3} : 5$
D. 8 to 11

7. If Joey earns $46.80 for 6 hours of work, what is Joey's rate of pay?
A. $6.80 per hour
B. $46.80 per week
C. $62.00 per day
D. $7.80 per hour

8. Which pair of ratios is NOT equal?
A. 72 to 64, 27 to 24
B. 25:10, 10 to 4
C. 6:7, 30:35
D. 7.5 to 18, 5 to 1

9. The Blue Devils won 13 games and lost 7. Find each ratio.
   a. games won to games lost
   b. games won to games played
   c. games played to games lost

10. At a meeting, there were 30 Democrats and 20 Republicans. Write each ratio as a fraction in lowest terms.
   a. Democrats to Republicans
   b. Republicans to all meeting participants
   c. All meeting participants to Democrats

11. A vase contains 16 roses, 10 carnations, and 14 daisies. Write each ratio in lowest terms using to.
   a. roses to daisies
   b. carnations to all flowers
   c. daisies to roses and carnations

12. Mr. Nolan drove 228 miles using 12 gallons of gasoline. What was his mileage per gallon?

For problems 13–16, find three equal ratios for each.

13. 5 to 8
14. $\frac{60}{40}$
15. 9:21
16. 25 to $33\frac{1}{3}$

**Constructed-Response Questions**

17. Irene made 11 baskets out of 15 free throws.
   a. Write her ratio of baskets to free throws and three ratios equal to it.
   b. If she continues this way, how many baskets will she have after 90 free throws?

18. The ratios in the box are all equal. Find the value of each variable.

\[
\begin{array}{cccc}
\frac{6}{x+2} & \frac{12}{10} & \frac{y-1}{15} & \frac{30}{z^2}
\end{array}
\]
6.2 Proportion

A proportion is a statement that two ratios are equal. A proportion shows that the numbers in two different ratios compare to each other in the same way.

The proportion \( \frac{2}{3} = \frac{10}{15} \) is read 2 is to 3 as 10 is to 15.

In a proportion, the cross products are equal. 3 and 10 are the means, or the terms in the middle of the proportion. 2 and 15 are the extremes, or the terms at the beginning and end of the proportion.

\[ 2 \times 15 = 3 \times 10 \]
\[ 30 = 30 \]

If the product of the means equals the product of the extremes, then you have a proportion.

To solve a proportion with an unknown term represented by a variable, set the cross products equal to each other. Then solve the resulting equation using division.

---

**Model Problems**

1. Tell whether the statement is a proportion: \( \frac{6}{9} \neq \frac{8}{12} \).

   **Solution** Determine if the cross products are equal.

   \[
   \frac{6}{9} \neq \frac{8}{12} \\
   9 \times 8 = 72 \text{ product of the means} \\
   6 \times 12 = 72 \text{ product of the extremes} \\
   72 = 72 \text{ The product of the means equals the product of the extremes, so } \frac{6}{9} = \frac{8}{12}.
   
   **Answer** The statement is a proportion.

2. Tell whether the statement is a proportion: \( \frac{12}{7} \neq \frac{9}{2} \).

   **Solution** Determine if the cross products are equal.

   \[
   \frac{12}{7} \neq \frac{9}{2} \\
   7 \times 9 = 63 \text{ product of the means} \\
   12 \times 2 = 24 \text{ product of the extremes} \\
   63 \neq 24 \text{ The product of the means does not equal the product of the extremes, so } \frac{12}{7} \neq \frac{9}{2}.
   
   **Answer** The statement is not a proportion.
3. Solve the proportion \( \frac{n}{18} = \frac{20}{45} \).

**Solution**  Set the cross products equal and solve for \( n \).
\[
18 \times 20 = n \times 45 \\
360 = 45n \\
\frac{360}{45} = \frac{45n}{45} \\
8 = n 
\]

**Answer**  \( \frac{8}{18} = \frac{20}{45} \)

4. Gleamo toothpaste commercials claim that 9 out of 10 people prefer it. If this is true, how many people out of 250 should prefer Gleamo?

**Solution**  Let \( n \) = number of people out of 250 who prefer Gleamo. Set up a proportion and solve for \( n \).
\[
\frac{9}{10} = \frac{n}{250} \\
10 \cdot n = 9 \cdot 250 \\
10n = 2,250 \\
\frac{10n}{10} = \frac{2,250}{10} \\
\frac{n}{10} = 225 \\
\]

**Answer**  225 out of 250 people should prefer Gleamo.

---

**Unit Pricing**

A useful application of proportions is unit pricing. The **unit price** of an item is the price per unit of measure. The unit could be an ounce, quart, pound, or some other unit.

To find the unit price of an item, set up and solve the proportion:
\[
\frac{\text{price paid}}{\text{quantity bought in units}} = \frac{\text{unit price}}{1 \text{ unit}}. 
\]

Since the denominator of the second ratio is 1, the proportion becomes:
\[
\frac{\text{price paid}}{\text{quantity}} = \text{unit price}. 
\]

---

**Model Problems**

5. A 12-ounce bottle of shampoo sells for $2.79. Find the unit price.

**Solution**  Let the unit be an ounce, and \( s = \) unit price.
\[
s = \frac{2.79}{12 \text{ oz}} = \$0.2325 \text{ per ounce or } \$0.23 \text{ rounded to the nearest cent.} 
\]

**Answer**  The unit price is $0.23 per ounce.
6. Which is the better buy: 5 bars of soap for $2.29 or 4 bars for $1.89?

Solution The unit is 1 bar of soap.

\[
\frac{2.29}{5} = 0.458 \text{ or } 0.46 \text{ per bar}
\]

\[
\frac{1.89}{4} = 0.4725 \text{ or } 0.47 \text{ per bar}
\]

Answer The 5 bars are the better buy.

1. Which fraction could be used to form a proportion with \( \frac{7}{8} \)?

A. \( \frac{13}{16} \)  
B. \( \frac{14}{15} \)  
C. \( \frac{21}{24} \)  
D. \( \frac{35}{25} \)

2. Which statement is a proportion?

A. \( \frac{2}{7} = \frac{10}{42} \)  
B. \( \frac{6}{24} = \frac{4}{16} \)  
C. \( \frac{5}{9} = \frac{15}{36} \)  
D. \( \frac{12}{30} = \frac{3}{5} \)

3. Which statement is NOT a proportion?

A. 4 is to 32 as 1 is to 8  
B. 51 is to 6 as 34 is to 4  
C. 9 is to 27 as 2 is to 6  
D. 60 is to 48 as 4 is to 5

4. Find the value of \( n \) in the proportion \( \frac{32}{48} = \frac{38}{n} \).

A. 56  
B. 57  
C. 60  
D. 64

5. Solve: \( \frac{10.5}{x} = \frac{3}{5} \).

A. 3.5  
B. 15.5  
C. 17.5  
D. 6.3

6. Solve: \( \frac{35}{21} = \frac{x}{27} \).

A. 41  
B. 45  
C. 36  
D. 49

7. A truck can travel 232 miles on 14.5 gallons of gasoline. How many gallons would the truck need to travel 400 miles?

A. 25 gal  
B. 27.5 gal  
C. 16 gal  
D. 64 gal

8. Which bottle of hair conditioner is the best buy?

A. 8 oz for $1.49  
B. 12 oz for $2.29  
C. 15 oz for $2.75  
D. 20 oz for $3.89
9. Compare. Write ≠ or = for each [ ].
   a. $\frac{5}{8}$ [ ] $\frac{15}{24}$  
   b. $\frac{8}{10}$ [ ] $\frac{36}{50}$
   c. $\frac{14}{18}$ [ ] $\frac{70}{80}$  
   d. $\frac{48}{69}$ [ ] $\frac{32}{46}$

10. Solve each proportion.
   a. $\frac{12}{n} = \frac{27}{36}$  
   b. $\frac{n}{26} = \frac{9}{39}$  
   c. $\frac{21}{27} = \frac{n}{63}$  
   d. $\frac{n}{16} = \frac{25}{40}$

11. One of the ratios in a proportion is $\frac{4}{5}$. Each of the cross products is equal to 120. What is the other ratio?

12. If 4 apple pies require 22 apples, how many pies can be made with 77 apples?

13. Find the unit price for each. Round to the nearest cent.
   a. 3 cans of cat food for $0.85
   b. 14 ounces of olive oil for $3.59
   c. 8.5 pounds of ground beef for $19.00
   d. 4 pairs of socks for $11.00

14. Choose the better buy for each comparison.
   a. 3 cans of tomato sauce for $1.49 or 5 cans of tomato sauce for $2.39
   b. 24 ounces of juice for $2.25 or 40 ounces of juice for $3.79
   c. 4.4 pounds of sugar for $2.35 or 10 pounds of sugar for $4.99
   d. a bag of 8 rolls for $1.89 or a bag of 18 rolls for $3.79

15. The ratio of 8th graders to 7th graders at a school is 5 to 8. If there are 440 7th graders, how many 8th graders are there? Show your work.

16. A company sent out 150 questionnaires and 54 were returned with answers. At this rate, how many questionnaires must the company send out in order to get at least 135 returned? Show your work.

Use the figure below for problems 17 and 18. The small gear makes 8 turns for every 5 turns of the large gear.

17. How many turns will the large gear make if the small gear makes 80 turns?

18. How many turns will the small gear make if the large gear makes 62.5 turns?

19. The ratio of female to male shoppers at a department store has been found to be 10 to 9. If 1,188 male shoppers were at the store one Saturday, how many shoppers were there in all that day? Show your work.

20. a. A box of national brand cornflakes is $2.09 for 12 ounces. A box of store label cornflakes is $3.09 for 20 ounces. Assuming both brands taste equally good, which is the better buy?
   b. If you have a 30¢-off coupon for the national brand, which is the better buy?
6.3 Scale Drawing

A scale drawing can be a reduction (such as a map or floor plan) or an enlargement (such as a drawing of a blood cell) of an actual object. The scale of the drawing is a ratio of the size of the drawing to the size of actual object, or:

\[
\text{scale} = \frac{\text{size of drawing}}{\text{size of actual object}}
\]

To find an unknown length for a scale drawing, write and solve a proportion.

---

Model Problems

1. The scale of a Louisiana map is 1 in. = 50 mi. Find the actual distance from Zachary to Franklin if the distance on the map is 2.75 in.

   **Solution**  Let \( d \) represent the actual distance in miles.

   \[
   \frac{\text{scale length}}{\text{actual distance}} = \frac{\text{map length}}{\text{unknown actual distance}}
   \]

   \[
   \frac{1 \text{ in.}}{50 \text{ mi}} = \frac{2.75 \text{ in.}}{d}
   \]

   \[
   1 \times d = 50 \times 2.75
   \]

   The product of the extremes = the product of the means.

   \[
   d = 137.5 \text{ miles}
   \]

   **Answer**  The actual distance is 137.5 miles.

2. Roy made a scale drawing of the schoolyard using a scale of 2 cm:3 m. He measured the gym and found that its length was 60 m. What was the length of his drawing?

   **Solution**  Let \( d \) represent the length of the drawing in centimeters.

   \[
   \frac{\text{scale length}}{\text{actual distance}} = \frac{\text{drawing length}}{\text{schoolyard length}}
   \]

   \[
   \frac{2}{3} = \frac{d}{60}
   \]

   \[
   3 \times d = 2 \times 60
   \]

   The product of the means = the product of the extremes.

   \[
   3d = 120
   \]

   \[
   \frac{3d}{3} = \frac{120}{3}
   \]

   Divide both sides of the equation by 3 to solve.

   \[
   d = 40 \text{ cm}
   \]

   **Answer**  The length of the drawing is 40 cm.
3. On a poster, a calculator that is actually 7 cm wide is shown as 0.5 m wide. If the calculator is actually 15.4 cm long, how long is it on the poster?

**Solution**  Remember that the actual dimensions are enlarged proportionately.

Let \( l \) represent the poster length in meters.

\[
\frac{\text{poster width}}{\text{poster length}} = \frac{\text{actual width}}{\text{actual length}}
\]

\[
\frac{0.5}{l} = \frac{7}{15.4}
\]

\[7 \times l = 0.5 \times 15.4\]  The product of the means = the product of the extremes.

\[7l = 7.7\]

\[\frac{7l}{7} = \frac{7.7}{7}\]  Divide both sides of the equation by 7 to solve.

\[l = 1.1\]

**Answer**  The length on the poster is 1.1 m.

---

**Practice**

1. The figure shows a scale drawing of a swimming pool. Use a centimeter ruler to measure the drawing. What are the actual dimensions of the pool?

![Scale Drawing](image)

Scale: 2 cm = 5 m

A. 6 m by 14 m  
B. 7.5 m by 17.5 m  
C. 10.5 m by 19.5 m  
D. 15 m by 21 m

2. A length of 20 miles is represented on a scale drawing by a line segment 4 centimeters long. What length is represented by a line segment 5.5 cm long?

A. 22.5 miles  
B. 25 miles  
C. 27.5 miles  
D. 30 miles

3. On a map, a distance of 40 kilometers is represented by a line segment 3 centimeters long. What length segment would you use to represent a distance of 140 kilometers?

A. 3.5 cm  
B. 7 cm  
C. 10.5 cm  
D. 12 cm

4. A scale drawing shows all dimensions \( \frac{1}{16} \) actual size. What is the length of a computer screen that is represented by a line segment \( \frac{3}{4} \) inches long?

A. 28 inches  
B. 36 inches  
C. 20 inches  
D. 9 inches

5. A Louisiana map uses a scale of 1.5 cm = 30 miles. On the map, the distance between Shreveport and Marksville is approximately 6.5 centimeters. What is the approximate actual distance between the cities?

A. 97.5 miles  
B. 110 miles  
C. 130 miles  
D. 195 miles
6. On a poster, a stamp that is actually 20 millimeters wide is shown 1 foot wide. If the stamp is actually 30 millimeters long, how long is it on the poster?
   A. \( \frac{2}{3} \) ft  
   B. \( \frac{3}{4} \) ft  
   C. 1\( \frac{1}{3} \) ft  
   D. 1\( \frac{1}{2} \) ft

7. A scale drawing of a room uses a 9-centimeter line segment to represent a length of 6 meters. Which of these could be the scale of the drawing?
   A. 2 cm:3 m  
   B. 3 cm:2 m  
   C. 3 cm:4 m  
   D. 4.5 cm:5 m

8. A model of a building uses a scale of 2 cm:1.5 m. The height of the building is 18 meters. What is the height of the model?
   A. 12 cm  
   B. 24 cm  
   C. 27 cm  
   D. 36 cm

For problems 9 and 10, make scale drawings using a scale of 0.5 in. = 2 ft.

9. a rectangular kitchen 12 feet by 16 feet
10. a rectangular cooking island in the kitchen that is 4 feet by 5 feet

The drawing below represents a hiking trail through a forest. For problems 11–14, use the drawing and a centimeter ruler to find the actual distances of the following.

11. A to B
12. B to C
13. C to D
14. the total length of the trail

**Constructed-Response Questions**

15. A drawing of a city’s downtown area uses a scale of 4 cm = 5 km. On the drawing, the length of a park is 1.8 cm. What is the actual length of the park?

16. A giant model of an insect is being built for a museum. The actual length of the insect is 0.6 inch and its width is 0.2 inch. The plans call for the model to be 30 inches long. How wide will the model be?

17. Wanda is 5 feet tall and her brother William is 6 feet tall. In a photograph of them standing side by side, William is 4.8 inches tall. How tall is Wanda in the photograph?

18. A map of the United States uses a scale of \( \frac{1}{4} \) inch = 80 miles. If the map distance between two cities in Texas is \( \frac{5}{8} \) inches, what is the actual distance between the cities?

19. In a scale drawing of a garden, a distance of 35 feet is represented by a line segment 4 inches long. On the same drawing, what distance is represented by a line segment 14 inches long?

20. A drawing uses a scale of 3 in. to 50 ft. The actual area of a rectangular parking lot is 7,500 square feet. What are the possible dimensions of a rectangle that could represent this lot on the drawing? Show your work.
6.4 Percent

The word \textit{percent} means \textit{for each hundred}. A \textbf{percent} is a ratio whose second term is 100. The symbol \% is used for percent.

\[ 100\% = \frac{100}{100} = 1 \]

Percents less than 100\% are numbers less than 1. Percents greater than 100\% are numbers greater than 1.

\[ 75\% = \frac{75}{100} = \frac{3}{4} \quad 160\% = \frac{160}{100} = 1 \frac{3}{5} \]

Decimals, fractions, and percents can be converted from one form to another:

- To write a decimal as a percent, multiply the decimal by 100 and write a percent sign after it.
- To write a percent as a decimal, divide the percent by 100 and omit the percent sign.
- To write a fraction as a percent, first change the fraction to a decimal. Then use the method above. (Another way is to find an equal ratio with a denominator of 100.)
- To write a percent as a fraction, first write the percent as the numerator without the percent sign. Use 100 as the denominator. Then write the fraction in lowest terms.

\[
\begin{align*}
160 & \quad 100 \\
3 & \quad 5
\end{align*}
\]

\[
\begin{align*}
75 & \quad 100 \\
3 & \quad 4
\end{align*}
\]

Model Problems

1. Write 0.625 as a percent.
   \textbf{Solution} \quad 0.625 \times 100 = 62.5
   \textbf{Answer} \quad 62.5\%

2. Write 7\% as a decimal.
   \textbf{Solution} \quad 7\% \div 100 = 0.07
   \textbf{Answer} \quad 0.07

To multiply by 100, move the decimal point 2 places to the right, then write a \% sign.

To divide by 100, move the decimal point 2 places to the left. Add zeros as placeholders if needed. Omit the \% sign.
3. Larry attended 4 out of 5 of the band rehearsals. What percent of the rehearsals did Larry attend?

**Solution**

Method I

\[
\frac{4}{5} = 0.8 = 80\%
\]

Method II

\[
\begin{align*}
40 & \quad 5 \\
\frac{4}{5} & = \frac{4 \times 20}{5 \times 20} = \frac{80}{100} = 80\%
\end{align*}
\]

**Answer** \(\frac{4}{5} = 0.80 = 80\%\)

4. Write each percent as a fraction in lowest terms.
   a. 46%  
   b. 13.5%  
   c. 128%

**Solution**

a. 46% = \(\frac{46}{100} = \frac{23}{50}\)

b. 13.5% = \(\frac{13.5}{100} = \frac{13.5 \times 2}{100 \times 2} = \frac{27}{200}\)

c. 128% = \(\frac{128}{100} = \frac{32}{25} = 1\frac{7}{25}\)

---

**Percent Shortcuts**

Some percents, like those in the table below, are easy to calculate mentally.

<table>
<thead>
<tr>
<th>Percent</th>
<th>Fractional Equivalent</th>
<th>Shortcut for Calculating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>(\frac{1}{100})</td>
<td>Divide by 100 or move the decimal point 2 places left.</td>
</tr>
<tr>
<td>10%</td>
<td>(\frac{10}{100} = \frac{1}{10})</td>
<td>Divide by 10 or move the decimal point 1 place left.</td>
</tr>
<tr>
<td>25%</td>
<td>(\frac{25}{100} = \frac{1}{4})</td>
<td>Divide by 4.</td>
</tr>
<tr>
<td>50%</td>
<td>(\frac{50}{100} = \frac{1}{2})</td>
<td>Divide by 2.</td>
</tr>
<tr>
<td>100%</td>
<td>(\frac{100}{100} = 1)</td>
<td>100% equals the whole amount.</td>
</tr>
<tr>
<td>200%</td>
<td>(\frac{200}{100} = 2)</td>
<td>Double or multiply by 2.</td>
</tr>
</tbody>
</table>

Once you have learned the shortcuts in the table, you can combine them to calculate other percents mentally.
Examples

1. Find 75% of 24. 75% = 25% + 50%. Calculate 25% and 50% of 24 mentally and then add to find 75%.
   
   25% of 24 = 6  
   50% of 24 = 12  
   6 + 12 = 18  
   So, 75% of 24 = 18.

2. Find 3% of 146. 3% = 1% × 3. Calculate 1% of 146 mentally and then multiply by 3.
   
   1% of 146 = 1.46  
   1.46 × 3 = 4.38  
   So, 3% of 146 = 4.38.

Model Problems

5. Calculate each percent mentally.
   a. 1% of 78  
   b. 10% of 300  
   c. 25% of 40  
   d. 50% of 62  
   e. 100% of 1,395  
   f. 200% of 9

Solution
   a. 1% of 78 = 0.78  Move the decimal point 2 places left.
   b. 10% of 300 = 30  Move the decimal point 1 place left.
   c. 25% of 40 = 10  Divide by 4.
   d. 50% of 62 = 31  Divide by 2.
   e. 100% of 1,395 = 1,395 100% equals the whole amount.
   f. 200% of 9 = 18  Multiply by 2.

6. Calculate each percent mentally.
   a. 20% of 982  
   b. 500% of 35
   c. 35% of 60

Solution
   a. 20% of 982
      20% = 2 × 10%  
      98.2 × 2 = 196.4  Find 10% of 982 and multiply by 2.
   b. 500% of 45
      500% = 100% × 5  
      45 × 5 = 225  Multiply the whole amount by 5.
   c. 35% of 60
      35% = 25% + 10%  
      Find 25% and 10% of 60 and add.
      25% of 60 = 15  
      10% of 60 = 6  
      15 + 6 = 21
1. What percent is shaded?

A. 1.23%  B. 23%  
C. 123%   D. 177%

2. Write 0.938 as a percent.
A. 9.38%  B. 93.8%  
C. 90.38% D. 938%

3. Which number is greater than 1?
A. 103%  B. 59.8%  
C. 87%   D. 95.08%

4. Jim read 296 pages of a 400-page book. What percent of the book did he read?
A. 74%  B. 29.6%  
C. 148% D. 296%

5. Which number is NOT equivalent to the others?
A. 56%  B. \( \frac{40}{75} \)  
C. 0.56 D. \( \frac{14}{25} \)

6. Which is equal to 350%?
A. 350  B. 0.35  
C. 3.5 D. 35

7. A bank is paying \( \frac{5\frac{1}{2}}{2} \)% on savings accounts. What fraction is equivalent?
A. \( \frac{11}{20} \)  B. \( \frac{11}{50} \)  
C. \( \frac{11}{100} \) D. \( \frac{11}{200} \)

8. Seven eighths of the students in Ms. Wilson’s class passed the mathematics test. What percent of the class did NOT pass the test?
A. 12.5%  B. 25%  
C. 62.5% D. 87.5%

9. Laurie makes 85% of her free throws. What fractional part of her free throws does Laurie make?
A. \( \frac{17}{50} \)  B. \( \frac{8}{15} \)  
C. \( \frac{17}{20} \) D. \( \frac{19}{25} \)

10. Which is the greatest?
A. 1% of 3,999  B. 10% of 421  
C. 25% of 160 D. 100% of 42

11. Write each as a percent.
   a. 0.03  b. 0.79  
c. 0.214 d. 1.18

12. Write each as a decimal.
   a. 32%  b. 176%  
c. 44.8% d. 0.1%

13. Write each as a percent.
   a. \( \frac{2}{5} \)  b. \( \frac{13}{20} \)  
c. \( \frac{4}{25} \) d. \( \frac{9}{16} \)

14. Write each as a fraction in lowest terms.
   a. 45%  b. 8%  
c. 77% d. \( \frac{71}{4} \)%
15. Write these numbers in order from least to greatest.

$$\frac{3}{4}, 390\%, 3.86, \frac{11}{3}, 3.6, 369\%$$

16. Calculate 75% of 400 mentally. Explain how you arrived at your answer.

17. In a survey of 300 teenagers, 156 said they earned some of their own money.
   a. What percent of the teenagers surveyed earned some of their own money?
   b. What percent of the teenagers surveyed did NOT earn money?

18. A 1-hour radio program is divided into the categories shown here.

<table>
<thead>
<tr>
<th>Category</th>
<th>Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music</td>
<td>18</td>
</tr>
<tr>
<td>News</td>
<td>15</td>
</tr>
<tr>
<td>Sports</td>
<td>12</td>
</tr>
<tr>
<td>Commercials</td>
<td>9</td>
</tr>
<tr>
<td>Call-ins</td>
<td>6</td>
</tr>
</tbody>
</table>

   a. Write each as a percent of the whole program.
   b. What should be true of the percents you wrote?

19. In 1988, the N.Y. Mets won the pennant in the National League East with a record of 100 wins and 60 losses. What percent of their games did the Mets win? Show your work.

20. This circle graph shows the methods of transportation used by students at Sunny Shores School.

   a. What percent of students come by car?
   b. Express the part for each type of transportation as a fraction and a decimal.

6.5 Solving Percent Problems

There are three basic types of problems that involve percents: finding a percent of a number, finding what percent one number is of another, and finding a number when a percent of it is known. Each problem can be solved by using a proportion or by writing an equation that relates a number to the whole quantity to which it is being compared.
1. What number is 70% of 250?

**Solution** One way to find a percent of a number is to first express the percent as a ratio, and then rewrite the question as a proportion, assigning a variable for the unknown number.

\[
70\% = \frac{70}{100} \quad \text{You must find the number that has the same ratio to 250 that 70 has to 100, so the proportion is:}
\]

\[
\frac{70}{100} = \frac{n}{250} \quad \text{Simplify } \frac{70}{100} \text{ to } \frac{7}{10} \text{ and then cross multiply.}
\]

\[10n = 7 \cdot 250 \quad \text{The product of the means = the product of the extremes.}
\]

\[10n = 1,750 \quad \text{Divide both sides of the equation by 10 to solve.}
\]

\[n = 175\]

**Answer** 70% of 250 is 175, which means that 70 has the same ratio to 100 as 175 has to 250.

2. The Martinez family spent 28% of its monthly income for housing. If the family’s monthly income is $3,200, how much did they spend for housing?

**Solution** Another way to find the percent of a number is to translate the question into an equation. Let \(n\) represent the unknown number. Write the percent as a decimal and use multiplication for “of.”

\[0.28 \times 3,200 = n\]

\[896 = n\]

**Answer** The Martinez family spent $896 for housing.

3. What percent of 75 is 12?

**Solution** The question asks what percent one number is of another. The unknown quantity is a percent. Write an equation, letting \(p\) represent the unknown percent.

\[p \times 75 = 12\]

\[75p = 12 \quad \text{Divide both sides of the equation by 75 to solve.}
\]

\[\frac{75p}{75} = \frac{12}{75}\]

\[p = \frac{12}{75} \quad \text{Divide or use equivalent fractions to convert } \frac{12}{75} \text{ to a percent.} \]
0.16
75)12.00

or \[
\frac{12}{75} = \frac{4}{25} = \frac{4 \times 4}{25 \times 4} = \frac{16}{100}
\]

Answer So, 12 is 16% of 75.

4. The Recommended Daily Allowance (RDA) of calcium for teenagers is 1200 milligrams. One day, Tina determined that she consumed 1500 milligrams of calcium. What percent of the RDA did Tina consume?

Solution What percent \( \times 1200 = 1500 \)?

\[
p \times 1200 = 1500
\]

1200\( p \) = 1500

\[
\frac{1200p}{1200} = \frac{1500}{1200}
\]

Divide both sides of the equation by 1200 to solve.

\[
p = \frac{5}{4} \text{ or } 1.25 \text{ or } 125%
\]

Answer 1500 milligrams is 125% of the RDA of 1200 milligrams.

5. How much money did Pete earn if $21 is 30% of the total?

Solution This problem asks you to find a number when a percent of it is known. You can rewrite the question as a proportion and solve for the unknown amount.

30% of what number is 21?

\[
\frac{30}{100} = \frac{21}{n}
\]

Cross multiply.

\[
2100 = 30n
\]

Divide both sides of the equation by 30 to solve.

\[
70 = n
\]

Answer Pete earned $70.

6. A container of yogurt states that it provides 6 grams of protein, which is 12% of the RDA. How much protein is recommended daily?

Solution

12% of what number is 6?

\[
0.12 \times n = 6
\]

0.12\( n \) = 6

\[
\frac{0.12n}{0.12} = \frac{6}{0.12}
\]

Divide both sides of the equation by 0.12 to solve.

\[
n = 50
\]

Answer The recommended number of grams of protein is 50.
1. What percent of 72 is 54?
   A. 62.5%
   B. 75%
   C. 87%
   D. 133\(\frac{1}{3}\)%

2. How much is 45% of 240?
   A. 53
   B. 84
   C. 108
   D. 118

3. 225% of what number is 81?
   A. 36
   B. 45
   C. 108
   D. 182.25

4. Brian saved 35% of the money he earned. If Brian earned $260, how much did he save?
   A. $46.50
   B. $74.28
   C. $91
   D. $117

5. Of 1,600 radios inspected, 112 were defective. What percent of the radios were defective?
   A. 7%
   B. 14.3%
   C. 18.6%
   D. 22%

6. The 15% tip on Craig’s lunch bill came to $2.40. What was the amount of the bill before the tip?
   A. $3.60
   B. $16.00
   C. $22.00
   D. $36.00

7. A charity walkathon raised $1,200. This amount was 125% of the amount raised last year. How much was raised last year?
   A. $480
   B. $960
   C. $1,004
   D. $1,500

8. Diane’s salary is $32,000 per year. Her car payments total $2,880 per year. What percent of her salary is spent on car payments?
   A. 9%
   B. 11%
   C. 13%
   D. 19%

9. A jewelry store is reducing the price of all items by 15%. The price of a silver bracelet will be $5.70 less than the regular price. Which equation can be used to find \(c\), the regular price.
   A. \(0.15 \times 5.70 = c\)
   B. \(5.70 - 0.15 = c\)
   C. \(0.15c = 5.70\)
   D. \(5.70c = 0.15\)

10. 58% of what number is 580?
    A. 336.4
    B. 1,000
    C. 3,364
    D. 10,000

11. Find the percent of each number.
    a. 3% of 280
    b. 18% of 550
    c. 135% of 160
    d. \(\frac{1}{2}\)% of 420
12. Find each percent.
   a. What percent of 14 is 56?
   b. What percent of 1,500 is 120?
   c. 65 is what percent of 200?
   d. 153 is what percent of 90?

13. The dinner bill for the Rao family was $58. Mr. Rao left a tip of 15% of the bill. What was the total cost of the family's dinner?

14. Four theater tickets cost $116. The sales tax on the tickets was $6.96. What was the sales tax rate?

**Constructed-Response Questions**

Use the circle graph below for problems 15 and 16.

**Favorite TV Sports**

- Basketball: 20%
- Football: 25%
- Baseball: 30%
- Tennis: 12%
- Golf: 8%
- Other: 5%

15. In a survey, 500 teenagers were asked to name their favorite sport to watch on television. How many chose:
   a. basketball
   b. golf
   c. football
   d. baseball

16. What is the greatest number of teenagers in the survey who might have named bowling as their favorite? Explain.

17. The neighborhood office supply store gives a 15% discount to senior citizens and an 8% discount to students. Phyllis, an eighth-grade student, got $1.64 off her purchase and her grandfather got $2.40 off his purchase. How much was each purchase before the discount?

18. At a fast-food restaurant, a large serving of fries contains 560 calories. Of these calories, 240 come from fat. To the nearest tenth, what percent of the total calories comes from fat?

19. The table shows the sales of different beverages at the Quik Shop for one week. What percent of the total number of bottles sold does each beverage represent?

<table>
<thead>
<tr>
<th>Beverage</th>
<th>Number of Bottles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffee Frappe</td>
<td>54</td>
</tr>
<tr>
<td>Orange Gold</td>
<td>110</td>
</tr>
<tr>
<td>Great Grape</td>
<td>46</td>
</tr>
<tr>
<td>Fruit Zinger</td>
<td>132</td>
</tr>
<tr>
<td>Tea Time</td>
<td>58</td>
</tr>
</tbody>
</table>

20. Last year, Sam earned $22,000 and saved 8% of his earnings. This year, Sam earned twice as much but his rate of savings was only half of last year.
   a. How does the amount of money Sam saved this year compare to the amount saved last year?
   b. What was the total amount Sam saved during the two years?
   c. What percent of Sam’s total earnings does his total savings represent. (Round to the nearest tenth of a percent.)
6.6 Percent of Increase and Decrease

To find the percent of increase or decrease, first subtract to find the amount of change. Then compare the amount of change to the original amount.

\[
\text{percent of change} = \frac{\text{amount of change (increase or decrease)}}{\text{original amount}}
\]

1. The membership of the Film Club increased from 24 to 30. Find the percent of increase.

\textbf{Solution}

\[
\begin{align*}
30 - 24 &= 6 \\
\frac{6}{24} &= 0.25 \\
0.25 &= 25\% \\
\end{align*}
\]

\textit{Subtract to find the amount of increase.}

\textit{Divide the amount of increase by the original amount.}

\textit{Write the decimal as a percent.}

\textbf{Answer}  The membership increased 25%.

2. During a thunderstorm, the outdoor temperature went from 88°F to 77°F. Find the percent of decrease.

\textbf{Solution}

\[
\begin{align*}
88 - 77 &= 11 \\
\frac{11}{88} &= 0.125 \\
0.125 &= 12.5\% \\
\end{align*}
\]

\textit{Subtract.}

\textit{Divide the amount of decrease by the original amount.}

\textbf{Answer}  The temperature decreased 12.5%.
1. The price of a share of stock went from $30 to $27. What was the percent of decrease?
   A. 3%  B. 10%  C. 11%  D. 19%
2. The population of a village rose from 5,000 to 5,800. What was the percent of increase?
   A. 9.6%  B. 13.8%  C. 16%  D. 24%
3. A loaf of bread that used to cost $1.50 now costs $1.70. What was the percent of increase in the price?
   A. 11.8%  B. 13 1/3%  C. 20%  D. 88%
4. A house was originally listed for sale at $250,000. After 3 months, the seller dropped the price to $235,000. What was the percent of decrease in the price?
   A. 6%  B. 9.2%  C. 15%  D. 94%
5. Which represents a percent increase of 20%?
   A. 20 to 30  B. 30 to 40  C. 50 to 60  D. 90 to 100
6. Which represents a percent decrease of 12.5%?
   A. 40 to 32  B. 72 to 60  C. 135 to 122.5  D. 168 to 147
7. Which percent increase in temperature is the greatest?
   A. 25°F to 31°F  B. 32°F to 40°F  C. 50°F to 59°F  D. 75°F to 90°F
8. Which student had the smallest percent decrease in test scores from week 1 to week 2?
   Test Scores
<table>
<thead>
<tr>
<th>Student</th>
<th>Week 1</th>
<th>Week 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jasmine</td>
<td>90</td>
<td>81</td>
</tr>
<tr>
<td>Randy</td>
<td>86</td>
<td>76</td>
</tr>
<tr>
<td>Maya</td>
<td>75</td>
<td>68</td>
</tr>
<tr>
<td>Steven</td>
<td>95</td>
<td>83</td>
</tr>
</tbody>
</table>
   A. Jasmine  B. Randy  C. Maya  D. Steven
9. The percent increase in the price of a car was 4%. The new price is $15,600. What was the price before the increase?
   A. $15,000  B. $14,976  C. $14,600  D. $14,000
10. The table shows Pam's hours of community service at the Senior Center. Which of the following is true?
   Pam's Community Service
<table>
<thead>
<tr>
<th>Month</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>10</td>
</tr>
<tr>
<td>June</td>
<td>20</td>
</tr>
<tr>
<td>July</td>
<td>30</td>
</tr>
</tbody>
</table>
   A. The percent increase from May to June is greater than the percent increase from June to July.
   B. The percent increase from May to June is less than the percent increase from June to July.
   C. The percent increase from May to June is equal to the percent increase from June to July.
   D. The percent increase from month to month cannot be determined.
6.7 Applications of Percent

There are many everyday situations that involve the use of percent. Determining the selling price of an item is a common problem for retailers and consumers. For the buyer, the amount a regular or list price is reduced is called a discount.

The rate of discount is the percent that the regular price is reduced.

- discount = regular price × rate of discount
- sale price = regular price − discount

11. Find the percent of increase.
   a. $5 to $7   b. 400 to 1,000
   c. 65 to 195   d. 1,256 to 1,413

12. Find the percent of decrease.
   a. $40 to $34   b. 80°F to 75°F
   c. 200 to 148   d. $17.50 to 0

13. Estimate each percent of change. Show your work.
   a. 97 to 74   b. 253 to 201
   c. 789 to 1,102   d. 1,006 to 1,160

14. a. What is the percent change from 20 to 25?
   b. What is the percent change from 25 to 20?
   c. Explain why the answers are different.

**Constructed-Response Questions**

Use a calculator for problems 15 and 16.

15. In 1990, the population of Wyoming was 453,588. In 2000, the population was 493,782. To the nearest tenth of a percent, what was the percent of increase in the population?

16. In 1990, the population of Washington, D.C., was 606,900. In 2000, the population was 572,059. To the nearest tenth of a percent, what was the percent of decrease in the population?

17. The numbers of scooters sold by a manufacturer are shown in the table.

<table>
<thead>
<tr>
<th>Monthly Scooter Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>September</td>
</tr>
<tr>
<td>October</td>
</tr>
<tr>
<td>November</td>
</tr>
<tr>
<td>December</td>
</tr>
</tbody>
</table>

   a. Explain the pattern.
   b. Assuming the pattern continues, find the sales for December.

18. A computer stock opened at $150 a share.
   a. There was a 20% increase in the share’s price. What was the new price?
   b. Next, there was a 20% decrease in the share’s price. What was the final price?
   c. What was the percent change from the opening price to the final price? Indicate if the change was an increase or decrease.
For the retailer, the **cost** is the original amount paid for an item.

The **markup** is the percent of increase. The **amount of markup** is the increase.

- amount of markup = cost × markup
- selling price = cost + amount of markup

---

**Model Problems**

1. A television set is on sale at 15% off the regular price of $459. What is the sale price of the television?

   **Solution**  
   \[
   15\% = 0.15 \\
   \text{discount} = 459 \times 0.15 = 68.85 \\
   \text{sale price} = 459 - 68.85 = 390.15
   \]

   **Answer** The sale price of the television is $390.15.

2. A department store buyer pays $20 for each sweater that the store will sell. The store sells the sweaters at a 75% markup. Find the selling price of each sweater.

   **Solution**  
   \[
   75\% = 0.75 \\
   \text{amount of markup} = 20 \times 0.75 = 15 \\
   \text{selling price} = 20 + 15 = 35
   \]

   **Answer** The selling price of each sweater is $35.

---

A **commission** is an amount of money that a salesperson earns on a sale. A percent is used to show the **rate of commission**.

- amount of commission = amount of sales × rate of commission

---

3. Vanessa is a salesperson at a jewelry store. She earns an 8% commission on each sale. How much does she earn on the sale of a $2,400 diamond ring?

   **Solution**  
   \[
   8\% = 0.08 \\
   \text{amount of commission} = 2400 \times 0.08 = 192
   \]

   **Answer** Vanessa earns a commission of $192.
Calculating Interest

Interest is a charge for money that is borrowed. When you take a loan from a bank, you pay the bank interest. When you deposit money in a bank, the bank pays you interest because it is using your money to carry on its business.

The principal ($p$) is the amount of money that is invested or borrowed.

The interest rate ($r$) is the percent charged or earned. The interest rate is usually based on 1 year:

- Interest ($I$) = principal $\times$ interest rate $\times$ time (in years)
  $$I = p \times r \times t$$

- Total amount owed or earned = principal + interest

For the calculation of simple interest, the principal and amount of interest earned each year stay the same.

4. Roberto has $700 in his savings account. If the bank pays 5% interest, how much money will Roberto have in his account:
   a. 1 year from now?   b. 2 years from now?

Solution
   a. $p = \$700, r = 5\% = 0.05, t = 1$
      $$I = p \times r \times t$$
      $$= \$700 \times 0.05 \times 1$$
      $$= \$35$$
      Total amount =
      $$\$700 + \$35 = \$735$$
   b. $p = \$700, r = 5\% = 0.05, t = 2$
      $$I = p \times r \times t$$
      $$= \$700 \times 0.05 \times 2$$
      $$= \$70$$
      Total amount =
      $$\$700 + \$70 = \$770$$

Answer  Roberto will have $735 after 1 year and $770 after 2 years if he makes no additional deposits.

5. Mr. Ito took out a 6-month loan of $1,500 at an 8% yearly interest rate. How much must Mr. Ito repay at the end of the 6 months?

Solution  Think:  6 months = $\frac{1}{2}$ year, so $t = \frac{1}{2}$ or 0.5
   $$p = \$1,500, r = 0.08, t = 0.5$$
   $$I = p \times r \times t$$
   $$= \$1,500 \times 0.08 \times 0.5$$
   $$= \$60$$
   Total = $\$1,500 + \$60 = \$1,560$

Answer  Mr. Ito must repay $1,560.
1. A tie that has a regular price of $16 is on sale at 20% off. What is the sale price?
   A. $3.20  B. $12.80  C. $14.00  D. $15.68

2. A stereo that regularly sells for $330 is on sale at 15% off. How much will a customer save on the stereo during the sale?
   A. $30  B. $49.50  C. $82.50  D. $280.50

3. Lauren bought a winter coat that was on sale for 40% off the regular price of $199. How much did Lauren pay for the coat?
   A. $119.40  B. $159.00  C. $179.60  D. $191.04

4. Mrs. Santiago bought a set of dishes at a factory outlet for $120. The same set of dishes is sold at a 60% markup in a department store. How much did she save?
   A. $48  B. $60  C. $72  D. $96

5. A restaurant manager figured that the food for the nightly steak special actually cost $8.00. The restaurant will sell the special at an 80% markup. How much will a customer pay for the steak special?
   A. $10.90  B. $12.60  C. $14.40  D. $16.00

6. Martin is paid a 12% commission on his shoe sales. He sold $780 worth of shoes. Find his commission.
   A. $56.60  B. $93.60  C. $124.80  D. $156.00

7. Andrea is paid an 18% commission on her cosmetic sales. She sold $550 worth of cosmetics. Find her commission.
   A. $220  B. $199  C. $118  D. $99

8. Ian deposits $900 in a savings certificate that pays 6$$1 \frac{1}{2}$$% annually. How much money will Ian have at the end of one year?
   A. $958.50  B. $965.80  C. $1,048.50  D. $1,485.00

9. Doreen invested $1,200 at 7% for 3 years. What will Doreen’s investment be worth at the end of the 3 years?
   A. $1,225.20  B. $1,452.00  C. $1,704.00  D. $2,520.00

10. Mr. Jaffrey borrowed $3,500 at 9% interest. He paid back the loan after 9 months. How much did he repay in all?
    A. $6,335.00  B. $5,862.50  C. $3,736.25  D. $3,657.50

11. Karyn bought a $49.95 leather tote bag on sale for 20% off. The sales tax in the area is 7%. To the nearest cent, what was the total cost of the tote bag?

12. A clothes boutique pays $32 for pairs of designer jeans, which it then marks up 65%. During March, the boutique has a 25% off sale. What is the sale price of the jeans?
13. Jared has priced a laptop computer at two stores. At Royal Electronics, the computer sells for $1,150, and there is a 15% off sale this month. At Crown Computers, the same laptop sells for $1,240, and there is a 20% off sale this month. Where will the computer cost less? How much will it cost?

14. A sweatshirt with a regular price of $34 is first discounted by 20% and then by an additional 10%.
   a. What is the final sale price?
   b. How do these two discounts compare to a single discount of 30%? Explain.

15. Beth receives a base salary of $215 per week plus a commission of 8% on all sales. How much does Beth earn in a week in which her sales total $2,200?

16. Nahum receives a commission of 18% on appliance sales in excess of $2,000 per week. One week, his sales were $6,850. How much was his commission that week?

17. Ms. O’Rourke purchased a certificate of deposit for $2,800. The certificate pays $5\frac{1}{2}\%$ interest per year. How much money will Ms. O’Rourke have after 2 years?

18. Mr. Sipowitz borrowed $25,000 to expand his cheese store. The interest rate was 10$\frac{1}{2}\%$ per year. How much will he have to repay at the end of 2 years?

19. Kyra loaned $1,400 to her brother Ken. Ken agreed to repay the loan in 6 months at a rate of 11% per year. How much interest will Kyra receive?

20. A bank pays 7$\frac{1}{2}\%$ interest on its savings certificates, and the customer can choose any whole number of years for the term. Joseph has $2,000 to invest. If he wants to double his money, what is the shortest term he can request for his certificate? Show your work.

### Chapter 6 Review

1. Which ratio makes the same comparison as 8 dogs to 6 cats?
   A. 6 cats to 8 dogs
   B. 12 dogs to 9 cats
   C. 12 cats to 9 dogs
   D. 10 dogs to 8 cats

2. Solve: \[ \frac{112}{3.2} = \frac{0.7}{m}. \]
   A. 0.02
   B. 2.24
   C. 20.0
   D. 24.5

3. A soup recipe calls for 1$\frac{1}{2}$ quarts of chicken broth. This recipe serves 8 people. How much broth would be needed to make soup for 28 people?
   A. 42 quarts
   B. 30 quarts
   C. 5$\frac{1}{4}$ quarts
   D. 3$\frac{3}{4}$ quarts
4. Yani answered correctly 34 of the 40 questions on a test. What percent of the questions did she answer correctly?
   A. 68%  B. 74%  C. 78%  D. 85%

5. Write 2.065 as a percent.
   A. 2.65%  B. 26.5%  C. 206.5%  D. 265%

6. Walter spent 60% of the $37.50 he had for a video game. What was the cost of the game?
   A. $24.00  B. $22.50  C. $15.00  D. $6.25

7. Sun Bright liquid detergent comes in four sizes. Which size is the best buy?
   A. 16 ounces for $1.29  B. 28 ounces for $2.19  C. 40 ounces for $2.89  D. 96 ounces for $7.25

8. A blueprint of an apartment building uses a scale of \( \frac{1}{2} \) inch = 4 feet. What is the actual length of a hallway that measures 13 inches on the blueprint?
   A. 11 feet  B. 14 feet  C. 20 feet  D. 24 feet

9. What percent of 2 is 20?
   A. 10%  B. 40%  C. 200%  D. 1,000%

10. A $64 pair of boots is on sale for 15% off. What is the sale price of the boots?
    A. $29.60  B. $48.20  C. $54.40  D. $56.60

11. The ratio of cups to cones sold at an ice cream shop is 8 to 9. If the store sold 1,098 cones in one week, how many cups and cones did it sell in all that week?

12. Express \( \frac{97}{20} \)
    a. as a decimal  b. as a percent

13. Ms. Sanchez earns $1,100 each week. Her employer withholds $308 for federal taxes. What percent of Ms. Sanchez's earnings is withheld for taxes?

**Constructed-Response Questions**

14. A wholesaler of kitchen appliances offers a discount of 12% on the first $10,000 worth of merchandise and 17% on additional merchandise. What would be the final cost of $18,000 worth of appliances? Show your work.

15. Troy bought a $1,200 savings certificate that paid simple interest. After 2 years, his money had earned $108. What was the annual interest rate?

16. A newspaper's average daily circulation increased from 510,000 to 545,700. What was the percent increase in circulation?

17. In a survey, 800 tourists in Lake Charles were asked to name their favorite type of international restaurant. The results are shown in the table.

```
<table>
<thead>
<tr>
<th>Favorite Type of Restaurant</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italian</td>
<td>39%</td>
</tr>
<tr>
<td>Chinese</td>
<td>25%</td>
</tr>
<tr>
<td>French</td>
<td>23%</td>
</tr>
<tr>
<td>Mexican</td>
<td>8%</td>
</tr>
<tr>
<td>Indian</td>
<td>5%</td>
</tr>
</tbody>
</table>
```

a. How many of those surveyed chose Italian?
b. How many more people chose French than Indian?
18. Use a scale of 2 cm = 3 m.
   a. Make a scale drawing of a rectangular garden that is 13.5 meters long and 21 meters wide.
   b. On the drawing, show a 1.5-cm square and label it Lettuce. What is the actual length of a side of the square bed for lettuce?

19. Find the next number in the pattern below:
   1500, 2100, 2940, . . .

20. On a 75-question test, Alec answered 9 questions incorrectly. If each question was worth the same amount, how many points did he earn out of 100 points?

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**Chapter 6 Cumulative Review**

1. Find the sum of 684.3 + 2,816.35 + 82.35 + 8.
   - A. 6,583.08
   - B. 3,591
   - C. 3,583.8
   - D. 2,906.7

2. How much greater is 64.7 than 6.9398?
   - A. 30.76
   - B. 56.872
   - C. 57.7602
   - D. 71.6398

3. Find the product of 8.75 and 0.734.
   - A. 6.4225
   - B. 64.2254
   - C. 64.226
   - D. 642.25

4. Divide 7.905 by 0.85.
   - A. 8.36
   - B. 9.03
   - C. 9.3
   - D. 93.6

5. Evaluate $16 - 3^2 + 2(4 - 2)$.
   - A. 3
   - B. 11
   - C. 14
   - D. 15

6. Evaluate $70 - 30 \div 5 + 3 \times 6$.
   - A. 26
   - B. $60\frac{3}{8}$
   - C. 66
   - D. 82

7. Which of these is the same as $2^5$?
   - A. $2 \times 5$
   - B. $2 \times 2 \times 2 \times 2 \times 2$
   - C. $5 \times 5$
   - D. 50

8. Keith buys an entertainment system for $100 down and $25 per month for 3 years. Which of these expressions represents the total amount he will pay for the system?
   - A. $100 + 3 \cdot 25$
   - B. $100 \cdot 3 \cdot 25$
   - C. $100 + 25 + (3 \times 12)$
   - D. $100 + 25 \cdot 3 \cdot 12$
9. Coffee beans cost $7.39 a pound. Mrs. Romano buys a package for $6.18. Which of these expressions could be used to find the weight, in pounds, of the package?

A. \(\frac{1}{\$7.39} = \frac{x}{\$6.18}\)

B. \(\frac{1}{\$6.18} = \frac{x}{\$7.39}\)

C. \(\frac{\$7.39}{\$6.18} = \frac{x}{1}\)

D. \(\frac{\$7.39}{x} = \frac{1}{\$6.18}\)

10. What percent of 6 is 15?

A. 40%

B. 66\(\frac{2}{3}\)

C. 150%

D. 250%

11. The scale of a map is 0.5 cm = 8.3 km. Use a centimeter ruler to draw the line segment that would represent a distance of 41.5 km on the map. Show how you found the length.

12. A taxi service charges $1.35 for the first one-tenth of a mile and $0.40 for each additional one tenth of a mile. Before the tip, Wendy’s ride cost $6.15. What distance did she travel?

13. Insert parentheses so that the expression below simplifies to 6. Show the simplification steps.

\[\frac{15 \times 3 + 5^2 - 6}{44 - 43 \times 69}\]

14. The sale price of a sofa is $501.50 after a 15% discount has been given. What was the original price of the sofa?

15. Star Disposal picks up trash every Monday from the following companies:

<table>
<thead>
<tr>
<th>Company</th>
<th>Tons of Trash</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-Time Toys</td>
<td>2(\frac{1}{2})</td>
</tr>
<tr>
<td>Brite Products</td>
<td>2(\frac{4}{5})</td>
</tr>
<tr>
<td>Cruz Inc.</td>
<td>3</td>
</tr>
<tr>
<td>Domino Partners</td>
<td>3(\frac{3}{10})</td>
</tr>
</tbody>
</table>

If Star charges $85.00 per ton, find the total amount Star will earn for Monday’s pickup.

16. Does subtraction of signed numbers follow the commutative property? Give examples to support your answer.

17. Last year, Mr. Prilik saved 8% of his $36,200 income. At the end of the year, he invested his savings at 5% interest. How much interest will his savings earn in one year? Show your work.

18. If 3 is subtracted from 4 times a number, the result is greater than 5.

a. Represent the statement above algebraically.

b. Find and graph the solution.

19. Four children chipped in to buy a Mother’s Day gift. Brittany gave half as much as Andrew. Clinton gave half as much as Brittany. Darlene gave $7, which was the same amount as her brother Clinton. How much money was there for the gift?

20. Mr. Lawrence has 24 coins worth $2.20. The coins are all nickels and dimes. How many of each coin does he have?