



CHAPTER
1

Operations With Whole Numbers and Decimals

Why Learn About Operations With Whole Numbers and Decimals?

We add, subtract, multiply, and divide whole numbers and decimals to solve problems in everyday life.

You can add whole numbers and decimals to find how much money you spend on lunches and snacks in a week. If you multiply the weekly amount by 4, you will have an estimate of what you would spend in a month.

Look at the beautiful, starry sky. There are many billions of stars in the universe. Do you know how many millions are in one billion?





Reading Mathematics

Reviewing Vocabulary

Understanding math language helps you become a successful problem solver. Here are some math vocabulary words you should know.

- | | |
|--------------------------|--|
| base (of a power) | the number that is used as a factor when evaluating powers |
| exponent | the number of times the base is used as a factor |
| power of 10 | a number that can be written as a product of tens |
| period | a group of three digits in a number set off by commas, such as thousands |

2^9 ← exponent
↑
base

Reading Words and Symbols

When you read mathematics, sometimes you read only words, sometimes you read words and symbols, and sometimes you read only symbols.

The location of a digit affects how you read it.

- ▶ The number 9,876,292 is read “nine million, eight hundred seventy-six thousand, two hundred ninety-two.”
- ▶ The number 9^9 is read “nine to the ninth power.”

9 = nine
90 = ninety
900 = nine hundred
9,000 = nine thousand

Try These

1. Read each pair of numbers. Make a check if the value of 8 is the same in each pair.

- a. 820 8,439 _____ b. 587 24,681 _____ c. 228 13.89 _____

2. Identify the number of periods in each of the following numbers.

- a. 487,097 _____ b. 635,970,274,167 _____
c. 284,592,746 _____

3. Which of the following numbers or expressions contain exponents?
Write the value of each number with an exponent.

- a. 58% _____ b. 2.5×10^3 _____ c. 10^8 _____ d. $378 + 23 + 9$ _____

4. Circle *true* or *false* for each statement.

- a. In the number 10^{23} , 10 is the exponent. *true* *false*
b. The expression 4.6×10^3 is equivalent to $4.6 \times 10 \times 10 \times 10$. *true* *false*
c. In the expression 128×10^8 , 10 is the base. *true* *false*

Upcoming Vocabulary



Write About It Here are some other vocabulary words you will use in this chapter. Watch for these words. Write about them in your journal.

ten thousandth
hundred thousandth
millionth



Place Value

You will learn how to read, write, and understand whole numbers and decimals.

New Vocabulary
ten thousandth
hundred thousandth
millionth

Learn About It

You can use the digits 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0 and a decimal point to write any number. The value of each digit in a number depends on its place in the number.

On a visit to a science museum, Eli learned that Pluto has an average distance from the Sun of about 5,913,603,800 km. Twenty times the circumference of Earth is only 0.000136 of the distance from Pluto to the Sun.



Different Ways to Read and Write Numbers

BILLIONS			MILLIONS			THOUSANDS			ONES			DECIMALS						
hundred billions	ten billions	billions	hundred millions	ten millions	millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones	tenths	hundredths	thousandths	ten thousandths	hundred thousandths	millionths	
		5	9	1	3	6	0	3	8	0	0	.	0	0	0	1	3	6

Whole Numbers

Standard form: 5,913,603,800

Word form: five billion, nine hundred thirteen million, six hundred three thousand, eight hundred

Short word form: 5 billion, 913 million, 603 thousand, 800

Expanded form: $5,000,000,000 + 900,000,000 + 10,000,000 + 3,000,000 + 600,000 + 3,000 + 800$

Decimals

Standard form: 0.000136

Word form: one hundred thirty-six millionths

Short word form: 136 millionths

Expanded form: $0.0001 + 0.00003 + 0.000006$

Another Example Hundred Billions

Standard form: 469,372,580,000

Word form: four hundred sixty-nine billion, three hundred seventy-two million, five hundred eighty thousand

Short word form: 469 billion, 372 million, 580 thousand

Expanded form: $400,000,000,000 + 60,000,000,000 + 9,000,000,000 + 300,000,000 + 70,000,000 + 2,000,000 + 500,000 + 80,000$

Think About It

- ▶ How do you know how many zeros to use when you write one hundred billion in standard form?
- ▶ How is zero used as a placeholder to tell the difference between the numbers 1.607 and 1.67?

Guided Practice

Write each number in short word form.

- 30,528,400 _____
- 2.0516 _____
- 3,000.65 _____

Ask Yourself

- In what place is each digit?

Write the value of each underlined digit.

- 78,870,043 _____
- 46.50417 _____
- 456,526,000,040 _____
- 7.00008 _____

Independent Practice

Write each number in word form and in expanded form.

- 1,462 _____

- 161,062,850 _____

Write each number in standard form.

- $200,000,000,000 + 10,000,000,000 + 50,000,000 + 40,000 + 3,000 + 90$ _____
- ninety-five and six hundred eighteen ten thousandths _____

Problem Solving • Reasoning

Use Data Use the table for Problems 18–20.

- Look at the average distance of the planet Mercury from the sun. Write the value of the digit 9.

- Write Mercury's length of day and length of year in short word form.

- Analyze** There are 1,000 meters in 1 kilometer. If you express the diameter of Mercury in meters, what will be the value of the first digit? _____



Mercury Data

Average distance from the sun	57,894,376 km
Planet diameter	4,878 km
Length of Day	58.6461 Earth days
Length of Year	87.9694 Earth days

Compare and Order Numbers

You will learn how to compare and order numbers by using a number line or by comparing digits.

Learn About It

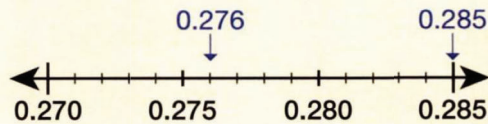
While studying diet and nutrition, Miriam learns that milk is an important source of calcium. Which contains more calcium, whole milk or nonfat milk?

Compare **0.276** and **0.285**.



Different Ways to Compare Decimals

You can use a number line.



Since 0.285 is to the right of 0.276 on the number line, $0.285 > 0.276$.

You can compare digits.

Align the decimal points. Compare digits from left to right until they are different.

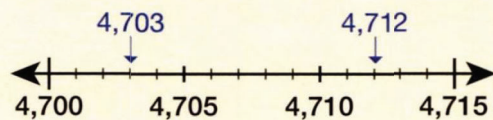
$$\begin{array}{r} 0.276 \\ 0.285 \end{array}$$

$8 > 7$, so the decimal $0.285 > 0.276$.

Solution: Since $0.285 > 0.276$, nonfat milk contains more calcium.

Different Ways To Compare Whole Numbers

You can use a number line.



Since 4,712 is to the right of 4,703 on the number line, $4,712 > 4,703$.

You can compare digits.

Align the decimal points. Compare digits from left to right until they are different.

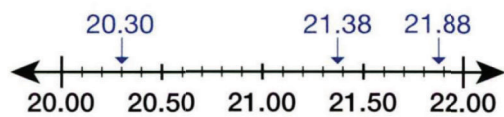
$$\begin{array}{r} 4,703 \\ 4,712 \end{array}$$

$1 > 0$, so $4,712 > 4,703$.

Another Example

Order 21.38, 20.30, and 21.88 from least to greatest.

Use a Number Line



$20.30 < 21.38 < 21.88$

Compare Digits

First Difference →

$$\begin{array}{r} 21.38 \\ 20.30 \\ 21.88 \end{array}$$

← Second Difference

Think About It

- ▶ When comparing 0.338 and 0.388, why can you start by comparing hundredths?
- ▶ Why is it important to align the decimal points when comparing decimals?

Guided Practice

Compare. Write $>$, $<$, or $=$ for each .

1. 1,463 1,436 2. 2,164 2.164 3. 0.351 0.3510

Order from greatest to least. Use a number line.

4. 1.53 15.3 1.3 5. 258 825 285 852
6. 0.404 0.440 0.044 0.40

Ask Yourself

- Did I align the decimal points correctly?
- Where do I start comparing digits?

Independent Practice

Compare. Write $>$, $<$, or $=$ for each .

7. 8.7 8.70 8. 0.55 0.65 9. 10.1 1.01 10. 216.7 217.6
11. 43.75 47.35 12. 99.9 9.99 13. 3.203 3.023 14. 0.003 0.0030

Order from least to greatest. Use a number line.

15. 5.3 3.6 6.4 16. 97.5 9.71 9.07 90.7
17. 0.0025 0.002 0.027 0.207

Problem Solving • Reasoning

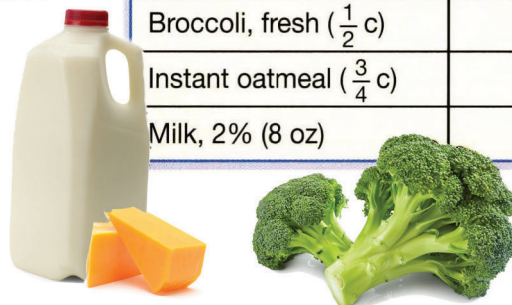
Use Data Use the table for Problems 20–22.

18. **Compare** A class compared the sodium content in different kinds of food. Look at the table on the right. Which has less sodium per serving, roast beef or broccoli?

Sodium Content	
Food	Sodium Per Serving
Cheddar cheese ($\frac{1}{2}$ c)	0.350 g
Roast beef (3 oz)	0.060 g
Broccoli, fresh ($\frac{1}{2}$ c)	0.010 g
Instant oatmeal ($\frac{3}{4}$ c)	0.255 g
Milk, 2% (8 oz)	0.120 g

19. Order the foods in the table from greatest to least amount of sodium per serving.

20. **Estimate** Which kind of food has about twice the sodium content per serving as milk has?



Round Numbers

U.S. dollar



You will learn how to round whole numbers and decimals by using place value.

Learn About It

Look at the coins on the right. In September 2000, one Canadian dollar was worth \$0.673491 in U.S. currency, and one Mexican peso was worth \$0.106769 in U.S. currency. How can these numbers be rounded?



Canadian dollar



Mexican peso

Rounding Rules

- Find the place to which you will round.
- If the digit to its right is 5 or greater, increase the rounding-place digit by one.
- If the digit to its right is less than 5, do not change the rounding-place digit.
- For a whole number, change all digits to the right of the rounded digit to zero.
- For a decimal, drop the digits to the right of the rounded digit.

Round 0.673491 to the nearest hundredth.

Step 1 Find the hundredths place.

0.673491 The hundredths digit is 7.
 ↑
 hundredths

Step 2 Look at the digit to its right. This digit is in the thousandth place. Round.

0.673491 **rounds to** 0.67
 ↑
 3 < 5, so the 7 does not change.

Solution: The number 0.673491 rounds to 0.67.

Round 0.106769 to the nearest ten thousandth.

Step 1 Find the ten-thousandths place.

0.106769 The ten-thousandths digit is 7.
 ↑
 ten-thousandths

Step 2 Look at the digit to its right. This digit is in the hundred-thousandths place. Round.

0.106769 **rounds to** 0.1068
 ↑
 6 > 5, so increase 7 to 8.

Solution: The number 0.106769 rounds to 0.1068.

Another Example

Whole Numbers

Round 1,328,940 to the nearest ten thousand.

1,328,940 8 > 5, so increase 2 to 3.

The number 1,328,940 rounds to 1,330,000.

Think About It

- ▶ Which place do you look at when deciding how to round a number to the nearest whole number? Why?
- ▶ If you round to a place in which the digit is zero, what should you do?

Guided Practice

Round each number to the underlined place.

- 2,564.03 _____
- 0.1282 _____
- 1.95 _____
- 9.6875 _____
- 100,617.4 _____
- 57,497 _____
- 236 _____
- 52,699 _____

Ask Yourself

- What digit is to the right of the underlined digit?
- Have I used the rounding rules correctly?

Independent Practice

Round each number to the underlined place.

- 0.236 _____
- 0.45266 _____
- 333.82 _____
- 199,756 _____
- 743,268 _____
- 916 _____
- 1,528 _____
- 457,962 _____
- 836,279 _____
- 348,975 _____
- 82,569,357 _____
- 71,896,256 _____

Problem Solving • Reasoning

Use Data Use the table for Problems 29–30.

21. Round each of the amounts in the table to the nearest hundredth.

22. Suppose you exchanged U.S. dollars for British pounds. How many British pounds would you get for \$1,000 in U.S. dollars?

23. **Estimate** While on vacation in Europe, Sarah buys a T-shirt that costs 15.85 euros. Sarah calculates that the T-shirt costs \$13.5993 in U.S. dollars. To the nearest whole dollar, what is the cost of the T-shirt in U.S. dollars?

24. **Write About It** When Yosef Chaim was in Mexico, one peso was worth about \$0.1068 in U.S. dollars. Yosef Chaim estimated that one peso was worth about one dime. Is Yosef Chaim's estimate correct?



Currency Equivalents to U.S. \$1.00

Currency	Value
Canadian dollar	1.4838
British pound	0.7144
Swedish krona	9.7780
Japanese yen	107.2400
Taiwanese dollar	31.0700
Mexican peso	9.3620
European euro	1.1655



Left: Swedish krona;
Center: Japanese yen;
Right: British pound

Place Value and Powers of Ten

You will learn how to relate powers of ten to place value.

Review Vocabulary
product
power of 10
base
factor
exponent

Learn About It

The **product** found by multiplying the number 10 by itself one or more times is a **power of 10**. You use exponents to write very large and very small numbers as powers of 10. Use 10 as the **base** and the number of times that 10 is a **factor** as the **exponent**.

exponent ▼

10⁴

◀ base

To read 10^4 , say “ten to the fourth power.”

$$10^4 = 10 \times 10 \times 10 \times 10 = 10,000$$

exponent ▼

10⁻⁴

◀ base

To read 10^{-4} , say “ten to the negative fourth power.”

$$10^{-4} = \frac{1}{10 \times 10 \times 10 \times 10} = \frac{1}{10,000} = 0.0001$$

Study the table below.

Powers of 10			
Power of 10	Standard Form	Fractional Form	Place Value
10^4	10,000	$\frac{10,000}{1}$	Ten thousands
10^3	1,000	$\frac{1,000}{1}$	Thousands
10^2	100	$\frac{100}{1}$	Hundreds
10^1	10	$\frac{10}{1}$	Tens
10^0	1	$\frac{1}{1}$	Ones
10^{-1}	0.1	$\frac{1}{10}$	Tenths
10^{-2}	0.01	$\frac{1}{100}$	Hundredths
10^{-3}	0.001	$\frac{1}{1,000}$	Thousandths
10^{-4}	0.0001	$\frac{1}{10,000}$	Ten thousandths

Look at the exponents.

The exponents are positive for numbers greater than 1 and negative for numbers less than 1. The exponent for 1 is zero.

Look at the pattern of zeros.

For numbers greater than 1, the exponent tells the number of zeros in the numerator. For numbers less than 1, the exponent tells the number of zeros in the denominator.

You can write whole numbers and decimals in expanded form, using powers of 10.

$$3,654 = (3 \times 10^3) + (6 \times 10^2) + (5 \times 10^1) + (4 \times 10^0)$$

$$0.25 = (2 \times 10^{-1}) + (5 \times 10^{-2})$$

Think About It

- If the exponent is $-n$, how many places will follow the decimal point?

Guided Practice

Write each number in expanded form, using powers of 10.

- 2,000,000 _____
- 125,317 _____

Write each number in standard form.

- $(5 \times 10^5) + (7 \times 10^4) + (2 \times 10^3) + (3 \times 10^2) + (9 \times 10^0)$ _____
- $(5 \times 10^{-1}) + (8 \times 10^{-2}) + (3 \times 10^{-4})$ _____

Ask Yourself

- Should I use a positive exponent or a negative exponent?
- What place value do I start with?

Independent Practice

Write each number in expanded form, using powers of ten.

- 3,000 _____
- 3.29 _____
- 26,000,000 _____
- 79 _____
- 3,250,000,000 _____
- 0.0051 _____

Write each number in standard form.

- $(3 \times 10^4) + (4 \times 10^0)$ _____
- $(6 \times 10^{-1}) + (7 \times 10^{-2})$ _____
- $(8 \times 10^0) + (4 \times 10^{-1})$ _____
- $(2 \times 10^4) + (3 \times 10^3) + (5 \times 10^1)$ _____
- $(4 \times 10^{-1}) + (9 \times 10^{-2}) + (5 \times 10^{-3})$ _____

Problem Solving • Reasoning

- A company puts 10 rubber bands in each package, 10 packages in each bundle, and 10 bundles in each box. If one crate holds 10 boxes, how many rubber bands are in each crate?

- An art teacher buys map pencils for seven fifth-grade classes and three sixth-grade classes. Each class needs 8 boxes of pencils. If there are 2 pencils in a box, how many pencils in all does the teacher buy?

- Analyze** To earn pocket money, Avi works at his father's hardware store. Each Sunday, he opens 10 large crates of different-sized nails. Each crate contains 10 trays, each tray contains 10 boxes, and each box contains 100 nails. What part of one crate does one nail represent? Express your answer as a power of 10.

Using Vocabulary

Circle *true* or *false*.

- All numbers can be expressed by using only powers of ten.
true false
- Any whole number can be used as an exponent.
true false
- The base of a power represents the number of times an exponent is used as a factor.
true false

Add and Subtract Whole Numbers and Decimals

You will learn how to add and subtract whole numbers and decimals.

Learn About It

Rivky is presenting a report on Mount Everest, the highest mountain in the world. Rochel is presenting a report on Mount McKinley, the highest mountain in the United States. How much taller is Mount Everest than Mount McKinley?



Subtract. $29,035 - 20,320 = n$

Find $29,035 - 20,320$.

Step 1 Align the digits by place value.

$$\begin{array}{r} 29,035 \\ - 20,320 \\ \hline \end{array}$$

Step 2 Subtract. Regroup if necessary.

$$\begin{array}{r} 8 10 \\ 29,035 \\ - 20,320 \\ \hline 8,715 \end{array}$$

Solution: Mount Everest is 8,715 feet taller than Mount McKinley.

Estimate to see if your answer is reasonable.

$$\begin{array}{l} 29,035 \text{ rounds to } 29,000 \\ 20,320 \text{ rounds to } 20,000 \\ 29,000 - 20,000 = 9,000 \end{array}$$

Since 8,715 is close to 9,000, the answer is reasonable.

Other Examples

A. Add Decimals

$$0.3517 + 0.483 + 0.1924$$

$$\begin{array}{r} 1 2 1 \\ 0.3517 \\ 0.4830 \leftarrow \text{Use zero as a placeholder.} \\ + 0.1924 \\ \hline 1.0271 \end{array}$$

Align the decimal points.

B. Subtract Decimals

$$2,300.61 - 584.1069$$

$$\begin{array}{r} 1 12 9 10 0 9 10 \\ 2,300.6100 \\ - 584.1069 \\ \hline 1,716.5031 \end{array}$$

Think About It

► Why is it important to align the decimal points when adding and subtracting?

Guided Practice

Find each sum or difference.

1. $1,452 + 7,639$ _____ 2. $545.29 - 82.5$ _____
3. $13.25 - 8.647$ _____ 4. $35.26 - 3.6$ _____
5. $85.36 + 14.2 + 5$ _____ 6. $4,163 - 573.5$ _____

Ask Yourself

- Did I align the digits by place value?

Independent Practice

Find each sum or difference. Then write your estimate and see if your answer seems reasonable.

7. $53.86 + 7.47$ _____ 8. $941.8 - 735$ _____
9. $7,852.45 + 953.6$ _____ 10. $0.593 + 0.284$ _____
11. $8,795.35 - 800$ _____ 12. $5.369 - 2.256$ _____
13. $3,806 - 3,042$ _____ 14. $14.2 + 0.36 + 1.5$ _____

Problem Solving • Reasoning

Solve. Choose a method.

Computation Methods

• Mental Math

• Estimation

• Paper and Pencil

• Calculator

15. **Analyze** Yosemite Falls is divided into three levels. The falls' total height is 2,425 ft tall. The upper level is 1,430 ft tall, and the lower level is 320 ft tall. How tall is the middle level?

16. Henny is looking at a map of the Nile River. On the map scale, 1 inch represents 250 miles. If the length of the river on the map is 16.7 inches, about how long is the actual river?

17. **Predict** In the United Kingdom, about 81.1% of the population is English, 9.5% is Scottish, 2.4% is Irish, and 1.9% is Welsh. If the total population is 100%, what percent does not belong to any of these groups?

18. Bracha reports these sizes for deserts: Sahara, 3,320,000 mi²; Gobi, 500,000 mi²; Chihuahuan, 175,000 mi²; and Sonoran, 120,000 mi². Compare the Sahara's size to the combined size of the other three deserts.

19. The average depth of the Atlantic Ocean is 3,926 m. Its greatest depth is 9,219 m. What is the difference between the average depth and the greatest depth?

20. **Compare** The area of Lake Erie is 9,930 mi². The area of Lake Superior is 31,820 mi². About how many times as large as Lake Erie is Lake Superior?

Problem-Solving Skill: Estimated or Exact Answers

You will learn how to determine whether a problem needs an exact solution or if an estimate is enough.

When you solve a problem, you can sometimes use an estimate. An estimate is often easy to do. At other times you need an exact answer. An exact answer gives you more precise information.

Look at the situations below.

Mrs. Mann is decorating a picture frame with buttons. The buttons cost \$1.85 each. If Mrs. Mann has \$19.00, does she have enough money to buy 9 buttons?

Since you only need to decide if \$19.00 is equal to or greater than $\$1.85 \times 9$, an estimate is all that is needed.

Round \$1.85 to \$2

Multiply $\$2 \times 9 = \18 .

The total cost is less than \$19.00, so Mrs. Mann has enough money to buy 9 buttons.

Reena is making a necklace for her friend Chaviva. She buys beads that cost \$3.29 a package. If she has \$10.00, how much money will Reena have left after buying 3 packages of beads?

Because the problem asks for the amount of money left over, an exact answer is needed.

Find the cost of the beads. $\$3.29 \times 3 = \9.87

Find the amount of money left. $\$10.00 - \$9.87 = \$0.13$

Reena will have \$0.13 left after buying 3 packages of beads.



Look Back When is it better to use an estimate?
When is it better to use an exact amount?



Guided Practice

Solve. Answer by estimating or calculating.

- Tzipora wants to buy two red candles and two purple candles. The red candles cost \$5.60 each, and the purple candles cost \$6.19 each. If Tzipora has \$24.50, does she have enough money to buy all four candles?
- Chavi is making a bracelet for her sister. Beads come in single-color packets only. If each packet costs \$1.15, can Chavi buy at least eight different colors of beads with his \$10.00? How much will eight packets of beads cost?

Think:

Does the problem require an exact answer?

Think:

Do both questions require that you know the exact cost?

Choose a Strategy

Solve. Use these or other strategies.

Problem-Solving Strategies

• Draw a Diagram

• Write an Equation

• Guess and Check

• Find a Pattern

- Shana is weaving a striped rug. She starts with a pink stripe, then weaves a blue stripe, a green stripe, a pink stripe, a blue stripe, a green stripe, and so on. If Shana continues her pattern, what will be the color of the twentieth stripe?
- Chaya Liba uses seven colors of yarn for a project. She uses 0.75 yard each of three colors, 1.1 yards of one color, and 1.5 yards each of three other colors. How many yards of yarn in all does she use?
- Devorah buys 6 large seashells. Each seashell costs \$2.35. If Devorah gives the cashier \$20.00, how much change should she receive?
- Chaviva buys a sunflower for each of her 8 friends. The flowers cost \$1.98 each. About how much money does Chaviva need to buy the flowers?
- Chava is making pillowcases for her parents. She has saved \$14.50 to buy fabric. The fabric she wants to buy costs \$3.95 per yard. How many whole yards can Chava buy?
- Shia is making a collage of geometric shapes. He has 4 more triangles than circles and twice as many squares as triangles. If Shia has 36 shapes in all, how many of each kind does he have?



Check Your Understanding of Lessons 1–6

Write each number in standard form.

- 242 million, 65 thousand, 9 _____
- two hundred forty-three ten thousandths _____

Order from least to greatest.

3. 250,413.7 250.413 25,062 250.96

Round each number to the underlined place.

4. 4.587 _____ 5. 137.556 _____

Write each number in expanded form, using powers of 10.

6. 50,000 _____ 7. 4.0021 _____

Find each sum or difference.

8. $1,070.26 - 338.5$ _____ 9. $29,420.8 + 8,425.31$ _____

Solve.

10. Pinny wants to use four colors to paint a chair. Two of the colors cost \$2.65 a can. The other two cost \$3.22 a can. If Pinny has \$9.62, can he buy all the paint? Explain.

How did you do?

If you had difficulty with any items in the Quick Check, you can use the following pages for review and extra practice.

ITEMS	REVIEW THESE PAGES	DO THESE EXTRA PRACTICE ITEMS
1–2	pages 4–5	Set A, page 46
3	pages 6–7	Set B, page 46
4–5	pages 8–9	Set C, page 46
6–7	pages 10–11	Set D, page 46
8–9	pages 12–13	Set E, page 47
10	pages 14–15	1–4, page 49

Test Prep • Cumulative Review

Maintaining the Standards

Circle the correct answer. If a correct answer is not here, choose NH.

- 1** Which number represents $(5 \times 10^3) + (4 \times 10^2)$?
- A** 54,000
B 5,400
C 0.0054
D 0.00054
-
- 2** Mr. Bree spent \$84.50 on groceries this week and \$102.75 last week. How much did he spend in all on groceries?
- F** \$18.25
G \$102.75
H \$187.25
J NH
-
- 3** When Simi's pay was calculated, the amount was \$18.916. What is this amount rounded to the nearest cent?
- A** \$18 **C** \$18.92
B \$18.91 **D** \$19
-
- 4** What is 345,996,111 rounded to the nearest hundred million?
- F** 400,000,000
G 500,000,000
H 600,000,000
J NH
-
- 5** What is the place value of the underlined digit?
- 45,899,331.003
- A** thousandth
B ten thousandth
C ten thousand
D ten million
-
- 6** For the first play, 1,006 tickets were sold. For the second play, only 678 tickets were sold. How many more tickets were sold for the first play?
- F** 328 tickets
G 678 tickets
H 1,006 tickets
J 1,684 tickets
-
- 7** Which set of numbers is correctly ordered from least to greatest?
- A** 0.013, 31.03, 3.103, 0.313
B 0.013, 31.03, 3.103, 0.313
C 0.013, 0.313, 3.103, 31.03
D 31.03, 3.103, 0.313, 0.013
-
- 8** What is the combined population of Abilene and Austin?

City Populations 1998	
City	Population
Abilene	108,257
Plano	219,486
Austin	552,434
El Paso	615,032

Multiply Whole Numbers

You will learn how to multiply whole numbers.

Learn About It

Malky is training for a jump rope competition. She starts by jumping rope a little each day. In one week, she jumps for a total of 42 minutes. If she jumps at a rate of 96 jumps per minute, what is the total number of jumps she makes during the week?



Multiply. $42 \times 96 = n$

Find 42×96 .

Step 1 Multiply by the ones digit. Regroup if necessary.

$$\begin{array}{r} 1 \\ 42 \\ \times 96 \\ \hline 252 \end{array} \leftarrow 42 \times 6$$

Step 2 Multiply by the tens digit. Regroup if necessary.

$$\begin{array}{r} 1 \\ 42 \\ \times 96 \\ \hline 252 \\ 3,780 \end{array} \leftarrow 42 \times 90$$

Step 3 Add the partial products.

$$\begin{array}{r} 42 \\ \times 96 \\ \hline 252 \\ + 3,780 \\ \hline 4,032 \end{array}$$

Estimate to check your work.

$$42 \text{ rounds to } 40$$

$$96 \text{ rounds to } 100$$

$$40 \times 100 = 4,000$$

4,032 is close to 4,000, so the answer is reasonable.

Solution: Malky jumps 4,032 times during the week.

Other Examples

A. Multiply by a Three-Digit Number

$$\begin{array}{r} 831 \\ \times 749 \\ \hline 7,479 \leftarrow 831 \times 9 \\ 33,240 \leftarrow 831 \times 40 \\ + 581,700 \leftarrow 831 \times 700 \\ \hline 622,419 \end{array}$$

B. Use the Distributive Property

$$\begin{aligned} 831 \times 749 &= 831 \times (700 + 40 + 9) \\ &= (831 \times 700) + (831 \times 40) + (831 \times 9) \\ &= 581,700 + 33,240 + 7,479 \\ &= 622,419 \end{aligned}$$

Think About It

- ▶ When a factor has two or more digits, why do you place zeros in the partial products?
- ▶ How can you tell if the product should be greater than or less than the product of the rounded numbers?

Guided Practice

Find each product.

$$\begin{array}{r} 1. \quad 256 \\ \times \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \quad 4,902 \\ \times \quad 23 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 181 \\ \times \quad 36 \\ \hline \end{array}$$

4. $22,432 \times 8$ _____

5. 874×24 _____

6. 385×521 _____

Ask Yourself

- Did I estimate to see if the answer is reasonable?
- Did I use zeros as placeholders in the partial products?

Independent Practice

Find each product. Estimate to see if your answer is reasonable.

$$\begin{array}{r} 7. \quad 479 \\ \times \quad 7 \\ \hline \end{array}$$

$$\begin{array}{r} 8. \quad 341 \\ \times \quad 5 \\ \hline \end{array}$$

$$\begin{array}{r} 9. \quad 147 \\ \times \quad 72 \\ \hline \end{array}$$

$$\begin{array}{r} 10. \quad 8,527 \\ \times \quad 45 \\ \hline \end{array}$$

11. $4,693 \times 7$ _____

12. 247×59 _____

13. $22,099 \times 6$ _____

14. $85,482 \times 8$ _____

15. 88×402 _____

16. 947×163 _____

17. $1,637 \times 22$ _____

18. $3,214 \times 12$ _____

19. $8,600 \times 8$ _____

20. $4,621 \times 50$ _____

21. $5,704 \times 82$ _____

22. 905×604 _____

Problem Solving • Reasoning

Use Data Use the table for Problems 23–24.

23. If Penina jumps for 12 minutes at the rate shown, what will her total number of jumps be?

24. **Compare** In 5 minutes, how many more jumps does Dini complete than Leah?

25. How many inches of rope are needed to make three 84-inch jump ropes, fourteen 96-inch ropes, eleven 108-inch ropes, and two 120-inch ropes?

26. **Write About It** The gym teacher needs 13 jump ropes. She can buy single ropes for \$4.00 each or ropes in packs of 3 for \$11.00 per pack. What is the least expensive way to purchase 13 jump ropes?

Jumping Rates

Jumper	Jumps per minute
Penina	101
Dini	97
Leah	88



Multiply Decimals by Whole Numbers

You will learn how to multiply decimals by whole numbers.



Learn About It

A craft store usually sells single posters for \$4.69 each. For a limited time, the store has a special offer of three posters for \$13.00. How much money will Chaim save if he buys three posters now?

First, find out how much three single posters would cost.

Multiply. $\$4.69 \times 3 = n$

Find $\$4.69 \times 3$.

Step 1 Multiply the factors as if the decimal point weren't there.

$$\begin{array}{r} \$4.69 \\ \times \quad 3 \\ \hline 14\ 07 \end{array}$$

Step 2 Place the decimal point. The number of decimal places in the product equals the sum of the number of decimal places in the factors.

$$\begin{array}{r} \$4.69 \leftarrow 2 \text{ decimal places} \\ \times \quad 3 \leftarrow + 0 \text{ decimal places} \\ \hline \$14.07 \leftarrow 2 \text{ decimal places} \end{array}$$

Solution: Since three posters at \$4.69 each would cost \$14.07, Chaim will save $\$14.07 - \13.00 , or \$1.07, if he buys the posters now.

Estimate to check your work.

$$\$4.69 \text{ rounds to } \$5$$

$$\$5 \times 3 = \$15$$

\$14.07 is close to \$15, so the answer is reasonable.

Another Example

Zeros in the Product

$$\begin{array}{r} 0.0149 \leftarrow 4 \text{ decimal places} \\ \times \quad 6 \leftarrow + 0 \text{ decimal places} \\ \hline 0.0894 \leftarrow 4 \text{ decimal places} \end{array}$$

Think About It

- Look at the product in Another Example. What do the zeros to the left of the digit 8 represent?

Guided Practice

Find each product.

1. 2.5×2 _____ 2. 4.1×6 _____

3. 10.3×7 _____ 4. 1.11×58 _____

Ask Yourself

- Should the answer be greater than or less than the whole number?
- How many decimal places should the product have?

5. 2.6×6 _____ 6. 5.16×15 _____
 7. 4.04×25 _____ 8. 0.54×426 _____

Independent Practice

Find each product. Estimate to check your work.

9. 2.8×3 _____ 10. 6.5×5 _____ 11. 7.7×7 _____
 12. 4.9×8 _____ 13. 3.8×29 _____ 14. 4.6×12 _____
 15. 3.2×24 _____ 16. 6.6×35 _____ 17. 4.3×52 _____
 18. 4.15×38 _____ 19. 8.02×59 _____ 20. 6.23×36 _____
 21. 7.28×14 _____ 22. 7.01×53 _____ 23. 3.70×19 _____
 24. 12.3×29 _____ 25. 27.2×46 _____ 26. 19.3×22 _____
 27. 0.406×61 _____ 28. 0.22×33 _____ 29. 0.52×58 _____

Problem Solving • Reasoning

Use Data Use the picture for Problems 33 and 34.

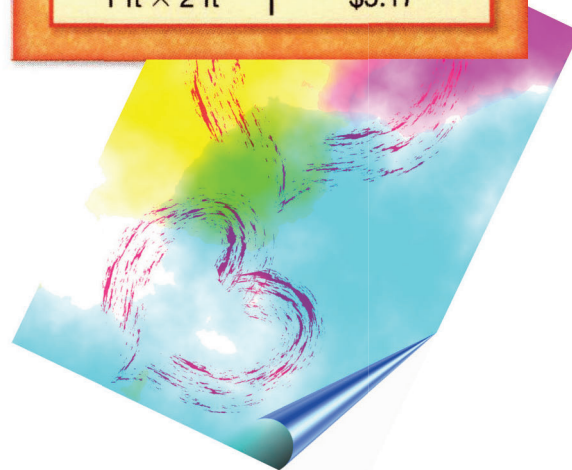
30. **Analyze** Sari and her three sisters each want to buy three new posters for their bedrooms. Together, they have \$40.00. If each buys the same size poster, what is the largest poster each can buy?

31. Yosef has \$14.75. He calculates that he can buy one 3 ft \times 4 ft poster and three 1 ft \times 2 ft posters. Do you agree with his calculation? If not, suggest what posters he could buy in addition to the 3 ft \times 4 ft poster.

32. **Estimate** The Caring Hearts Charity has designed a poster to advertise its annual clothing drive. If it costs \$2.49 to print one poster, about how much will it cost to print 36 posters?

33. **Write About It** Tuvia is going to buy two 3-D posters that cost \$2.99 each before tax. The tax rate is 8 cents per dollar. Tuvia calculates that the total cost of the posters will be \$11.38. Is this answer reasonable?

Size	Price
3 ft \times 4 ft	\$5.35
2 ft \times 3 ft	\$4.69
1 ft \times 2 ft	\$3.17



Multiply Decimals by Decimals

You will learn how to multiply one decimal by another decimal.

Learn About It

Perry is buying food at the local supermarket. She buys 4.5 pounds of potatoes. If potatoes cost \$0.33 per pound, how much will Perry pay for 4.5 pounds of potatoes?

Multiply. $0.33 \times 4.5 = n$



Find 0.33×4.5 .

Step 1 Multiply the factors as if the decimal points weren't there.

$$\begin{array}{r} ^1 \\ 0.33 \\ \times 4.5 \\ \hline 165 \\ + 1320 \\ \hline 1485 \end{array}$$

Step 2 Place the decimal point in the product.

$$\begin{array}{r} \$0.33 \leftarrow 2 \text{ decimal places} \\ \times 4.5 \leftarrow 1 \text{ decimal place} \\ \hline 165 \\ + 1320 \\ \hline \$1.485 \leftarrow 3 \text{ decimal places} \end{array}$$

Step 3 Since you are working with money, round to the nearest cent.

$$\$1.485 \text{ rounds to } \$1.49$$

Solution: Perry will pay \$1.49 for 4.5 pounds of potatoes.

Another Example

Zeros in the Product

$$\begin{array}{r} 1.839 \leftarrow 3 \text{ decimal places} \\ \times 0.05 \leftarrow + 2 \text{ decimal places} \\ \hline 0.09195 \leftarrow 5 \text{ decimal places} \end{array}$$

Estimate to check your work.

$$\begin{array}{l} \$0.33 \text{ rounds to } \$0.30 \\ 4.5 \text{ rounds to } 5 \\ \$0.30 \times 5 = \$1.50 \\ \$1.49 \text{ is close to } \$1.50, \text{ so the answer is reasonable.} \end{array}$$

Think About It

► What is the product of 1.525×0.004 ? How do you know where to place the decimal point?

Guided Practice

Find each product.

1. 2.2×2.3 _____
2. 5.4×1.02 _____
3. 1.21×0.08 _____
4. 12.1×2.1 _____
5. 5.31×6.05 _____
6. 0.61×0.309 _____

Ask Yourself

- How many decimal places should the product have?

Independent Practice

Find each product. Estimate to see if your answer is reasonable.

$$\begin{array}{r} 7. \quad 4.7 \\ \times 0.2 \\ \hline \end{array}$$

$$\begin{array}{r} 8. \quad 8.9 \\ \times 1.6 \\ \hline \end{array}$$

$$\begin{array}{r} 9. \quad 7.4 \\ \times 4.7 \\ \hline \end{array}$$

$$\begin{array}{r} 10. \quad 3.15 \\ \times 0.22 \\ \hline \end{array}$$

$$\begin{array}{r} 11. \quad 41.6 \\ \times 4.5 \\ \hline \end{array}$$

$$\begin{array}{r} 12. \quad 31.2 \\ \times 3.33 \\ \hline \end{array}$$

$$\begin{array}{r} 13. \quad 8.51 \\ \times 4.12 \\ \hline \end{array}$$

$$\begin{array}{r} 14. \quad 60.2 \\ \times 4.3 \\ \hline \end{array}$$

$$15. 18.3 \times 8.62 \quad \underline{\hspace{2cm}} \quad 16. 14.2 \times 34.5 \quad \underline{\hspace{2cm}} \quad 17. 41.52 \times 2.6 \quad \underline{\hspace{2cm}}$$

$$18. 3.482 \times 0.014 \quad \underline{\hspace{2cm}} \quad 19. 561.2 \times 2.15 \quad \underline{\hspace{2cm}} \quad 20. 4.215 \times 4.22 \quad \underline{\hspace{2cm}}$$

$$21. 4.62 \times 3.355 \quad \underline{\hspace{2cm}} \quad 22. 8.423 \times 7.64 \quad \underline{\hspace{2cm}} \quad 23. 4.8 \times 4.326 \quad \underline{\hspace{2cm}}$$

$$24. 125.2 \times 6.54 \quad \underline{\hspace{2cm}} \quad 25. 13.7 \times 4.87 \quad \underline{\hspace{2cm}} \quad 26. 321.7 \times 46.5 \quad \underline{\hspace{2cm}}$$


$$27. 16.3 \times 245.2 \quad \underline{\hspace{2cm}} \quad 28. 6.45 \times 84.72 \quad \underline{\hspace{2cm}} \quad 29. 4.8 \times 4.326 \quad \underline{\hspace{2cm}}$$

Problem Solving • Reasoning

Use Data Use the prices shown for Problems 31–33.

30. Dassy bought six apples. They weigh 2.38 lb. How much did Dassy spend on the apples?
- _____

31. Shaya plans to make a fruit salad. If he buys a pineapple, 2.53 lb of mangoes, 3.64 lb of oranges, 4.14 lb of bananas, and 2.74 lb of grapes, how much money will Shaya spend on fruit?
- _____

-  32. **Write About It** Simi and her father spent \$1.89 buying fruit. If they bought 1.5 lb of fruit, what kind of fruit did Simi and her father buy?
- _____



33. **Analyze** At a store's grand opening, every 15th customer gets \$10. Every 50th customer gets a mug. Which customer will be the first to get both \$10 and a mug?
- _____

Problem-Solving Strategy: Work Backward

You will learn how to solve a problem by working backward.

When a problem gives you the result of a sequence of operations, you can work backward to find the amount with which the sequence began.

Problem A school received a shipment of videos of the school play. Half of the videos were sold before lunch. During lunch, 15 were sold. After lunch, three times as many videos were sold as during lunch. Eight videos remained at the end of the day. How many videos were in the shipment?



Understand

What is the question?

How many videos were in the shipment?

What do you know?

- Half were sold before noon.
- 15 were sold during lunch.
- (3×15) were sold after lunch.
- 8 remained at the end of the day.

Plan

How can you find the answer?

Start with what you know and work backward. Because inverse operations “undo” each other, use inverse operations to work backward.

Remember:

Addition and subtraction are inverse operations. Multiplication and division are inverse operations.

Solve

Start with the number of videos remaining at the end of the day. Then work backward.

- Add the number of videos sold after lunch.
 $8 + (3 \times 15) = 53$
- To that sum, add the number sold during lunch.
 $53 + 15 = 68$
68 represents the half not sold before lunch.
- To find the total number of videos in the shipment, multiply by 2.
 $68 \times 2 = 136$

There were 136 videos in the shipment.

Look Back

Look back at the problem.

Does your answer make sense? How can you check your answer?