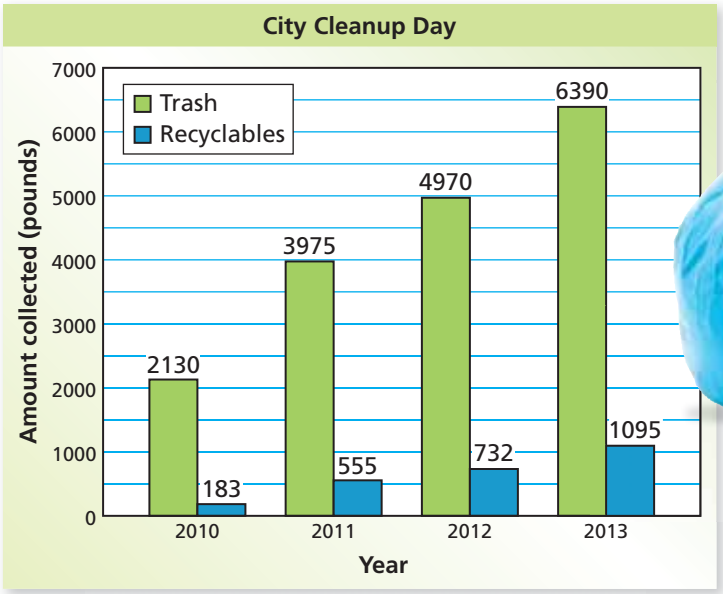
1.1 Whole Number Operations

Essential Question How do you know which operation to choose when solving a real-life problem?

1 ACTIVITY: Choosing an Operation

Work with a partner. The double bar graph shows the history of a citywide cleanup day.



- **Copy each question below.**
- **Underline a key word or phrase that helps you know which operation to use to answer the question. State the operation. Why do you think the key word or phrase indicates the operation you chose?**
- **Write an expression you can use to answer the question.**
- **Find the value of your expression.**

a. What is the total amount of trash collected from 2010 to 2013?

b. How many more pounds of recyclables were collected in 2013 than in 2010?

c. How many times more recyclables were collected in 2012 than in 2010?

d. The amount of trash collected in 2014 is estimated to be twice the amount collected in 2011. What is that amount?

Whole Numbers

In this lesson, you will

- determine which operation to perform.
- divide multi-digit numbers.

2 ACTIVITY: Checking Answers

Math Practice

Communicate Precisely
What key words should you use so that your partner understands your explanation?

Work with a partner.

a. Explain how you can use estimation to check the reasonableness of the value of your expression in Activity 1(a).

b. Explain how you can use addition to check the value of your expression in Activity 1(b).

c. Explain how you can use estimation to check the reasonableness of the value of your expression in Activity 1(c).

d. Use mental math to check the value of your expression in Activity 1(d). Describe your strategy.

3 ACTIVITY: Using Estimation

Work with a partner. Use the map. Explain how you found each answer.

a. Which two lakes have a combined area of about 33,000 square miles?

b. Which lake covers an area about three times greater than the area of Lake Erie?

c. Which lake covers an area that is about 16,000 square miles greater than the area of Lake Ontario?

d. Estimate the total area covered by the Great Lakes.

What Is Your Answer?

4. **IN YOUR OWN WORDS** How do you know which operation to choose when solving a real-life problem?

5. In a *magic square*, the sum of the numbers in each row, column, and diagonal is the same and each number from 1 to 9 is used only once. Complete the magic square. Explain how you found the missing numbers.

?	9	2
?	5	?
8	?	?

Practice Use what you learned about choosing operations to complete Exercises 8–11 on page 7.

1.1 Lesson

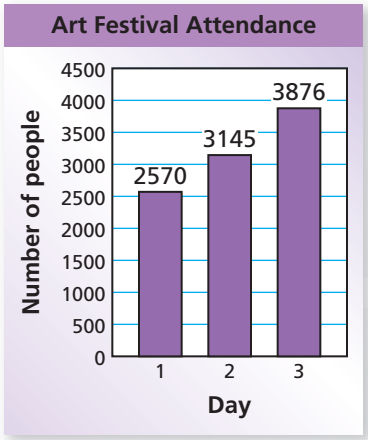
Check It Out
Lesson Tutorials
BigIdeasMath.com

Recall the four basic operations: addition, subtraction, multiplication, and division.

Operation	Words	Algebra
Addition	the *sum* of	$a + b$
Subtraction	the *difference* of	$a - b$
Multiplication	the *product* of	$a \times b$ $\quad a \cdot b$
Division	the *quotient* of	$a \div b$ $\quad \frac{a}{b}$ $\quad b\overline{)a}$

EXAMPLE 1 Adding and Subtracting Whole Numbers

The bar graph shows the attendance at a three-day art festival.



a. What is the total attendance for the art festival?

You want to find the total attendance for the three days. In this case, the phrase *total attendance* indicates you need to find the sum of the daily attendances.

Line up the numbers by their place values, then add.

$$\begin{array}{r} {\scriptstyle 111} \\ 2570 \\ 3145 \\ +\ 3876 \\ \hline 9591 \end{array}$$

The total attendance is 9591 people.

b. What is the increase in attendance from Day 1 to Day 2?

You want to find how many more people attended on Day 2 than on Day 1. In this case, the phrase *how many more* indicates you need to find the difference of the attendances on Day 2 and Day 1.

Line up the numbers by their place values, then subtract.

$$\begin{array}{r} {\scriptstyle 10} \\ {\scriptstyle 2\cancel{0}14} \\ \cancel{3145} \\ -\ 2570 \\ \hline 575 \end{array}$$

The increase in attendance from Day 1 to Day 2 is 575 people.

EXAMPLE 2 Multiplying Whole Numbers

A school lunch contains 12 chicken nuggets. Ninety-five students buy the lunch. What is the total number of chicken nuggets served?

You want to find the total number of chicken nuggets in 95 groups of 12 chicken nuggets. The phrase *95 groups of 12* indicates you need to find the product of 95 and 12.

$$\begin{array}{r} 12 \\ \times\ 95 \\ \hline 60 \\ 108 \\ \hline 1140 \end{array}$$

Multiply 12 by the ones digit, 5.
Multiply 12 by the tens digit, 9.
Add.

There were 1140 chicken nuggets served.

Study Tip

In Example 2, you can use estimation to check the reasonableness of your answer.
$12 \times 95 \approx 12 \times 100$
$= 1200$
Because $1200 \approx 1140$, the answer is reasonable.

On Your Own

Now You're Ready
Exercises 12–20

Find the value of the expression. Use estimation to check your answer.

1. $1745 + 682$ **2.** $912 - 799$ **3.** 42×118

EXAMPLE 3 Dividing Whole Numbers: No Remainder

You make 24 equal payments for a go-kart. You pay a total of $840. How much is each payment?

You want to find the number of groups of 24 in $840. The phrase *groups of 24 in $840* indicates you need to find the quotient of 840 and 24.

Use long division to find the quotient.
Decide where to write the first digit of the quotient.

$$\begin{array}{r} ? \\ 24\overline{)840} \end{array}$$

Do not use the hundreds place because 24 is greater than 8.

$$\begin{array}{r} ? \\ 24\overline{)840} \end{array}$$

Use the tens place because 24 is less than 84.

So, divide the tens and write the first digit of the quotient in the tens place.

$$\begin{array}{r} 3 \\ 24\overline{)840} \\ -\ 72 \\ \hline 12 \end{array}$$

Divide 84 by 24: There are three groups of 24 in 84.
Multiply 3 and 24.
Subtract 72 from 84.

Next, bring down the 0 and divide the ones.

$$\begin{array}{r} 35 \\ 24\overline{)840} \\ -\ 72 \\ \hline 120 \\ -\ 120 \\ \hline 0 \end{array}$$

Divide 120 by 24: There are five groups of 24 in 120.
Multiply 5 and 24.
Subtract 120 from 120.

The quotient of 840 and 24 is 35.

So, each payment is $35.

Remember

$\frac{\text{dividend}}{\text{divisor}} = \text{quotient}$

So, quotient × divisor = dividend.

Check Find the product of the quotient and the divisor.

$$\begin{array}{rl} 35 & \text{quotient} \\ \times\ 24 & \text{divisor} \\ \hline 140 & \\ 70 & \\ \hline 840 & \text{dividend} \end{array} \checkmark$$

On Your Own

Now You're Ready
Exercises 21–23

Find the value of the expression. Use estimation to check your answer.

4. $234 \div 9$ **5.** $\frac{986}{58}$ **6.** $840 \div 105$

7. Find the quotient of 9920 and 320.

When you use long division to divide whole numbers and you obtain a remainder, you can write the quotient as a mixed number using the rule

$$\text{dividend} \div \text{divisor} = \text{quotient} + \frac{\text{remainder}}{\text{divisor}}.$$

EXAMPLE 4 Real-Life Application

A 301-foot-high swing at an amusement park can take 64 people on each ride. A total of 8983 people ride the swing today. All the rides are full except for the last ride. How many rides are given? How many people are on the last ride?

To find the number of rides given, you need to find the number of groups of 64 people in 8983 people. The phrase *groups of 64 people in 8983 people* indicates you need to find the quotient of 8983 and 64.

Divide the place-value positions from left to right.

```
      140 R23
64)8983
 − 64
   258
 − 256
     23
   − 0
    23
```

There is one group of 64 in 89.

There are four groups of 64 in 258.

There are no groups of 64 in 23.

The remainder is 23.

Do not stop here. You must write a 0 in the ones place of the quotient.

The quotient is $140\frac{23}{64}$. This indicates 140 groups of 64, with 23 remaining.

So, 141 rides are given, with 23 people on the last ride.

On Your Own

Now You're Ready
Exercises 24–26

Find the value of the expression. Use estimation to check your answer.

8. $\frac{6096}{30}$ **9.** $45{,}691 \div 28$ **10.** $3215 \div 430$

11. **WHAT IF?** In Example 4, 9038 people ride the swing. What is the least number of rides possible?

1.1 Exercises

Check It Out
Help with Homework
BigIdeasMath.com

Vocabulary and Concept Check

VOCABULARY **Determine which operation the word or phrase represents.**

1. sum **2.** times **3.** the quotient of

4. decreased by **5.** total of **6.** minus

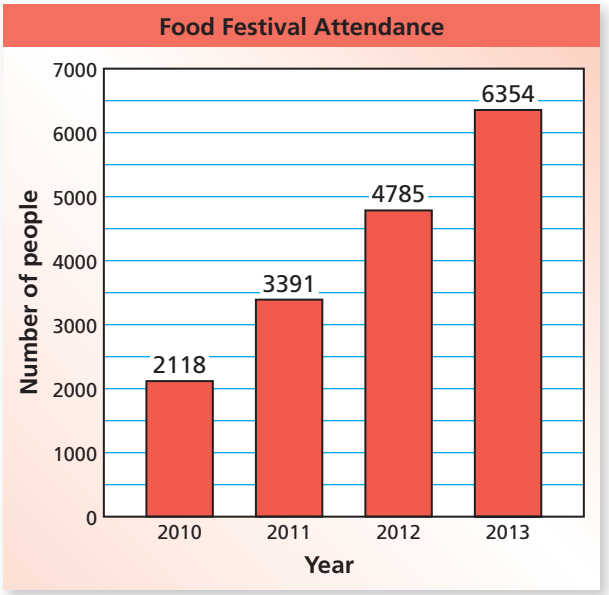
7. **VOCABULARY** Use the division problem shown to tell whether the number is the divisor, dividend, or quotient.

$$\begin{array}{r} 26 \\ 34\overline{)884} \end{array}$$

a. 884 **b.** 26 **c.** 34

Practice and Problem Solving

The bar graph shows the attendance at a food festival. Write an expression you can use to answer the question. Then find the value of your expression.



8. What is the total attendance at the food festival from 2010 to 2013?

9. How many more people attended the food festival in 2012 than in 2011?

10. How many times more people attended the food festival in 2013 than in 2010?

11. The festival projects that the total attendance for 2014 will be twice the attendance in 2012. What is the projected attendance for 2014?

Find the value of the expression. Use estimation to check your answer.

1 **12.** $2219 + 872$ **13.** $\begin{array}{r} 5351 \\ +\ 1730 \\ \hline \end{array}$ **14.** $3968 + 1879$

15. $7694 - 5232$ **16.** $9165 - 4729$ **17.** $\begin{array}{r} 2416 \\ -\ 1983 \\ \hline \end{array}$

2 **18.** $\begin{array}{r} 84 \\ \times\ 37 \\ \hline \end{array}$ **19.** 124×56 **20.** 419×236

3 **21.** $837 \div 27$ **22.** $\frac{588}{84}$ **23.** $7440 \div 124$

4 **24.** $6409 \div 61$ **25.** $8241 \div 173$ **26.** $\frac{33{,}505}{160}$

ERROR ANALYSIS **Describe and correct the error in finding the value of the expression.**

27.

$$\begin{array}{r} 39 \\ \times\ 17 \\ \hline 273 \\ 39 \\ \hline 312 \end{array}$$

28.

$$\begin{array}{r} 19 \\ 12\overline{)1308} \\ -12 \\ \hline 108 \\ -108 \\ \hline 0 \end{array}$$

Determine the operation you would use to solve the problem. Do not answer the question.

29. Gymnastic lessons cost $30 per week. How much will 18 weeks of gymnastic lessons cost?

30. The scores on your first two tests were 82 and 93. By how many points did your score improve?

31. You are setting up tables for a banquet for 150 guests. Each table seats 12 people. What is the minimum number of tables you will need?

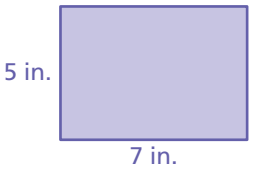
32. A store has 15 boxes of peaches. Each box contains 45 peaches. How many peaches does the store have?

33. Two shirts cost $18 and $25. What is the total cost of the shirts?

34. A gardener works for 14 hours during a week and charges $168. How much does the gardener charge for each hour?

Find the perimeter and area of the rectangle.

35.



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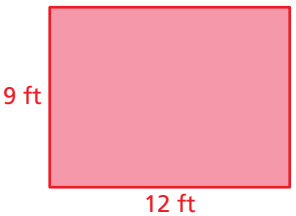

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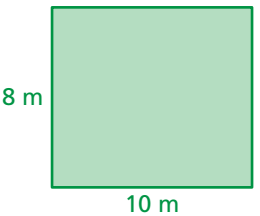

38. **BOX OFFICE** The number of tickets sold for the opening weekend of a movie is 879,575. The movie was shown in 755 theaters across the nation. What was the average number of tickets sold at each theater?

39. **LOGIC** You find that the product of 93 and 6 is 558. How can you use addition to check your answer? How can you use division to check your answer?

40. **NUMBER SENSE** Without calculating, decide which is greater: 3999 ÷ 129 or 3834 ÷ 142. Explain.

41. **REASONING** In a division problem, can the remainder be greater than the divisor? Explain.

42. **WATER COOLER** You change the water jug on the water cooler. How many cups can be completely filled before you need to change the water jug again?

43. **ARCADE** You have $9, one of your friends has $10, and two of your other friends each have $13. You combine your money to buy arcade tokens. You use a coupon to buy 8 tokens for $1. The cost of the remaining tokens is four for $1. You and your friends share the tokens evenly. How many tokens does each person get?

44. **BOOK SALE** You borrow bookcases like the one shown to display 943 books at a book sale. You plan to put 22 books on each shelf. No books will be on top of the bookcases.

a. How many bookcases must you borrow to display all the books?

b. You fill the shelves of each bookcase in order, starting with the top shelf. How many books are on the third shelf of the last bookcase?

45. **MODELING** The siding of a house is 2250 square feet. The siding needs two coats of paint. The table shows information about the paint.

Can Size	Cost	Coverage
1 quart	$18	80 square feet
1 gallon	$29	320 square feet

a. What is the minimum cost of the paint needed to complete the job?

b. How much paint is left over?

46. Critical Thinking Use the digits 3, 4, 6, and 9 to complete the division problem. Use each digit once.

$$\square\,\square{,}000 \div \square\,00 = \square\,0$$

Fair Game Review What you learned in previous grades & lessons

Plot the ordered pair in a coordinate plane. *(Skills Review Handbook)*

47. (1, 3) **48.** (0, 4) **49.** (6, 0) **50.** (4, 2)

51. **MULTIPLE CHOICE** Which of the following numbers is *not* prime? *(Skills Review Handbook)*

Ⓐ 1 Ⓑ 2 Ⓒ 3 Ⓓ 5