CHAPTER 8
Systems of Measurement
BIG Idea Solve application problems involving estimation and measurement of length, weight, volume, time, and temperature.

CHAPTER 9
Geometry: Angles and Polygons
BIG Idea Use geometric vocabulary to describe angles, polygons, and circles.

CHAPTER 10
Measurement: Perimeter, Area, and Volume
BIG Idea Solve application problems involving estimation and measurement of length, area, and volume.
Math and Geography

Road Trip  Let’s hit the road! Come join us on a cross-country trip to see the nation. In preparation, you’ll need a map to figure out how far you’re traveling. You’re also going to need to load up your car with all the necessary travel essentials. Don’t overdo it though, there’s only so much room in there. Put on your geometry thinking cap and let’s get packing!

Math Online  Log on to tx.msmath1.com to begin.
Knowledge and Skills

- Solve application problems involving estimation and measurement of length, area, time, temperature, volume, weight, and angles. **TEKS 6.8**

Key Vocabulary

capacity (p. 384)
mass (p. 397)
metric system (p. 392)
temperature (p. 415)

Real-World Link

Mountains Guadalupe Peak is the highest point in Texas at 2,667 meters or about 3 kilometers. Located in Guadalupe Mountains National Park, this distance is about the same as 30 city blocks.

Systems of Measurement Make this Foldable to help you organize your notes on metric and customary units. Begin with a sheet of 11” × 17” paper.

1. Fold the paper in half along the length. Then fold in thirds along the width.
2. Unfold and cut along the two top folds to make three strips. Cut off the first strip.
3. Refold the two top strips. Then fold the entire booklet in thirds along the length.
4. Unfold and draw lines along the folds. Label as shown.
Option 1
Take the Quick Quiz below. Refer to the Quick Review for help.

**Quick Quiz**

**Add. (Used in Lesson 8-7)**

1. \(8.73 + 11.96\)
2. \(54.26 + 21.85\)
3. \(3.04 + 9.92\)
4. \(76.38 + 44.15\)
5. \(7.9 + 8.62\)
6. \(15.37 + 9.325\)

**Subtract. (Used in Lesson 8-7)**

8. \(17.46 - 3.29\)
9. \(68.05 - 24.38\)
10. \(9.85 - 2.74\)
11. \(8.43 - 3.26\)
12. \(73.91 - 50.68\)
13. \(27 - 8.62\)

**Example 1**

Find \(46.2 + 8.08\).

Line up the decimal points.

\[
\begin{array}{c}
1 \\
46.20 \\
+ 8.08 \\
54.28
\end{array}
\]

**Example 2**

Find \(52.08 - 12.96\).

Line up the decimal points.

\[
\begin{array}{c}
4 \ \ 11 \ \ 10 \\
52.08 \\
- 12.96 \\
39.12
\end{array}
\]

Since 9 is larger than 0, rename the 2 in the ones place as 11 and the 5 in the tens place as 4. Then subtract.

**Example 3**

Find \(45 \times 100\).

\[
\begin{array}{c}
100 \\
\times 45 \\
500 \\
+ 4000 \\
4500
\end{array}
\]

So, \(45 \times 100 = 4500\).

**Quick Review**

**Example 1**

Find \(46.2 + 8.08\).

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54.28
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**Example 3**

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\[
\begin{array}{c}
100 \\
\times 45 \\
500 \\
+ 4000 \\
4500
\end{array}
\]

So, \(45 \times 100 = 4500\).
Using string, measure and cut the lengths of your arm and your shoe.

Use the strings to find the classroom length in arms and classroom width in shoes. Record the nonstandard measures.

Use a yardstick or tape measure to find the length in yards and width in feet. Record the standard measures.

1. Compare your nonstandard measures with the nonstandard measures of other groups. Are they similar? Why or why not?
2. Compare your standard measures with the standard measures of other groups. Are they similar? Why or why not?
3. Explain the advantages and the disadvantages of using nonstandard measurement and standard measurement.

The most commonly used customary units of length are shown below.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Customary Units of Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 inch (in.)</td>
<td>width of a quarter</td>
</tr>
<tr>
<td>1 foot (ft)  = 12 in.</td>
<td>length of a large adult foot</td>
</tr>
<tr>
<td>1 yard (yd)  = 3 ft</td>
<td>length from nose to fingertip</td>
</tr>
<tr>
<td>1 mile (mi)  = 1,760 yd</td>
<td>10 city blocks</td>
</tr>
</tbody>
</table>

Rulers are usually separated into eighths of an inch.
**Draw a Line Segment**

1. **Draw a line segment measuring \(2 \frac{3}{8}\) inches.**

   Draw a line segment from 0 to \(2 \frac{3}{8}\) in.

**CHECK Your Progress**

a. **Draw a line segment measuring \(1 \frac{3}{4}\) inches.**

**Real-World EXAMPLE**

2. **KEYS** Measure the key’s length to the nearest half, fourth, or eighth inch.

   The key is between \(1 \frac{3}{4}\) inches and \(1 \frac{7}{8}\) inches. It is closer to \(1 \frac{3}{4}\) inches.

   The length of the key is about \(1 \frac{3}{4}\) inches.

**CHECK Your Progress**

b. **BOOKS** Measure the width of the cover of this textbook to the nearest half, fourth, or eighth inch.

**EXAMPLE**

3. **Change Larger Units to Smaller Units**

   \(3 \text{ ft} = \square \text{ in.}\)

   **METHOD 1** Use a ratio table.

   You know that 1 foot is equal to 12 inches. Set up the ratio table with the measures you know.

   \[
   \begin{array}{c|c}
   \text{Feet} & 1 & 3 \\
   \text{Inches} & 12 & 36 \\
   \end{array}
   \]

   Since \(1 \times 3 = 3\), multiply each quantity by 3.

   So, 3 feet = 36 inches.
**METHOD 2** Select an appropriate operation.

Since 1 foot = 12 inches, multiply 3 by 12.

\[ 3 \times 12 = 36 \]

So, 3 feet = 36 inches.

**Study Tip**

**Measurement**

When changing from larger units to smaller units, there will be a greater number of smaller units than larger units. When changing from smaller units to larger units, there will be fewer larger units than smaller units.

**EXAMPLE**

Change Smaller Units to Larger Units

\[ 21 \text{ ft} = \underline{} \text{ yd} \]

Since 3 feet = 1 yard, divide 21 by 3.

\[ 21 \div 3 = 7 \]

So, 21 feet = 7 yards.

**Check Your Progress**

Complete.

\[ f. \ 36 \text{ ft} = \underline{} \text{ yd} \quad g. \ 54 \text{ in.} = \underline{} \text{ ft} \quad h. \ 2,640 \text{ yd} = \underline{} \text{ mi} \]

A bookcase is 59 inches tall. The distance between the top of the bookcase and the ceiling is about 4 feet. Which is closest to the distance between the floor and the ceiling?

\[ A \ 4 \text{ ft} \quad B \ 5 \text{ ft} \quad C \ 8 \text{ ft} \quad D \ 9 \text{ ft} \]

**Read the Test Item**

You need to find the distance from the floor to the ceiling.

**Solve the Test Item**

The bookcase is about 60 inches or 5 feet tall. So, the distance between the floor and the ceiling is 5 + 4 or 9 feet. The answer is D.

**Check Your Progress**

i. Kylee hiked 118 feet and then another 7 yards before resting. Which is closest to the distance Kylee hiked before resting?

\[ F \ 7 \text{ yd} \quad G \ 15 \text{ yd} \quad H \ 45 \text{ yd} \quad J \ 47 \text{ yd} \]
Example 1 (p. 379)
Draw a line segment of each length.
1. \(1 \frac{1}{4} \text{ in.}\)
2. \(\frac{5}{8} \text{ in.}\)

Example 2 (p. 379)
Measure the length of each line segment or object to the nearest half, fourth, or eighth inch.
3. 

Example 3, 4 (pp. 379–380)
Complete.
5. \(4 \text{ yd} = \square \text{ ft}\)
6. \(4 \text{ mi} = \square \text{ yd}\)
7. \(72 \text{ in.} = \square \text{ yd}\)
8. \(54 \text{ ft} = \square \text{ yd}\)

Example 5 (p. 380)
9. **TEST PRACTICE** Brianna’s brother is about 25 inches shorter than she is. If Brianna is 5 feet tall, which is closest to her brother’s height in feet?
   A 2 ft 
   B 3 ft 
   C 4 ft 
   D 5 ft

Exercises

Draw a line segment of each length.
10. \(2 \frac{1}{2} \text{ in.}\)
11. \(3 \frac{1}{4} \text{ in.}\)
12. \(\frac{3}{4} \text{ in.}\)
13. \(1 \frac{3}{8} \text{ in.}\)

Measure the length of each line segment or object to the nearest half, fourth, or eighth inch.
14. 
15. 
16. 

Complete.
20. \(5 \text{ yd} = \square \text{ in.}\)
21. \(6 \text{ yd} = \square \text{ ft}\)
22. \(6 \text{ ft} = \square \text{ in.}\)
23. \(3 \text{ mi} = \square \text{ ft}\)
24. \(48 \text{ in.} = \square \text{ ft}\)
25. \(10 \text{ ft} = \square \text{ yd}\)
26. \(6,160 \text{ yd} = \square \text{ mi}\)
27. \(510 \text{ in.} = \square \text{ ft}\)

28. **SPACE SCIENCE** The largest telescope in the world is powerful enough to identify a penny that is 5 miles away. How many yards is this?
29. **ROLLER COASTERS** Top Thrill Dragster at Cedar Point in Sandusky, Ohio, is the tallest roller coaster in the United States. It has a height of 420 feet. What is this height in yards?

Determine the greater measurement. Explain your reasoning.

30. 1\(\frac{1}{2}\) yards or 48 inches

31. 54 inches or 4\(\frac{1}{3}\) feet

32. **ANIMALS** The length with tail of a bighorn sheep ranges from 50 inches to 62 inches long. What is the range of this length in feet?

33. **BACKPACKS** Kathy estimates that her backpack is 30 inches long. Is this a reasonable estimate? Why or why not?

Determine whether you would measure each length or distance in inches, feet, yards, or miles. Explain your reasoning.

34. length of a computer monitor

35. distance from your home to school

36. distance from home plate to the pitchers mound on a baseball field

**ESTIMATION** Estimate the length of each object. Then measure to find the actual length.

37. the length of your bedroom to the nearest foot

38. the width of your student ID card to the nearest eighth inch

39. the height of your dresser to the nearest foot

40. the height of a classroom wall to the nearest yard

41. the length of a new pencil to the nearest half inch

42. **FIND THE DATA** Refer to the Texas Data File on pages 16–19. Choose some data and write a real-world problem in which you would convert a customary measurement of length.

43. **H.O.T. Problems**

   **REASONING** Explain the math error in the comic.

   **OPEN ENDED** Draw a segment that measures between 1\(\frac{1}{2}\) inches and 2\(\frac{1}{4}\) inches long. State the measure of the segment to the nearest fourth inch. Then state the measure to the nearest eighth inch.

   **CHALLENGE** How many sixteenths of an inch are in a foot? How many half inches are in a yard?
46. **FIND THE ERROR** Liseli and Gabe are changing 168 inches to feet. Who is correct? Explain your reasoning.

![Image of Liseli and Gabe with calculations]

47. **WRITING IN MATH** Suppose your friend says that 24 feet is equal to 2 inches. Is this reasonable? Explain.

48. The diagram below shows the dimensions of a football field.

![Diagram of a football field]

What is the width of the field expressed in feet?
A. $3\frac{1}{4}$ ft  
B. $13\frac{1}{2}$ ft  
C. 120 ft  
D. 480 ft

49. Mr. Cortez’s car is about 71 inches wide. His garage door is 9 feet wide. How much wider is the garage door than Mr. Cortez’s car?

- F. 1 ft
- G. 2 ft
- H. 3 ft
- J. 4 ft

50. Estimate each percent. (Lesson 7-8)

- 23% of 97
- 34% of 117
- 44% of 39
- 78% of 83

51. **TEEN** Christina hit the ball over the net 3 out of her last 5 attempts. Find the probability of Christina hitting the ball over the net on her next attempt. Suppose Christina attempts 15 hits. About how many hits over the net will she make? (Lesson 7-6)

52. **SALES** What type of display would be most appropriate to show the change in the number of magazines Wade sold over each of the last 5 days? (Lesson 2-8)

53. **PREREQUISITE SKILL** Multiply or divide. (Page 658)

- 4 × 8
- 16 × 5
- 5,000 ÷ 2,000
- 400 ÷ 8
Main IDEA

Change units of capacity and weight in the customary system.

**Targeted TEKS 6.4**
The student uses letters as variables in mathematical expressions to describe how one quantity changes when a related quantity changes. (A) Use tables and symbols to represent and describe proportional and other relationships such as those involving conversions, arithmetic sequences (with a constant rate of change), perimeter and area. 6.8 The student solves application problems involving estimation and measurement of length, area, time, temperature, volume, weight, and angles. (D) Convert measures within the same measurement system (customary and metric) based on relationships between units. Also addresses TEKS 6.8(A), 6.8(B), 6.11(D).

NEW Vocabulary

capacity
fluid ounce
cup
pint
quart
gallon
ounce
pound
ton

READING in the Content Area

For strategies in reading this lesson, visit tx.msmath1.com.

**Mini Lab**

Several different milk containers are shown below.

Fill the pint container with water. Then pour the water into the quart container. Repeat until the quart container is full. Record the number of pints needed to fill the quart.

Fill the quart container with water. Then pour the water into the gallon container. Repeat until the gallon container is full. Record the number of quarts needed to fill the gallon.

Complete.

1. 1 quart = ■ pints
2. 2 quarts = ■ pints
3. 1 gallon = ■ quarts
4. 1 gallon = ■ pints
5. What fractional part of 1 gallon would fit in 1 pint?
6. How many gallons are equal to 12 quarts? Explain.

Capacity refers to the amount that can be held in a container. The most commonly used customary units of capacity are shown.

**Key Concept**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 <strong>fluid ounce</strong> (fl oz)</td>
<td>2 tablespoons of water</td>
</tr>
<tr>
<td>1 cup (c) = 8 fl oz</td>
<td>coffee cup</td>
</tr>
<tr>
<td>1 <strong>pint</strong> (pt) = 2 c</td>
<td>small ice cream container</td>
</tr>
<tr>
<td>1 quart (qt) = 2 pt</td>
<td>large liquid measuring cup</td>
</tr>
<tr>
<td>1 gallon (gal) = 4 qt</td>
<td>large plastic jug of milk</td>
</tr>
</tbody>
</table>

As with units of length, you can use a ratio table to change between units of capacity.
Vocabulary Link

Capacity

Everyday Use  the maximum amount that can be contained, as in a theater filled to capacity

Math Use  amount that can be held in a container

Change Units of Capacity

Complete.

1. \(3 \text{ qt} = \_ \text{ pt}\)

METHOD 1  Use a ratio table.

You know that there are 2 pints in 1 quart. Set up the ratio table with the measures you know. Then multiply each quantity by the same number.

\[
\begin{array}{c|c|c}
\text{Quarts} & 1 & 3 \\
\hline
\text{Pints} & 2 & 6 \\
\end{array}
\]

Since \(1 \times 3 = 3\), multiply 2 by 3.

METHOD 2  Select an appropriate operation.

You are changing a larger unit to a smaller unit. Since 1 quart = 2 pints, multiply 3 by 2.

\[3 \times 2 = 6\]

So, 3 quarts = 6 pints.

2. \(64 \text{ fl oz} = \_ \text{ pt}\)

First, find the number of cups in 64 fluid ounces.

Since 8 fluid ounces = 1 cup, divide 64 by 8.

\[64 \div 8 = 8\]

So, 64 fluid ounces = 8 cups. Next, find the number of pints in 8 cups.

Since 2 cups = 1 pint, divide 8 by 2.

\[8 \div 2 = 4\]

So, 64 fluid ounces = 4 pints.

Check  For Example 2, since 8 fluid ounces = 1 cup and 2 cups = 1 pint, you need to divide twice.

\[64 \div 8 = 8\] and \[8 \div 2 = 4\].

So, 64 fluid ounces = 4 pints.

Choose Your Method

a. \(4 \text{ pt} = \_ \text{ c}\)  

b. \(32 \text{ fl oz} = \_ \text{ c}\)

c. \(3 \text{ gal} = \_ \text{ qt}\)

The most commonly used customary units of weight are shown.

**KEY CONCEPT**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ounce (oz)</td>
<td>pencil</td>
</tr>
<tr>
<td>1 pound (lb)</td>
<td>package of notebook paper</td>
</tr>
<tr>
<td>1 ton (T)</td>
<td>small passenger car</td>
</tr>
</tbody>
</table>
Change Units of Weight

3. TRUCKS A truck weighs 7,000 pounds. How many tons is this?

\[
7,000 \text{ lb} = \_ T \\
7,000 \div 2,000 = 3 \frac{1}{2} \\
\text{Divide to change pounds to tons.}
\]

So, 7,000 pounds = 3 \frac{1}{2} tons.

4. PARTIES How many 4-ounce party favors can be made with 5 pounds of mixed nuts?

First, find the total number of ounces in 5 pounds.
\[5 \times 16 = 80 \quad \text{Multiply by 16 to change pounds to ounces.}\]

Next, find how many sets of 4 ounces are in 80 ounces.
\[80 \text{ oz} \div 4 \text{ oz} = 20\]

So, 20 party favors can be made with 5 pounds of mixed nuts.

Real-World Link

A pickup truck that is said to be “one-and-a-half tons,” means that the maximum amount of weight it can carry is 1 \frac{1}{2} tons, or 3,000 pounds.

Source: cartalkcars.com

Check Your Progress

d. CONSTRUCTION At a construction site, 3 tons of rocks were hauled away. How many pounds is this?

e. PETS Justin’s dog eats 20 ounces of dry dog food each day. If Justin buys a 40-pound bag of dog food, how many days will it last?

Examples 1, 2

(p. 385)

Examples 1, 2 (p. 385)

Complete.
\[
1. 7 \text{ pt} = \_ \text{ c} \\
2. 24 \text{ qt} = \_ \text{ gal} \\
3. 16 \text{ pt} = \_ \text{ gal} \\
4. 5 \text{ c} = \_ \text{ fl oz} \\
5. 16 \text{ pt} = \_ \text{ qt} \\
6. 8 \text{ c} = \_ \text{ pt}
\]

Example 3

(p. 386)

7. MAMMALS The heaviest land mammal, the African elephant, can weigh more than 7 tons. How many pounds is this?

8. AIRCRAFTS The maximum takeoff weight of an F-15E Strike Eagle is 81,000 pounds. How many tons is this?

Example 4

(p. 386)

9. FOOD Miguela bought a 10-pound bag of potatoes. How many people can be served 8 ounces of potatoes?

10. BREAKFAST Roman uses 1 cup of milk for his cereal every morning. How many times will he be able to have cereal with milk with 1 quart of milk?
Complete.

11. \(5 \text{ qt } = \boxed{■} \text{ pt}\)
12. \(8 \text{ gal } = \boxed{■} \text{ qt}\)
13. \(24 \text{ fl oz } = \boxed{■} \text{ c}\)
14. \(32 \text{ qt } = \boxed{■} \text{ gal}\)
15. \(6 \text{ pt } = \boxed{■} \text{ c}\)
16. \(13 \text{ qt } = \boxed{■} \text{ gal}\)
17. \(9 \text{ gal } = \boxed{■} \text{ pt}\)
18. \(24 \text{ fl oz } = \boxed{■} \text{ pt}\)
19. \(1,500 \text{ lb } = \boxed{■} \text{ T}\)
20. \(112 \text{ oz } = \boxed{■} \text{ lb}\)
21. \(84 \text{ oz } = \boxed{■} \text{ lb}\)
22. \(4 \text{ T } = \boxed{■} \text{ lb}\)

23. MAMMALS  The heaviest marine mammal, the blue whale, can weigh more than 143 tons. How many pounds is this?

24. ICE CREAM  In the United States, the annual consumption of ice cream is 24 pints per person. How many gallons of ice cream is this per person?

25. BAKING  A pumpkin pie recipe calls for 15 ounces of pumpkin. About how many pies can be made with 8 pounds of pumpkin?

26. MAPLE SYRUP  Vermont produces about 430,000 gallons of maple syrup each year. How many 2-quart containers of maple syrup can be made from 430,000 gallons of syrup?

Write and solve a proportion to complete each conversion.

27. \(6 \text{ gal } = \boxed{■} \text{ qt}\)
28. \(7 \text{ lb } = \boxed{■} \text{ oz}\)
29. \(48 \text{ fl oz } = \boxed{■} \text{ c}\)

Choose the better estimate for each measure.

30. cups or quarts?
31. fluid ounces or pints?

32. ounces or pounds?
33. pounds or tons?

Find the greater quantity. Explain your reasoning.

34. 14 cups or 5 pints
35. 4 pints or 60 fluid ounces
36. The number of cups of juice in a 12-ounce can.
37. The number of pints in a 9-quart bottle of laundry detergent.

38. **TRIATHLON** During the Ironman Triathlon World Championships, about 250,000 cups of water are given away. Each cup contains 8 fluid ounces. About how many gallons of water are given away?

39. **FIND THE DATA** Refer to the Texas Data File on pages 16–19. Choose some data and write a real-world problem in which you would convert a customary measurement of capacity or weight.

40. **RECIPES** Ellen has 12 quart jars and 24 pint jars to fill with strawberry jam. If her recipe makes 5 gallons of jam, will she have enough jars? Explain.

**COOKING** For Exercises 41–43, use the following information.
Chef Tom Perini, from Buffalo Gap, Texas, uses the ingredients at the right in one of his favorite dishes.

41. How many ounces of prime rib are needed?
42. There are 16 tablespoons in 1 cup. How many tablespoons of coarse ground black pepper are needed?
43. How can you find how many tablespoons of garlic powder are needed?

44. **OPEN ENDED** Without looking at their labels, estimate the weight or capacity of three packaged food items in your kitchen. Then compare your estimate to the actual weight or capacity.

45. **SELECT A TECHNIQUE** A homemade ice cream recipe calls for 2 pints of heavy cream. At the grocery store, Antonia finds that heavy cream is sold in 10-ounce containers and 24-ounce containers. Which of the following techniques might Antonia use to determine if buying one 10-ounce container and one 24-ounce container will be enough for the ice cream recipe? Justify your selection(s). Then use the technique(s) to solve the problem.

46. **CHALLENGE** Create a function table that shows the number of fluid ounces in 1, 2, 3, and 4 cups. Graph the ordered pairs (cups, fluid ounces) on a coordinate plane. Then describe the graph.

47. **WRITING IN MATH** Determine whether 1 cup of sand and 1 cup of cotton balls would have the same capacity, the same weight, both, or neither. Explain your reasoning.
48. A store advertises a 32-ounce container of juice for $0.99. What is the capacity of the container in cups?
   A 1 cup
   B 2 cups
   C 4 cups
   D 8 cups

49. GRIDDABLE A can of green beans weighs 13 ounces. How many pounds does a case of 24 cans weigh?

50. Which table represents the relationship between pounds and ounces?

<table>
<thead>
<tr>
<th>Pounds</th>
<th>Ounces</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
</tr>
<tr>
<td>3</td>
<td>48</td>
</tr>
<tr>
<td>4</td>
<td>64</td>
</tr>
<tr>
<td>H</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>32</td>
</tr>
<tr>
<td>G</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>32</td>
<td>2</td>
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<tr>
<td>48</td>
<td>3</td>
</tr>
<tr>
<td>64</td>
<td>4</td>
</tr>
<tr>
<td>J</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>32</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
</tr>
</tbody>
</table>

51. MEASUREMENT Measure the width of your pencil to the nearest eighth inch. (Lesson 8-1)

52. GAMES An air hockey table that normally sells for $158.99 is on sale for 75% of the regular price. What would be a reasonable amount for the sale price? (Lesson 7-8)

BASKETBALL For Exercises 53 and 54, use the following information.
In the first five basketball games, Jamil made 9 out of 12 free-throw attempts. (Lesson 7-6)

53. Find the probability of Jamil making his next free-throw attempt.

54. Suppose Jamil attempts 40 free throws throughout the season. About how many free throws will you expect him to make? Justify your reasoning.

55. PARKS The table shows the acreage of the largest national parks in the U.S. To the nearest tenth of a million, what is the acreage of each of the parks? (Lesson 3-3)

<table>
<thead>
<tr>
<th>Park</th>
<th>Acreage (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrangell-St. Elias, Alaska</td>
<td>13.27</td>
</tr>
<tr>
<td>Gates of the Arctic, Alaska</td>
<td>8.47</td>
</tr>
<tr>
<td>Denali, Alaska</td>
<td>6.07</td>
</tr>
<tr>
<td>Katmai, Alaska</td>
<td>4.73</td>
</tr>
<tr>
<td>Death Valley, California</td>
<td>3.37</td>
</tr>
</tbody>
</table>

Source: Scholastic Book of World Records

GET READY for the Next Lesson

PREREQUISITE SKILL Estimate each measure. (Lesson 8-1)

56. the width of a quarter
57. the width of a doorway
58. the width of your palm
Explore 8-3

**The Metric System**

The basic unit of length in the metric system is the *meter*. All other metric units of length are defined in terms of the meter.

The most commonly used metric units of length are shown in the table.

<table>
<thead>
<tr>
<th>Metric Unit</th>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>millimeter</td>
<td>mm</td>
<td>thousandth</td>
</tr>
<tr>
<td>centimeter</td>
<td>cm</td>
<td>hundredth</td>
</tr>
<tr>
<td>meter</td>
<td>m</td>
<td>one</td>
</tr>
<tr>
<td>kilometer</td>
<td>km</td>
<td>thousand</td>
</tr>
</tbody>
</table>

A metric ruler or tape measure is easy to read. The ruler below is labeled using *centimeters*.

The pencil below is about 12.4 centimeters long.

To read *millimeters*, count each individual unit or mark on the metric ruler.

There are ten millimeter marks for each centimeter mark. The pencil is about 124 millimeters long.

$$124 \text{ mm} = 12.4 \text{ cm}$$

There are 100 centimeters in one meter. Since there are 10 millimeters in one centimeter, there are $10 \times 100$ or 1,000 millimeters in one meter. The pencil is $\frac{124}{1,000}$ of a meter or 0.124 meter long.

$$124 \text{ mm} = 12.4 \text{ cm}$$

$$12.4 \text{ cm} = 0.124 \text{ m}$$

**Main IDEA**

Measure in metric units.

**Targeted TEKS 6.8**

The student solves application problems involving estimation and measurement of length, area, time, temperature, volume, weight, and angles.

Select and use appropriate units, tools, or formulas to measure and to solve problems involving length (including perimeter), area, time, temperature, volume, and weight.

**Main Idea**

Measure in metric units.
Use metric units of length to measure various items.

**STEP 1** Copy the table.

<table>
<thead>
<tr>
<th>Object</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm</td>
</tr>
<tr>
<td>length of pencil</td>
<td></td>
</tr>
<tr>
<td>length of sheet of paper</td>
<td></td>
</tr>
<tr>
<td>length of your hand</td>
<td></td>
</tr>
<tr>
<td>width of your little finger</td>
<td></td>
</tr>
<tr>
<td>length of table or desk</td>
<td></td>
</tr>
<tr>
<td>length of chalkboard eraser</td>
<td></td>
</tr>
<tr>
<td>width of door</td>
<td></td>
</tr>
<tr>
<td>height of door</td>
<td></td>
</tr>
<tr>
<td>distance from doorknob to the floor</td>
<td></td>
</tr>
<tr>
<td>length of classroom</td>
<td></td>
</tr>
</tbody>
</table>

**STEP 2** Use a metric ruler or tape measure to measure the objects listed in the table. Complete the table.

**ANALYZE THE RESULTS**

1. Tell which unit of measure is most appropriate for each item. How did you decide which unit was most appropriate?

2. **LOOK FOR A PATTERN** Examine the pattern between the numbers in each column. How are the numbers in the first and second columns related? in the first and third columns? in the second and third columns?

3. **MAKE A CONJECTURE** If you know the length of an object measured in millimeters, explain how you could find its length measured in centimeters.

4. **MAKE A CONJECTURE** If you know the length of an object measured in meters, explain how you could find its length measured in centimeters.

5. Select three objects around your classroom that would be best measured in meters, three objects that would be best measured in centimeters, and three objects that would be best measured in millimeters. Explain your choices.

6. Write the name of a common object that you think has a length that corresponds to each length. Explain your choices.
   a. 5 centimeters  
   b. 3 meters  
   c. 1 meter  
   d. 75 centimeters
Main IDEA
Use metric units of length.

Targeted TEKS 6.8
The student solves application problems involving estimation and measurement of length, area, time, temperature, volume, weight, and angles. (A) Estimate measurements (including circumference) and evaluate reasonableness of results. (B) Select and use appropriate units, tools, or formulas to measure and to solve problems involving length (including perimeter), area, time, temperature, volume, and weight.

NEW Vocabulary
- meter
- metric system
- millimeter
- centimeter
- kilometer

SCIENCE The table shows the deepest points in several oceans.

1. What unit of measure is used?
2. What is the depth of the deepest point?
3. Use the Internet or another source to find the meaning of meter. Then write a sentence explaining how a meter compares to a yard.

Deepest Ocean Points

<table>
<thead>
<tr>
<th>Ocean</th>
<th>Point</th>
<th>Depth (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pacific</td>
<td>Mariana Trench</td>
<td>10,924</td>
</tr>
<tr>
<td>Atlantic</td>
<td>Puerto Rico Trench</td>
<td>8,648</td>
</tr>
<tr>
<td>Indian</td>
<td>Java Trench</td>
<td>7,125</td>
</tr>
</tbody>
</table>

Source: geography.about.com

A meter is the basic unit of length in the metric system. The metric system is a decimal system of weights and measures. The most commonly used metric units of length are shown below.

### Key Concept

<table>
<thead>
<tr>
<th>Unit</th>
<th>Model</th>
<th>Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 millimeter (mm)</td>
<td>thickness of a dime</td>
<td>1 mm ≈ 0.04 inch</td>
</tr>
<tr>
<td>1 centimeter (cm)</td>
<td>half the width of a penny</td>
<td>1 cm ≈ 0.4 inch</td>
</tr>
<tr>
<td>1 meter (m)</td>
<td>width of a doorway</td>
<td>1 m ≈ 1.1 yards</td>
</tr>
<tr>
<td>1 kilometer (km)</td>
<td>six city blocks</td>
<td>1 km ≈ 0.6 mile</td>
</tr>
</tbody>
</table>

The segment at the right is 1 centimeter or 10 millimeters long. This is about 0.4 inch in customary units.

### Vocabulary Link

Millimeter

- **Everyday Use**: one thousandth, as a millennium is one thousand years
- **Math Use**: a metric unit of length; one millimeter equals one-thousandth of a meter

### Examples

**Use Metric Units of Length**

1. Write the metric unit of length that you would use to measure the width of a paper clip.

   The width of a paper clip is greater than the thickness of a dime, but less than half the width of a penny. So, the millimeter is an appropriate unit of measure.
Write the metric unit of length that you would use to measure each of the following.

2. **height of a desk**
   
   Since the height of a desk is close to the width of a doorway, the meter is an appropriate unit of measure.

3. **distance across Indiana**
   
   Since the distance across Indiana is much greater than 6 city blocks, this is measured in kilometers.

4. **width of a CD**
   
   Since the width of a CD is greater than half the width of a penny and much less than the width of a doorway, the centimeter is an appropriate unit of measure.

**CHECK Your Progress**

a. thickness of a nickel   b. height of a cereal box

**Real-World EXAMPLE**

**INSECTS** Estimate the metric length of the honey bee. Then measure to find the actual length.

The length of the honey bee appears to be the width of a penny. So, the honey bee is about 2 centimeters. Use a ruler to measure the actual length of the honey bee.

The honey bee is 18 millimeters long.

c. **FOOD** Estimate the length of the blueberry. Then measure to find the actual length.

**Personal Tutor at tx.msmath1.com**
Examples 1–4 (pp. 392–393)

Write the metric unit of length that you would use to measure each of the following.

1. thickness of a calculator
2. distance from home to school
3. height of a tree
4. width of a computer screen

Example 5 (p. 393)

Estimate the metric length of each figure. Then measure to find the actual length.

5. 
6. 

Exercises

Write the metric unit of length that you would use to measure each of the following.

7. thickness of a note pad
8. thickness of a watchband
9. length of a trombone
10. width of a dollar bill
11. length of a bracelet
12. length of the Mississippi River
13. distance from Knoxville, Tennessee, to Asheville, North Carolina
14. distance from home plate to first base on a baseball field

Estimate the metric length of each figure. Then measure to find the actual length.

15. 
16. 
17. 
18. 
19. 
20.
21. **SKYSCRAPER** Which metric unit of length would be the best to use to describe the height of the Bank of America Plaza in Dallas?

22. **RESEARCH** Use the Internet or another source to find the height of the Bank of America Plaza in Dallas, Texas. Is the height given in the metric unit you selected in Exercise 19? If not, in what unit is the measurement given?

Estimate the metric length of each of the following. Then measure to find the actual length.

23. student ID card
24. chalkboard
25. eraser on end of pencil
26. width of a cell phone

27. **FLOOR PLANS** Estimate the metric length and width of your bedroom or classroom. Then use a meterstick to check your measurement.

28. **MAPS** Estimate the distance in centimeters between Los Angeles and Palm Springs on the map. Then use a ruler to check your measurement.

29. Which customary unit of length is comparable to a meter?
30. Is a mile or a foot closer in length to a kilometer?

Find the greater length. Explain your reasoning.

31. 15 millimeters or 3 centimeters
32. 3 feet or 1 meter
33. 1 mile or 2 kilometers
34. 5 centimeters or 1 inch

35. **FARMING** If you were to build a fence around a cattle pasture, would you need to be accurate to the nearest kilometer, to the nearest meter, or to the nearest centimeter? Explain your reasoning.

36. **COLLECT THE DATA** Choose three classmates or three members of your family. (You can include yourself.) Which metric unit of length would you use to measure each person’s height? Estimate the combined height of all three people. Then use a measuring device to measure and check the reasonableness of your estimate.

37. **OPEN ENDED** Give two examples of items that can be measured with a meterstick and two examples of items that cannot reasonably be measured with a meterstick.

38. **CHALLENGE** Order 4.8 mm, 4.8 m, 4.8 cm, 0.48 m, and 0.048 km from greatest to least measurement.

39. **WRITING IN MATH** Identify the four most commonly used metric units of length and describe an object having each length. Use objects that are different from those given in the lesson.

---

**Real-World Link**

The Bank of America Plaza is the tallest building in Dallas, Texas. It was built in 1985 and has 72 stories.

Source: dallasky.com
40. What is the best estimate for the length of the paper clip?

![Paper Clip Image]

A 3 mm  B 3 cm  C 0.3 m  D 0.3 km

41. Which metric unit would you use to measure the distance an athlete jumps in a long jump competition?

F millimeter  G centimeter  H meter  J kilometer

42. **PAINTING** Painters used 170 gallons of white topcoat to paint the famous Hollywood sign. How many quarts is this?  (Lesson 8-2)

Complete.  (Lesson 8-1)

43. 4 ft = □ in.  44. 5280 yd = □ mi  45. 144 in. = □ yd

46. **FAMILIES** At a school, there are 108 students in the 6th grade. Of these, 18 students do not have any siblings. In Mr. Romain’s class, 8 of the 26 students have no siblings. Is the number of students without siblings in Mr. Romain’s class proportional to the number of students without siblings in the 6th grade? Explain.  (Lesson 6-3)

Add or subtract. Write in simplest form.  (Lesson 5-4)

47. \(\frac{1}{5} + \frac{2}{5}\)  48. \(\frac{3}{8} + \frac{2}{8}\)  49. \(\frac{6}{7} - \frac{3}{7}\)  50. \(\frac{9}{10} - \frac{3}{10}\)

51. **ACTORS** The table shows the earnings of actors with the highest career box-office earnings. To the nearest tenth of a billion, what are the earnings of each actor?  (Lesson 3-3)

<table>
<thead>
<tr>
<th>Actor</th>
<th>Earnings (billions of dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harrison Ford</td>
<td>3.25</td>
</tr>
<tr>
<td>Samuel L. Jackson</td>
<td>3.02</td>
</tr>
<tr>
<td>Tom Hanks</td>
<td>2.84</td>
</tr>
<tr>
<td>Tom Cruise</td>
<td>2.56</td>
</tr>
<tr>
<td>Eddie Murphy</td>
<td>2.48</td>
</tr>
</tbody>
</table>

Source: *Scholastic Book of World Records 2005*

52. **MONEY** Write an integer that represents a direct deposit of $200 into a savings account.  (Lesson 2-9)

53. fluid ounce  54. pound  55. quart

**PREREQUISITE SKILL** Name an item sold in a grocery store that is measured using each type of unit.

---

396  Chapter 8 Systems of Measurement
Main IDEA
Use metric units of mass and capacity.

**Targeted TEKS 6.8** The student solves application problems involving estimation and measurement of length, area, time, temperature, volume, weight, and angles.

(A) Estimate measurements (including circumference) and evaluate reasonableness of results. (B) Select and use appropriate units, tools, or formulas to measure and to solve problems involving length (including perimeter), area, time, temperature, volume, and weight.

**NEW Vocabulary**
mass
milligram
gram
kilogram
milliliter
liter

---

**MINI Lab**
Place a breath mint on one side of a balance scale and some paper clips on the other side until the scale balances. How many paper clips were used?

**STEP 2** Read the label on the mints to find the mass in grams of one mint.

**STEP 3** Find the number of paper clips needed to balance 2 pencils of the same size.

1. How does the number of paper clips needed to balance the roll of breath mints compare to the mass of the roll in grams?
2. Estimate the mass of one paper clip.
3. How many paper clips were needed to balance 2 pencils?
4. What is the mass of 1 pencil in grams?

---

The **mass** of an object is the amount of material it contains. The most commonly used metric units of mass are shown below.

**KEY CONCEPT**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Model</th>
<th>Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 milligram</td>
<td>grain of salt</td>
<td>1 mg (\approx) 0.00004 oz</td>
</tr>
<tr>
<td>1 gram</td>
<td>small paper clip</td>
<td>1 g (\approx) 0.04 oz</td>
</tr>
<tr>
<td>1 kilogram</td>
<td>six medium apples</td>
<td>1 kg (\approx) 2 lb</td>
</tr>
</tbody>
</table>

**Use Metric Units of Mass**

Write the metric unit of mass that you would use to measure each of the following. Then estimate the mass.

1. **sheet of notebook paper**
A sheet of paper has a mass greater than a small paper clip, but less than six medium apples. So, the gram is the appropriate unit.

   **Estimate** A sheet of paper has slightly more mass than a paper clip.
   
   One estimate for the mass of a sheet of paper is about 6 grams.
A bag of potatoes has a mass greater than six apples. So, the kilogram is the appropriate unit.

**Estimate** A bag of potatoes contains about 15 potatoes.

One estimate for the mass of a bag of potatoes is about 2 or 3 kilograms.

Write the metric unit of mass that you would use to measure each of the following. Then estimate the mass.

- a. tennis ball
- b. horse
- c. aspirin

The most commonly used metric units of capacity are shown below.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Model</th>
<th>Metric Units of Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 milliliter (mL)</td>
<td>eyedropper</td>
<td>1 mL ≈ 0.03 fl oz</td>
</tr>
<tr>
<td>1 liter (L)</td>
<td>small pitcher</td>
<td>1 L ≈ 1 qt</td>
</tr>
</tbody>
</table>

There are 1,000 milliliters in a liter. You can use this information to estimate capacity.

**Use Metric Units of Capacity**

Write the metric unit of capacity that you would use to measure each of the following. Then estimate the capacity.

- a. goldfish bowl
- b. glass of milk
- c. cooler of lemonade
- d. raindrop

**Real-World Link**

Most pet goldfish range in length from 2.5 to 10 centimeters. However, in the wild, they may be up to 40 centimeters long.

Source: factmonster.com

Most pet goldfish range in length from 2.5 to 10 centimeters. However, in the wild, they may be up to 40 centimeters long.

Source: factmonster.com
One kilogram is equal to 1,000 grams. You can use this information to compare metric units.

### Compare Metric Units

**ANATOMY** The table shows the average mass of several human organs. Is the combined mass of the lungs more or less than one kilogram?

<table>
<thead>
<tr>
<th>Human Organs</th>
<th>Average Mass (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>10,886</td>
</tr>
<tr>
<td>Right Lung</td>
<td>580</td>
</tr>
<tr>
<td>Left Lung</td>
<td>510</td>
</tr>
<tr>
<td>Male Heart</td>
<td>315</td>
</tr>
<tr>
<td>Female Heart</td>
<td>265</td>
</tr>
<tr>
<td>Thyroid</td>
<td>35</td>
</tr>
</tbody>
</table>

Find the total mass.

\[
\text{right lung} \quad 580 \text{ g} \\
\text{left lung} \quad + \quad 510 \text{ g} \\
\text{total} \quad 1,090 \text{ g}
\]

Since 1 kilogram = 1,000 grams and 1,090 grams is more than 1,000 grams, the combined mass of the lungs is more than one kilogram.

**RECIPES** The table shows the liquid ingredients of a fruit punch recipe. Does the recipe call for more or less than a liter of pineapple juice and ginger ale? Explain.

<table>
<thead>
<tr>
<th>Fruit Punch Liquid Ingredients</th>
<th>Amount (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pineapple juice</td>
<td>510</td>
</tr>
<tr>
<td>water</td>
<td>769</td>
</tr>
<tr>
<td>ginger ale</td>
<td>375</td>
</tr>
</tbody>
</table>

**EXAMPLES 1–4** (pp. 397–398)

Write the metric unit of mass or capacity that you would use to measure each of the following. Then estimate the mass or capacity.

1. nickel
2. bucket of water
3. laptop computer
4. juice in a lemon
5. light bulb
6. one-gallon paint can

**Example 5** (p. 399)

**FOOD** For Exercises 7–9, use the list of ingredients at the right for a dark chocolate cake.

7. Is the total amount of sugar, chocolate, butter, and flour more or less than one kilogram?

8. Write the quantities of ingredients needed for two cakes.

9. Is the total amount of sugar, chocolate, butter, and flour for two cakes more or less than one kilogram? Explain.

<table>
<thead>
<tr>
<th>Dark Chocolate Cake</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 medium eggs</td>
</tr>
<tr>
<td>175 grams sugar</td>
</tr>
<tr>
<td>280 grams chocolate</td>
</tr>
<tr>
<td>100 grams butter</td>
</tr>
<tr>
<td>100 grams flour</td>
</tr>
</tbody>
</table>
Write the metric unit of mass or capacity that you would use to measure each of the following. Then estimate the mass or capacity.

10. granola bar
11. grape
12. large watermelon
13. cow
14. large bowl of punch
15. bathtub
16. chipmunk
17. shoe
18. grain of sugar
19. postage stamp
20. 10 drops of food coloring
21. ink in a ballpoint pen

**ANALYZE TABLES** For Exercises 22 and 23, use the table at the right that shows the mass of ducks.

<table>
<thead>
<tr>
<th>Bird</th>
<th>Average Mass (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Teal</td>
<td>409</td>
</tr>
<tr>
<td>Cinnamon Teal</td>
<td>440</td>
</tr>
<tr>
<td>Hottentot Teal</td>
<td>243</td>
</tr>
<tr>
<td>Marbled Teal</td>
<td>308</td>
</tr>
</tbody>
</table>

22. Is the combined mass of a cinnamon teal, cape teal, and marbled teal more or less than one kilogram?

23. Which birds from the table will have a combined mass closest to one kilogram? Explain your reasoning.

24. **CEREAL** Your favorite cereal comes in a 1.7-kilogram box or a 39-gram box. Which box is larger? Explain.

25. **SOAP** Liquid soap comes in 1.89-liter containers and 221-milliliter containers. Which container is smaller? Explain.

**ANALYZE TABLES** For Exercises 26 and 27, use the following information and the table at the right.

A kiloliter is equal to 1,000 liters, and is about the amount needed to fill 5 bathtubs.

<table>
<thead>
<tr>
<th>Country</th>
<th>Per Person Consumption (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>82</td>
</tr>
<tr>
<td>Canada</td>
<td>46</td>
</tr>
<tr>
<td>Germany</td>
<td>116</td>
</tr>
<tr>
<td>Spain</td>
<td>126</td>
</tr>
<tr>
<td>Mexico</td>
<td>133</td>
</tr>
</tbody>
</table>

Source: Nestlé Waters Press

26. Is the amount of bottled water consumed by all countries in the table more or less than half a kiloliter?

27. About how many bathtubs could be filled with the amount of bottled water consumed by 15 people in Mexico in 2003?

28. **MEDICINE** The doctor told you to take 1,250 milligrams of aspirin for your sprained ankle. According to the bottle at the right, how many tablets should you take?
29. **OPEN ENDED** Locate and identify an item found at your home that has a capacity of about one liter.

30. **NUMBER SENSE** The mass of a dime is recorded as 4. What metric unit was used to measure the mass? Explain your reasoning.

31. **CHALLENGE** Determine whether the following statement is true or false. If false, give a counterexample.

   Any two items filled to the same capacity will also have the same mass.

32. **WRITING IN MATH** Write a problem about a real-world situation in which you would have to decide which metric unit to use to measure the mass or capacity of an item.

33. The capacity of a glass of iced tea would best be measured in what metric unit?
   
   A milliliters  
   B liters  
   C milligrams  
   D grams

34. Which of the following items on Allie’s grocery list has a mass of about 2 kilograms?
   
   F bag of marshmallows  
   G can of green beans  
   H loaf of bread  
   J bag of flour

**Spiral Review**

Write the metric unit of length that you would use to measure each of the following. *(Lesson 8-3)*

35. length of a hand

36. thickness of a folder

37. **MEASUREMENT** How many ounces are in 5 pounds? *(Lesson 8-2)*

38. **WEATHER** For Exercises 38 and 39, use the following information. *(Lesson 7-5)*

   A morning radio announcer reports that the chance of rain today is 85%.

38. What is the probability that it will not rain?


40. **PREREQUISITE SKILL** Leon has 45 baseball cards. He is collecting 5 more cards each month. Alicia has 30 baseball cards, and she is collecting 10 more each month. How many months will it be before Alicia has more cards than Leon? Use the look for a pattern strategy. *(Lesson 6-5)*
MAIN IDEA: Solve problems using benchmarks.

e-Mail: USE BENCHMARKS

YOUR MISSION: Use a benchmark to solve the problem.

THE PROBLEM: How can Tyra make punch for the party with no metric measuring containers?

TYRA: I need to add one-half liter of juice concentrate to 3 liters of water. I have a clean 2-liter cola bottle.

EXPLORE

You need to measure 0.5 liter of juice concentrate and 3 liters of water. You have a 2-liter cola bottle.

PLAN

A benchmark is a measurement by which other items can be measured. Take the 2-liter bottle and use a marker to visually divide it into four approximately equal sections. Each section will be about 0.5 liter.

SOLVE

Mark the 2-liter bottle into four sections. Pour the concentrate into the bottle until it reaches the first mark on the bottle. You have about 0.5 liter of concentrate.

CHECK

Since 4 halves equal 2 wholes, a fourth of the bottle should equal 0.5 liter.

1. **WRITING IN MATH** Explain why the 2-liter bottle is a good benchmark to use for measuring the 0.5 liter of concentrate.

2. Describe how you could measure 3 liters of water for the punch.
Use a benchmark to solve Exercises 3 and 4.

3. **INTERIOR DESIGN** Pete wants to put a border around his room. He needs to know the approximate length and width of the room in meters. He has some string, and he knows that the distance from the doorknob to the floor is about one meter. Describe a way Pete could estimate the distances in meters.

4. **PROBABILITY** The students in Mrs. Delgado’s math class want to determine the probability that a person picked at random from the class is taller than 200 centimeters. They know that the doorway is 3 meters high. Describe a way the students can determine who is taller than 200 centimeters.

Use any strategy to solve Exercises 5–8. Some strategies are shown below.

5. **BUSINESS** The North Shore Fish Market reported the following sales each day during the first half of April. Which is greater, the mean or the median sales during this time?

<table>
<thead>
<tr>
<th>April</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>$700</td>
<td>$720</td>
<td>$790</td>
<td>$650</td>
<td>$950</td>
<td>$1,100</td>
</tr>
<tr>
<td>Day</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Sales</td>
<td>$750</td>
<td>$900</td>
<td>$850</td>
<td>$625</td>
<td>$930</td>
<td>$1,030</td>
</tr>
<tr>
<td>Day</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Sales</td>
<td>$800</td>
<td>$900</td>
<td>$1,600</td>
<td>$1,700</td>
<td>$1,800</td>
<td>$1,900</td>
</tr>
<tr>
<td>Day</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Sales</td>
<td>$1,000</td>
<td>$2,000</td>
<td>$2,100</td>
<td>$2,150</td>
<td>$2,160</td>
<td>$2,170</td>
</tr>
<tr>
<td>Day</td>
<td>19</td>
<td>20</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
</tr>
</tbody>
</table>

6. **MEASUREMENT** What is the missing measurement in the pattern?

..., ■, \( \frac{1}{4} \) in., \( \frac{1}{8} \) in., \( \frac{1}{16} \) in., ...

7. **PARTIES** Debra has a string of ribbon to tie around party favors. She knows that her hand span is 20 centimeters. She needs to know the length of the ribbon in order to find out how many equal-size pieces she can cut. Describe a way Debra could estimate the length of the ribbon.

8. **NUMBER SENSE** A number multiplied by itself is 676. What is the number?

For Exercises 9–12, select the appropriate operation(s) to solve the problem. Justify your selection(s) and solve the problem.

9. **GEOMETRY** Find the area of the figure.

![Diagram of a figure with dimensions 45 cm, 32 cm, and 20 cm]

10. **MONEY** Antwon purchased a portable MP3 player for $129.98, including tax. How much change should he receive from $150?

11. **SOFTBALL** The Grayson Middle School softball team won three times as many games as they lost. If they lost 5 games, how many games did they play?

12. **FOOTBALL** The table shows the passing leaders of Super Bowl games. How much greater was the distance that Kurt Warner passed the ball in the 2000 Super Bowl than in the 2002 Super Bowl in feet?

<table>
<thead>
<tr>
<th>Passing Leaders</th>
<th>Player</th>
<th>Year</th>
<th>Yards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kurt Warner</td>
<td>2000</td>
<td>414</td>
<td></td>
</tr>
<tr>
<td>Kurt Warner</td>
<td>2002</td>
<td>365</td>
<td></td>
</tr>
<tr>
<td>Donovan McNabb</td>
<td>2005</td>
<td>357</td>
<td></td>
</tr>
</tbody>
</table>

Source: superbowl.com
CHAPTER 8
Mid-Chapter Quiz
Lessons 8-1 through 8-5

Complete. (Lesson 8-1)

1. 10,560 ft = ■ mi
2. ■ in. = 2 yd
3. 18 ft = ■ yd

Find the length of each line segment or object to the nearest half, fourth, or eighth inch. (Lesson 8-1)

4.

5.

6. HEIGHT Scott is 78 inches tall. The height of a ceiling is 9 feet. How many feet are between him and the ceiling when he is standing? (Lesson 8-1)

Complete. (Lesson 8-2)

7. 22 pt = ■ qt
8. ■ qt = 14 gal
9. 32 oz = ■ lb
10. ■ fl oz = 5 c
11. 9 pt = ■ c
12. ■ gal = 48 pt

13. TEST PRACTICE How much punch is made with 1 pint of ginger ale, 1 cup of orange juice, and 3 cups of pineapple juice? (Lesson 8-2)

   A 1 pint   C 3 pints
   B 2 pints   D 5 pints

Write the metric unit of length that you would use to measure each of the following. Then measure to find the actual length. (Lesson 8-3)

18. Estimate the metric length of each of the following.

19. 

20. VOLLEYBALL COURTS Which metric unit would be the best to use to describe the length and width of a volleyball court? (Lesson 8-3)

Write the metric unit of mass or capacity that you would use to measure each of the following. Then estimate the mass or capacity. (Lesson 8-4)

21. washing machine
22. can of soup
23. tank of gas
24. shoelace
25. packet of sugar

26. TEST PRACTICE The weight of an eraser would best be measured in what metric units? (Lesson 8-4)

   F milliliters   H grams
   G liters   J milligrams

27. ELECTRONICS Josefina is buying a stereo and wants to place it on a shelf on her entertainment center. She needs to know if there is enough space to place the stereo on the shelf. If Josefina only has a piece of string that is 5 inches long, describe a way she could estimate the height of the shelf. (Lesson 8-5)
FOOD  The table shows the estimated consumption of baked beans per person for several countries.

1. How many grams of baked beans are consumed per person in the United States?

2. How many kilograms of baked beans are consumed per person in the United States?

3. Describe the relationship between the quantities you found in Exercises 1 and 2.

4. Compare the number of grams and kilograms of baked beans consumed by the other countries in the table. Make a conjecture about how to convert from grams to kilograms.

To change from one unit to another in the metric system, you multiply or divide by powers of 10. The chart below shows the relationship between the units in the metric system and the powers of 10.

<table>
<thead>
<tr>
<th>1,000</th>
<th>100</th>
<th>10</th>
<th>1</th>
<th>0.1</th>
<th>0.01</th>
<th>0.001</th>
</tr>
</thead>
<tbody>
<tr>
<td>thousands</td>
<td>hundreds</td>
<td>tens</td>
<td>ones</td>
<td>tenths</td>
<td>hundredths</td>
<td>thousandths</td>
</tr>
</tbody>
</table>

Each place value is 10 times the place value to its right.

In Lesson 8-1, you learned the following methods for changing customary units of measure.

- To change from a larger unit to a smaller unit, multiply.
- To change from a smaller unit to a larger unit, divide.

You can use the same methods for changing metric units of measure.
Change Metric Units

1. mm = 26 cm
   Since 1 centimeter = 10 millimeters, multiply 26 by 10.
   \[26 \times 10 = 260\]
   So, 260 mm = 26 cm.

2. 135 g = kg
   Since 1,000 grams = 1 kilogram, divide 135 by 1,000.
   \[135 \div 1,000 = 0.135\]
   So, 135 g = 0.135 kg.

Complete.

3. \[513 \text{ mL} = \_ \text{ L} \quad \text{b.} \quad 5 \text{ cm} = \_ \text{ mm} \quad \text{c.} \quad \_ \text{ mg} = 82 \text{ g}\]

Personal Tutor at tx.msmath1.com

3. TRIATHLONS Will has run 200 meters. How many more kilometers does he need to run in order to finish the running portion of the San Diego International Triathlon?

   First, change 200 meters to kilometers. You can use a proportion.

   \[\frac{1 \text{ km}}{1,000 \text{ m}} = \frac{x \text{ km}}{200 \text{ m}}\]

   \[x = 1 \div 5 = 0.2\]

   So, 200 meters = 0.2 kilometer.

   Subtract to find the number of kilometers Will still needs to run.
   \[10 - 0.2 = 9.8\]

   Will needs to run 9.8 kilometers.

   \[\text{d. WATER} \quad \text{A person should drink about 1.9 liters of water daily. Miko drank 1,650 milliliters one morning. How much more water should Miko drink during the day?}\]
Complete.

1. \( 95 \text{ g} = \square \text{ mg} \)
2. \( 5 \text{ L} = \square \text{ mL} \)
3. \( \square \text{ mm} = 38 \text{ cm} \)
4. \( \square \text{ L} = 75 \text{ mL} \)
5. \( 205 \text{ mg} = \square \text{ g} \)
6. \( 85 \text{ mm} = \square \text{ cm} \)

7. **TRAVEL** Booker’s family drove 42 kilometers from Brownsville to Harlingen and then another 2,300 meters to his aunt’s house. What is the total number of kilometers Booker’s family drove?

Complete.

8. \( \square \text{ L} = 95 \text{ mL} \)
9. \( \square \text{ g} = 1,900 \text{ mg} \)
10. \( 52 \text{ mm} = \square \text{ cm} \)
11. \( 354 \text{ cm} = \square \text{ m} \)
12. \( \square \text{ mg} = 6 \text{ g} \)
13. \( \square \text{ mL} = 238 \text{ L} \)
14. \( 4 \text{ m} = \square \text{ mm} \)
15. \( 18 \text{ L} = \square \text{ mL} \)
16. \( \square \text{ L} = 136 \text{ mL} \)
17. \( \square \text{ g} = 7 \text{ mg} \)
18. \( 1,300 \text{ g} = \square \text{ kg} \)
19. \( 450 \text{ m} = \square \text{ km} \)

20. **ANIMALS** If a rhinoceros has a mass of 3,600 kilograms and a pygmy mouse has a mass of 8 grams, how much more mass is the rhinoceros than the pygmy mouse?

21. **TRACK** A running track at a college is 200 meters long. Isabel wants to run 1 kilometer on this track. How many laps will she have to run?

Complete.

22. \( 500 \text{ mg} = \square \text{ kg} \)
23. \( 250 \text{ mm} = \square \text{ km} \)
24. \( 200,000 \text{ mL} = \square \text{ kL} \)
25. \( 3 \text{ km} = \square \text{ cm} \)

Order each set of measurements from least to greatest.

26. \( 4.2 \text{ kg}, 420 \text{ g}, 400,000 \text{ mg} \)
27. \( 560 \text{ mm}, 55 \text{ cm}, 5.6 \text{ km} \)
28. \( 630 \text{ mg}, 63 \text{ g}, 6.3 \text{ kg} \)
29. \( 8.2 \text{ km}, 8,500 \text{ mm}, 80 \text{ m} \)

30. **BRIDGES** The table shows the length of the three longest suspension bridges in the United States. If Perez biked over the main span of the Golden Gate Bridge and back, about how many kilometers did he bike?

<table>
<thead>
<tr>
<th>U.S. Suspension Bridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridge</td>
</tr>
<tr>
<td>Verrazano Narrows</td>
</tr>
<tr>
<td>Golden Gate</td>
</tr>
<tr>
<td>Mackinac Straits</td>
</tr>
</tbody>
</table>

Source: Top 10 of Everything

31. **FITNESS** Danielle walked 0.75 kilometer each day for five days. How many meters did she walk in all?
32. **FIND THE DATA** Refer to the Texas Data File on pages 16–19. Choose some data and write a real-world problem in which you would need to change metric units.

33. **TRACK** At a track meet, Andres raced in the 5,000-meter run, 10,000-meter run, and 400-meter hurdles. How many total kilometers did Andres race at the track meet?

34. **RESEARCH** Use the Internet or another source to find other metric prefixes for very large and very small units of measure. List three of each type and explain their meaning.

**BASEBALL** For Exercises 35–37, use the table at the right.

35. List the home runs in order from greatest to least.

36. How much longer was Mickey Mantle’s longest home run than his fifth longest home run?

37. Find the mean, median, and mode of the home runs. Which of these measures best represents the data?

38. **OPEN ENDED** Choose a metric measure between 1 and 100. Then write two measures equivalent to that measure.

39. **CHALLENGE** If Tyra has \(x\) milligrams of food for her parrot, write an algebraic expression for the amount of kilograms of parrot food she has.

40. **SELECT A TOOL** Rachelle takes a large jug of lemonade to her brother’s soccer games. She sells cups of the lemonade to the fans. The jug contains 10 liters of lemonade, and each cup will hold 400 milliliters. Which of the following tools might Rachelle use to determine how many cups to bring with her? Justify your selection(s). Then use the tool(s) to solve the problem.

41. **FIND THE ERROR** Jacinta and Trina are changing 590 centimeters to meters. Who is correct? Explain your reasoning.

42. **WRITING IN MATH** Explain the steps you would use to change 7 kiloliters to milliliters.
43. **GRIDDABLE** Nestor bought a 3-meter telephone cord. What is the length of the cord in millimeters?

44. The mass of Ethan’s dog is 25,900 grams. What is the mass of his dog in kilograms?
   - **A** 2.59 kg
   - **B** 25.9 kg
   - **C** 259 kg
   - **D** 2,590 kg

45. Chicago’s Buckingham Fountain contains 133 jets that spray about 52,990 liters of water into the air every minute. Which proportion can be used to find \( x \), the number of kiloliters of water the fountain sprays every minute?
   - **F** \( \frac{52,990 \text{ L}}{x \text{ kL}} = \frac{1 \text{ kL}}{1,000 \text{ L}} \)
   - **G** \( \frac{1 \text{ L}}{52,990 \text{ L}} = \frac{x \text{ kL}}{1,000 \text{ kL}} \)
   - **H** \( \frac{52,990 \text{ L}}{x \text{ kL}} = \frac{1,000 \text{ L}}{1 \text{ kL}} \)
   - **J** \( \frac{x \text{ kL}}{52,990 \text{ L}} = \frac{1,000 \text{ L}}{1 \text{ kL}} \)

46. **DRIVEWAYS** Before seal coating his driveway, Tito needs to know its length and width. He knows that it is about 3 meters wide. Describe a way he could estimate the length and width of his driveway without using a metric ruler. *(Lesson 8-5)*

47. **FOOD** Which is the better estimate for the capacity of a glass of milk, 360 liters or 360 milliliters? *(Lesson 8-4)*

48. **MEASUREMENT** Estimate the metric length of the battery. Then measure to find the actual length. *(Lesson 8-3)*

Write each mixed number as an improper fraction. *(Lesson 4-3)*

49. \( 1 \frac{7}{8} \)
50. \( 7 \frac{3}{8} \)
51. \( 6 \frac{6}{7} \)
52. \( 3 \frac{2}{5} \)

53. **ARCHITECTURE** Use front-end estimation to find the difference in the ceiling heights between the kitchen and the bedroom. *(Lesson 3-4)*

54. If the input values of a function are 0, 1, and 6 and the corresponding outputs are 4, 5, and 10, what is the function rule? *(Lesson 1-6)*

**GET READY for the Next Lesson**

**PREREQUISITE SKILL** Add or subtract. *(Lesson 3-5)*

55. \( 3.26 + 4.86 \)
56. \( 9.32 - 4.78 \)
57. \( 27.48 + 78.92 \)
58. \( 7.18 - 2.31 \)
MONEY MATTERS  Bethany’s grandfather promises to pay her for each hour she spends doing extra chores. The table shows the amount of time spent on each extra chore.

1. How long did Bethany take to wash the car? to run errands?
2. What is the sum of the minutes? of the hours?
3. How long did it take to wash the car and run errands?

The most commonly used units of time are shown below.

<table>
<thead>
<tr>
<th>Key Concept</th>
<th>Units of Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>Model</td>
</tr>
<tr>
<td>1 second (s)</td>
<td>time needed to say 1,001</td>
</tr>
<tr>
<td>1 minute (min) = 60 seconds</td>
<td>time for 2 average TV commercials</td>
</tr>
<tr>
<td>1 hour (h) = 60 minutes</td>
<td>time for 2 weekly TV sitcoms</td>
</tr>
</tbody>
</table>

To add or subtract measures of time, use the following steps.

**Step 1** Add or subtract the seconds.

**Step 2** Add or subtract the minutes.

**Step 3** Add or subtract the hours.

**Other Units of Time**
1 day = 24 hours
1 week = 7 days
1 month ≈ 30 days
1 year = 12 months

**Add and Subtract Units of Time**

**Find the sum of 4 h 20 min and 2 h 50 min.**

**Estimate** 4 h 20 min + 2 h 50 min ≈ 4 h + 3 h or 7 h

4 h 20 min Add minutes first, then hours.
+ 2 h 50 min
6 h 70 min

70 minutes is greater than 60 minutes or 1 hour.

6 h (1 h 10 min) Rename 70 minutes as 1 hour and 70 – 60 or 10 min.
7 h 10 min Add hours.

**Check for Reasonableness** 7 h 10 min ≈ 7 h

**NEW Vocabulary**

elapsed time
2 Find the difference of 8 h 20 min 35 s and 3 h 45 min 30 s.

Estimate 8 h 20 min 35 s — 3 h 45 min 30 s ≈ 8 h — 4 h or 4 h

Subtract the seconds first. Notice that you cannot subtract 45 minutes from 20 minutes.

(7 h 60 min) 20 min 35 s Rename 8 h as 7 h + 1 h or 7 h 60 min.
− 3 h 45 min 30 s
5 s

7 h 80 min 35 s Add the minutes.
− 3 h 45 min 30 s
5 s

7 h 80 min 35 s Subtract the minutes, then the hours.
− 3 h 45 min 30 s
4 h 35 min 5 s

Check for Reasonableness 4 h 35 min 5 s ≈ 4 h ✔

a. 5 h 55 min + 6 h 17 min
b. 11 h 25 min 20 s − 4 h 5 min 35 s
c. 9 h 35 s + 2 h 59 min 49 s

ASTRONOMY The table shows the rotation of several planets relative to the Sun. How much longer is a day on Mars than a day on Saturn?

Estimate

24 h 39 min 35 s — 10 h 39 min 23 s ≈ 25 h — 11 h or 14 h

Subtract seconds first, then minutes, and finally the hours.

The day on Mars is 14 hours 12 seconds longer than on Saturn.

Check for Reasonableness 14 h 12 s ≈ 14 h ✔

d. HOMEWORK Shiro spent 1 hour and 25 minutes working on a social studies project and 40 minutes on math homework. How much time did Shiro spend on homework?
Sometimes you need to determine the **elapsed time**, which is how much time has passed from beginning to end.

### Elapsed Time

**TRAVEL** A flight leaves Boston at 11:35 A.M. and arrives in Miami at 2:48 P.M. How long is the flight?

You need to find how much time has elapsed.

> 11:35 A.M. to 12:00 noon is 25 minutes.
> 12:00 noon to 2:48 P.M. is 2 hours 48 minutes.

Add the elapsed time before noon and the elapsed time after noon to find the total elapsed time.

\[
\begin{align*}
&25 \text{ min} \\
+ &2 \text{ h } 48 \text{ min} \\
= &2 \text{ h } 73 \text{ min} = 3 \text{ h } 13 \text{ min} \quad \text{Rename 73 min as 1 h 13 min.}
\end{align*}
\]

The length of the flight is 3 hours 13 minutes.

**e. APPOINTMENTS** Lucita left school at 8:25 A.M. for an orthodontics appointment and returned at 10:50 A.M. How long was she gone from school?

### Add or Subtract

1. \[4 \text{ h } 23 \text{ min} + 6 \text{ h } 52 \text{ min} = 11 \text{ h } 75 \text{ min} = 12 \text{ h } 15 \text{ min}\]
2. \[5 \text{ h } 15 \text{ min } 10 \text{ s} - 2 \text{ h } 30 \text{ min } 45 \text{ s} = 2 \text{ h } 45 \text{ min } 25 \text{ s}\]
3. \[8 \text{ h } 35 \text{ s} + 7 \text{ h } 29 \text{ min } 54 \text{ s} = 16 \text{ h } 58 \text{ min } 89 \text{ s} = 16 \text{ h } 59 \text{ min } 28 \text{ s}\]

**Example 3**

The table shows the average prime-time television viewing time for all viewers. How much more time did a viewer spend watching television in 2003 than in 1950?

<table>
<thead>
<tr>
<th>Year</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>4 h 35 min</td>
</tr>
<tr>
<td>2003</td>
<td>8 h 22 min</td>
</tr>
</tbody>
</table>

Source: Nielsen Media Research

**Example 4**

**SCHOOL** Anoki left his house at 6:45 A.M. to go to school and returned at 2:55 P.M. How much time elapsed between the time Anoki left his house and returned home from school?
Add or subtract.

6. 15 h 45 min + 20 h 30 min
7. 35 min 25 s + 24 min 40 s
8. 6 h 29 min 28 s − 2 h 48 min 14 s
9. 2 h 57 min 19 s − 1 h 23 min 42 s
10. 12 h 21 min 45 s + 8 h 45 min 16 s
11. 5 h 28 s + 3 h 8 min 40 s

12. **ASTRONOMY** Refer to the table in Example 3. How much longer is a day on Earth than a day on Neptune?

13. **MUSIC** Benjamin spent 90 minutes practicing the piano and then 1 hour and 20 minutes listening to the radio. How much time did Benjamin spend practicing the piano and listening to the radio?

**Find the elapsed time.**

14. 7:28 A.M. to 10:07 A.M.
15. 5:30 P.M. to 9:56 P.M.
16. 6:25 A.M. to 4:45 P.M.
17. 9:30 P.M. to 3:39 A.M.

18. **BASKETBALL** The school basketball game started at 6:30 P.M. and ended at 8:22 P.M. How long was the game?

19. **SHOPPING** Berta, Crystal, and Taylor went shopping and then to a movie. If they left Berta’s house at 9:30 A.M. and got back at 6:40 P.M., how long were they gone?

Add or subtract.

20. 8 h 41 s + 3 h 11 min 8 s + 58 min 10 s
21. 8 h 25 s + 50 s
22. 5 h + 1 h 15 min 12 s

23. **ANALYZE TABLES** The table shows the times for three flights leaving from three different airports in the Washington, D.C., area and traveling to Detroit. If Adriana wants the shortest travel time to Detroit from Washington, D.C., which airport should she choose?

<table>
<thead>
<tr>
<th>Airport</th>
<th>Departure Time</th>
<th>Arrival Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>WDI</td>
<td>7:31 A.M.</td>
<td>10:05 A.M.</td>
</tr>
<tr>
<td>DCA</td>
<td>7:15 A.M.</td>
<td>9:43 A.M.</td>
</tr>
<tr>
<td>BWI</td>
<td>7:23 A.M.</td>
<td>9:53 A.M.</td>
</tr>
</tbody>
</table>

24. **COOKING** Suppose Mr. James puts a meat loaf in the oven at 11:49 A.M. It needs to bake for 1 hour and 35 minutes. At what time should he take the meat loaf out of the oven?

25. **THEATER** The three acts of a play are 28 minutes, 20 minutes, and 14 minutes long. There are 15-minute intermissions between each act. If the play starts at 7:30 P.M., when will it end?

26. **CHALLENGE** Kimmie and her family went out of town for several days. If they left Friday at 2:45 P.M. and returned on Wednesday at 11:00 A.M., find the elapsed time.
27. **REASONING** Determine if a stopwatch is *always*, *sometimes*, or *never* a good way to measure the length of a movie. Explain your reasoning.

28. **OPEN ENDED** Identify a starting time in the morning and an ending time in the afternoon where the elapsed time is 3 hours 45 minutes.

29. **Which One Doesn’t Belong?** Identify the time that is not the same as the others. Explain your reasoning.

30. **WRITING IN MATH** Write a problem about an activity you do on a regular basis in which you need to figure the elapsed time.

---

### TEST PRACTICE

31. Denzell left for Six Flags Over Texas at 9:15 A.M. and returned home at 6:05 P.M. About how many hours elapsed between the time he left and the time he returned home from the amusement park?

A 3 h  
B 8 h  
C 9 h  
D 10 h

32. **GRIDDDABLE** Evan spent 2 hours and 35 minutes doing research for a paper. Then he spent 1 hour and 25 minutes writing the paper. How many hours did Evan spend on these two activities?

33. The table shows the time Heather spends on each activity in the morning. About how much time in all does it take for Heather to get ready and arrive at work?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get ready in the morning</td>
<td>35 minutes</td>
</tr>
<tr>
<td>Walk to the bus stop</td>
<td>12 minutes</td>
</tr>
<tr>
<td>Bus ride to work</td>
<td>48 minutes</td>
</tr>
<tr>
<td>Walk from the bus stop to work</td>
<td>8 minutes</td>
</tr>
</tbody>
</table>

F 1 hour 43 minutes  
G 1 hour 3 minutes  
H 1.43 hours  
J 1.03 hours

---

### Spiral Review

**Complete.** *(Lesson 8-6)*

34. \[ L = 450 \text{ mL} \]  
35. \[ 65 \text{ m} = \text{ cm} \]  
36. \[ 8,800 \text{ g} = \text{ kg} \]

37. **MEASUREMENT** To measure the water in a washing machine, which metric unit of capacity would you use? *(Lesson 8-4)*

**PREREQUISITE SKILL** Add or subtract. *(Page 657)*

38. \[ 364 + 132 \]  
39. \[ 55 + 249 \]  
40. \[ 189 - 162 \]  
41. \[ 204 - 79 \]

---

414 Chapter 8 Systems of Measurement
Choose and estimate reasonable temperatures.

**Targeted TEKS 6.8**
The student solves application problems involving estimation and measurement of length, area, time, temperature, volume, weight, and angles. **(A) Estimate measurements** (including circumference) and **evaluate reasonableness of results. (B) Select and use appropriate units, tools, or formulas to measure and to solve problems involving length (including perimeter), area, time, temperature, volume, and weight.**

**NEW Vocabulary**
temperature
degree
Celsius (°C)
Fahrenheit (°F)

**Main IDEA**

Use a thermometer that has both a Fahrenheit (°F) and a Celsius (°C) scale to measure the temperature of the items listed.

<table>
<thead>
<tr>
<th>Item</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(°F)</td>
</tr>
<tr>
<td>classroom temperature</td>
<td></td>
</tr>
<tr>
<td>outside temperature</td>
<td></td>
</tr>
<tr>
<td>temperature of glass of ice water</td>
<td></td>
</tr>
<tr>
<td>temperature of cold water from faucet</td>
<td></td>
</tr>
<tr>
<td>temperature of hot water from faucet</td>
<td></td>
</tr>
</tbody>
</table>

1. Copy the table and record your findings.
2. **Use your findings to predict the temperature of each item.**  
   1. cold glass of milk   2. hot cup of coffee   3. frozen dessert

**Temperature** is the measure of hotness or coldness of an object or environment. It is measured as **degrees** on a temperature scale.

In the metric system, temperature is measured in degrees **Celsius (°C)**. Water freezes at 0°C and boils at 100°C.

In the customary system, temperature is measured in degrees **Fahrenheit (°F)**. Water freezes at 32°F and boils at 212°F.

The thermometers at the right show common temperatures in degrees Celsius and degrees Fahrenheit.
Choose Reasonable Temperatures

Choose the more reasonable temperature for each.

1. water in a warm bath: 75°F or 105°F
   Normal body temperature is 98.6°F, so you would want a warm bath to be warmer than your body temperature. So, 105°F is a more reasonable temperature.

2. inside a classroom: 21°C or 84°C
   On the Celsius scale, water boils at 100°C. So, 84°C would be too hot for the temperature inside of a classroom. The more reasonable temperature is 21°C.

3. glass of iced tea: 5°C or -25°C
   Water freezes at 0°C, so a glass of iced tea would be cool but not freezing yet, nor below freezing at -25°C. So, 5°C is a more reasonable temperature.

Choose the more reasonable temperature for each.

a. hot soup: 40°C or 90°C
b. slice of warm apple pie: 60°F or 110°F

Give Reasonable Temperatures

Give a reasonable estimate of the temperature in degrees Fahrenheit and degrees Celsius for each situation.

4. outdoor swimming
   Swimming is typically an activity for a warm summer day. So, a reasonable temperature is 90°F and 30°C.

5. temperature in a refrigerator
   The temperature in a refrigerator should be colder than room temperature so that food will not spoil but not cold enough for food to freeze. So, a reasonable temperature is 35°F and 2°C.

6. temperature of hail
   Hail is made of ice. So, the temperature should be a little less than freezing. A reasonable temperature is 30°F and -1°C.

Give a reasonable estimate of the temperature in degrees Fahrenheit and degrees Celsius for each activity.

c. snowboarding
d. playing baseball
Choose the more reasonable temperature for each.
1. cake in oven: 200°F or 350°F
2. ice cream: −10°C or 10°C
3. person with a fever: 81°F or 101°F
4. hot chocolate: 60°C or 30°C

Give a reasonable estimate of the temperature in degrees Fahrenheit and degrees Celsius for each activity.
5. attending a football game
6. snow skiing
7. planting flowers
8. hiking
9. FISHING Kendrick plans on going ice fishing at Bitterroot Lake, Montana, this weekend. What is a reasonable temperature Kendrick can expect while ice fishing?

Choose the more reasonable temperature for each.
10. inside a restaurant: 31°F or 71°F
11. ice water: 5°C or 25°C
12. walk-in freezer: 19°F or 39°F
13. hot grill: 120°F or 200°F
14. baking pie in oven: 70°C or 170°C
15. frozen vegetables: −10°C or 10°C
16. HOT TUBS The Pecks purchased a hot tub. Should they set the hot tub heater thermostat at 39°C or 80°C? Explain your reasoning.
17. HOCKEY At a hockey game, Liana states that the temperature on the ice is 40°F. Her friend thinks 20°F is more reasonable. Who is correct? Explain your reasoning.

Give a reasonable estimate of the temperature in degrees Fahrenheit and degrees Celsius for each activity.
18. jogging
19. taking a hot shower
20. horseback riding
21. ice skating
22. going to an amusement park
23. sunbathing on the beach
24. SUMMER It is a warm summer day. If the temperature reads 30 degrees, is this 30°C or 30°F?
25. COOKING Use the table at the right. Makayla began cooking chicken that had a temperature of 38°F. What is a reasonable amount the temperature of the chicken will need to rise in order to be safe to eat?

<table>
<thead>
<tr>
<th>Meat</th>
<th>Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef, medium well</td>
<td>150–155</td>
</tr>
<tr>
<td>Chicken</td>
<td>165–175</td>
</tr>
<tr>
<td>Turkey</td>
<td>165–175</td>
</tr>
<tr>
<td>Pork</td>
<td>150</td>
</tr>
</tbody>
</table>

Source: whatscookingamerica.net
26. **Elevation** Air temperature decreases about 6°C for every increase in the elevation of 1,000 meters. If the temperature outside starts out at 30°C, make a table of values for the temperature at elevations of 1,000, 2,000, 3,000, 4,000, 5,000, and 6,000 meters. What is the difference in the temperature at 3,000 meters and 6,000 meters? (Assume the starting elevation is 0 meters.)

**H.O.T. Problems**

**Challenge** The expression \( \frac{5(F - 32)}{9} \), where \( F \) is the temperature in degrees Fahrenheit, can be used to convert temperatures to degrees Celsius. Convert each temperature to degrees Celsius.

27. 77°F  
28. 41°F  
29. 194°F

30. **Writing in Math** A local newspaper used the display at the right to illustrate the weather for the upcoming week. Write and solve a real-world problem using the temperatures in the display.

31. Which of the following is a reasonable temperature for the activity shown in the illustration below?

   A 25°C  
   B 35°F  
   C 80°C  
   D 150°F

32. On a cold winter morning, Cara walked outside to get the newspaper. The temperature outside was 5°F. What is a reasonable estimate for the difference between this temperature and Cara’s normal body temperature?

   F 80°F  
   G 90°F  
   H 100°F  
   J 110°F

33. **Marathons** The first winner of the Boston Marathon in 1897 had a winning time of 2 hours 55 minutes 10 seconds. In 2005, the winner of the Boston Marathon had a winning time of 2 hours 11 minutes 45 seconds. How much faster was the winning time in 2005 than in 1897? (Lesson 8-7)

   Complete. (Lesson 8-6)

34. 6,000 L = ■ kL  
35. 84 mm = ■ cm  
36. ■ g = 3,700 mg
Main IDEA
Select appropriate units and tools to measure objects or activities.

Targeted TEKS 6.8
The student solves application problems involving estimation and measurement of length, area, time, temperature, volume, weight, and angles.
(B) Select and use appropriate units, tools, or formulas to measure and to solve problems involving length (including perimeter), area, time, temperature, volume, and weight.

An attribute is a characteristic of an object. For example, one attribute of a quarter is that it is made of metal. Some attributes of an object can be measured. For example, you can measure how much a quarter weighs and its thickness. In this lab, you will measure the attributes of several objects or activities.

Activity

1. Select an object in your classroom such as a desk, book, backpack, or trashcan.

2. Make a list of all the measurable attributes of your object. Choose from among length, weight or mass, or capacity.

3. Select an appropriate tool from among those provided by your teacher and measure each attribute. Record each measure using appropriate units in a table like the one below.

<table>
<thead>
<tr>
<th>Object</th>
<th>Attribute(s)</th>
<th>Tool</th>
<th>Measurement</th>
</tr>
</thead>
</table>

4. Choose a different object with at least one attribute that requires the use of a different tool to measure. Then repeat Steps 1 through 3.

Analyze the Results

1. Express each attribute of the object you measured using different units. For example, if you measured the length of the object in centimeters, write this length in meters.

2. Write a real-world problem in which one of your measurements is needed to solve the problem. For example, if you measured the time it takes to sharpen one new pencil, a problem might be to estimate the time it would take for each student in your class to sharpen a new pencil before a test.
2. Select a classroom activity such as sharpening your pencil or walking from the door to your desk.

STEP 2
Make a list of all the measurable attributes of your activity. Choose from among length, time, or temperature.

STEP 3
Select an appropriate tool from among those provided by your teacher and measure each attribute. Record each measure using appropriate units.

STEP 4
Choose a different activity with at least one attribute that requires the use of a different tool to measure. Then repeat Steps 1 through 3.

ANALYZE THE RESULTS

3. Express each attribute of the activity you measured using different units. For example, if you measured the time it took to do an activity in minutes, write this time using seconds.

4. Write a real-world problem in which one of your measurements is needed to solve the problem. For example, if you measured the time it took to sharpen one new pencil, a problem might be to estimate the time it would take for each student in your class to sharpen a new pencil before taking a test.

Suppose you were going to organize the following events for a field day at your school. What tools would you need to set up the event and determine a winner?

5. 50-meter dash: Who can run the fastest?

6. Softball throw: Who can throw the farthest?

7. Water relay: Which team can fill up their bucket the fastest using a leaking cup?

8. Indicate an ideal outdoor temperature, in Fahrenheit and Celsius degrees, for the field day event described in Exercise 7. Explain your reasoning.
Be sure the following Key Concepts are noted in your Foldable.

**Key Concepts**

**Customary Units of Length** (Lesson 8-1)
- 1 inch (in.) = 12 in.
- 1 yard (yd) = 3 ft
- 1 mile (mi) = 1,760 yd

**Customary Units of Capacity** (Lesson 8-2)
- 1 fluid ounce (fl oz) = 8 fl oz
- 1 pint (pt) = 2 c
- 1 quart (qt) = 2 pt
- 1 gallon (gal) = 4 qt

**Customary Units of Weight** (Lesson 8-2)
- 1 ounce (oz) = 16 oz
- 1 ton (T) = 2,000 lb

**Metric Units of Length** (Lesson 8-3)
- 1 millimeter (mm) = 1 centimeter (cm)
- 1 meter (m) = 1 kilometer (km)

**Metric Units of Mass and Capacity** (Lesson 8-4)
- 1 milligram (mg) = 1 milliliter (mL)
- 1 gram (g) = 1 liter (L)
- 1 kilogram (kg)

**Changing Metric Units** (Lesson 8-6)
- To change from a larger unit to a smaller unit, multiply by powers of 10. To change from a smaller unit to a larger unit, divide by powers of 10.

**Measures of Time** (Lesson 8-7)
- Elapsed time is how much time has passed from beginning to end.

**Measures of Temperature** (Lesson 8-8)
- Temperature is measured in degrees Fahrenheit (°F) and in degrees Celsius (°C).

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**Vocabulary Check**

Choose the correct term or number to complete each sentence.

1. A centimeter equals (one tenth, one hundredth) of a meter.
2. You should (multiply, divide) to change from larger to smaller units.
3. One paper clip has a mass of about one (gram, kilogram).
4. One cup is equal to (16, 8) fluid ounces.
5. The basic unit of capacity in the metric system is the (liter, gram).
6. To convert from 15 yards to feet, you should (multiply, divide) by 3.
7. One centimeter is (longer, shorter) than 1 millimeter.
Lesson-by-Lesson Review

8-1 Length in the Customary System (pp. 378–383)

Complete.
8. 2 mi = ■ ft  9. ■ in. = 5 ft
10. 9 yd = ■ ft  11. 72 in. = ■ yd

Draw a line segment of each length.
12. \(\frac{7}{8}\) in.  13. 1\(\frac{1}{2}\) in.  14. 3\(\frac{1}{4}\) in.

15. **BASKETBALL** The length of an NBA basketball court is 94 feet. The length of a high school basketball court is 28 yards. What is the difference in feet between the two courts?

Example 1 Complete 36 ft = ■ yd.

\[
36 \div 3 = 12
\]
Since 1 yard = 3 feet, divide 36 by 3.

So, 36 ft = 12 yd.

Example 2 Draw a line segment measuring \(1\frac{3}{8}\) inches.

Draw a line segment from 0 to \(1\frac{3}{8}\).

8-2 Capacity and Weight in the Customary System (pp. 384–389)

Complete.
16. 5 T = ■ lb  17. ■ qt = 44 c
18. ■ lb = 12 oz  19. ■ pt = 8 qt
20. 64 fl oz = ■ c  21. 3 gal = ■ qt
22. **FOOD** Lana bought 9 gallons of cider for the school party. How many 1-cup servings will she be able to serve?

Example 3 Complete 5 qt = ■ pt.

\[
5 \times 2 = 10
\]
Since 1 quart = 2 pints, multiply 5 by 2 to change a larger unit to a smaller unit.

So, 5 quarts = 10 pints.

8-3 Length in the Metric System (pp. 392–396)

Write the metric unit of length that you would use to measure each of the following.
23. height of your school
24. the length of the state of Kentucky
25. thickness of slice of bread
26. distance across school gym
27. length of your arm

Example 4 Write the metric unit of length that you would use to measure the height of a slide on the school playground.

Compare the slide with an item in the table on page 392. The height of a slide is larger than half the width of a penny and smaller than six city blocks. So, you would use the meter.
8-4  **Mass and Capacity in the Metric System**  (pp. 397–401)

Write the metric unit of mass or capacity that you would use to measure each of the following. Then estimate the mass or capacity.

28. an apple  
29. a pitcher of lemonade  
30. a snowflake  
31. an automobile  
32. a can of soda  

33. **SHOPPING**  Your favorite juice comes in 1.5 liter containers and 355 milliliter containers. Which container has less juice?

**Example 5**  Write the metric unit of mass that you would use to measure a cell phone. Then estimate the mass.

The mass of a cell phone is greater than a paper clip, but less than a textbook. So, the gram is the appropriate unit.

**Estimate**  There are 1,000 grams in a kilogram. A cell phone is much heavier than a paper clip, but not nearly as heavy as a textbook.

One estimate for the mass of a cell phone is about 500 grams.

8-5  **PSI: Use Benchmarks**  (pp. 403–404)

Use a benchmark to solve each problem.

34. **SCARVES**  Cho is making scarves for a craft sale. Each scarf must be 12 inches long. She only has a piece of string that is 3 inches long to measure. How can she measure the scarves?

35. **PUNCH**  Arturo needs to add 3 quarts of orange juice to the punch. He only has a gallon jug to measure the orange juice. Describe a way he can measure the orange juice.

**Example 6**  Leo needs to add 2 pints of cream to make ice cream, but all he has is a \( \frac{1}{2} \) cup to measure out the amount of cream. How can he measure the cream? Use the benchmark strategy.

There are two \( \frac{1}{2} \) cups in one cup and 2 cups in one pint. Leo needs 2 pints or 4 cups of cream. So, he should measure out eight \( \frac{1}{2} \) cups of cream.

8-6  **Changing Metric Units**  (pp. 405–409)

Complete.

36. 300 mL = \( \underline{\quad} \) L  
37. \( \underline{\quad} \) g = 1 mg  
38. \( \underline{\quad} \) m = 75 km  
39. 5 kg = \( \underline{\quad} \) g  
40. 345 cm = \( \underline{\quad} \) m  
41. \( \underline{\quad} \) m = 23 mm  
42. 5,200 L = \( \underline{\quad} \) kL  
43. 35 m = \( \underline{\quad} \) cm  
44. **PUNCH**  Sabrina mixes 6 liters of punch. How many milliliters is this?

**Example 7**  Complete 9 g = \( \underline{\quad} \) mg.

Since 1 gram = 1,000 milligrams, multiply 9 by 1,000.

\[ 9 \times 1,000 = 9,000 \]

So, 9 g = 9,000 mg.
8-7 Measures of Time (pp. 410–414)

Add or subtract.

45. $5 \text{ h } 20 \text{ min} + 2 \text{ h } 16 \text{ min} = \text{ h } 36 \text{ min}$

46. $7 \text{ h } 45 \text{ min} - 4 \text{ h } 32 \text{ min}$

47. $9 \text{ h } 7 \text{ min} - 8 \text{ h } 7 \text{ min } 8 \text{ s}$

48. $2 \text{ h } 35 \text{ min} + 6 \text{ h } 41 \text{ min}$

49. $7 \text{ h } 20 \text{ min} + 2 \text{ h } 48 \text{ min } 10 \text{ s}$

50. $6 \text{ h } 50 \text{ min } 40 \text{ s} - 3 \text{ h } 35 \text{ min } 20 \text{ s}$

51. **FRENCH** Luanda’s French lesson started at 6:45 P.M. and ended at 7:30 P.M. How long was her lesson?

52. **TRAVEL** Aaron flew from Orlando, Florida, to Philadelphia, Pennsylvania. His plane left Orlando at 9:34 A.M., and the flight took 3 hours 55 minutes. What time did he arrive in Philadelphia?

Example 8 Add.

Add or subtract.

45. $3 \text{ h } 50 \text{ min} + 2 \text{ h } 15 \text{ min} = 5 \text{ h } 65 \text{ min}$

Rename 65 min as 1 h 5 min.

$5 \text{ h } 65 \text{ min} = 6 \text{ h } 5 \text{ min}$

Example 9 Subtract.

Subtract.

51. $5 \text{ h } 10 \text{ min } 53 \text{ s} - 2 \text{ h } 29 \text{ min } 30 \text{ s}$

Subtract the seconds first.

You cannot subtract 29 min from 10 min, so rename $5 \text{ h } 10 \text{ min } 53 \text{ s}$ as $4 \text{ h } 70 \text{ min}$.

So, $4 \text{ h } 70 \text{ min} - 2 \text{ h } 29 \text{ min } 30 \text{ s} = 2 \text{ h } 41 \text{ min}$

8-8 Measures of Temperature (pp. 415–418)

Choose the more reasonable temperature for each.

53. boiling water: 100°F or 212°F

54. inside your bedroom: 45°F or 74°F

55. hot apple cider: 58°C or 28°C

56. **FROZEN DINNERS** Theodore took a frozen dinner out of the freezer. Give a reasonable estimate of the temperature of the frozen dinner in degrees Fahrenheit.

Example 10 Choose the more reasonable temperature for a popsicle: $-5°C$ or $35°C$.

Water freezes at 0°C, so a popsicle would need to be frozen. $35°C$ is too warm for a frozen popsicle.

So, a more reasonable temperature for a popsicle is $-5°C$. 
Complete.

1. 48 in. = ■ ft
2. 2 yd = ■ in.
3. ■ mm = 7 cm
4. ■ fl oz = 3 c
5. 48 c = ■ gal
6. ■ yd = 8 mi
7. 328 mL = ■ L
8. ■ pt = 6 qt
9. 150 g = ■ kg
10. ■ km = 57 m
11. 1,000 mg = ■ g
12. 8 L = ■ mL

13. **ICE CREAM** A baseball team orders 5 gallons of ice cream for its end-of-season party. How many cups of ice cream is this?

14. **TEST PRACTICE** Determine which container of milk is the best buy by finding the price to the nearest cent for one pint of milk.

<table>
<thead>
<tr>
<th>Milk</th>
<th>Amount</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 gal</td>
<td>$2.18</td>
</tr>
<tr>
<td></td>
<td>1 qt</td>
<td>$1.29</td>
</tr>
<tr>
<td></td>
<td>1 pt</td>
<td>$0.75</td>
</tr>
<tr>
<td></td>
<td>1 gal</td>
<td>$2.25</td>
</tr>
</tbody>
</table>

A 1 pt  
B 1 qt  
C 2 gal  
D 1 gal

15. **FOOD** Estimate the metric length of the almond. Then measure to find the actual length.

18. **FISH TANKS** Kelly needs to fill her 10-gallon fish tank. She only has a quart container to measure out the water. Describe how she could fill the fish tank using only the quart container.

Write the metric unit of mass or capacity that you would use to measure each of the following. Then estimate the mass or capacity.

19. five $1 bills
20. a bucket of water

Add or subtract.

21. 19 min 30 s  
   - 12 min 40 s
22. 7 h 20 min  
   + 2 h 48 min 10 s

23. **TEST PRACTICE** The table shows the time Jerry spent doing work in his yard. About how much time does it take for Jerry to do all of these activities?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mowing the lawn</td>
<td>45 minutes</td>
</tr>
<tr>
<td>Raking leaves</td>
<td>18 minutes</td>
</tr>
<tr>
<td>Edging</td>
<td>9 minutes</td>
</tr>
<tr>
<td>Trimming the bushes</td>
<td>15 minutes</td>
</tr>
</tbody>
</table>

F 1.3 hours  
G 1.15 hours  
H 1 hour 30 minutes  
J 1 hour 45 minutes

Choose the more reasonable temperature for each item.

24. Is a glass of apple juice more likely to be −8°C or 18°C?
25. Is the inside of a sauna more likely to be 55°F or 86°F?
Read each question. Then fill in the correct answer on the answer document provided by your teacher or on a sheet of paper.

1. The length of a table is 2 meters. What is the length of the table in centimeters?
   A 2,000 cm       C 20 cm
   B 200 cm         D 2 cm

2. Mrs. Baker has 25 students in her class. If each student needs 4 file cards, which equation can be used to find s, the total number of file cards needed?
   F s = 25 ÷ 4       H s = 25 − 4
   G s = 25 × 4       J s = 25 + 4

3. Edmundo had 1 penny, 1 nickel, 1 dime, and 1 quarter in a bag. He picked 2 coins at random from the bag. Which diagram shows all the possible coin combinations of the 2 coins that Edmundo picked?
   A
   B
   C
   D

4. Bob’s Boot Shop sold 60% of its stock of winter boots before the first snow of the year. What fraction of the stock of winter boots has NOT yet been sold?
   F \( \frac{3}{5} \)       H \( \frac{1}{4} \)
   G \( \frac{2}{5} \)       J \( \frac{1}{40} \)

5. **GRIDDABLE** Mia has a bag containing 2 purple, 5 orange, 7 blue, and 6 red marbles. If she randomly chooses one marble from the bag, what is the probability that the marble will be purple?

6. A bag of apples weighs 2,450 grams. What is the weight of the bag of apples in kilograms?
   A 0.00245 kg      C 2.45 kg
   B 24.5 kg        D 0.245 kg

7. The Music Shop records the number of CDs sold each month. What is the median number of CDs sold each month. What is the median number of CDs sold?

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of CDs Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>50</td>
</tr>
<tr>
<td>February</td>
<td>35</td>
</tr>
<tr>
<td>March</td>
<td>42</td>
</tr>
<tr>
<td>April</td>
<td>85</td>
</tr>
<tr>
<td>May</td>
<td>97</td>
</tr>
<tr>
<td>June</td>
<td>110</td>
</tr>
<tr>
<td>July</td>
<td>97</td>
</tr>
</tbody>
</table>

   F 32   H 97
   G 85   J 110

8. **GRIDDABLE** For lunch today, Kaneesha bought a hamburger for $2.75, a fruit cup for $1.10, and milk for $0.55. What was the total cost of Kaneesha’s meal?
9. The formula \( V = \frac{1}{3}Bh \) can be used to find the volume of a pyramid. Which of the following best represents \( \frac{1}{3} \)?

A 3.3  
B 0.33  
C 3  
D 0.67

10. Daniel went shopping for shoes. He bought one pair of shoes for $32.50, another pair for $29.99, and a third pair for $49.50. Which procedure could be used to find the average price of the shoes?

F Multiply the sum of the prices of the shoes by the total number of shoes purchased.  
G Add the sum of the prices of the shoes by the total number of shoes purchased.  
H Divide the sum of the prices of the shoes and by the total number of shoes purchased.  
J Subtract the sum of the prices of the shoes by the total number of shoes purchased.

11. The cost of renting a car is $50 plus an additional $.10 for each mile driven. Which equation can be used to find \( t \), the cost in dollars of the rental for \( m \) miles?

A \( t = 0.10m + 25 \)  
B \( t = 50 + 0.10 \)  
C \( t = 50(m + 0.10) \)  
D \( t = 50 + 0.10m \)

12. Alex needs to take 250 milliliters of a particular type of medicine. How many liters of medicine is this?

F 2.5 L  
H 0.25 L  
G 25 L  
J 2,500 L

**Question 12** When answering extended response items on standardized tests, make sure you show your work clearly because you may receive points for items that are partially correct.

**Pre-AP**

Record your answers on a sheet of paper. Show your work.

13. Victor tutors younger students at the community center on Saturdays. It takes Victor 20 minutes to get ready and leave the house. The walk to the bus stop is 10 minutes long, and the bus ride to the community center is 40 minutes long. Finally, Victor walks 5 minutes from the bus stop to the community center.

a. If Victor is scheduled to arrive at 3:00 P.M., what is the latest time at which he could start getting ready to leave?

b. Explain the strategy you used to answer part a.

c. Victor has to be home by 7:00 P.M. If it takes him 5 minutes longer to get home, at what time should he leave the community center?

d. How long does Victor spend tutoring on Saturdays?