UNIT 3

Expressions

Essential Question

HOW can you communicate mathematical ideas effectively?

Chapter 5
Expressions

Numerical and algebraic expressions can be used to represent and solve real-world problems. In this chapter, you will write and evaluate expressions and apply the properties of operations to generate equivalent expressions.

Chapter 5
Expressions

Steve Mason/Getty Images

Essential Question

HOW is it helpful to write numbers in different ways?

Common Core GPS

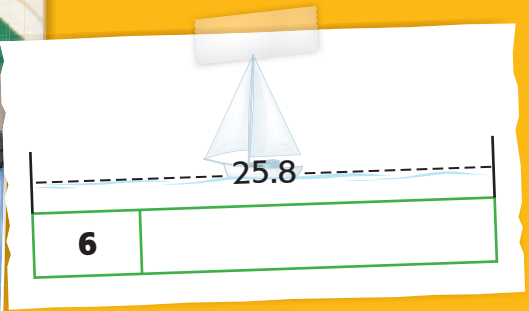
Content Standards
MCC6.EE.1, MCC6.EE.2, MCC6.EE.2a, MCC6.EE.2b, MCC6.EE.2c, MCC6.EE.3, MCC6.EE.4, MCC6.EE.6, MCC6.NS.3, MCC6.NS.4

Mathematical Practices
1, 2, 3, 4, 5, 6, 7

Math in the Real World

Sailboats can travel at a cruising speed of about 6 knots. In a recent race from the United States to the United Kingdom, a racing sailboat traveled at an average speed of 25.8 knots.

Use the bar diagram below to find the difference between the cruising speed and the racing sailboat's speed.



FOLDABLES® Study Organizer

1. Cut out the correct Foldable from the FL pages in the back of this book.
2. Place your Foldable on the Key Concept page toward the end of this chapter.
3. Use the Foldable throughout this chapter to help you learn about expressions.

What Tools Do You Need?

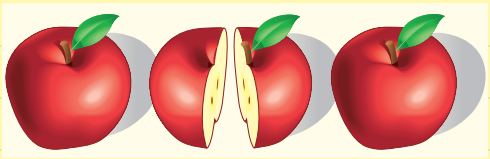
Vocabulary

algebra	defining the variable	like terms
algebraic expression	Distributive Property	numerical expression
Associative Properties	equivalent expressions	perfect square
base	evaluate	powers
coefficient	exponent	properties
Commutative Properties	factor the expression	term
constant	Identity Properties	variable

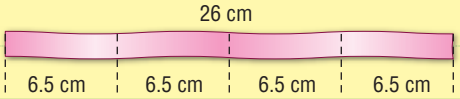
Study Skill: Reading Math

Meaning of Division Look for these other meanings when you are solving a word problem.

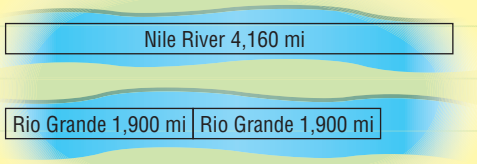
- **To share :**
  Zach and his friend are going to share 3 apples equally. How many apples will each boy have?



- **To take away equal amounts :**
  Isabel is making bookmarks from a piece of ribbon. Each bookmark is 6.5 centimeters long. How many bookmarks can she make from a piece of ribbon that is 26 centimeters long?



- **To find how many times greater :**
  The Nile River, the longest river on Earth, is 4,160 miles long. The Rio Grande River is 1,900 miles long. About how many times as long is the Nile than the Rio Grande?



Practice

Identify the meaning of division shown in each problem. Then solve the problem.

1. The Jackson family wants to buy a flat screen television that costs $1,200. They plan to pay in six equal payments. What will be the amount of each payment?

2. A full-grown blue whale can weigh 150 tons. An adult African elephant weights about 5 tons. How many times as great does a blue whale weigh than an African elephant?

When Will You Use This?

Watch Play it online!

Your Turn! You will solve this problem in the chapter.

Are You Ready?

Try the Quick Check below.
Or, take the Online Readiness Quiz.

Quick Review

Common Core Review MCC4.NBT.5, MCC5.NF.1

Example 1

Multiply 5 × 5 × 5 × 5.

5 is used as a factor four times.

$5 \times 5 \times 5 \times 5 = 625$

Example 2

Find $3\frac{7}{8} - 1\frac{1}{2}$.

$3\frac{7}{8} = 3\frac{7}{8}$ Rename using the LCD, 8.

$-\ 1\frac{1}{2} = -\ 1\frac{4}{8}$

$2\frac{3}{8}$ Subtract.

Quick Check

Number Patterns **Multiply.**

1. $7 \times 7 \times 7 =$ _____

2. $2 \times 2 \times 2 =$ _____

3. $9 \times 9 \times 9 \times 9 =$ _____

Show your work.

Fractions **Add or subtract. Write in simplest form.**

4. $\frac{4}{5} - \frac{1}{2} =$ _____

5. $\frac{8}{9} + \frac{2}{3} =$ _____

6. $3\frac{1}{10} - 2\frac{5}{6} =$ _____

7. What fraction more of the coupon books did Jabar sell than Guto?

_____

Coupon Book Sales	
Student	**Fraction of Total Sales**
Guto	$\frac{1}{12}$
Holly	$\frac{3}{40}$
Jabar	$\frac{2}{15}$

How Did You Do?

Which problems did you answer correctly in the Quick Check?
Shade those exercise numbers below.

1 2 3 4 5 6 7

Inquiry Lab
Structure of Expressions

Inquiry **HOW can you identify the parts of an expression using mathematical terms?**

Content Standards MCC6.EE.2, MCC6.EE.2b

Mathematical Practices 1, 3, 4

Recycle Fitness Fortress recycles plastic water bottles. On Saturday, 8 bottles were placed in the bins. On Sunday, 8 more bottles were recycled.

Investigation 1

You can use an expression to represent the number of bottles that were recycled. An *expression* consists of a combination of numbers and operations. Each *term* of an expression is separated by a plus or minus sign.

Step 1 Use a bar diagram to represent the number of bottles recycled on Saturday. Use a second bar diagram to represent the number of bottles recycled on Sunday.

Saturday	**8 bottles**
Sunday	**8 bottles**

Step 2 The addition expression $8 + 8$ represents the total. How many terms are in the expression? ☐

Does the expression represent a *sum*, *product*, or *quotient*?

_____

Step 3 The multiplication expression 2×8 also represents the total.

How many terms are in the expression? ☐

Does the expression represent a *sum*, *product*, or *quotient*?

_____

Collaborate

Work with a partner. Rewrite each sum as a product. Then identify the number of terms in each expression.

1. $14 + 14 =$ _____

Sum: _____

Product: _____

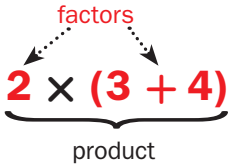
2. $92 + 92 + 92 =$ _____

Sum: _____

Product: _____

Investigation 2

Some expressions can be written as the product of a sum. For example, $2 \times (3 + 4)$ represents the product of 2 and the sum of 3 and 4. The expression $2 \times (3 + 4)$ can also be thought of as the product of two *factors*.



Fundraising Melina and Kendrick are selling tins of cashews for a school fundraiser. Melina sold 5 tins on Monday and 5 tins on Tuesday. Kendrick sold 4 tins Monday and 4 tins on Tuesday.

Step 1 Divide and label each bar diagram to represent the amount sold each day.

Monday

Tuesday

Step 2 Write an expression involving a sum of four terms to represent the total amount sold.

☐ + ☐ + ☐ + ☐

Step 3 Complete the expression below involving the product of a sum to represent the total amount sold.

$2 \times (\square + \square)$

In the expression above, what are the two factors? _____

In the expression above, which factor can be thought of as both a single term and a sum of two terms? _____

Collaborate

Work with a partner. Rewrite each sum as the product of a sum. Then identify the factors.

3. $1 + 4 + 1 + 4 =$ _____
Factors: _____

4. $32 + 32 + 2 + 2 =$ _____
Factors: _____

5. $79 + 8 + 79 + 8 =$ _____
Factors: _____

6. $19 + 56 + 56 + 19 =$ _____
Factors: _____

Collaborate

Work with a partner. Represent each expression using bar diagrams.

7. $5 + 5$

8. $9 + 9$

Work with a partner. Represent each expression using bar diagrams. Then identify the factors.

9. $2 \times (3 + 1)$

Factors: _____

Which factor is also a sum?

_____

10. $2 \times (5 + 2)$

Factors: _____

Which factor is also a sum?

_____

Work with a partner. Represent each diagram as a sum.

11. _____

17	17

12. _____

74	74

Work with a partner. Represent each diagram as the product of a sum. Then identify the factors.

13. Product: _____

Factors: _____

Which factor is also a sum?

_____

5	8
5	8

14. Product: _____

Factors: _____

Which factor is also a sum?

_____

54	58
54	58

Analyze

Work with a partner to match each description to the correct expression. The first one is already done for you.

	Description	Expression
15.	This expression is a sum of two terms.	**a.** $(1 + 2) \times 2$
16.	This expression can be thought of as a product of two factors. One of the factors is the sum of 6 and 4.	**b.** $6 + 6$
17.	This expression can be thought of as a product of two factors. One of the factors is the sum of 1 and 2.	**c.** $14 \div 7$
18.	This expression is the quotient of 14 and 7.	**d.** $(6 + 4) \times 2$

19. **Reason Inductively** Consuela wrote the expression $2 \times (31 + 47)$. She states that the expression is a product and that the expression $(31 + 47)$ is a factor. Marcus states that the expression $(31 + 47)$ is a sum of two terms. Who is correct? Explain. _____

Reflect

20. **Model with Mathematics** Write an expression and a real-world problem for the situation modeled to the right.

4 pounds	**6 pounds**
4 pounds	**6 pounds**

21. inquiry HOW can you identify the parts of an expression using mathematical terms?

Powers and Exponents

What You'll Learn

Scan the lesson. Predict two things you will learn about exponents.

- _____
- _____

Essential Question

HOW is it helpful to write numbers in different ways?

Vocabulary

base
exponent
powers
perfect square

Common Core GPS

Content Standards
MCC6.EE.1, MCC6.NS.3

Mathematical Practices
1, 3, 4, 6, 8

Vocabulary Start-Up

A product of like factors can be written in exponential form using an exponent and a base. The **base** is the number used as a factor. The **exponent** tells how many times a base is used as a factor.

1. Fill in the boxes with the words *factors*, *exponent*, and *base*.

$$\underline{10} \times \underline{10} = 10^{\square}$$

2. Give an example of an exponent.

_____

3. Write the definition of exponent in your own words.

_____

_____

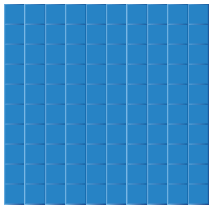
Real-World Link

MP3 players come in different storage sizes such as 2GB, 4GB, or 16GB, where GB means gigabyte. One gigabyte is equal to $10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$ bytes. What is this number written with exponents? ☐

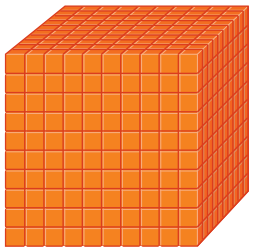
Work Zone

Write Products as Powers

Numbers expressed using exponents are called **powers**. For example, 100 is a power of 10 because it can be written as 10^2. Numbers like 100 are **perfect squares** because they are the squares of whole numbers.



$10 \times 10 = 100$
$10^2 = 100$



$10 \times 10 \times 10 = 1{,}000$
$10^3 = 1{,}000$

Perfect cubes are numbers with three identical whole numbers factors such as 4 x 4 x 4 = 64. So, the number 64 is a perfect cube.

Examples

Tutor

1. **Write $6 \times 6 \times 6 \times 6$ using an exponent.**

$6 \times 6 \times 6 \times 6 = 6^4$ 6 is used as a factor four times.

2. **Write $4 \times 4 \times 4$ using an exponent.**

The factor ☐ is the base.

The factor is multiplied ☐ times.

The exponent is ☐.

So, $4 \times 4 \times 4$ can be written as _____.

Show your work.

a. _____

b. _____

Got It? **Do these problems to find out.**

Write each product using an exponent.

a. $7 \times 7 \times 7 \times 7$

b. $9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9$

Write Powers as Products

To write powers as products, determine the base and the exponent. The base of 10^2 is 10 and the exponent is 2. To read powers, consider the exponent. The power 10^2 is read as *ten squared* and 10^3 is read as *ten cubed*.

Examples

Tutor

3. **Write 5^2 as a product of the same factor. Then find the value.**

The base is 5. The exponent is 2. So, 5 is used as a factor two times.

$5^2 = 5 \times 5$ Write 5^2 as a product.

$= 25$ Multiply 5 by itself.

4. **Write 1.5^3 as a product of the same factor. Then find the value.**

The base is 1.5. The exponent is 3. So, 1.5 is used as a factor three times.

$1.5^3 = 1.5 \times 1.5 \times 1.5$ Write 1.5^3 as a product.

$= 3.375$ Multiply.

5. **Write $\left(\frac{1}{2}\right)^3$ as a product of the same factor. Then find the value.**

The base is $\frac{1}{2}$. The exponent is 3. So $\frac{1}{2}$ is used as a factor three times.

$\left(\frac{1}{2}\right)^3 = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ Write $\left(\frac{1}{2}\right)^3$ as a product.

$= \frac{1}{8}$ Multiply.

Notation

In Example 5, the fraction $\frac{1}{2}$ is set in parentheses to note that the entire fraction is the base

$\left(\frac{1}{2}\right)^3 = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$

Without the parentheses, it is understood that the base is only the numerator of the fraction.

$\frac{1^3}{2} = \frac{1 \times 1 \times 1}{2} = \frac{1}{2}$

Show your work.

Got It? Do these problems to find out.

Write each power as a product of the same factor. Then find the value.

c. 10^5 **d.** 2.1^2 **e.** $\left(\frac{1}{4}\right)^2$

c. _____

d. _____

e. _____

Example

Tutor

6. STEM **The zoo has an aquarium that holds around 7^4 gallons of water. About how many gallons of water does the aquarium hold?**

$7^4 = 7 \times 7 \times 7 \times 7$ Write 7^4 as a product.

$= 2{,}401$ Multiply.

So, the aquarium holds about 2,401 gallons of water.

Got It? Do this problem to find out.

Show your work.

f. STEM Michigan has more than 10^4 inland lakes. Find the value of 10^4.

f. _____

Guided Practice

Check

Write each product using an exponent. (Examples 1 and 2)

1. $8 \times 8 \times 8 =$ _____

2. $1 \times 1 \times 1 \times 1 \times 1 =$ _____

Show your work.

Write each power as a product of the same factor. Then find the value. (Examples 3–5)

3. $\left(\frac{1}{7}\right)^3 =$ _____

4. $2^5 =$ _____

5. $1.4^2 =$ _____

6. Coal mines have shafts that can be as much as 7^3 feet deep. About how many feet deep into Earth's crust are these shafts? (Example 6)

_____

_____

7. **Building on the Essential Question** How is using exponents helpful? _____

_____

_____

_____

Rate Yourself!

How confident are you about powers and exponents? Shade the ring on the target.

For more help, go online to access a Personal Tutor.

Name _____ My Homework _____

Independent Practice

Go online for Step-by-Step Solutions eHelp

Write each product using an exponent. (Examples 1 and 2)

1. $6 \times 6 =$

Show your work.

2. $1 \times 1 \times 1 =$

3. $5 \times 5 \times 5 \times 5 \times 5 \times 5 =$

4. $12 \times 12 =$

5 $27 \times 27 \times 27 \times 27 =$

6. $15 \times 15 \times 15 =$

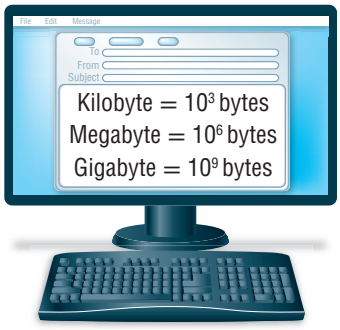
Write each power as a product of the same factor. Then find the value. (Examples 3–5)

7 $6^4 =$

8. $0.5^3 =$

9 $\left(\frac{1}{8}\right)^2 =$

10. CCSS **Identify Repeated Reasoning** A byte is a basic unit of measurement for information storage involving computers. (Example 6)



a. A kilobyte is equal to 10^3 bytes. Write 10^3 as a product of the same factor. Then find the value.

b. A megabyte is equal to 10^6 bytes. Write 10^6 as a product of the same factor. Then find the value.

c. How many more bytes of information are in a gigabyte than a megabyte? _____

Find the value of each expression.

11. $0.5^4 + 1 =$ _____

12. $3.2^3 \times 10 =$ _____

13. $10.3^3 + 8 =$ _____

H.O.T. Problems Higher Order Thinking

14. **Model with Mathematics** Write a power whose value is greater than 1,000. _____

15. **Persevere with Problems** Use the table to solve.

Powers of 2	Powers of 4	Powers of 10
$2^4 = 16$	$4^4 = 256$	$10^4 = 10{,}000$
$2^3 = 8$	$4^3 = 64$	$10^3 = 1{,}000$
$2^2 = 4$	$4^2 = 16$	$10^2 = 100$
$2^1 =$	$4^1 =$	$10^1 =$
$2^0 =$	$4^0 =$	$10^0 =$

a. Describe the pattern for the powers of 2.

Write 2^1 and 2^0 in the table. _____

b. Describe the pattern for the powers of 4.

Write 4^1 and 4^0 in the table. _____

c. Describe the pattern for the powers of 10. Write 10^1 and 10^0 in the table. _____

16. **Be Precise** Multiplication is defined as repeated addition. Use the word repeated to define exponential form. Justify your reasoning.

_____

_____

Georgia Test Practice

17. Jalisa is packing a moving truck. She can pack each layer with 7 boxes long and 7 boxes wide. The truck height is 7 layers tall. How many boxes can she pack in the truck?

Ⓐ 7 boxes

Ⓑ 21 boxes

Ⓒ 49 boxes

Ⓓ 343 boxes

Name _____ My Homework _____

Extra Practice

Write each product using an exponent.

18. $6 \times 6 \times 6 =$ 6^3

Homework Help

The factor 6 is used 3 times.
The base is 6.
The exponent is 3.

19. $10 \times 10 \times 10 =$ _____

20. $32 \times 32 \times 32 \times 32 =$ _____

21. $9 \times 9 =$ _____

22. $7 \times 7 \times 7 \times 7 \times 7 \times 7 =$ _____

23. $13 \times 13 \times 13 \times 13 \times 13 =$ _____

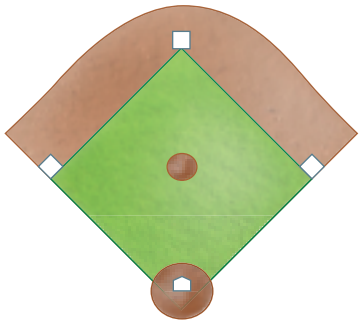
Write each power as a product of the same factor. Then find the value.

24. $3^7 =$ _____

25. $0.06^2 =$ _____

26. $\left(\frac{1}{4}\right)^3 =$ _____

27. CCSS **Be Precise** The baseball infield at the right has an area of 90^2 square feet What is the area of the infield?



_____

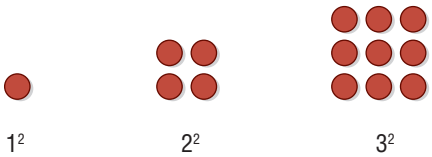
28. Last week Bakery Marvels baked 5^5 muffins. How many muffins did Bakery Marvels bake?

_____

29. Luke ran 3.5^3 miles in the month of January. How many miles did Luke run in January? _____

Georgia Test Practice

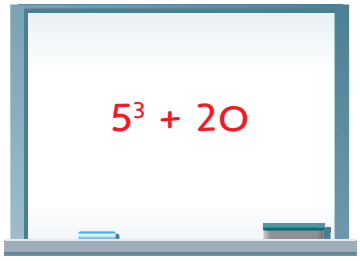
30. If the pattern of figures continues, which value represents the number of counters in the sixth figure in the pattern?



1^2 2^2 3^2

Ⓐ 1
Ⓑ 36
Ⓒ 729
Ⓓ 46,656

31. **Short Response** Mrs. Torrey wrote the expression below on the board for her students to solve. What is the value of the expression?



32. **Short Response** Mrs. Covington traveled about 8^4 miles from Ohio to Hawaii. About how many miles did Mrs. Covington travel?

Common Core Review

Multiply or divide. MCC4.NBT.5, MCC4.NBT.6

33. $6 \times 8 =$ _____

34. $64 \div 8 =$ _____

35. $42 \div 7 =$ _____

36. All video games are on sale at The Game House for $29 each. How much will Bella pay for 3 video games? MCC4.NBT.5

37. Max and two of his friends carpooled on a visit to the zoo. The cost of admission was $12 per person. Parking cost $7 per car. How much did the group pay on their visit to the zoo? MCC4.OA.3

Numerical Expressions

What You'll Learn

Scan the lesson. Predict two things you will learn about numerical expressions.

- _____
- _____

Essential Question

HOW is it helpful to write numbers in different ways?

Vocabulary

numerical expression
order of operations

Common Core GPS

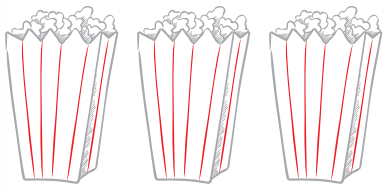
Content Standards
MCC6.EE.1

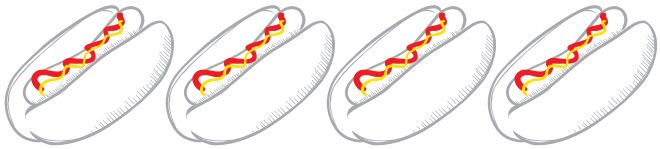
Mathematical Practices
1, 2, 3, 4, 5

Real-World Link

Snacks The table shows the cost of different snacks at a concession stand at the school hockey game.

Item	Price ($)
Popcorn	2
Juice or Soda	1
Hot Dog	4

1.  = $ ☐

2.  = $ ☐

3. Find the total cost of buying 3 boxes of popcorn and 4 hot dogs.

_____

4. What two operations did you use in Exercises 1–2? Explain how to find the answer to Exercise 3 using these operations.

_____

_____

Key Concept

Order of Operations

1. Simplify the expressions inside grouping symbols, like parentheses.
2. Find the value of all powers.
3. Multiply and divide in order from left to right.
4. Add and subtract in order from left to right.

Work Zone

A **numerical expression** like $3 \times 2 + 4 \times 4$ is a combination of numbers and operations. The **order of operations** tells you which operation to perform first so that everyone finds the same value for an expression.

Examples

Tutor

Find the value of each expression.

1. $10 - 2 + 8$

There are no grouping symbols or powers.

There are no multiplication or division symbols.

Add and subtract in order from left to right.

$10 - 2 + 8 = 8 + 8$ Subtract 2 from 10 first.

$= 16$ Add 8 and 8.

2. $4 + 3 \times 5$

There are no grouping symbols or powers.

Multiply before adding.

$4 + 3 \times 5 = 4 + 15$ Multiply 3 and 5.

$= 19$ Add 4 and 15.

Show your work.

Got It? Do these problems to find out.

a. $10 + 2 \times 15$

b. $16 \div 2 \times 4$

a. _____

b. _____

Parentheses and Exponents

Expressions inside grouping symbols, such as parentheses are simplified first. Follow the order of operations inside parentheses. For example in the expression $3 + (4^2 + 5)$, you will need to find the value of the power, 4^2, before you can add the expression inside the parentheses.

STOP and Reflect

Why is it important to have the order of operations?

Examples

Tutor

Find the value of each expression.

3. $20 \div 4 + 17 \times (9 - 6)$

$20 \div 4 + 17 \times (9 - 6) = 20 \div 4 + 17 \times 3$ Subtract 6 from 9.

$= 5 + 17 \times 3$ Divide 20 by 4.

$= 5 + 51$ Multiply 17 by 3.

$= 56$ Add 5 and 51.

4. $3 \times 6^2 + 4$

$3 \times 6^2 + 4 = 3 \times 36 + 4$ Find 6^2.

$= 108 + 4$ Multiply 3 and 36.

$= 112$ Add 108 and 4.

5. $5 + (8^2 - 2) \times 2$

$5 + (8^2 - 2) \times 2 = 5 + (\square - 2) \times 2$ Simplify the exponent.

$= 5 + \square \times 2$ Simplify inside parentheses.

$= 5 + \square$ Multiply.

$= \square$ Add.

Got It? Do these problems to find out.

c. $25 \times (5 - 2) \div 5 - 12$

d. $24 \div (2^3 + 4)$

Show your work.

c. _____

d. _____

Example

Watch Tutor

6. **Write an expression for the total cost of 5 lotions, 2 candles, and 4 lip balms. Find the total cost.**

Cost of Items			
Item	Lotion	Candle	Lip balm
Cost ($)	5	7	2

$5 \times \$5 + 2 \times \$7 + 4 \times \$2$

$= 5^2 + 2 \times 7 + 4 \times 2$ Simplify 5^2 to find the cost of the lotions.

$= 25 + 2 \times 7 + 4 \times 2$

$= 25 + 14 + 4 \times 2$ Multiply 2 and 7 to find the cost of the candles.

$= 25 + 14 + 8$ Multiply 4 and 2 to find the cost of the lip balms.

$= 47$

The total cost of the items is $47.

Got It? **Do this problem to find out.**

e. Alexis and 3 friends are at the mall. Each person buys a pretzel for $4, sauce for $1, and a drink for $2. Write an expression for the total and find the total cost.

Show your work.

e. _____

Guided Practice

Check

Find the value of each expression. (Examples 1–5)

1. $9 + 3 - 5 =$

2. $(26 + 5) \times 2 - 15 =$

3. $5^2 + 8 \div 2 =$

Show your work.

4. **Financial Literacy** Tickets to a play cost $10 for members and $24 for nonmembers. Write an expression to find the total cost of 4 nonmember tickets and 2 member tickets. Then find the total cost. (Example 6)

5. **Building on the Essential Question** How are grouping symbols helpful in simplifying expressions correctly?

Rate Yourself!

How well do you understand order of operations? Circle the image that applies.

Clear | Somewhat Clear | Not So Clear

For more help, go online to access a Personal Tutor. Tutor

Name _____ My Homework _____

Independent Practice

Go online for Step-by-Step Solutions eHelp

Find the value of each expression. (Examples 1–5)

1. $8 + 4 - 3 =$ _____

Show your work.

2. $38 - 19 + 12 =$ _____

3. $7 + 9 \times (3 + 8) =$ _____

4. $15 - 2^3 \div 4 =$ _____

5 $55 \div 11 + 7 \times (2 + 14) =$ _____

6. $5^3 - 12 \div 3 =$ _____

7. $8 \times (2^4 - 3) + 8 =$ _____

8. $9 + 4^3 \times (20 - 8) \div 2 + 6 =$ _____

9. Financial Literacy Tyree and four friends go to the movies. Each person buys a movie ticket for $7, a snack for $5, and a drink for $2. Write an expression for the total cost of the trip to the movies. Then find the total cost. (Example 6)

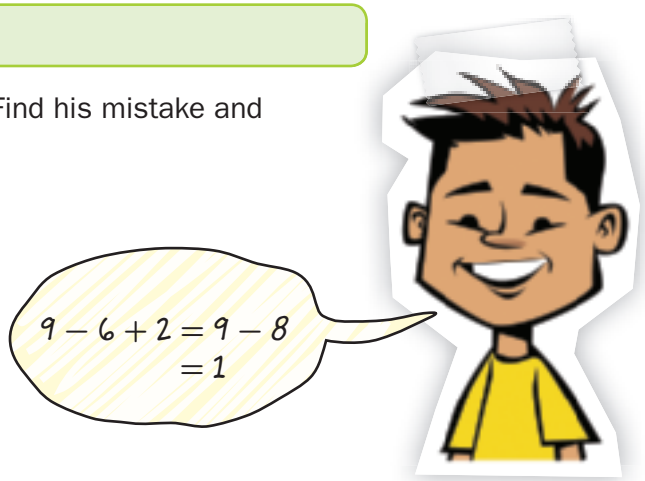
10. Financial Literacy The Molina family went to a concert together. They purchased 4 concert tickets for $25 each, 3 T-shirts for $15 each, and a poster for $10. Write an expression for the total cost. Then find the total cost. (Example 6)

11 **Use Math Tools** A wholesaler sells rolls of fruit snacks in two sizes of bags. The table shows the number of rolls that come in each bag. Write an expression that could be used to determine the number of rolls in 3 large bags and 2 small bags. Then find the number of rolls.

Bag	Number of Rolls
Large	10
Small	5

H.O.T. Problems Higher Order Thinking

12. **Find the Error** Luis is finding $9 - 6 + 2$. Find his mistake and correct it.



13. **Reason Inductively** Use the expression $34 - 12 \div 2 + 7$.

a. Place parentheses in the expression so that the value of the expression is 18.

b. Place parentheses in the expression to find a value other than 18. Then find the value of the new expression.

14. **Persevere with Problems** Write an expression with a value of 10. It should contain four numbers and two different operations.

Georgia Test Practice

15. Arleta is 2 years younger than Josh, and Josh is 5 years older than Monica, who is 9 years old. Which expression could you use to find Arleta's age?

Ⓐ $9 + 5 + 2$ Ⓒ $9 - 5 + 2$

Ⓑ $2 + 9 - 5$ Ⓓ $9 + 5 - 2$

Name _____ My Homework _____

Extra Practice

Find the value of each expression.

16. $9 + 12 - 15 =$ 6

Homework Help

$9 + 12 - 15 = 21 - 15$
$= 6$

17. $22 - 17 + 8 =$ _____

18. $(9 + 2) \times 6 - 5 =$ _____

19. $27 \div (3 + 6) \times 5 - 12 =$ _____

20. $26 + 6^2 \div 4 =$ _____

21. $22 \div 2 \times 3^2 =$ _____

22. $12 \div 4 + (5^2 - 6) =$ _____

23. $96 \div 4^2 + (25 \times 2) - 15 - 3 =$ _____

24. **Financial Literacy** Admission to a circus is $16 for adults and $8 for children. Write an expression to find the total cost of 3 adult tickets and 8 children's tickets. Then find the total cost.

_____

_____

25. CCGPS **Reason Inductively** Addison is making caramel apples. She has $2\frac{1}{2}$ bags of apples. One full bag has 8 apples, and each apple weighs 5 ounces. Write an expression that could be used to find the total number of ounces of apples Addison has. Then find the total number of ounces.

_____

_____

Georgia Test Practice

26. Kailey wants to buy 4 pencils and 3 notebooks. Which expression shows how to find the total cost of 4 pencils and 3 notebooks?

Pencils	$0.50
Notebooks	$2.25

Ⓐ $3(\$0.50) + 4(\$2.25)$

Ⓑ $4(\$0.50) - 3(\$2.25)$

Ⓒ $4(\$0.50) + 3(\$2.25)$

Ⓓ $4(\$0.50) \times 3(\$2.25)$

27. Denzel had $3\frac{2}{5}$ boxes of party favors. One full box contained 15 bags of favors, and each bag had 3 items in it. Which expression could be used to find the total number of items Denzel had?

Ⓕ $3\frac{2}{5} + 15 \times 3$

Ⓖ $3\frac{2}{5} \times 15 \times 3$

Ⓗ $3\frac{2}{5} \times 15 + 3$

Ⓘ $3\frac{2}{5}(15 + 3)$

28. Short Response Evaluate $5^2 \div 5 \times 3 + 9$.

_____

Common Core Review

Find the missing number. MCC4.NBT.4

29. $131 + \square = 140$

30. $\square - 6 = 354$

31. $\square + 210 = 224$

32. Use skip counting and the number line to find the missing number. MCC4.OA.5

$3 \times \square = 12$

33. Sophie earns $7 an hour babysitting and $8 an hour for cleaning the house. Last week she babysat for 3 hours and cleaned for 2 hours.

How much did Sophie earn last week? MCC4.OA.3 _____

Algebra: Variables and Expressions

What You'll Learn

Scan the lesson. List two real-world scenarios in which you would use variables and expressions.

- _____
- _____

Essential Question

HOW is it helpful to write numbers in different ways?

Vocabulary

algebra
variable
algebraic expression
evaluate

Common Core GPS

Content Standards
MCC6.EE.2, MCC6.EE.2c, MCC6.EE.6

Mathematical Practices
1, 2, 3, 4, 6

Vocabulary Start-Up

Algebra is a language of symbols including variables. A **variable** is a symbol, usually a letter, used to represent a number.

Scan the lesson to complete the graphic organizer.

Math Meaning	Everyday Meaning
variable	
Example	**Non-example**

Real-World Link

A box contains an unknown number of markers. There are 2 markers outside the box. The total number of markers is represented by the bar diagram below.

unknown number of markers	2 markers

1. Suppose there are 14 markers in the box. Find the total number of markers. Explain your answer. _____

Work Zone

Evaluate One-Step Expressions

Algebraic expressions contain at least one variable and at least one operation. For example, the expression $n + 2$ represents *the sum of an unknown number and two.*

Any letter can be used as a variable. ⟶ $n + 2$

The letter x is often used as a variable. To avoid confusion with the symbol $\times$, there are other ways to show multiplication.

$5 \cdot x$	$5(x)$	$5x$
5 times x	5 times x	5 times x

The variables in an expression can be replaced with any number. Once the variables have been replaced, you can **evaluate**, or find the value of, the algebraic expression.

Examples

Tutor

1. **Evaluate $16 + b$ if $b = 25$.**

$16 + b = 16 + 25$ Replace b with 25.

$= 41$ Add 16 and 25.

2. **Evaluate $x - y$ if $x = 64$ and $y = 27$.**

$x - y = 64 - 27$ Replace x with 64 and y with 27.

$= 37$ Subtract 27 from 64.

Show your work.

3. **Evaluate $6x$ if $x = \frac{1}{2}$.**

$6x = 6 \cdot \frac{1}{2}$ Replace x with $\frac{1}{2}$.

$= 3$ Multiply 6 and $\frac{1}{2}$.

a. _____

b. _____

c. _____

d. _____

Got It? **Do these problems to find out.**

Evaluate each expression if $a = 6$, $b = 4$, and $c = \frac{1}{3}$.

a. $a + 8$ **b.** $a - b$ **c.** $a \cdot b$ **d.** $9c$

Evaluate Multi-Step Expressions

To evaluate multi-step expressions, replace each variable with the correct value and follow the order of operations.

Examples

Tutor

4. **Evaluate $5t + 4$ if $t = 3$.**

$5t + 4 = 5 \cdot 3 + 4$ Replace t with 3.

$= 15 + 4$ Multiply 5 and 3.

$= 19$ Add 15 and 4.

5. **Evaluate $4x^2$ if $x = \frac{1}{8}$.**

$4x^2 = 4 \cdot \left(\frac{1}{8}\right)^2$ Replace x with $\frac{1}{8}$.

$= 4 \cdot \frac{1}{64}$ Simplify $\left(\frac{1}{8}\right)^2$.

$= \frac{1}{16}$ Multiply.

6. **Evaluate $10a + 7$ if $a = \frac{1}{5}$.**

$10a + 7 = 10\left(\frac{\square}{\square}\right) + 7$ Replace a with $\frac{1}{5}$.

$= \square + 7$ Multiply 10 and $\frac{1}{5}$.

$= \square$ Add.

Got It? **Do these problems to find out.**

Evaluate each expression if $d = 12$ and $e = \frac{1}{3}$.

e. $2d - 5$

f. $50 - 3d$

g. $9e^2$

Show your work.

e. _____

f. _____

g. _____

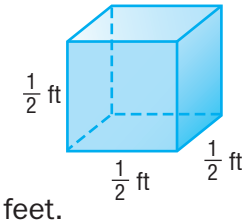
Example

7. **Khalil is wrapping a gift for his brother's birthday. The box has side lengths that are $\frac{1}{2}$ foot. Use the expression $6s^2$, where s represents the length of a side, to find the surface area of the box he is wrapping. Write your answer in square feet.**

$6s^2 = 6 \cdot \left(\frac{1}{2}\right)^2$ Replace s with $\frac{1}{2}$.

$= 6 \cdot \frac{1}{4}$ Simplify $\left(\frac{1}{2}\right)^2$.

$= \frac{6}{4}$ or $1\frac{1}{2}$ Multiply.



So, the surface area of the box is $1\frac{1}{2}$ square feet.

Guided Practice

Evaluate each expression if $m = 4$, $z = 9$, and $r = \frac{1}{6}$. (Examples 1–6)

1. $3 + m$ _____

Show your work.

2. $z - m$ _____

3. $12r$ _____

4. $4m - 2$ _____

5. $60r - 4$ _____

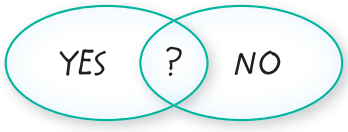
6. $3r^2$ _____

7. The amount of money that remains from a 20-dollar bill after Malina buys 4 party favors for p dollars each is $20 - 4p$. Find the amount remaining if each favor cost $3. (Example 7) _____

8. **Building on the Essential Question** How are numerical expressions and algebraic expressions different?

Rate Yourself!

Are you ready to move on? Shade the section that applies.



For more help, go online to access a Personal Tutor.

Name _____ My Homework _____

Independent Practice

Go online for Step-by-Step Solutions eHelp

Evaluate each expression if $m = 2$, $n = 16$, and $p = \frac{1}{3}$. (Examples 1–6)

1. $m + 10$ _____

Show your work.

2. $n \div 4$ _____

3. $m + n$ _____

4. $6m - 1$ _____

5. $3p$ _____

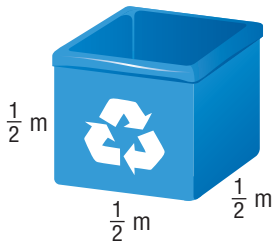
6. $12p$ _____

7 $12m - 4$ _____

8. $9p^2$ _____

9. A paper recycling bin has the dimensions shown. Use the expression s^3, where s represents the length of a side, to find the volume of the bin. Write your answer in cubic meters. (Example 7)

_____



10. CCSPS **Model with Mathematics** Refer to the graphic novel frame below for Exercises a–b.

a. What is the total cost for one individual admission and one individual movie pass on Family Night? _____

b. The expression $14.50x$ can be used to find the total cost for x tickets on Family Night for admission and the movie. What is the cost for 3 tickets? _____

11 Financial Literacy Julian earns $13.50 per hour. His company deducts 23% of his pay each week for taxes. Julian uses the expression $0.77(13.50h)$ to compute his earnings after taxes for the hours h he works. What will be his earnings after taxes, if he works 40 hours?

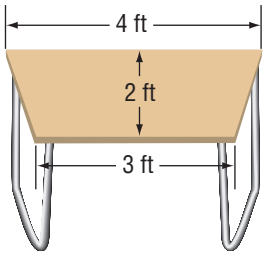
Evaluate each expression if $x = 3$, $y = 12$, and $z = 8$.

12. $4z + 8 - 6$ _____

13. $7z \div 4 + 5x$ _____

14. $y^2 \div (3z)$ _____

15. CCSPS **Be Precise** To find the area of a trapezoid, use the expression $\frac{1}{2}h(b_1 + b_2)$, where h represents the height, b_1 represents the length of the top base, and b_2 represents the length of the bottom base. What is the area of the trapezoidal table?



H.O.T. Problems Higher Order Thinking

16. CCSPS **Persevere with Problems** Isandro and Yvette each have a calculator. Yvette starts at 100 and subtracts 7 each time. Isandro starts at zero and adds 3 each time. If they press the keys at the same time, will their displays ever show the same number? If so, what is the number?

17. CCSPS **Reason Abstractly** Provide an example of a numerical expression and one example of an algebraic expression. Explain.

Georgia Test Practice

18. Evaluate the expression $36y + 9$ if $y = \frac{1}{6}$.

Ⓐ 14 Ⓒ 51

Ⓑ 15 Ⓓ 225

Name _____ My Homework _____

Extra Practice

Evaluate each expression if $m = 2$, $n = 16$, and $g = \frac{1}{5}$.

19. $n + 8$ 24

$n + 8 = 16 + 8$
$= 24$

Homework Help

20. $12 \div m$ _____

21. $n - m$ _____

22. $2n - 6$ _____

23. $15g$ _____

24. $45g$ _____

25. $7m + 8$ _____

26. $50g^2$ _____

27. Financial Literacy Colton earns $7 per hour plus $1.50 for each pizza delivery. The expression $7h + 1.50d$ can be used to find the total earnings after h hours and d deliveries have been made. How much money will Colton earn after working 15 hours and making 8 deliveries?

_____

_____

28. Be Precise As a member of a music club, you can order CDs for $14.99 each. The music club also charges $4.99 for each shipment. The expression $14.99n + 4.99$ represents the cost of n CDs. Find the total cost for ordering 3 CDs.

_____

Evaluate each expression if $a = \frac{1}{2}$, $b = 15$, and $c = 9$.

29. $c^2 + a$ _____

30. $2ac$ _____

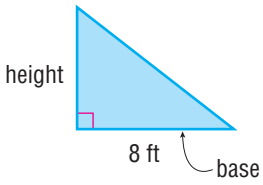
31. $b^2 - 5c$ _____

32. What is the value of $st \div (6r)$ if $r = 5$, $s = 32$, and $t = 45$?

_____

Georgia Test Practice

33. The height of the triangle below can be found using the expression $48 \div b$ where b is the base of the triangle. Find the height of the triangle.



Ⓐ 4 ft
Ⓑ 6 ft
Ⓒ 8 ft
Ⓓ 10 ft

34. Short Response The expression 4s can be used to find the perimeter of a square where s represents the length of a side. What is the perimeter of a square with side lengths of 26.2 inches?

_____

35. The table shows the total medal counts for different countries from the 2008 Summer Olympic games.

Total Medal Count	
Country	**Number of Medals**
Germany	41
United States	110
Canada	x
France	40
Russia	72
Japan	25

Which expression represents the total number of medals earned by all the countries listed in the table?

Ⓕ $288 - x$
Ⓖ $2x + 288$
Ⓗ $x - 288$
Ⓘ $288 + x$

Common Core Review

Write the symbol $<$, $>$, or $=$ for each description. MCC4.NF.2, MCC4.NF.7

36. equal to _____

37. greater than _____

38. less than _____

39. Write a number sentence to show that *two plus four equals six*. MCC5.OA.2

_____

40. Write a number sentence to show *the sum of fourteen and eight is twenty-two*. MCC5.OA.2

_____

41. Gianna skied three times farther than Xavier. Xavier skied four miles. How far did Gianna ski? MCC4.NBT.5

_____

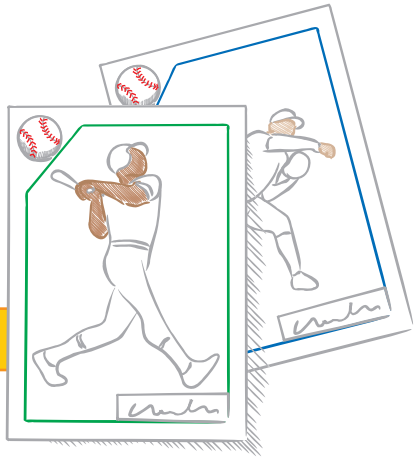
Inqury Lab
Write Expressions

Inquiry **HOW can bar diagrams help you to write expressions in which letters stand for numbers?**

Content Standards
MCC6.EE.2, MCC6.EE.2a, MCC6.EE.2b

Mathematical Practices
1, 3, 4

Baseball Cards Kevin has 6 more baseball cards than Elian. Write an algebraic expression to represent the number of baseball cards Kevin has.



What do you know? _____

_____

What do you need to know? _____

_____

Investigation 1

Algebraic expressions are similar to numerical expressions.

Step 1 Elian has an unknown number of baseball cards *c*. Use a bar diagram to show Elian's cards.

Elian | ***c* cards** |

Step 2 Kevin has 6 more baseball cards than Elian. Complete the bar diagram below to show how many baseball cards Kevin has.

Kevin | ***c* cards** | ☐ **cards** |

So, Kevin has ☐ + ☐ baseball cards.

Recall that the terms of an expression are separated by addition or subtraction signs.

How many terms are in the expression? ☐

Does the expression represent a *sum*, *difference*, *product*, or *quotient*?

_____

Investigation 2

Sam sent 10 fewer messages in July than in August. Write an algebraic expression to represent the number of text messages Sam sent in July.

Step 1 Sam sent an unknown number of messages m in August. Label the bar diagram to represent the messages Sam sent in August.

Step 2 Sam sent 10 fewer messages in July. Label the bar diagram to show the messages Sam sent in July.

So, Sam sent ☐ − 10 messages in July.

How many terms are in the expression? ☐

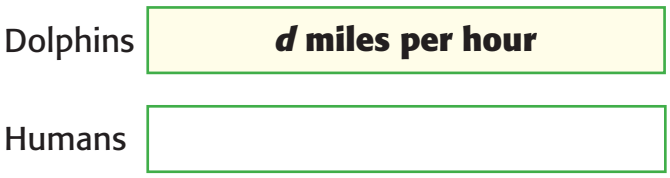
Does the expression represent a *sum*, *difference*, *product*, or *quotient*?

Investigation 3

A bottlenose dolphin can swim d miles per hour. Humans swim one third as fast as dolphins. Write an algebraic expression that could be used to find out how fast humans can swim.

Step 1 Dolphins can swim an unknown number of miles per hour d. Use a bar diagram to represent the speed a dolphin swims.

Step 2 Humans swim one third as fast as dolphins. Divide and shade a second bar diagram to represent the speed humans can swim.



So, humans can swim ☐ ÷ ☐ miles per hour.

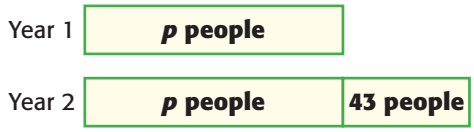
How many terms are in the expression? ☐

Does the expression represent a *sum*, *difference*, *product*, or *quotient*?

Collaborate

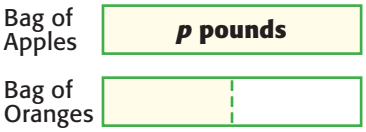
Work with a partner. Write a real-world problem and algebraic expression for each situation modeled.

1.



Show your work.

2.



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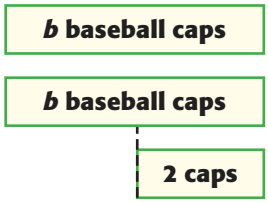

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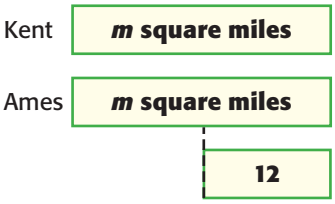

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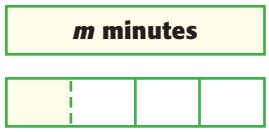

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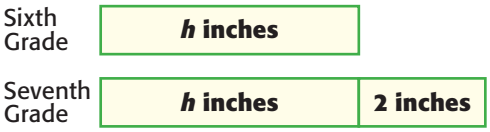


Analyze

Work with a partner to complete the table. The first one is done for you.

	Algebraic Expression	Word Phrase	Model
	$t + 8$	the sum of a number and 8	t | 8
7.	$r - 4$		
8.	$5w$		
9.	$\frac{c}{3}$		
10.	$7 + m$		

11. **Reason Inductively** Write an algebraic expression that represents *a number y divided by 10.* _____

Reflect

12. **Model with Mathematics** Write a real-world situation and an algebraic expression that is represented by the bar diagram.

w	w	w	3

_____

_____

13. HOW can bar diagrams help you to write expressions in which letters stand for numbers?

_____

_____

Algebra: Write Expressions

What You'll Learn

Scan the lesson. List two headings you would use to make an outline of the lesson.

- _____
- _____

Essential Question

HOW is it helpful to write numbers in different ways?

Vocabulary

defining the variable

Common Core GPS

Content Standards
MCC6.EE.2, MCC6.EE.2a, MCC6.EE.2c, MCC6.EE.6

Mathematical Practices
1, 2, 3, 4, 6

Real-World Link

Watch

Airports Missouri has 8 major commercial airports. California has 24 major commercial airports.

1. Alabama has 4 fewer airports than Missouri.

a. Underline the key math word in the problem.

b. Circle the operation you would use to determine how many airports are located in Alabama. Explain.

\+ − × ÷

_____

_____

_____

2. California has three times as many airports as Georgia.

a. Underline the key math word in the problem.

b. Circle the operation would you use to find how many airports Georgia has. Explain.

\+ − × ÷

_____

_____

_____

3. Missouri has two times as many airports as Ohio. How many airports does Ohio have?

8 ◯ 2 = _____

Work Zone

Write Phrases as Algebraic Expressions

To write verbal phrases as algebraic expressions, follow the steps below. In the second step, **defining the variable**, choose a variable and decide what it represents.

Words	Describe the situation. Use only the most important words.
Variable	Choose a variable to represent the unknown quantity.
Expression	Translate your verbal phrase into an algebraic expression.

Examples

Tutor

Write each phrase as an algebraic expression.

1. ***eight dollars more than Ryan earned***

Words	eight dollars more than Ryan earned
Variable	Let d represent the number of dollars Ryan earned.
Model	Ryan's earnings: a bar labeled d, and a bar labeled d and 8
Expression	The expression is $d + 8$.

2. ***ten dollars less than the original price***

Words	ten dollars less than the original price
Variable	Let p represent the original price.
Model	original price: a bar labeled p, a bar labeled p, and a segment labeled \$10
Expression	The expression is $p - 10$.

Less Than

You can write *ten more than a number* as either $10 + p$ or $p + 10$. But *ten less than a number* can only be written as $p - 10$.

3. ***four times the number of gallons***

Words	four times the number of _____
Variable	Let _____ represent _____.
Model	number of gallons [ ]
Expression	The expression is _____.

Show your work.

a. _____

b. _____

c. _____

Got It? **Do these problems to find out.**

a. four points fewer than the Bulls scored

b. 12 times the number of feet

c. the total cost of a shirt and an $8 pair of socks

Write Two-Step Expressions

Two-step expressions contain two different operations.

Example

Tutor

4. **Write the phrase *5 less than 3 times the number of points* as an algebraic expression.**

Words	5 less than 3 times the number of points
Variable	Let p represent the number of points.
Model	number of points: [p][p][p] with [5] below the last p
Expression	The expression is $3p - 5$.

Got It? **Do this problem to find out.**

d. Write the phrase *$3 more than four times the cost of a pretzel* as an algebraic expression.

d. _____

Example

5. **Terri bought a magazine for $5, and 2 bottles of nail polish. Write an expression to represent the total amount she spent. Then find the total amount if each bottle of nail polish cost $3.**

Step 1 The nail polish costs an unknown amount. Use d to represent the cost of the nail polish.

Step 2 She bought 2 bottles of polish plus a magazine.

total amount	***d* dollars**	***d* dollars**	**$5**

The expression is $2 \times d + 5$ or $2d + 5$.

$2d + 5 = 2(3) + 5$ Replace d with 3.

$= 6 + 5$ Multiply.

$= 11$ Add.

So, the total amount is $11.

Guided Practice

Define a variable and write each phrase as an algebraic expression.
(Examples 1–4)

1. four times more money than Elliot _____
2. half as many pages as George _____
3. the width of a box that is 4 inches less than the length _____
4. the cost of 5 CDs and a $12 DVD _____

5. Shoko bought a box of popcorn for $3.50 and three medium drinks. Define a variable and write an expression to represent the total amount they spent. Then find the total amount if one drink costs $1.50. (Example 5)

6. **Building on the Essential Question** How can writing phrases as algebraic expressions help you solve problems?

Rate Yourself!

☐ I understand how to write algebraic expressions.

Great! You're ready to move on!

☐ I still have some questions about writing algebraic expressions.

No Problem! Go online to access a Personal Tutor.

Name _____ My Homework _____

Independent Practice

Go online for Step-by-Step Solutions eHelp

Define a variable and write each phrase as an algebraic expression.
(Examples 1–4)

1. six feet less than the width

2. 6 hours more per week than Theodore studies

3 six years less than Tracey's age

4. 2 less than one third of the points that the Panthers scored

5 The United States House of Representatives has 35 more members than four times the number of members in the United States Senate. Define a variable and write an expression to represent the number of members in the House of Representatives. Then find the number of members in the House of Representatives, if there are 100 members in the Senate.
(Example 5)

6. CCSPS **Multiple Representations** Dani uses the table to help her convert measurements when she is sewing.

Number of feet	3	6	9	12
Number of yards	1	2	3	4

a. Words Describe the relationship between the number of feet and the number of yards.

b. Symbols Write an expression for the number of yards in f feet.

c. Numbers Find the number of yards in 63 feet.

7. CCSPS **Be Precise** An inch is equal to about 2.54 centimeters. Write an expression which estimates the number of centimeters in x inches. Then estimate the number of centimeters in 12 inches.

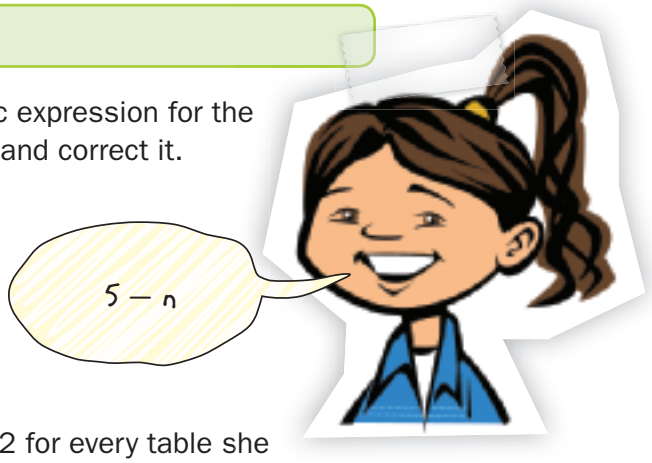
8. **Financial Literacy** A Euro was equal to about 1.2 American dollars on a recent day. Write an expression which estimates the number of dollars in x Euros. Then estimate the number of American dollars equal to 25 Euros. _____

9. Justin is 2 years older than one third Marcella's age. Aimee is four years younger than 2 times Justin's age. Define a variable and write an expression to represent Justin's age. Then find Justin's age and Aimee's age if Marcella is 63 years old.

_____

H.O.T. Problems Higher Order Thinking

10. CCGPS **Find the Error** Elisa is writing an algebraic expression for the phrase *5 less than a number.* Find her mistake and correct it.



_____

11. CCGPS **Persevere with Problems** Wendy earns $2 for every table she serves plus 20% of the total customer order. Define a variable and write an expression to represent the amount of money she earns for one table.

_____

12. CCGPS **Justify Conclusions** If n represents the amount of songs stored on an MP3 player, analyze the meaning of the expressions $n + 7$, $n - 2$, $4n$, and $n \div 2$.

_____

Georgia Test Practice

13. The rates for renting a car are shown.

Glades Car Rental	
Cost per day	$19.00
Cost per mile	$0.15

Which expression could be used to find the cost of renting a car for 3 days and driving m miles?

Ⓐ $19 + 0.15m$ Ⓒ $3 \times 19 + 0.15m$

Ⓑ $19m + 3 \times 0.15$ Ⓓ $3m + 19 \times 0.15$

Name _____ My Homework _____

Extra Practice

Define a variable and write each phrase as an algebraic expression.

14. four times as many apples a = the number of apples; $4 \times a$ or $4a$

Homework Help

15. ten more shoes than Ruben _____

16. $5 dollars less on dinner than James spent _____

17. 3 more than twice as many ringtones as Mary _____

18. Melinda goes bowling on Saturday afternoons. She bowls three games and pays for shoe rental. Define a variable and write an expression to represent the total cost Melinda pays. Then find the total cost if one game cost $4. _____

Bowl-A-Rama	
One Game	■
Shoe Rental	$2

19. Kiyo bought a pizza for $12.75 and four medium drinks at Pauli's Pizza. Define a variable and write an expression to represent the total amount of money he spent. Then find the total cost if one drink costs $3.

20. Moesha's music library has 17 more than two times the number of songs than Damian's music library. Define a variable and write an expression to represent the number of songs in Moesha's music library. Then find the number of songs in Moesha's library if Damian has 5 songs in his library.

21. CCSPS **Reason Abstractly** Cierra has 3 more than one half as many purses as Aisha. Define a variable and write an expression to represent the number of purses in Cierra's collection. Then find the number of purses in Cierra's collection if Aisha has 12 purses.

Georgia Test Practice

22. Marco and his friends bought game tokens for $15 and three admission tickets to Fun Palace. Which expression could be used to represent the total amount of money they spent if t represents the cost of tickets?

Ⓐ $3t + 15$ Ⓒ $3t - 15$

Ⓑ $15t + 3$ Ⓓ $3t \div 15$

23. The number of students at Parkerville High School is 21 less than 2 times the number of students at Midtown Middle School. Which expression could be used to represent the total number of students at Parkerville High School if s represents the number of students at Midtown High School?

Ⓕ $2s + 21$ Ⓗ $2s - 21$

Ⓖ $21 - 2s$ Ⓘ $12 + 2s$

24. **Short Response** Carmen bought a plant that is 4 centimeters tall. Each week, the plant grows an additional 2 centimeters. Write an expression to show the height of the plant after w weeks.

_____

Common Core Review

Evaluate each expression. MCC5.NBT.7

25. $7 + 0.8 =$ _____

26. $8.3 \times 1 =$ _____

27. $3.5 + (4 + 7) =$ _____

28. Samantha ran five miles each day for seven days. Mariska ran seven miles each day for five days. Did the girls run the same distance? Explain. MCC4.OA.2

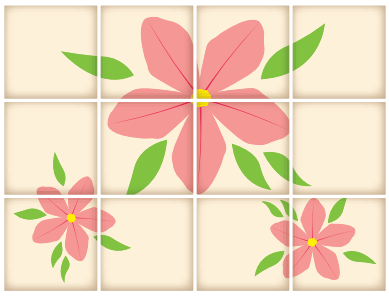
_____

_____

29. Michele is painting a tile backsplash for her kitchen sink. Write two multiplication sentences to find the total number of tiles Michele is painting. MCC4.NBT.5

_____

_____



Act It Out

Content Standards
MCC6.EE.2
Mathematical Practices
1, 3, 4

Case #1 Table Trouble

Ariana is arranging tables for her volleyball banquet. The rectangular tables can seat up to 6 people. She can line up tables to seat more people.

How many people can be seated using four tables?

1 Understand ***What are the facts?***

Each rectangular table can seat up to 6 people.

2 Plan ***What is your strategy to solve this problem?***

Use the rectangle to represent one table. Use counters to represent each seat. Draw an X to show where each counter was placed.

3 Solve ***How can you apply the strategy?***

Act out the situation to find the number seats at four tables. Use counters to represent each seat. Draw an X to show where each counter was placed.

Four tables can seat ____ people.

4 Check ***Does the answer make sense?***

Use the expression $4x + 2$, where x represents the number of tables.

So, ____ × ____ + ____ = ____. ✓

Analyze the Strategy

Tutor

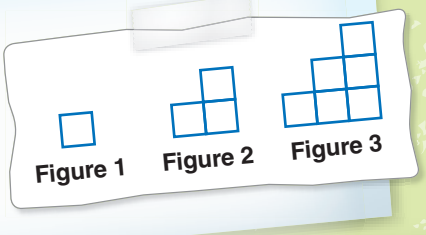
Reason Inductively Explain how the *act it out* strategy could help you check the reasonableness of answers. _____

_____

Case #2 Step It Up

Assume the pattern continues in the figures at the right.

Find the number of squares in Figure 5.



1 Understand

Read the problem. What are you being asked to find?

I need to find _____.

Underline key words and values in the problem.
What information do you know?

Figure 1 has ☐ square. Figure 2 has ☐ squares. Figure 3 has ☐ squares.

2 Plan

Choose a problem-solving strategy.

I will use the _____ strategy.

3 Solve

Use your problem-solving strategy to solve the problem. Make a guess.

Use counters to recreate the figures.
Use 1 counter for Figure 1, 3 counters for Figure 2, and 6 counters for Figure 3.

☐ counters are added to Figure 1 to make Figure 2.

☐ counters are added to Figure 2 to make Figure 3.

Add ☐ counters to Figure 3 to make Figure 4.

Then add ☐ counters to Figure 4 to make Figure 5.

So, _____.

4 Check

Use information from the problem to check your answer.

To check your answer, draw a model. Draw two additional squares for the first figure, three additional squares for the second figure, and so on.

Collaborate Work with a small group to solve the following cases. Show your work on a separate piece of paper.

Case #3 Teams

Twenty-four students will be divided into four equal-size teams. Each student will count off, beginning with the number 1 as the first team.

If Nate is the eleventh student to count off, to which team number will he be assigned?

Case #4 Savings

Dakota has $2 in her savings account. Each week she adds $3.

How much money does Dakota have after 5 weeks? after n weeks?

Case #5 Geometry

Suppose the pattern at the right continues.

How many toothpicks are used to create Figure 6?

Figure 1 Figure 2 Figure 3

Case #6 School

The birth months of the students in Miss Desimio's geography class are shown.

Birth Months		
June	July	April
March	July	June
October	May	August
June	April	October
May	October	April
September	December	January

How many more students were born in June than in August?

Circle a strategy below to solve the problem.

- *Look for a pattern.*
- *Solve a simpler problem.*
- *Use logical reasoning.*
- *Make a table.*

Mid-Chapter Check

Vocabulary Check

1. **Be Precise** Define *powers*. Provide an example of power with an exponent of 2. (Lesson 1)

2. Fill in the blank in the sentence below with the correct term. (Lesson 2)

   The _____ tells you which operation to perform first so that everyone finds the same value for an expression.

Skills Check and Problem Solving

Write each power as a product of the same factor. Then find the value. (Lesson 1)

3. $7^2 =$ _____

4. $5^5 =$ _____

Evaluate each expression if $x = 6$. (Lesson 3)

5. $x + 11$ _____

6. $4(x - 5)$ _____

7. $2x \div 6$ _____

8. **Reason Abstractly** Tia is 8 years younger than her sister Annette. Annette is y years old. Write an algebraic expression that describes Tia's age. (Lesson 4)

9. **Georgia Test Practice** The cost of a shirt and pair of pants is shown. Which of the following expressions can be used to find the cost of 4 shirts and 3 pairs of pants? (Lesson 2)

   Ⓐ $4 \times \$16 \times 3 \times \$23$

   Ⓑ $4 \times \$16 + 3 \times \$23$

   Ⓒ $4 + \$16 \times 3 + \$23$

   Ⓓ $4 + \$16 + 3 + \$23$

Lesson 5

Algebra: Properties

What You'll Learn

Scan the lesson. Predict two things you will learn about properties.

- _____
- _____

Essential Question

HOW is it helpful to write numbers in different ways?

Vocabulary

properties
Commutative Properties
Associative Properties
Identity Properties
equivalent expressions

Common Core GPS

Content Standards
MCC6.EE.3

Mathematical Practices
1, 2, 3, 4, 5

Real-World Link

Baking Angelica and Nari are baking cookies for a bake sale fundraiser. Angelica baked 6 sheets with 10 cookies each and Nari baked 10 sheets with 6 cookies each.

1. How many total cookies can Angelica bake?

6 ◯ 10 = ☐

2. How many total cookies did Nari bake?

10 ◯ 6 = ☐

3. What do you notice about your answers for Exercises 1 and 2?

_____

_____

4. What do these exercises suggest about the order in which factors are multiplied?

_____

_____

Key Concept

Use Properties to Compare Expressions

Work Zone

Commutative Properties The order in which two numbers are added or multiplied does not change their sum or product.

$7 + 9 = 9 + 7$ $\quad 4 \cdot 6 = 6 \cdot 4$

$a + b = b + a$ $\quad a \cdot b = b \cdot a$

Associative Properties The way in which three numbers are grouped when they are added or multiplied does not change their sum or product.

$3 + (9 + 4) = (3 + 9) + 4$ $\quad 8 \cdot (5 \cdot 7) = (8 \cdot 5) \cdot 7$

$a + (b + c) = (a + b) + c$ $\quad a \cdot (b \cdot c) = (a \cdot b) \cdot c$

Identity Properties The sum of an addend and 0 is the addend. The product of a factor and 1 is the factor.

$13 + 0 = 13$ $\quad 7 \cdot 1 = 7$

$a + 0 = a$ $\quad a \cdot 1 = a$

Properties are statements that are true for any number. The expressions 6×10 and 10×6 are called **equivalent expressions** because they have the same value. This illustrates the Commutative Property.

Examples

Tutor

Determine whether the two expressions are equivalent. If so, tell what property is applied. If not, explain why.

1. **$15 + (5 + 8)$ and $(15 + 5) + 8$**

The numbers are grouped differently. They are equivalent by the Associative Property.

Use an $=$ sign to compare the expressions.

So, $15 + (5 + 8) = (15 + 5) + 8$.

2. **$(20 - 12) - 3$ and $20 - (12 - 3)$**

The expressions are not equivalent because the Associative Property is not true for subtraction.

Use the $\neq$ sign to show the expressions are not equivalent.

So, $(20 - 12) - 3 \neq 20 - (12 - 3)$.

Determine whether the two expressions are equivalent. If so, tell what property is applied. If not, explain why.

3. **34 + 0 and 34**

The expressions are equivalent by the Identity Property.

So, 34 + 0 = 34.

4. **20 ÷ 5 and 5 ÷ 20**

The expressions are not equivalent because the Commutative Property does not hold for division.

So, 20 ÷ 5 ≠ 5 ÷ 20.

Got It? **Do these problems to find out.**

a. 5 × (6 × 3) and (5 × 6) × 3 **b.** 27 ÷ 3 and 3 ÷ 27

Use Properties to Solve Problems

Properties can also be used to write equivalent expressions and to solve problems.

Example

Tutor

5. **In a recent season, the Kansas Jayhawks had 15 guards, 4 forwards, and 3 centers on their roster. Write two equivalent expressions using the Associative Property that can be used to find the total number of players on their roster.**

The Associative Property states that the grouping of numbers when they are added does not change the sum, so 15 + (4 + 3) is the same as (15 + 4) + 3.

Got It? **Do this problem to find out.**

c. **Financial Literacy** Brandi earned $7 babysitting and $12 cleaning out the garage. Write two equivalent expressions using the Commutative Property that can be used to find the total amount she earned.

Division

The Commutative Property does not hold for division. To prove this, simplify the expressions in Example 4,

$20 \div 5 = 4$

$5 \div 20 = \frac{1}{4}$

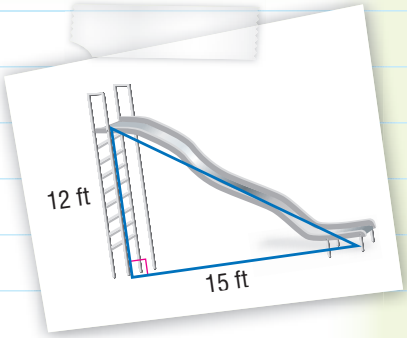
Since 4 is not equal to $\frac{1}{4}$, expressions are not equivalent.

Show your work.

a. _____

b. _____

c. _____



Show your work.

d. _____

Example

Tutor

6. **The area of a triangle can be found using the expression $\frac{1}{2}bh$, where b is the base and h is the height. Find the area of the triangle shown at the left.**

$\frac{1}{2}bh = \frac{1}{2}(15)(12)$ Replace b with 15 and h with 12.

$= \frac{1}{2}(12)(15)$ Commutative Property

$= 6(15)$ Multiply. $\frac{1}{2} \times 12 = 6$

$= 90$ square feet Multiply.

The area of the triangle is 90 square feet.

Got It? **Do this problem to find out.**

d. Financial Literacy Vickie earned $6 an hour while working 11 hours over the weekend. She put $\frac{1}{3}$ of what she earned in a savings account. Find how much she put into the account.

Guided Practice

Check

Determine whether the two expressions are equivalent. If so, tell what property is applied. If not, explain why. (Examples 1–4)

1. $(35 + 17) + 43$ and $35 + (17 + 43)$ _____

2. $(25 - 9) - 5$ and $25 - (9 - 5)$ _____

3. 59×1 and 59 _____

4. At a gymnastics meet, a gymnast scored an 8.95 on the vault and a 9.2 on the uneven bars. Write two equivalent expressions that could be used to find her total score. (Example 5)

_____

5. Nadia bought suntan lotion for $12, sunglasses for $15, and a towel for $18. Use the Associative Property to mentally find the total of her purchases. (Example 6) _____

_____

6. **Building on the Essential Question** How can using properties help you to simplify expressions?

_____

_____

Rate Yourself!

How confident are you about using properties? Check the box that applies.

☐ ☐ ☐ ☐ ☐

For more help, go online to access a Personal Tutor.

Tutor

FOLDABLES Time to update your Foldable!

Name _____ My Homework _____

Independent Practice

Go online for Step-by-Step Solutions eHelp

Determine whether the two expressions are equivalent. If so, tell what property is applied. If not, explain why. (Examples 1–4)

1. $(8 + 27) + 52$ and $8 + (27 + 52)$ _____

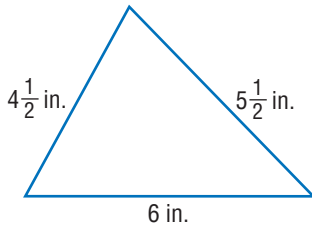
2. $(3 \cdot 6) \cdot 9$ and $3 \cdot (6 \cdot 9)$ _____

3 $72 - (63 - 8)$ and $(72 - 63) - 8$ _____

4. $36 \div (12 \div 3)$ and $(36 \div 12) \div 3$ _____

5. $0 + 32$ and 0 _____

6. STEM Find the perimeter of the triangle shown. (Example 6)



_____

7 Each day, about 75,000 people visit Paris, France. Use the Commutative Property to write two equivalent expressions that could be used to find the number of people that visit over a 5-day period. (Example 5)

_____

_____

Use one or more properties to rewrite each expression as an expression that does not use parentheses.

8. $(y + 1) + 4 =$ _____

9. $(6 \cdot r) \cdot 7 =$ _____

Find the value of *x* that makes a true statement.

10. $24 + x = 24$ _____

11 $17 + x = 3 + 17$ _____

12. **Reason Abstractly** The graphic shows the driving distance between certain cities in Florida.

a. Write a number sentence that compares the mileage from Miami to Jacksonville to Tampa, and the mileage from Tampa to Jacksonville to Miami.

b. Refer to part a. Name the property that is illustrated by this sentence.

H.O.T. Problems Higher Order Thinking

13. **Reason Abstractly** Write two equivalent expressions that illustrate the Associative Property of Addition.

14. **Construct an Argument** Determine whether $(18 + 35) \times 4 = 18 + 35 \times 4$ is *true* or *false*. Explain.

15. **Persevere with Problems** A *counterexample* is an example showing that a statement is not true. Provide a counterexample to the following statement.

Division of whole numbers is commutative.

Georgia Test Practice

16. Which of the following illustrates the Associative Property?

Ⓐ $8 \cdot 0 = 0$

Ⓑ $8 \cdot (3 \cdot 4) = (8 \cdot 3) \cdot 4$

Ⓒ $14 \cdot 1 = 14$

Ⓓ $7 \cdot 4 = 4 \cdot 7$

Name _____ My Homework _____

Extra Practice

Determine whether the two expressions are equivalent. If so, tell what property is applied. If not, explain why.

Homework Help

17. 64 + 0 and 64 yes; Identity Property

18. 23 • 1 and 23 _____

19. 8 ÷ 2 and 2 ÷ 8 _____

20. 46 + 15 and 15 + 46 _____

21. 13 • 1 and 1 _____

22. **Use Math Tools** Anita's mother hosted a party. The table shows the costs. Use the Associative Property to write two equivalent expressions that could be used to find the total amount spent.

_____

_____

Party Costs	
Item	**Cost ($)**
Cake	12
Hot dogs and hamburgers	24
Drinks	6

23. Ella sold 37 necklaces for $20 each at the craft fair. She is going to donate half of the money she earned to charity. Use the Commutative Property to mentally find how much money she will donate. Explain the steps you used.

_____

_____

Use one or more properties to rewrite each expression as an expression that does not use parentheses.

24. 2 + (*x* + 4) = _____

25. 4 + (*b* + 0) = _____

26. 1 • (*n* • 8) = _____

27. 20 • (6 • *y*) = _____

28. (6 + *m*) + 9 _____

29. (*w* • 12) • 3 _____

Georgia Test Practice

30. Which of the following expressions could you use to find the total number of desks at both Medina and Monroe Middle Schools?

Middle School	Number of Classrooms	Number of Desks per Classroom
Medina	12	25
Monroe	12	25
Yorktown	15	20

Ⓐ $(2 \times 12) \times 25$ Ⓒ $25(12 + 2)$

Ⓑ $2 + (12 + 25)$ Ⓓ $2(12 + 25)$

31. Which of the following expressions is equivalent to $3 + (4 + 7)$?

Ⓕ $3 + (7 + 5)$ Ⓗ 13

Ⓖ $(3 \cdot 4) \cdot 7$ Ⓘ $(3 + 4) + 7$

32. Which property is illustrated by the number sentence $0 + 17 = 17$?

Ⓐ Associative Property of Addition

Ⓑ Commutative Property of Multiplication

Ⓒ Identity Property of Multiplication

Ⓓ Identity Property of Addition

33. **Short Response** Jared deposits $2 into his savings account every day for 6 weeks. Using the Associative Property, write two equivalent expressions that could be used to find how much money he saved after 6 weeks.

_____

Common Core Review

Write each number in expanded form. MCC4.NBT.2

34. 15 = _____

35. 37 = _____

36. 209 = _____

37. Lakisha had $10 bills and $1 bills in her wallet. She used seven bills to buy a pair of shoes for $43. How many of each type of bill did she spend? MCC4.OA.3

_____

_____

38. Margo has 3 dimes. Justin has 5 dimes. They put their money into a donation box for a local pet shelter. What is the value of the money they added to the donation box? Explain. MCC4.OA.3

_____

_____

Inquiry Lab
The Distributive Property

Inquiry **HOW can you use models to evaluate and compare expressions?**

Content Standards
MCC6.EE.3
Mathematical Practices
1, 3, 5

Fair Fun Three friends are going to a concert at the fair. They each want admission to the fair, which is $6.00 and admission to the concert, which is $22.00. What is the total that the three friends will spend?

Investigation 1

Watch

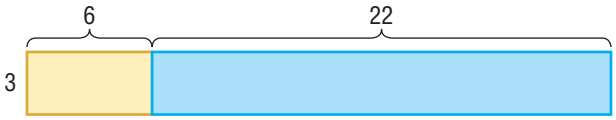
Step 1 Write an expression to represent the amount spent in dollars.

$$3(6 + 22)$$

3 → friends; 6 → fair admission; 22 → concert

Step 2 Use area models to evaluate the expression.

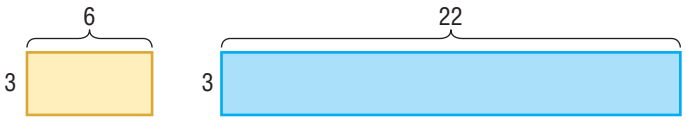
Method 1 Add the lengths. Then multiply.



$3(6 + 22) = 3(28)$

$= \square$

Method 2 Find each area. Then add.



$3 \cdot 6 + 3 \cdot 22 = 18 + 66$

$= \square$

Since both expressions are equal to $\square$, they are equivalent.

So, $3(6 + 22) = 3 \cdot \square + 3 \cdot \square$.

Investigation 2

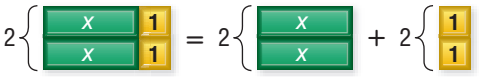
Tools

You can also use algebra tiles to model expressions with variables. Refer to the set of algebra tiles below.

The green rectangular tile represents the variable x.

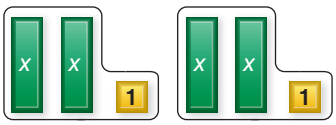
The yellow square tile represents the integer 1.

Just like 2(3) means 2 groups of 3, $2(x + 1)$ means 2 groups of $x + 1$.



Use algebra tiles to tell whether the expressions $2(2x + 1)$ and $4x + 2$ are equivalent.

Step 1 Model the expression $2(2x + 1)$.



There are ____ groups with $2x + 1$ in each group.

Step 2 Group like tiles together.

The model shows ____ x-tiles and ____ integer tiles.

Both models have the same number of x-tiles and the same number of integer tiles.

So, the expression $2(2x + 1)$ is _____ to the expression $4x + 2$.

Collaborate

Work with a partner. Draw area models to show that the pairs of expressions are equivalent.

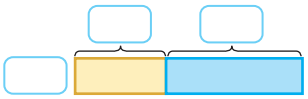
1. **$2(4 + 6)$ and $(2 \cdot 4) + (2 \cdot 6)$**

$2(4 + 6) = 2(\_\_\_\_\_)$

$= \_\_\_\_\_$

$(2 \cdot 4) + (2 \cdot 6) = \_\_\_\_\_ + \_\_\_\_\_$

$= \_\_\_\_\_$



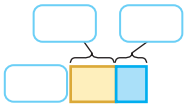
2. **$4(3 + 2)$ and $(4 \cdot 3) + (4 \cdot 2)$**

$4(3 + 2) = 4(\_\_\_\_\_)$

$= \_\_\_\_\_$

$(4 \cdot 3) + (4 \cdot 2) = \_\_\_\_\_ + \_\_\_\_\_$

$= \_\_\_\_\_$



3. **$6(20 + 3)$ and $(6 \cdot 20) + (6 \cdot 3)$**

$6(20 + 3) = 6(\_\_\_\_\_)$

$= \_\_\_\_\_$

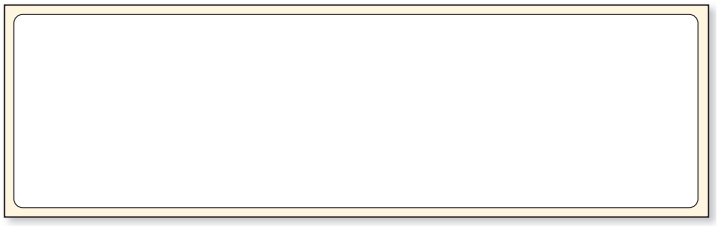
$(6 \cdot 20) + (6 \cdot 3) = \_\_\_\_\_ + \_\_\_\_\_$

$= \_\_\_\_\_$

Use algebra tiles to tell whether the pairs of expressions are equivalent.

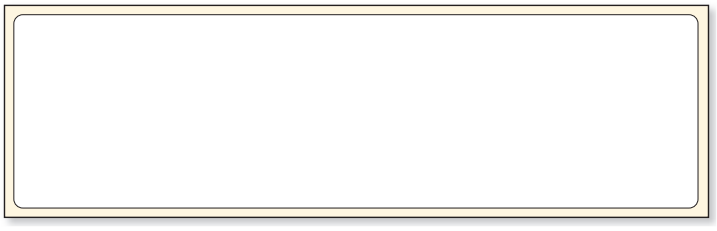
4. **$3(x + 1)$ and $3x + 3$** _____

$3(x + 1)$: ____ x-tiles, ____ integer tiles $3x + 3$: ____ x-tiles, ____ integer tiles



5. **$2(3x + 2)$ and $6x + 4$** _____

$2(3x + 2)$: ____ x-tiles, ____ integer tiles $6x + 4$: ____ x-tiles, ____ integer tiles



Analyze

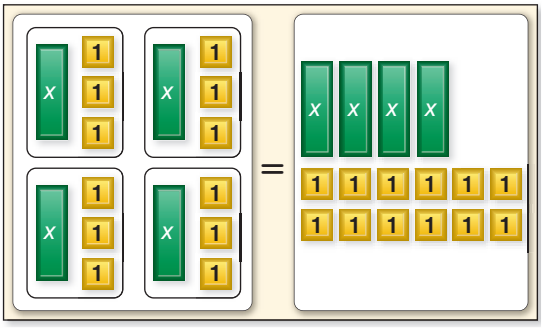
Work with a partner to complete the table. Use a model if needed. The first one is done for you.

	Expression	Rewrite the expression.	Evaluate.
	$2(4 + 1)$	$2(4) + 2(1)$	10
6.	$7(8 + 4)$		
7.	$9(3 + 9)$		
8.	$5(3 + 5)$		
9.	$2(24 + 6)$		
10.	$3(16 + 5)$		
11.	$4(8 + 7)$		
12.	$6(22 + 9)$		

13. **Reason Inductively** How would you evaluate 3(23) mentally?

Reflect

14. **Use Math Tools** A friend decides that $4(x + 3) = 4x + 3$. Use the algebra tiles at the right to explain to your friend that $4(x + 3) = 4x + 12$.



15. HOW can you use models to evaluate and compare expressions?

The Distributive Property

What You'll Learn

Scan the lesson. List two headings you would use to make an outline of the lesson.

- _____

_____

- _____

_____

Essential Question

HOW is it helpful to write numbers in different ways?

Vocabulary

Distributive Property

factor the expression

Common Core GPS

Content Standards
MCC6.EE.3, MCC6.NS.4

Mathematical Practices
1, 3, 4, 5, 6, 7, 8

Real-World Link

Watch

Baseball Three friends went to a baseball game. Each ticket cost $20 and all three friends bought a baseball hat for $15 each.

Lifesize/Getty Images

1. What does the expression 3(20 + 15) represent?

3 represents: _____

20 represents: _____

15 represents: _____

2. Evaluate the expression in Exercise 1.

(20 + 15) = ☐

☐ × ☐ = ☐

3. What does the expression 3 × 20 + 3 × 15 represent?

3 × 20 represents: _____

3 × 15 represents: _____

4. Evaluate the expression 3 × 20 + 3 × 15.

3 × 20 = ☐

3 × 15 = ☐

☐ + ☐ = ☐

5. What do you notice about the answers to Exercises 2 and 4?

_____

_____

Key Concept

Distributive Property

Words To multiply a sum by a number, multiply each addend by the number outside the parentheses.

Example

Numbers

$2(7 + 4) = 2 \times 7 + 2 \times 4$

Algebra

$a(b + c) = ab + ac$

Work Zone

The expressions $3(20 + 15)$ and $3 \times 20 + 3 \times 15$ show how the **Distributive Property** combines addition and multiplication.

Example

Tutor

1. **Find $9 \times 4\frac{1}{3}$ mentally using the Distributive Property.**

$9 \times 4\frac{1}{3} = 9\left(4 + \frac{1}{3}\right)$ Write $4\frac{1}{3}$ as $4 + \frac{1}{3}$.

$= 9(4) + 9\left(\frac{1}{3}\right)$ Distributive Property

$= 36 + 3$ Multiply.

$= 39$ Add.

Show your work.

a. _____

b. _____

c. _____

Got It? Do these problems to find out.

Find each product mentally. Show the steps you used.

a. $5 \times 2\frac{3}{5}$ **b.** $12 \times 2\frac{1}{4}$ **c.** 2×3.6

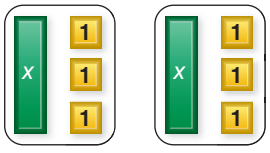
Example

Tools Tutor

2. **Use the Distributive Property to rewrite $2(x + 3)$.**

$2(x + 3) = 2(x) + 2(3)$ Distributive Property

$= 2x + 6$ Multiply.



d. _____

e. _____

f. _____

Got It? Do these problems to find out.

Use the Distributive Property to rewrite each expression.

d. $8(x + 3)$ **e.** $5(9 + x)$ **f.** $2(x + 3)$

Example

Tutor

3. **Fran is making a pair of earrings and a bracelet for four friends. Each pair of earrings uses 4.5 centimeters of wire and each bracelet uses 13 centimeters. Write two equivalent expressions and then find how much total wire is needed.**

Using the Distributive Property, $4(4.5) + 4(13)$ and $4(4.5 + 13)$ are equivalent expressions.

$4(4.5) + 4(13) = 18 + 52$
$= 70$

$4(4.5 + 13) = 4(17.5)$
$= 70$

So, Fran needs 70 centimeters of wire.

Got It? **Do this problem to find out.**

Show your work.

g. Each day, Martin lifts weights for 10 minutes and runs on the treadmill for 25 minutes. Write two equivalent expressions and then find the total minutes that Martin exercises for 7 days.

g. _____

Factor an Expression

When numeric or algebraic expressions are written as a product of their factors, the process is called **factoring the expression**.

Example

Tutor

4. **Factor $12 + 8$.**

$12 = 2 \cdot 2 \cdot 3$ Write the prime factorization of 12 and 8.
$8 = 2 \cdot 2 \cdot 2$ Circle the common factors.

The GCF of 12 and 8 is $2 \cdot 2$ or 4.

Write each term as a product of the GCF and its remaining factor. Then use the Distributive Property to *factor out* the GCF.

$12 + 8 = 4(3) + 4(2)$ Rewrite each term using the GCF.
$= 4(3 + 2)$ Distributive Property

So, $12 + 8 = 4(3 + 2)$.

Prime Factorization

The prime factorization of an algebraic expression contains both the prime factors and any variable factors. For example, the prime factorization of $6x$ is $2 \cdot 3 \cdot x$.

Got It? **Do these problems to find out.**

Factor each expression.

h. $9 + 21$ **i.** $14 + 28$ **j.** $80 + 56$

h. _____

i. _____

j. _____

Example

5. **Factor $3x + 15$.**

$3x = 3 \cdot x$ Write the prime factorization of 15 and $3x$.

$15 = 3 \cdot 5$ Circle the common factors.

The GCF of $3x$ and 15 is 3.

$3x + 15 = 3(x) + 3(5)$ Rewrite each term using the GCF.

$= 3(x + 5)$ Distributive Property

So, $3(x + 5) = 3x + 15$.

Got It? **Do these problems to find out.**

Factor each expression.

k. $16 + 4x$ **l.** $7x + 42$ **m.** $36x + 30$

Show your work.

k. _____

l. _____

m. _____

Guided Practice

1. Find $9 \times 8\frac{2}{3}$ mentally. Show the steps you used. (Example 1) _____

Use the Distributive Property to rewrite each algebraic expression. (Example 2)

2. $3(x + 1) =$ _____

3. $5(x + 8) =$ _____

4. $4(x + 6) =$ _____

Show your work.

Factor each expression. (Examples 4 and 5)

5. $25 + 60 =$ _____

6. $4x + 40 =$ _____

7. **Financial Literacy** Six friends are going to the state fair. The cost of one admission is $9.50, and the cost for one ride on the Ferris wheel is $1.50. Write two equivalent expressions and then find the total cost. (Example 3)

8. **Building on the Essential Question** How can the Distributive Property help you to rewrite expressions?

Rate Yourself!

How well do you understand the Distributive Property? Circle the image that applies.

Clear Somewhat Clear Not So Clear

For more help, go online to access a Personal Tutor.

Name _____ My Homework _____

Independent Practice

Go online for Step-by-Step Solutions eHelp

Find each product mentally. Show the steps you used. (Example 1)

1. $9 \times 44 =$

Show your work.

2. $4 \times 5\frac{1}{8} =$

3 $7 \times 3.8 =$

Use the Distributive Property to rewrite each algebraic expression. (Example 2)

4. $8(x + 7) =$ _____

5. $6(11 + x) =$ _____

6. $8(x + 1) =$ _____

7 CCSPS **Identify Repeated Reasoning** A coyote can run up to 43 miles per hour while a rabbit can run up to 35 miles per hour. Write two equivalent expressions and then find how many more miles a coyote can run in six hours than a rabbit at these rates. (Example 3)

Factor each expression. (Examples 4 and 5)

8. $8 + 16 =$ _____

9. $54 + 24 =$ _____

10. $63 + 81 =$ _____

11. $11x + 55 =$ _____

12. $32 + 16x =$ _____

13. $77x + 21 =$ _____

14. **Model with Mathematics** Refer to the graphic novel frame below for Exercises a–b.

a. Write two equivalent expressions that demonstrate the Distributive Property for the cost of x tickets for admission and movie passes on Family Night. _____

b. Is it less expensive for a youth to pay regular admission with a movie pass or go on Family Night? Explain. _____

_____

H.O.T. Problems Higher Order Thinking

15. **Persevere with Problems** Evaluate the expression $0.1(3.7)$ mentally. Justify your response using the Distributive Property. _____

_____

16. **Identify Structure** Write two equivalent expressions involving decimals that illustrate the Distributive Property. _____

_____

17. **Construct an Argument** A friend rewrote the expression $5(x + 2)$ as $5x + 2$. Write a few sentences to your friend explaining the error. Then, rewrite the expression $5(x + 2)$ correctly. _____

_____

Georgia Test Practice

18. Which of the following expressions is equivalent to $6x + 24$?

Ⓐ $3(x + 12)$ Ⓑ $6(x - 4)$ Ⓒ $6(x + 4)$ Ⓓ $x(6 + 4)$

Name _____ My Homework _____

Extra Practice

Find each product mentally. Show the steps you used.

19. $4 \times 38 =$ 152

Homework Help

$4(30) + 4(8)$
$= 120 + 32$
$= 152$

20. $11 \times 27 =$ _____

21. $3 \times 3.9 =$ _____

Use the Distributive Property to rewrite each algebraic expression.

22. $4(x + 2) =$ _____

23. $3(x + 7) =$ _____

24. $5(2x + 7) =$ _____

25. CCSPS **Be Precise** Mrs. Singh bought 9 folders and 9 notebooks. The cost of each folder was $2.50. Each notebook cost $4. Write two equivalent expressions and then find the total cost.

_____

26. CCSPS **Be Precise** Five friends bought admission tickets to the museum and a box lunch. The cost of each admission ticket was $11.75. Each box lunch cost $5. Write two equivalent expressions and then find the total cost.

_____

Factor each expression.

27. $27 + 12 =$ _____

28. $12 + 36 =$ _____

29. $16 + 20 =$ _____

30. $2x + 8 =$ _____

31. $30 + 12x =$ _____

32. $42x + 49 =$ _____

Georgia Test Practice

33. Which of the following statements represents the Distributive Property?

Ⓐ $7x + 1 = 7(x + 1)$

Ⓑ $7(x + 1) = 7x + 7$

Ⓒ $7x + 7 = 7(x + 7)$

Ⓓ $7(x + 1) = x + 7$

34. Four friends ate lunch together at a deli. Each friend ordered the items in the table.

Item	Cost ($)
Sandwich	2.75
Drink	1.25

Which expression represents the total cost of the four meals?

Ⓕ 4($4)

Ⓖ 4($3)

Ⓗ 4($2.50)

Ⓘ 4($1.50)

35. Short Response Use the Distributive Property to factor the algebraic expression $4x + 20$.

_____

Common Core Review

Evaluate each expression. MCC5.NBT.7

36. $4 + 5.23 + 3 =$ _____

37. $4 \times 0 \times 9.17 =$ _____

38. $1.8 \times 1 \times 2 =$ _____

39. Elise and her sister Marta recorded the amount they saved each week for a month. How much did each person save? Use the information in the table to compare the total amount that Elise saved to the total amount Marta saved. MCC4.OA.3 _____

Week	Elise's Savings ($)	Marta's Savings ($)
1	20	15
2	15	20
3	10	10
4	20	20

40. Each bottle holds 16 fluid ounces of water. Bottles are packaged in 4 rows of 6 bottles. How many ounces of water are in each package? MCC4.NBT.4 _____

Inquiry Lab
Equivalent Expressions

Content Standards
MCC6.EE.4
Mathematical Practices
1, 3, 4

Inquiry **HOW do you know that two expressions are equivalent?**

Tickets Derrick and his friends bought tickets for the dirt bike rally. The cost of each ticket was x dollars. Derrick bought 2 tickets on Saturday and 3 tickets on Sunday. They paid $4 for parking. The expression $2x + 4 + 3x$ represents the total cost in dollars of the dirt bike rally.

Investigation

Tools

Simplify the expression $2x + 4 + 3x$ using algebra tiles.

Step 1 Choose tiles to represent each addend. Use ____ x-tiles to model $2x$, ____ 1 tiles to model 4, and ____ x-tiles to model $3x$.

Step 2 Find the like terms. The like terms are ____ and ____ because they are both x-tiles. There are a total of ____ x-tiles and four 1-tiles.

Step 3 Draw the algebra tiles in the space below, placing all like terms together.

Step 4 Rewrite the expression using addition to combine the like terms. Add $2x$ and $3x$.

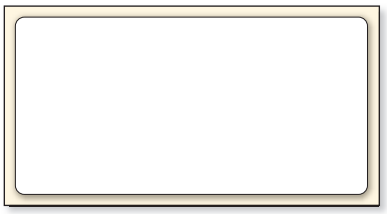
So, $2x + 4 + 3x =$ ____ + ____.

Collaborate

Work with a partner. Simplify each expression using algebra tiles. Draw algebra tile models to represent each expression.

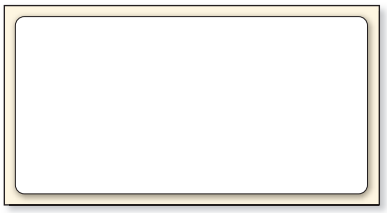
1. $x + 4x + x =$ _____

2. $4x + 7 + 2x =$ _____



3. $x + 1 + 3x =$ _____

4. $2(x + 2) =$ _____



Reflect

5. CCSPS **Model with Mathematics** Maggie is x years old. Her brother Demarco is 4 years older than her. Anna is 3 times as old as Demarco. Write and simplify an expression that represents Anna's age. Explain.

_____

_____

6. Inquiry HOW do you know that two expressions are equivalent?

_____

_____

Equivalent Expressions

What You'll Learn

Scan the lesson. List two headings you would use to make an outline of the lesson.

- _____
- _____

Essential Question

HOW is it helpful to write numbers in different ways?

Vocabulary

term
coefficient
constant
like terms

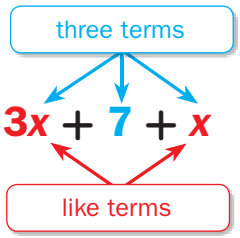
Common Core GPS

Content Standards
MCC6.EE.2, MCC6.EE.2b, MCC6.EE.3, MCC6.EE.4

Mathematical Practices
1, 3, 4, 5, 7

Vocabulary Start-Up

When addition or subtraction signs separate an algebraic expression into parts, each part is called a **term**. The numerical factor of a term that contains a variable is called the **coefficient**. A term without a variable is called a **constant**. **Like terms** are terms that contain the same variables, such as x, $2x$, and $3x$.

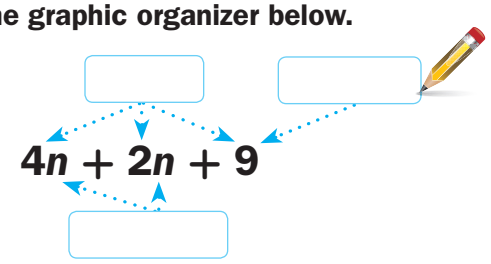


The three terms are $3x$, 7, and x.

The terms $3x$ and x are like terms because they have the same variable, x.

The constant is 7.

Label the graphic organizer below.



Real-World Link

Games Andrew's mother gave him a computer game and $10 for his birthday. His aunt gave him two computer games and $5. The expression $x + 10 + 2x + 5$, where x represents the cost of each game, can be used to represent Andrew's birthday gifts.

1. What is the coefficient of the term $2x$? ____

2. How many terms are in the expression $x + 10 + 2x + 5$? ____

Work Zone

Simplify Expressions with One Variable

To simplify an algebraic expression, use properties to write an equivalent expression that has no like terms and no parentheses.

Numbers	Variables
$3 + 3 = 2(3)$ or 6	$x + x = 2x$

Equivalent Expressions

Two expressions are equivalent when the expressions have the same value, no matter what value is substituted for x. So, $24x$ is equivalent to $4(6x)$.

Example

Tutor

1. **Simplify the expression $4(6x)$.**

$4(6x) = 4 \cdot (6 \cdot x)$ Parentheses indicate multiplication.

$= (4 \cdot 6) \cdot x$ Associative Property

$= 24x$ Multiply 4 and 6.

Show your work.

a. _____

b. _____

c. _____

Got It? **Do these problems to find out.**

Simplify each expression.

a. $(3 \cdot x) \cdot 11$ **b.** $x + x + x$ **c.** $7x + 8 + x$

Example

Real World

Tutor

2. **Three friends will pay $\$x$ each for admission to the museum plus \$1 each to view the mummy exhibit. A fourth friend will pay admission but will not view the mummy exhibit. Write and simplify an expression that represents the total cost.**

The expression $\underbrace{3(x + 1)}_{\text{cost of admission and exhibit for three friends}} + \underbrace{x}_{\text{cost of admission for the fourth friend}}$ represents the total cost.

$3(x + 1) + x = 3x + 3 + x$ Distributive Property

$= 3x + x + 3$ Commutative Property

$= 4x + 3$ Combine like terms.

So, the total cost is $\$4x + \$3$.

Got It? **Do this problem to find out.**

d. Write and simplify an expression for the total cost of six friends to go to the museum if only four friends view the mummy exhibit.

d. _____

Simplify Expressions with Two Variables

Properties can be used to simplify or to factor expressions with two variables.

Compare the effects of operations on numbers to the effects of operations on variables.

Numbers	Variables
$3 + 3 + 4 = 2(3) + 4$	$x + x + y = 2x + y$

Examples

Tutor

3. **Simplify the expression $(14y + x) + 22y$.**

$(14y + x) + 22y = (x + 14y) + 22y$ Commutative Property

$= x + (14y + 22y)$ Associative Property

$= x + 36y$ Combine like terms.

4. **Simplify $4(2x + y)$ using the Distributive Property.**

$4(2x + y) = 4(2x) + 4(y)$ Distributive Property

$= 8x + 4y$ Multiply.

5. **Factor $27x + 18y$.**

Step 1 Find the GCF of $27x$ and $18y$.

$27x = 3 \cdot 3 \cdot 3 \cdot x$ Write the prime factorization of $27x$ and $18y$.

$18y = 2 \cdot 3 \cdot 3 \cdot y$ Circle the common factors.

The GCF of $27x$ and $18y$ is $3 \cdot 3$ or 9.

Step 2 Write each term as a product of the GCF and its remaining factor. Then use the Distributive Property to *factor out* the GCF.

$27x + 18y = 9(3x) + 9(2y)$ Rewrite each term using the GCF.

$= 9(3x + 2y)$ Distributive Property

Got It? **Do these problems to find out.**

e. Simplify $3x + 9y + 2x$.

f. Simplify $7(3x + y)$.

g. Factor $12x + 8y$.

Show your work.

e. _____

f. _____

g. _____

Example

6. **The farmer's market sells fruit baskets. Each basket has 3 apples and 1 pear. Use a to represent the cost of each apple and p to represent the cost of each pear. Write and simplify an expression that represents the total cost of 5 baskets.**

Use the expression $3a + p$ to represent the cost of each basket.

Use $5(3a + p)$ to represent the cost of 5 baskets.

Use the Distributive Property to rewrite $5(3a + p)$.

$5(3a + p) = 5(3a) + 5(p)$ Distributive Property

$= 15a + 5p$ Multiply.

So, the total cost of five baskets is $15a + 5p$.

Guided Practice

Simplify each expression. (Examples 1, 3, and 4)

1. $5(6x) =$ _____

2. $2x + 5y + 7x =$ _____

3. $4(2x + 5y) =$ _____

Show your work.

4. Factor $35x + 28y$. (Example 5) _____

5. Mikayla bought five skirts at $\$x$ each. Three of the five skirts came with a matching top for an additional \$9 each. Write and simplify an expression that represents the total cost of her purchase. (Example 2)

_____

6. The gift bag from Claire Cosmetics includes 5 bottles of nail polish and 2 tubes of lip gloss. Use p to represent the cost of each bottle of nail polish and g to represent the cost of each tube of lip gloss. Write and simplify an expression that represents the total cost of 8 gift bags. (Example 6)

_____

7. **Building on the Essential Question** How can properties help to write equivalent algebraic expressions?

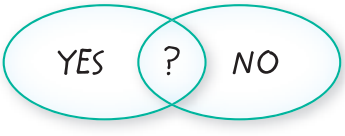
_____

_____

_____

Rate Yourself!

Are you ready to move on? Shade the section that applies.



For more help, go online to access a Personal Tutor.

Name _____ My Homework _____

Independent Practice

Go online for Step-by-Step Solutions eHelp

Simplify each expression. (Examples 1, 3, and 4)

1. $x + 4x + 6x =$ _____

Show your work.

2. $3x + 4x + 5x =$ _____

3 $9(5x) =$ _____

4. $3x + 8y + 13x =$

_____

5. $7(3x + 5y) =$

_____

6. $3x + 6x + 2x =$

_____

Factor each expression. (Example 5)

7 $24x + 18y =$ _____

8. $16x + 40y =$ _____

9. Eight friends went to a hockey game. The price of admission per person was $\$x$. Four of the friends paid an extra $6 each for a player guide book. Write and simplify an expression that represents the total cost. (Example 2)

_____

10. Gabriella is x years old. Her sister, Felicia, is six years older than she is. Their mother is twice as old as Felicia. Their aunt, Tanya, is x years older than their mother. Write and simplify an expression that represents Tanya's age in years. (Example 2)

_____

11 A DVD box set includes 3 thriller movies and 2 comedies. Use t to represent the cost of each thriller and c to represent the cost of each comedy. Write and simplify an expression that represents the total cost of 6 box sets. (Example 6)

_____

12. A fall candle gift set has 4 vanilla candles and 6 pumpkin spice candles. Use v to represent the cost of each vanilla candle and p to represent the cost of each pumpkin candle. Write and simplify an expression that represents the total cost of 4 sets. (Example 6)

_____

Find the value of *y* that makes each equation true for all values of *x*.

13. $3x + 6x = yx$ _____

14. $x + 5 + 11x = 12x + y$ _____

15. **Use Math Tools** Pizza Palace charges $\$x$ for a large cheese pizza and an additional fee based on the number of toppings ordered.

Pizza Palace Prices	
Pizza	**Price ($)**
large cheese	x
add 1 topping	add \$0.75
add 2 toppings	add \$1.50
add 3 toppings	add \$2.25
add 4 toppings	add \$3.75

a. Two large cheese pizzas and three large pepperoni pizzas are ordered. Write and simplify an expression that represents the total cost. _____

b. Write and simplify an expression that represents the total cost of eight large pizzas, if two are cheese and six have four toppings each.

_____

c. Elsa orders three large cheese pizzas, a large pepperoni and mushroom pizza, and a large green pepper and onion pizza. Write and simplify an expression that represents the total cost.

_____

H.O.T. Problems Higher Order Thinking

16. **Identify Structure** Write an expression that, when simplified, is equivalent to $15x + 7$. _____

17. **Reason Inductively** Explain why the expressions $y + y + y$ and $3y$ are equivalent.

_____

_____

Persevere with Problems **For Exercises 18 and 19, simplify each expression.**

18. $7x + 5(x + 3) + 4x - x - 2$ _____

19. $6 + 2(x - 8) + 3x - 11 + x$ _____

Georgia Test Practice

20. Which of the following expressions is equivalent to $63x + 35y$?

Ⓐ $9(7x + 4y)$ Ⓒ $98x$

Ⓑ $60x + 35y + 5x$ Ⓓ $7(9x + 5y)$

Name _____ My Homework _____

Extra Practice

Simplify each expression.

21. $4x + 2x + 3x =$ $9x$

$4x + 2x + 3x = (4x + 2x) + 3x$
$= 6x + 3x$
$= 9x$

Homework Help

22. $2x + 8x + 4x =$ _____

23. $7(3x) =$ _____

24. $8y + 4x + 6y =$ _____

25. $4(7x + 5y) =$ _____

26. $6x + 2x =$ _____

Factor each expression.

27. $10x + 15y =$ _____

28. $35x + 63y =$ _____

29. CCSPS **Use Math Tools** Four friends went to see a movie. Each ticket cost $\$x$. The table shows the prices of several items at the theater. They bought four large pretzels and four bottles of water. Write and simplify an expression that represents the total cost of tickets and snacks or beverages.

_____

Snack or Beverage	Price
large popcorn	$4
large pretzel	$3
small soda	$2
bottle of water	$2

30. Seven friends have similar cell phone plans. The price of each plan is $\$x$. Three of the seven friends pay an extra $4 per month for unlimited text messaging. Write and simplify an expression that represents the total cost of the seven plans.

_____

31. A set of glassware includes 5 tall glasses and 3 juice glasses. Use t to represent the cost of each tall glass and j to represent the cost of each juice glass. Write and simplify an expression that represents the total of cost of 4 sets.

_____

Identify the terms, like terms, coefficients, and constants in each expression.

32. $4y + 5 + 3y$

_____

_____

33. $2x + 3y + x + 7$

_____

_____

Georgia Test Practice

34. Which of the following is true concerning the expression $6x + 3 + x$?

Ⓐ $6x$ and 3 are like terms.

Ⓑ $6x$ and x are like terms.

Ⓒ The simplified form of the expression is $6x + 3$.

Ⓓ The simplified form of the expression is $10x$.

35. Twenty-six students will attend the field trip to the career center. The cost to attend the career center is $\$x$. Fifteen of these students will pay an additional \$3 to attend the automotive class. Which expression represents the total cost?

Ⓕ $15(x + 3) + 26x$

Ⓖ $26(x + 3)$

Ⓗ $26(x + 3) + 15x$

Ⓘ $15(x + 3) + 11x$

36. Short Response A variety pack of juice includes 5 bottles of grape juice and 7 bottles of apple juice. Use g to represent the cost of each bottle of grape juice and a to represent the cost of each bottle of apple juice. Write an expression in simplest form that represents the total cost of 3 variety packs.

Common Core Review

Find the missing number that makes the sentence true. MCC4.NF.3b

37. $\frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{\square}{\square}$

38. $\frac{4}{7} = \frac{2}{7} + \frac{\square}{\square}$

39. $2\frac{5}{9} = 2 + \frac{\square}{\square}$

40. Soccer balls cost \$18 each. Complete the table and use a pattern to find the cost of 2, 3, and 4 soccer balls. MCC4.OA.5

Number of Soccer Balls	Addition Pattern	Total Cost (\$)
1	18	\$18
2	18 + 18	
3	18 + ☐ + ☐	
4	18 + ☐ + ☐ + ☐	

41. Find the missing number in the pattern below. MCC4.OA.5

14, 21, ☐, 35, 42, ...

21ST CENTURY CAREER in Engineering

Water Slide Engineer

Do you love riding the twisting, turning, plunging slides at water parks? Do you have ideas that would make them more fun and exciting? If so, you should think about a career designing water slides! Water slide engineers apply engineering principles, the newest technology, and their creativity to design state-of-the-art water slides that are both innovative and safe. These engineers are responsible for designing not only the winding flumes that riders slide down, but also the pumping systems that allow the slides to have the appropriate flow of water.

College & Career READINESS

Explore college and careers at ccr.mcgraw-hill.com

Is This the Career for You?

Are you interested in a career as a water slide engineer? Take some of the following courses in high school.

- Algebra
- Computer-Aided Drafting
- Engineering Calculus
- Engineering Technology
- Physics

Find out how math relates to a career in Engineering.

It's a Slippery Ride!

Use the information in the table to solve each problem.

1. The table shows the relationship between the number of minutes and the gallons of water pumped out on The Black Hole. Write an expression to determine the number of gallons pumped out for any number of minutes.

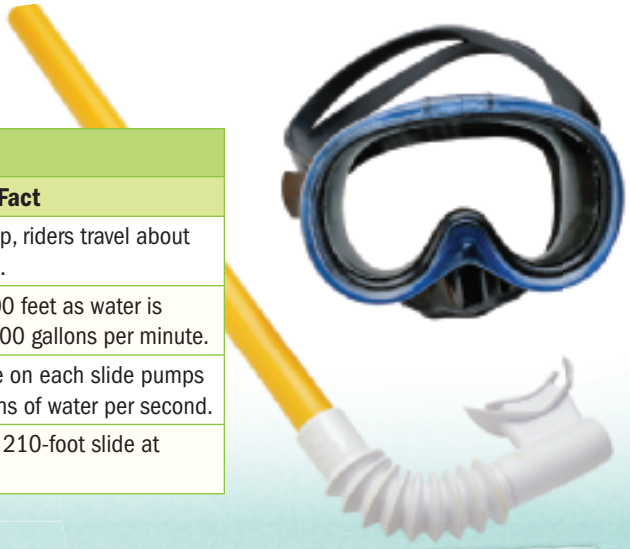
Number of Minutes (m)	Water Pumped Out (g)
3	3,000
6	6,000
9	9,000

2. Refer to the fact about Big Thunder. Define a variable. Then write an expression that could be used to find the number of feet that riders travel in any number of seconds.

3. Write two equivalent expressions that could be used to find the number of gallons of water pumped out of the Crush 'n' Gusher after 90 seconds. Then determine the number of gallons pumped in 90 seconds.

4. Explain how you could use the Distributive Property to find how many gallons of water are pumped out of The Black Hole in $2\frac{1}{2}$ minutes.

Water Slides	
Water Slide, Park	**Fact**
Big Thunder, Rapids Water Park	At the steepest drop, riders travel about 30 feet per second.
The Black Hole, Wet 'n Wild	Riders plummet 500 feet as water is pumped out at 1,000 gallons per minute.
Crush 'n' Gusher, Typhoon Lagoon	The water jet nozzle on each slide pumps out about 23 gallons of water per second.
Gulf Scream, Adventure Island	Riders hurl down a 210-foot slide at 25 miles per hour.



Career Project

It's time to update your career portfolio!

Find three water slides in your state. Use a spreadsheet to compare several features of the slides, such as the longest drop, total length, and gallons of water pumped. Describe how you, as a water slide engineer, would have designed the slides differently.

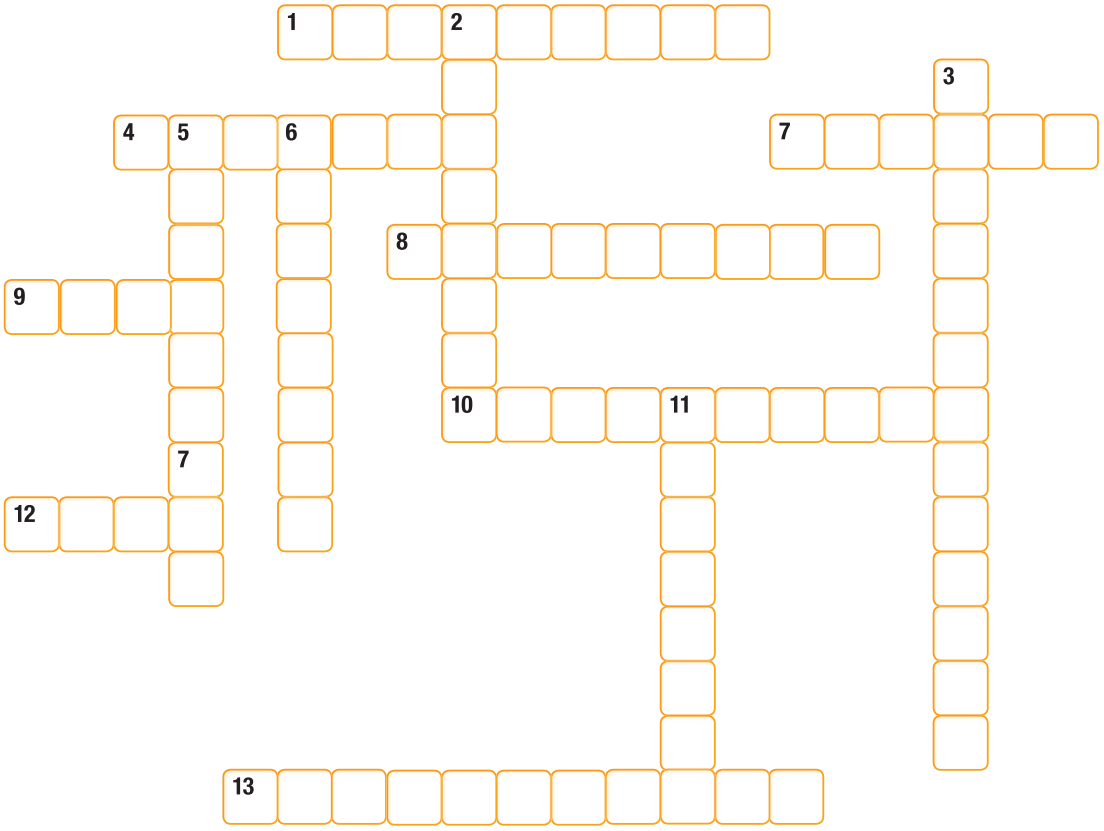
List several challenges associated with this career.

-
-
-
-
-

Chapter Review

Vocabulary Check

Complete the crossword puzzle using the vocabulary list at the beginning of the chapter.



Across

1. an expression which combines variables, numbers, and at least one operation
4. a mathematical language of symbols, including variables
7. numbers expressed using exponents
8. an expression which combines numbers and operations
9. in a power, the number used as a factor
10. expressions that have the same value
12. each part of an algebraic expression separated by a plus or minus sign
13. the numerical factor of a term that contains a variable

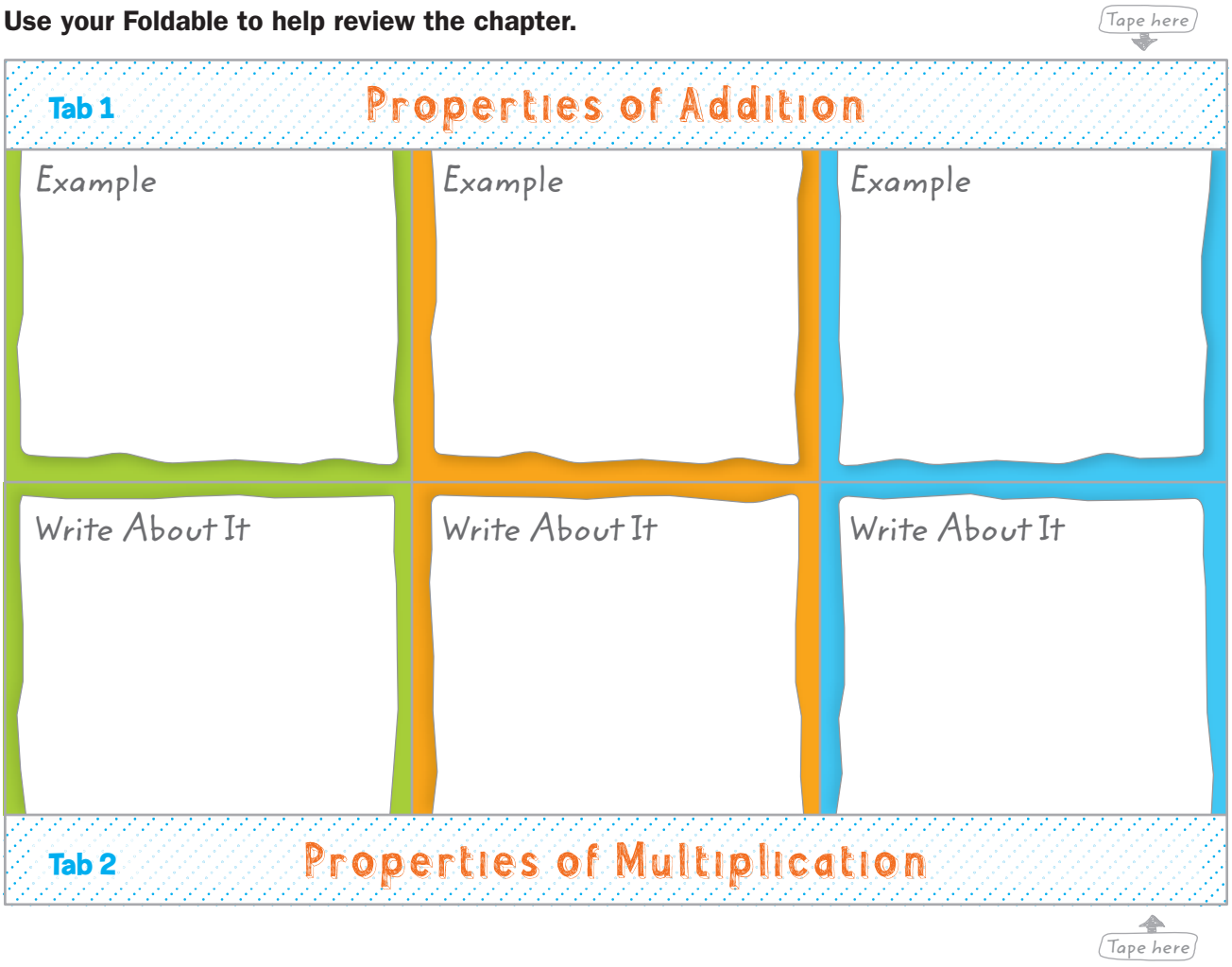
Down

2. to find the value of an algebraic expression
3. numbers with square roots that are whole numbers
5. terms that contain the same variables to the same power
6. in a power, the number that tells how many times the base is used as a factor
11. a symbol used to represent a number

Key Concept Check

Use Your FOLDABLES

Use your Foldable to help review the chapter.



Got it?

Match each expression with the equivalent expression.

1. $2(6x + 6)$

2. $16x - 8$

3. $3(x - 2)$

4. $3(4x + 4)$

5. $2x + 6$

6. $4(x + 3)$

a. $2(x + 3)$

b. $4x + 12$

c. $12x + 12$

d. $3x - 6$

e. $8(2x - 1)$

f. $2x + 8$

Problem Solving

1. On a family trip, Natalie counted 3 groups of 5 motorcycles and an additional 7 solo motorcycles. Write an expression for the number of motorcycles Natalie saw. Then find the number of motorcycles. (Lesson 2)

2. Lloyd will tile a square kitchen floor with square ceramic tiles. The number of tiles needed is equal to $a^2 \div b^2$, where a is the floor length in inches and b is the length of the tile in inches. If $a = 96$ and $b = 8$, how many tiles are needed? (Lesson 3)

3. **Reason Abstractly** The table shows the amount of memory used on Caleb's MP3 player. Define a variable and write an expression to represent the total memory used on his MP3 player. (Lesson 4)

Type	Memory (GB)
music	
video	0.5

4. Germaine walks at the rate of 10 feet every five seconds while Nolan walks at the rate of 15 feet every five seconds. If Germaine has a head start of 25 feet, after how many seconds will they be at the same spot? (PSI)

5. **Use Math Tools** The table shows the number of magazine subscriptions each person sold. Write two equivalent expression that could be used to find the total subscriptions sold. (Lesson 5)

Magazine Subscriptions Sold	
Charlie	14
Mike	16
Patty	11

6. Admission to a car show costs $9.50. Lunch at the Snack Shop costs $5.50. Find the total cost for four admissions to the car show and four lunches at the Snack Shop. (Lesson 6)

7. Five friends ate at a buffet restaurant. The cost of each buffet was $\$x$. Three of the friends also bought a beverage for $2 each. Write and simplify an expression for the total cost. (Lesson 7)

Reflect

Answering the Essential Question

Use what you learned about expressions to complete the graphic organizer.

Essential Question

HOW is it helpful to write numbers in different ways?

Expression	Variable	Write a real-world example. What does the variable represent?
$17x$	x	Each ticket to the school play costs $7. The variable x represents the number of tickets purchased.
$9 + y$		
$23 - p$		
$\frac{d}{4}$		
$\frac{3}{5}c$		

Answer the Essential Question. HOW is it helpful to write numbers in different ways?