Name _____ Date _____

2-1 Comparing and Ordering Decimals (pages 44–46)

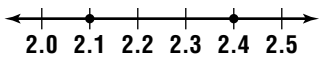
NS1.1

When you use words like *more*, *less*, or *equal to*, you are comparing numbers. You can compare decimals by using a number line or by comparing the digits in each place-value position.

EXAMPLES

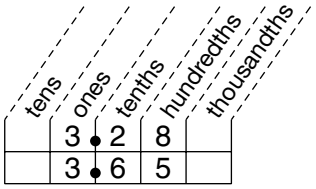
A Compare 2.1 and 2.4.

On a number line, numbers to the right are greater than numbers to the left. So, 2.1 < 2.4.



B Compare 3.28 and 3.65.

Start at the left and compare the digits in each place-value position. In the ones place, the digits are the same. In the tenths place, 2 < 6. So, 3.28 < 3.65.



Try These Together

Replace each ● with , , or to make a true sentence.

1. 3.141 ● 3.414

HINT: Compare digits in each place-value position.

2. 25.9 ● 2.59

HINT: Try placing the decimals on a number line.

PRACTICE

Replace each ● with , , or to make a true sentence.

3. 1.2 ● 1.8

4. 3.4 ● 3.1

5. 0.25 ● 0.38

6. 1.56 ● 1.42

7. 9.95 ● 10.23

8. 5.64 ● 5.75

9. 4.15 ● 4.13

10. 0.61 ● 0.61

11. Which is the greatest: 1.2, 1.8, or 1.5?

12. Order 0.76, 0.64, and 0.35 from least to greatest.

13. Recreation Shawna likes to jog around the lake. There are two different trails for her to choose from. Trail A is 1.56 km long and Trail B is 1.24 km long. Which trail is shorter?

14. **Standardized Test Practice** For a class picture, taller students should stand in the back and shorter students in the front. Ayla is 55.75 inches, Karen is 56.25 inches, Juana is 54.25 inches, and Nikki is 56 inches tall. Order the four girls from shortest to tallest.

A Karen, Nikki, Juana, Ayla

B Juana, Ayla, Karen, Nikki

C Ayla, Juana, Karen, Nikki

D Juana, Ayla, Nikki, Karen

Answers: **1.** < **2.** > **3.** < **4.** > **5.** < **6.** > **7.** < **8.** < **9.** > **10.** = **11.** 1.8 **12.** 0.35, 0.64, 0.76 **13.** Trail B **14.** D

Name _____ Date _____

2-2 Rounding Decimals (pages 47–49)

NS1.1, MR2.5

You can round decimals to any place-value position.

Rounding Decimals	• Underline the place you want to round to. • Look at the digit to the right of the underlined place. • Leave the underlined digit the same if the digit to the right is 0, 1, 2, 3, or 4. • Round up by adding 1 to the underlined digit if the digit to the right is 5, 6, 7, 8, or 9. • Then drop all the digits to the right of the underlined digit.

EXAMPLES

A Round 47.541 to the nearest tenth.

Underline the digit in the tenths place (5). Look at the digit to the right (4). Since 4 is less than 5, leave the underlined digit the same. Then drop all the digits to the right. The answer is 47.5.

B Round 1.0271 to the nearest hundredth.

Underline the digit in the hundredths place (2). Because the next digit to the right is greater than 5, add one to the underlined digit. Then drop all the digits to the right. The answer is 1.03.

Try These Together

1. Round 62.358 to the nearest hundredth.

HINT: Remember that with an 8 you round up.

2. Round 1.0254 to the underlined place-value position.

HINT: With a 2 you leave the underlined digit the same.

PRACTICE

Round each number to the place indicated.

3. 1.54; tenth

4. 15.613; hundredth

5. 0.18; tenth

6. 11.877; hundredth

7. 35.644; hundredth

8. 9.4563; thousandth

Round each number to the underlined place-value position.

9. 6.3̲76

10. 8.26̲4

11. 0.058̲8

12. Maps Charlotte is calculating how many miles her family will drive on a trip from Payneville to Fayette and then on to Princeton. It is 324.5 miles from Payneville to Fayette and 580.64 miles from Fayette to Princeton. Find the distance from Payneville to Princeton to the nearest tenth of a mile.

13. **Standardized Test Practice** In September, Rosa's dog weighed 45.84 pounds. In February, it weighed 56.7 pounds. To the nearest tenth, how much weight did it gain?

A 10.8 pounds **B** 10.9 pounds **C** 11 pounds **D** 11.1 pounds

Answers: **1.** 62.36 **2.** 1.0 **3.** 1.5 **4.** 15.61 **5.** 0.2 **6.** 11.88 **7.** 35.64 **8.** 9.456 **9.** 6.4 **10.** 8.26 **11.** 0.059 **12.** 905.1 miles **13.** B

Name _____ Date _____

2-3 Estimating with Decimals

(pages 50–53)

MR2.6

When you work with decimals, you can use rounding to estimate sums, differences, products, or quotients.

Estimate by Rounding	You can round the decimals you are working with to the same place-value position and then add, subtract, multiply, or divide. When estimating a product or quotient, round to place-value positions that are easy to multiply or divide.
Estimate by Clustering	You can use **clustering** to estimate sums if all of the decimals you are adding seem to be clustered around a common quantity.

EXAMPLES

A Estimate 26.8×3.6.

Round 26.8 to 30 because 30 is an easy factor to multiply. Round 3.6 to 4, which is the nearest whole number.

$30 \times 4 = 120$ The product is about 120.

B Estimate $7.234 + 6.985 + 7.158$.

Use clustering to estimate because all of the decimal addends cluster around 7. Round each addend to 7. There are three numbers. So, the sum is about 7×3, or 21.

Try These Together

1. Estimate $277 \div 6.8$.

HINT: Round the dividend and divisor to numbers that can be easily divided.

2. Estimate $3.2 + 2.7 + 2.9 + 3.3 + 3.1$.

HINT: The addends cluster around what number?

PRACTICE

Estimate by rounding.

3. $5.1\overline{)25.4}$

4. 2.6×3.4

5. $5.8 + 4.5$

6. $9.9 - 8.1$

7. $6.1 + 8.3$

8. $15.34 - 12.86$

9. $3.9\overline{)28.3}$

10. 10.21×3.48

Estimate by clustering.

11. 4.9, 5.3, +5.2

12. 12.6, 13.1, +12.9

13. 0.95, 1.06, +1.11

14. 15.5, 14.8, +15.3

15. Shopping Alena bought a pair of shoes for $19.79 and a shirt for $12.64. Estimate how much money she spent.

16. **Standardized Test Practice** The three chimpanzees in a zoo weigh 78.5, 81.25, and 79.75 pounds. Estimate the sum of the weights of the three chimpanzees.

A 80 pounds **B** 200 pounds **C** 240 pounds **D** 300 pounds

Answers: **1–15.** Sample answers are given. **1.** 40 **2.** 15 **3.** 5 **4.** 9 **5.** 10 or 11 **6.** 2 **7.** 14 **8.** 2 **9.** 7 **10.** 30 or 35 **11.** 15 **12.** 39 **13.** 3 **14.** 45 **15.** $33 **16.** C

2-4

Name _____ Date _____

Multiplying Decimals (pages 56–59)

AF1.2, MR1.2, MR2.4

Multiplying decimals is much like multiplying whole numbers. Use the following rule to find the number of decimal places in the product.

Multiplying Decimals	The number of decimal places in the product of two decimals is the sum of the number of decimal places in the factors.

EXAMPLES

Multiply.

A 2.7×0.5

2.7 ← *one decimal place*
×0.5 ← *one decimal place*
1.35 ← *two decimal places*

B 0.312×4.1

0.312 ← *three decimal places*
× 4.1 ← *one decimal place*
1.2792 ← *four decimal places*

Try These Together

Multiply.

1. 0.26×3.4
HINT: Count the decimal places in the factors.

2. 1.7×0.062
HINT: Count the decimal places in the factors.

PRACTICE

Place the decimal point in each product.

3. $0.2 \times 0.8 = 16$
4. $0.9 \times 0.6 = 54$
5. $2.2 \times 0.5 = 11$
6. $3.6 \times 0.6 = 216$
7. $1.5 \times 0.3 = 45$
8. $2.4 \times 0.4 = 96$
9. $0.6 \times 0.3 = 18$
10. $6.8 \times 0.5 = 34$

Multiply.

11. $\begin{array}{r} 0.8 \\ \times 0.6 \\ \hline \end{array}$
12. $\begin{array}{r} 1.3 \\ \times 0.2 \\ \hline \end{array}$
13. $\begin{array}{r} 4.5 \\ \times 0.3 \\ \hline \end{array}$
14. $\begin{array}{r} 0.12 \\ \times 0.3 \\ \hline \end{array}$

15. 2.5×1.5
16. 0.55×0.02
17. 0.8×1.1
18. 2.3×1.6

19. Transportation High-speed passenger trains between Osaka and Tokyo, Japan, travel at speeds of 217 kilometers per hour. Another high-speed passenger train between Paris, France, and Geneva, Switzerland, travels 1.2 times as fast as the ones in Japan. To the nearest kilometer per hour, how fast does the high-speed train between Paris and Geneva travel?

20. **Standardized Test Practice** Dugan rode in a bicycle ride for charity. He rode 75.5 miles each day for three days. How many miles did he ride total?

A 226.5 miles **B** 22.65 miles **C** 2,260.5 miles **D** 2.265 miles

Answers: **1.** 0.884 **2.** 0.1054 **3.** 0.16 **4.** 0.54 **5.** 1.1 **6.** 2.16 **7.** 0.45 **8.** 0.96 **9.** 0.18 **10.** 3.4 **11.** 0.48 **12.** 0.26 **13.** 1.35 **14.** 0.036 **15.** 3.75 **16.** 0.011 **17.** 0.88 **18.** 3.68 **19.** 260 kilometers per hour **20.** A

Name _____ Date _____

2-5 Powers of Ten (pages 61–63)

You can find the product of a number and a power of ten by using the following patterns.

Notice that the digits of the original decimal and the product are the same. The difference is the position of the decimal point. The exponent on 10 tells you the number of places to move the decimal point to the right.	**Decimal**		**Power of Ten**	**Product**
	12.3	×	10^0 (or 1) =	12.3
	12.3	×	10^1 (or 10) =	123
	12.3	×	10^2 (or 100) =	1,230
	12.3	×	10^3 (or 1,000) =	12,300
You can use a similar pattern when you multiply by a power of 10 that is less than 1. Since you are multiplying by a power of 10 that is less than one, the product is less than the original decimal. The decimal point moves to the left.	**Decimal**		**Power of Ten**	**Product**
	12.3×		0.1 $\left(\text{or } \frac{1}{10^1}\right)$ =	1.23
	12.3	×	0.01 $\left(\text{or } \frac{1}{10^2}\right)$ =	0.123
	12.3	×	0.001 $\left(\text{or } \frac{1}{10^3}\right)$ =	0.0123

EXAMPLES

A Multiply 0.548 and 10^3 mentally.

The power is three, so move the decimal point three places to the right.

$0.548 \times 10^3 = 548$

B Multiply 2,504 and 0.01 mentally.

The power is $\frac{1}{10^2}$, so move the decimal point two places to the left.

$2{,}504 \times 0.01 = 25.04$

Try These Together

Multiply mentally.

1. 3.14×10^5

HINT: Move the decimal point to the right.

2. 0.21×0.001

HINT: Move the decimal point to the left.

PRACTICE

Multiply mentally.

3. 0.2×10

4. 1.856×10^3

5. 1.2×100

6. 0.34×10^2

7. 2.68×0.1

8. 57.8×0.01

9. 658×0.01

10. 25.23×10^2

11. Computers The microprocessors used in computers are incredibly small. The outer surface of the microprocessor is made from a silicon layer that is only 4.0×0.0001 inch thick. Write this number in standard form.

12. **Standardized Test Practice** The moon revolves around Earth at an average speed of 3.7×10^3 kilometers per hour. Write this number in standard form.

A 3,700,000 km/hr **B** 37,000 km/hr **C** 3,700 km/hr **D** 370,000 km/hr

Answers: **1.** 314,000 **2.** 0.00021 **3.** 2 **4.** 1,856 **5.** 120 **6.** 34 **7.** 0.268 **8.** 0.578 **9.** 6.58 **10.** 2,523 **11.** 0.0004 inch **12.** C

Name _____ Date _____

2-6 Dividing Decimals (pages 66–69)

MR2.6

When you divide two decimals, change the divisor to a whole number by moving the decimal point to the right. Then move the decimal point in the dividend the same number of places to the right. Then divide as with whole numbers.

EXAMPLE

Find the quotient 99.84 ÷ 4.8.

First estimate: 100 ÷ 5 = 20

$4.8\overline{)99.84}$ → $48\overline{)998.4}$

$$\begin{array}{r} 20.8 \\ 48\overline{)998.4} \\ -96 \\ \hline 3\,84 \\ -3\,84 \\ \hline 0 \end{array}$$

Make the divisor, 4.8, a whole number by moving the decimal point one place to the right. Then move the decimal point in the dividend one place to the right also. Divide as with whole numbers.

Compared to the estimate, the quotient is reasonable.

Try These Together

Find each quotient.

1. 16.2 ÷ 3.6

HINT: Move the decimal points one place to the right.

2. 56.7 ÷ 0.324

HINT: Move the decimal points in the dividend and divisor the same number of places so that the divisor is a whole number.

PRACTICE

Without finding or changing each quotient, change each problem so that the divisor is a whole number.

3. 1.5 ÷ 0.3 **4.** 10.4 ÷ 5.2 **5.** 5.6 ÷ 0.8 **6.** 1.19 ÷ 0.85

7. 2.08 ÷ 0.65 **8.** 0.81 ÷ 0.9 **9.** 4.2 ÷ 0.75 **10.** 267.3 ÷ 89.1

Divide.

11. 2.75 ÷ 0.05 **12.** 4.86 ÷ 0.6 **13.** 36 ÷ 0.03 **14.** 0.09 ÷ 0.03

15. 0.36 ÷ 0.4 **16.** 0.68 ÷ 0.08 **17.** 25.2 ÷ 0.84 **18.** 0.92 ÷ 0.23

Solve each equation.

19. 0.112 ÷ 0.08 = q **20.** r = 4.25 ÷ 1.7

21. Fitness Shaneece swims the 50-meter freestyle for her swim team. Her best time is 29.51 seconds. To the nearest tenth, find her speed in meters per second.

22. **Standardized Test Practice** A can of juice costs $0.75. If it holds 12 ounces, what is the cost of the juice per ounce? Round to the nearest cent.

A $0.07 **B** $0.05 **C** $0.08 **D** $0.06

Answers: **1.** 4.5 **2.** 175 **3.** 15 ÷ 3 **4.** 104 ÷ 52 **5.** 56 ÷ 8 **6.** 119 ÷ 85 **7.** 208 ÷ 65 **8.** 8.1 ÷ 9 **9.** 420 ÷ 75 **10.** 2,673 ÷ 891 **11.** 55 **12.** 8.1 **13.** 1,200 **14.** 3 **15.** 0.9 **16.** 8.5 **17.** 30 **18.** 4 **19.** 1.4 **20.** 2.5 **21.** 1.7 m/sec **22.** D

Name _____ Date _____

2-7 Decimals and Fractions

(pages 70–73)

NS1.2

Any fraction can be written as a decimal by using division.

Write a Fraction as a Decimal	Use paper and pencil to write $\frac{4}{5}$ as a decimal. $\frac{4}{5}$ means $4 \div 5$. Divide 4 by 5, and the quotient is the decimal you want to find, 0.8.
Repeating Decimals	Decimals like 0.333333 . . . are called **repeating decimals** because the digits repeat. **Bar notation** can be used to indicate that decimals repeat. $0.6666666 \ldots = 0.\overline{6}$, $0.277777 \ldots = 0.2\overline{7}$, $0.737373 \ldots = 0.\overline{73}$ Bar notation is useful because some fractions, when written as decimals, are repeating decimals. For example, $\frac{2}{3} = 0.\overline{6}$.

EXAMPLES

Express the fractions as decimals. Use bar notation for repeating decimals.

A $\frac{3}{5}$

$\frac{3}{5} = 3 \div 5$

$$\begin{array}{r} 0.6 \\ 5\overline{)3.0} \\ -30 \\ \hline 0 \end{array}$$

Divide 3 by 5.

Therefore, $\frac{3}{5} = 0.6$.

B $\frac{3}{11}$

$\frac{3}{11} = 3 \div 11$

$$\begin{array}{r} 0.2727\ldots \\ 11\overline{)3.00} \\ -22 \\ \hline 80 \\ -77 \\ \hline 30 \\ -22 \\ \hline 8 \end{array}$$

Divide 3 by 11. The digits 2 and 7 will repeat since 8 and 3 will continue to alternate as the remainders.

Therefore, $\frac{3}{11} = 0.\overline{27}$.

Try These Together

Express each fraction or mixed number as a decimal. If the decimal is a repeating decimal, use bar notation.

1. $\frac{1}{6}$

HINT: Divide 1 by 6.

2. $4\frac{7}{8}$

HINT: The whole number is written to the left of the decimal point.

PRACTICE

Express each fraction or mixed number as a decimal. If the decimal is a repeating decimal, use bar notation.

3. $\frac{3}{6}$ **4.** $\frac{2}{9}$ **5.** $\frac{12}{25}$ **6.** $5\frac{2}{3}$ **7.** $8\frac{4}{9}$ **8.** $7\frac{1}{4}$

9. **Standardized Test Practice** Suppose that $\frac{1}{8}$ of D'andre's class scored As on their science exam. Express this fraction as a decimal.

A 0.215 **B** 0.125 **C** 0.252 **D** 0.115

Answers: **1.** $0.1\overline{6}$ **2.** 4.875 **3.** 0.5 **4.** $0.\overline{2}$ **5.** 0.48 **6.** $5.\overline{6}$ **7.** $8.\overline{4}$ **8.** 7.25 **9.** B

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Name _____ Date _____

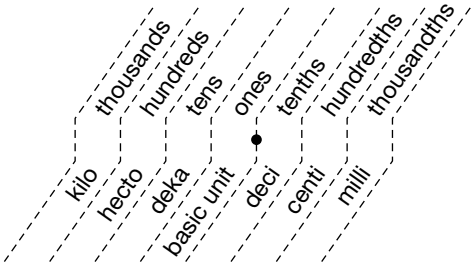
The Metric System (pages 74–76)

AF2.1

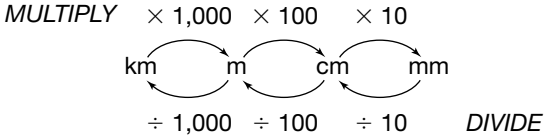
The following table describes the basic units of measurement in the **metric system**.

Length	The metric unit of length is the **meter (m)**. A meter is about the distance from the floor to a doorknob.
Mass	The metric unit of mass is the **gram (g)**. Mass is the amount of matter that an object contains. A paper clip has a mass of about one gram.
Capacity	The **liter (L)** is the basic unit of capacity in the metric system. Capacity is the amount of dry or liquid material an object can hold. Soft drinks often come in 2-liter plastic containers.

The basic metric units can be changed into larger or smaller units by dividing or multiplying by powers of 10. For example, 1 kilometer is 1×10^3 m. The chart below shows the relationship between the metric units and the powers of 10.



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



EXAMPLES

A 4.6 L = ? mL

To change from liters to milliliters, multiply by 1,000 since 1 L = 1,000 mL.
4.6 × 1,000 = 4,600
4.6 L = 4,600 mL

B 122 cm = ? m

To change from centimeters to meters, divide by 100 since 1 m = 100 cm.
122 ÷ 100 = 1.22
122 cm = 1.22 m

PRACTICE

Complete.

1. 5 m = ? cm **2.** 96 cm = ? mm **3.** 150 mm = ? cm

4. 2.5 kL = ? L **5.** 1,200 g = ? kg **6.** 1,565 mL = ? L

7. **Standardized Test Practice** There are 8,000 milligrams of protein in one serving of peanut butter. How many grams of protein are there in 5 servings of peanut butter?

A 0.4 g **B** 40 g **C** 4 g **D** 400 g

Answers: **1.** 500 **2.** 960 **3.** 15 **4.** 2,500 **5.** 1.2 **6.** 1,565 **7.** B

Name _____ Date _____

2-9 Scientific Notation (pages 77–79)

You can write numbers such as 4.5 billion in **scientific notation** by using a power of ten.

Scientific Notation	Numbers expressed in scientific notation are written as the product of a number that is at least one but less than ten and a power of ten. The power of ten is written with an exponent. To write a number in scientific notation, move the decimal point to the right of the first nonzero digit, and multiply this number by a power of ten. To find the power of ten, count the number of places you moved the decimal point. The decimal part of a number written in scientific notation is often rounded to the hundredths place.

EXAMPLES

A Write 45,692 in scientific notation.

4.5692 — *Move the decimal point 4 places to get a number between 1 and 10.*

4.5692×10^4 — *You moved the decimal point 4 places so the power of ten is 4.*

4.57×10^4 — *Round to the nearest hundredth.*

B Write 4.5 billion in scientific notation.

4.5 billion = $4.5 \times 1{,}000{,}000{,}000$

$= 4.5 \times 10^9$ $10^9 = 1{,}000{,}000{,}000$

4.5 billion is 4.5×10^9.

Try These Together

1. Write 734 in scientific notation.

HINT: Move the decimal point to the right of the 7. Count the number of places you moved the decimal point.

2. Write 93 million in scientific notation.

HINT: Write 93 million in standard form. Then move the decimal point.

PRACTICE

Write each number in scientific notation.

3. 650 **4.** 5,000 **5.** 8,500

6. 1,500,000 **7.** 6,070 **8.** 640,000

9. 3,300 **10.** 28,000,000 **11.** 300

Replace each ● with $<$, $>$, or $=$ to make a true sentence.

12. 6,000 ● 6×10^2 **13.** 1,200 ● 1.2×10^4 **14.** 30,500 ● 3.05×10^2

15. Money Matters The national debt of a country is the amount of money it has borrowed from its people or other countries. In 1919, the national debt of the United States was $25.5 billion dollars. Write $25.5 billion in scientific notation.

16. **Standardized Test Practice** Comets are clumps of dust and frozen gases floating in the solar system. Recently, pieces of a comet slammed into Jupiter's atmosphere at 210,000 km/h. Write 210,000 in scientific notation.

A 2.1×10^4 **B** 2.1×10^2 **C** 2.1×10^3 **D** 2.1×10^5

Answers: **1.** 7.34×10^2 **2.** 9.3×10^7 **3.** 6.5×10^2 **4.** 5.0×10^3 **5.** 8.5×10^3 **6.** 1.5×10^6 **7.** 6.07×10^3 **8.** 6.4×10^5 **9.** 3.3×10^3 **10.** 2.8×10^7 **11.** 3.0×10^2 **12.** $>$ **13.** $<$ **14.** $>$ **15.** $\$2.55 \times 10^{10}$ **16.** D

Name _____ Date _____

2 Chapter 2 Review

NS1.1, NS1.2

Unit Price Game

Follow the example below to pick the items that have the lower unit price. You and your parent can take turns, as if you were contestants on a TV game show.

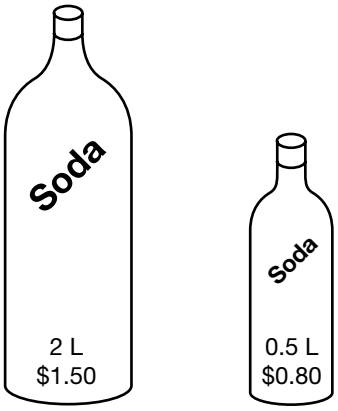
EXAMPLE

Which bottle of soda has a lower unit price?
What you need to find is the price per liter of soda.
Divide the cost by the number of liters of soda in the bottle.

Unit price of large bottle:
$1.50 ÷ 2 = $0.75 per liter

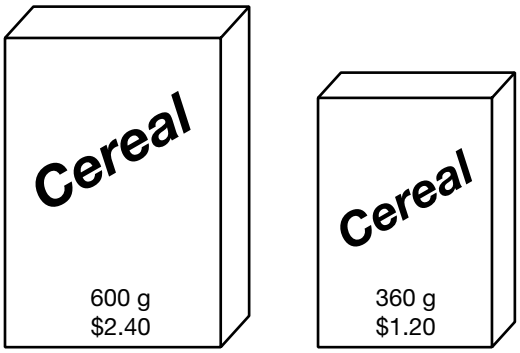
Unit price of small bottle:
$0.80 ÷ 0.5 = $1.60 per liter

The large bottle has a lower unit price.



Circle the item in each pair with the lower unit price.

1.



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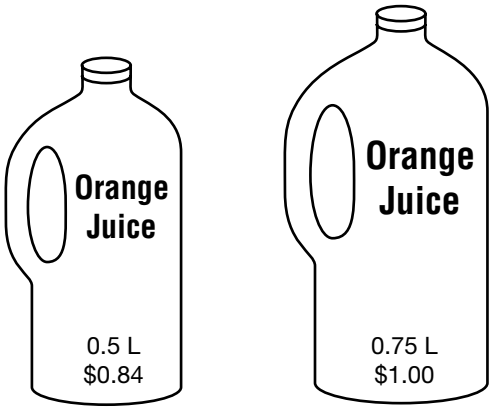

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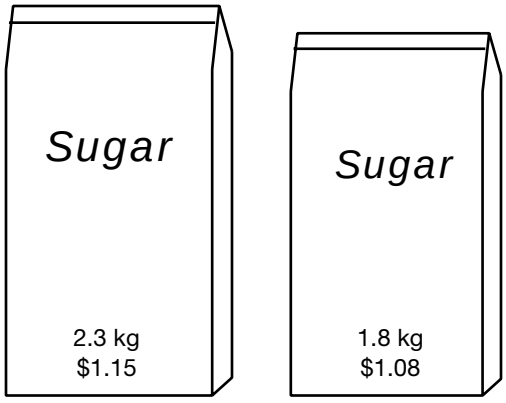

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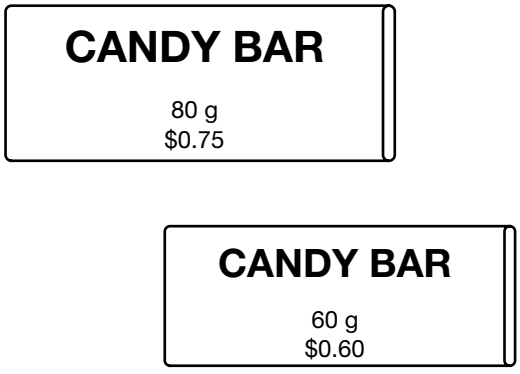

Answers are located on page 112.