Chapter 1

Place Value, Multiplication, and Expressions

Show What You Know

Check your understanding of important skills.

Name _____

▶ Place Value Write the value of each digit for the given number.

1. 2,904

2 _____

9 _____

0 _____

4 _____

2. 6,423

6 _____

4 _____

2 _____

3 _____

▶ Regroup Through Thousands Regroup. Write the missing numbers.

3. 40 tens = _____ hundreds

4. 60 hundreds = _____ thousands

5. _____ tens 15 ones = 6 tens 5 ones

6. 18 tens 20 ones = _____ hundreds

▶ Missing Factors Find the missing factor.

7. $4 \times$ _____ $= 24$

8. $6 \times$ _____ $= 48$

9. _____ $\times 9 = 63$

Be a Math Detective and use the clues at the right to find the 7-digit number. What is the number?

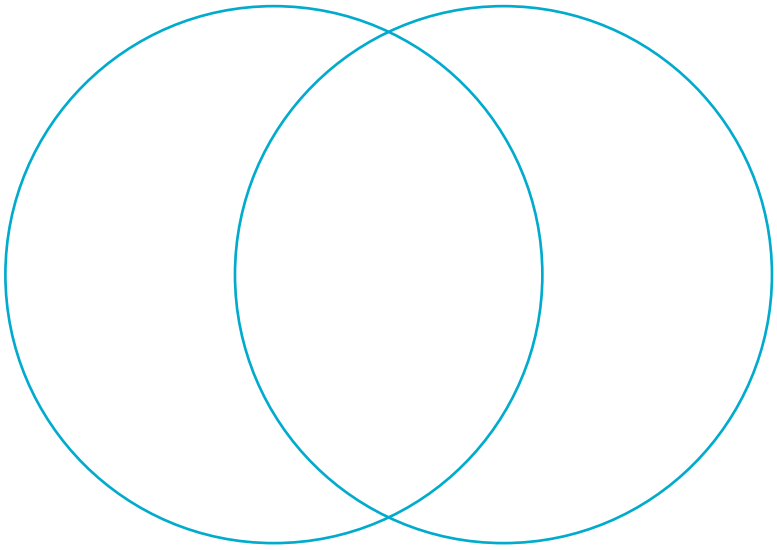
Clues

- **This 7-digit number is 8,920,000 when rounded to the nearest ten thousand.**
- **The digits in the tens and hundreds places are the least and same value.**
- **The value of the thousands digit is double that of the ten thousands digit.**
- **The sum of all its digits is 24.**

Vocabulary Builder

Visualize It

Sort the review words into the Venn diagram.



Review Words
estimate
factor
multiply
place value
product
quotient

Preview Words
base
Distributive Property
evaluate
exponent
inverse operations
numerical expression
order of operations
period

Understand Vocabulary

Write the preview words that answer the question "What am I?"

1. I am a group of 3 digits separated by commas in a multidigit number. _____

2. I am a mathematical phrase that has numbers and operation signs but no equal sign. _____

3. I am operations that undo each other, like multiplication and division. _____

4. I am the property that states that multiplying a sum by a number is the same as multiplying each addend in the sum by the number and then adding the products. _____

5. I am a number that tells how many times the base is used as a factor. _____

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Name _____

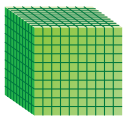
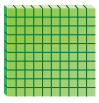
Place Value and Patterns

Essential Question How can you describe the relationship between two place-value positions?

Investigate

Materials ■ base-ten blocks

You can use base-ten blocks to understand the relationships among place-value positions. Use a large cube for 1,000, a flat for 100, a long for 10, and a small cube for 1.

Number	1,000	100	10	1
Model				
Description	large cube	flat	long	small cube

Complete the comparisons below to describe the relationship from one place-value position to the next place-value position.

A.
- Look at the long and compare it to the small cube.

  The long is _____ times as much as the small cube.
- Look at the flat and compare it to the long.

  The flat is _____ times as much as the long.
- Look at the large cube and compare it to the flat.

  The large cube is _____ times as much as the flat.

B.
- Look at the flat and compare it to the large cube.

  The flat is _____ of the large cube.
- Look at the long and compare it to the flat.

  The long is _____ of the flat.
- Look at the small cube and compare it to the long.

  The small cube is _____ of the long.

MATHEMATICAL PRACTICES

Math Talk How many times as much is the flat compared to the small cube? the large cube to the small cube? **Explain.**

Draw Conclusions

1. **Describe** the pattern you see when you move from a lesser place-value position to the next greater place-value position.

2. **Describe** the pattern you see when you move from a greater place-value position to the next lesser place-value position.

Make Connections

You can use your understanding of place-value patterns and a place-value chart to write numbers that are 10 times as much as or $\frac{1}{10}$ of any given number.

Hundred Thousands	Ten Thousands	One Thousands	Hundreds	Tens	Ones
		?	300	?	

10 times as much as

$\frac{1}{10}$ of

_____ is 10 times as much as 300.

_____ is $\frac{1}{10}$ of 300.

Use the steps below to complete the table.

STEP 1 Write the given number in a place-value chart.

STEP 2 Use the place-value chart to write a number that is 10 times as much as the given number.

STEP 3 Use the place-value chart to write a number that is $\frac{1}{10}$ of the given number.

Number	10 times as much as	$\frac{1}{10}$ of
10		
70		
9,000		

Name _____

Share and Show MATH BOARD

Complete the sentence.

1. 500 is 10 times as much as _____.

2. 20,000 is $\frac{1}{10}$ of _____.

3. 900 is $\frac{1}{10}$ of _____.

4. 600 is 10 times as much as _____.

Use place-value patterns to complete the table.

Number	10 times as much as	$\frac{1}{10}$ of
5. 10		
6. 3,000		
7. 800		
8. 50		

Number	10 times as much as	$\frac{1}{10}$ of
9. 400		
10. 90		
11. 6,000		
12. 200		

H.O.T. Complete the sentence with 100 or 1,000.

13. 200 is _____ times as much as 2.

14. 4,000 is _____ times as much as 4.

15. 700,000 is _____ times as much as 700.

16. 600 is _____ times as much as 6.

17. 50,000 is _____ times as much as 500.

18. 30,000 is _____ times as much as 30.

19. **Write Math** **Explain** how you can use place-value patterns to describe how 50 and 5,000 compare.

_____

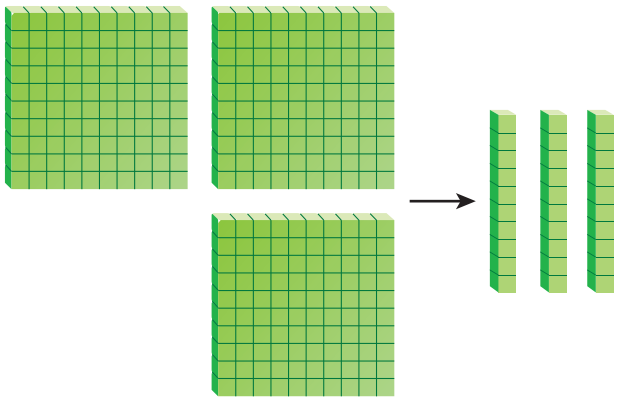
_____

Problem Solving

H.O.T. Sense or Nonsense?

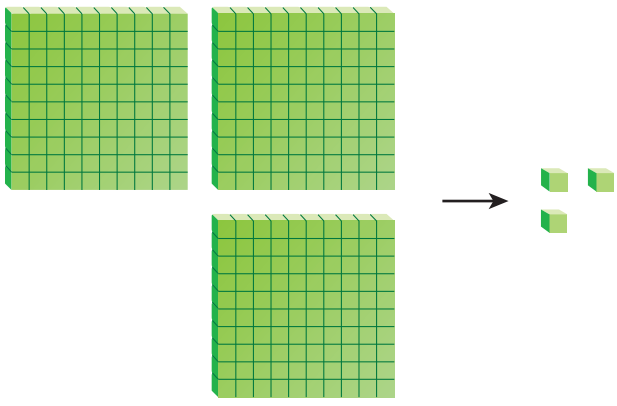
20. Mark and Robyn used base-ten blocks to show that 300 is 100 times as much as 3. Whose model makes sense? Whose model is nonsense? **Explain** your reasoning.

Mark's Work



300

Robyn's Work



300

- **Explain** how you would help Mark understand why he should have used small cubes instead of longs.

FOR MORE PRACTICE:
Standards Practice Book, pp. P3–P4

Name _____

Place Value of Whole Numbers

Essential Question How do you read, write, and represent whole numbers through hundred millions?

UNLOCK the Problem REAL WORLD

The diameter of the sun is 1,392,000 kilometers. To understand this distance, you need to understand the place value of each digit in 1,392,000.

A place-value chart contains periods. A **period** is a group of three digits separated by commas in a multidigit number. The millions period is left of the thousands period. One million is 1,000 thousands and is written as 1,000,000.

Periods

MILLIONS			THOUSANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones
		1,	3	9	2,	0	0	0
		1 × 1,000,000	3 × 100,000	9 × 10,000	2 × 1,000	0 × 100	0 × 10	0 × 1
		1,000,000	300,000	90,000	2,000	0	0	0

The place value of the digit 1 in 1,392,000 is millions. The value of 1 in 1,392,000 is $1 \times 1{,}000{,}000 = 1{,}000{,}000$.

Standard Form: 1,392,000
Word Form: one million, three hundred ninety-two thousand
Expanded Form:
$(1 \times 1{,}000{,}000) + (3 \times 100{,}000) + (9 \times 10{,}000) + (2 \times 1{,}000)$

Math Idea

When writing a number in expanded form, if no digits appear in a place value, it is not necessary to include them in the expression.

Try This! **Use place value to read and write numbers.**

Standard Form: 582,030

Word Form: five hundred eighty-two _____, _____

Expanded Form: $(5 \times 100{,}000) + (\_\_\_\_ \times \_\_\_\_) + (2 \times 1{,}000) + (\_\_\_\_ \times \_\_\_\_)$

- The average distance from Jupiter to the sun is four hundred eighty-three million, six hundred thousand miles. Write the number that shows this distance. _____

Place-Value Patterns

Canada's land area is about 4,000,000 square miles. Iceland has a land area of about 40,000 square miles. Compare the two areas.

Example 1 Use a place-value chart.

STEP 1 Write the numbers in a place-value chart.

MILLIONS			THOUSANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones

STEP 2

Count the number of whole number place-value positions.

4,000,000 has _____ more whole number places than 40,000.

Think: 2 more places is 10 × 10, or 100.

4,000,000 is _____ times as much as 40,000.

So, Canada's estimated land area is _____ times as much as Iceland's estimated land area.

Remember

The value of each place is 10 times as much as the value of the next place to its right or $\frac{1}{10}$ of the value of the next place to its left.

You can use place-value patterns to rename a number.

Example 2 Use place-value patterns.

Rename 40,000 using other place values.

40,000	4 ten thousands	4 × 10,000
40,000	_____ thousands	_____ × 1,000
40,000	_____	_____

Name _____

Share and Show MATH BOARD

1. Complete the place-value chart to find the value of each digit.

MILLIONS			THOUSANDS			ONES		
Hundreds	Tens	Ones	Hundreds	Tens	Ones	Hundreds	Tens	Ones
		7,	3	3	3,	8	2	0
		7 × 1,000,000	3 × _____	3 × 10,000	___ × 1,000	8 × 100	_____	0 × 1
		_____	_____	30,000	3,000	_____	20	0

Write the value of the underlined digit.

2. 1,57<u>4</u>,833 _____

3. 598,<u>1</u>02 _____

4. 7,0<u>9</u>3,455 _____

5. <u>3</u>01,256,878 _____

Write the number in two other forms.

6. (8 × 100,000) + (4 × 1,000) + (6 × 1) _____ _____

7. seven million, twenty thousand, thirty-two _____ _____

On Your Own

Write the value of the underlined digit.

8. 8<u>4</u>9,567,043 _____

9. 9,<u>4</u>22,850 _____

10. <u>9</u>6,283 _____

11. <u>4</u>98,354,021 _____

12. 791,<u>3</u>50 _____

13. <u>2</u>7,911,534 _____

14. 105,9<u>8</u>0,774 _____

15. 8,26<u>5</u>,178 _____

Write the number in two other forms.

16. 345,000 _____ _____ _____

17. 119,000,003 _____ _____ _____

Problem Solving REAL WORLD

Use the table for 18–19.

Average Distance from the Sun (in thousands of km)			
Mercury	57,910	Jupiter	778,400
Venus	108,200	Saturn	1,427,000
Earth	149,600	Uranus	2,871,000
Mars	227,900	Neptune	4,498,000

18. Which planet is about 10 times as far as Earth is from the sun?

_____

19. Which planet is about $\frac{1}{10}$ of the distance Uranus is from the Sun?

_____

20. H.O.T. **What's the Error?** Matt wrote the number four million, three hundred five thousand, seven hundred sixty-two as 4,350,762. **Describe** and correct his error.

_____

_____

SHOW YOUR WORK

21. Write Math **Explain** how you know that the values of the digit 5 in the numbers 150,000 and 100,500 are not the same.

_____

_____

_____

_____

_____

22. **Test Prep** In the number 869,653,214, which describes how the digit 6 in the ten-millions place compares to the digit 6 in the hundred-thousands place?

Ⓐ 10 times as much as

Ⓑ 100 times as much as

Ⓒ 1,000 times as much as

Ⓓ $\frac{1}{10}$ of

FOR MORE PRACTICE:
Standards Practice Book, pp. P5–P6

Name _____

Properties

Essential Question How can you use properties of operations to solve problems?

You can use the properties of operations to help you evaluate numerical expressions more easily.

Properties of Addition

Commutative Property of Addition If the order of addends changes, the sum stays the same.	$12 + 7 = 7 + 12$
Associative Property of Addition If the grouping of addends changes, the sum stays the same.	$5 + (8 + 14) = (5 + 8) + 14$
Identity Property of Addition The sum of any number and 0 is that number.	$13 + 0 = 13$

Properties of Multiplication

Commutative Property of Multiplication If the order of factors changes, the product stays the same.	$4 \times 9 = 9 \times 4$
Associative Property of Multiplication If the grouping of factors changes, the product stays the same.	$11 \times (3 \times 6) = (11 \times 3) \times 6$
Identity Property of Multiplication The product of any number and 1 is that number.	$4 \times 1 = 4$

UNLOCK the Problem REAL WORLD

The table shows the number of bones in several parts of the human body. What is the total number of bones in the ribs, the skull, and the spine?

Part	Number of Bones
Ankle	7
Ribs	24
Skull	28
Spine	26

To find the sum of addends using mental math, you can use the Commutative and Associative Properties.

Use properties to find 24 + 28 + 26.

$24 + 28 + 26 = 28 + $ _____ $+ 26$ Use the _____ Property to reorder the addends.

$= 28 + (24 + $ _____ $)$ Use the _____ Property to group the addends.

$= 28 +$ _____ Use mental math to add.

$=$ _____

So, there are _____ bones in the ribs, the skull, and the spine.

MATHEMATICAL PRACTICES

Math Talk **Explain** why grouping 24 and 26 makes the problem easier to solve.

Distributive Property

Multiplying a sum by a number is the same as multiplying each addend by the number and then adding the products.

$5 \times (7 + 9) = (5 \times 7) + (5 \times 9)$

The Distributive Property can also be used with multiplication and subtraction. For example, $2 \times (10 - 8) = (2 \times 10) - (2 \times 8)$.

Example 1 Use the Distributive Property to find the product.

One Way Use addition.

$8 \times 59 = 8 \times (\_\_\_\_\_ + 9)$ Use a multiple of 10 to write 59 as a sum.

$= (\_\_\_\_\_ \times 50) + (8 \times \_\_\_\_\_)$ Use the Distributive Property.

$= \_\_\_\_\_ + \_\_\_\_\_$ Use mental math to multiply.

$= \_\_\_\_\_$ Use mental math to add.

Another Way Use subtraction.

$8 \times 59 = 8 \times (\_\_\_\_\_ - 1)$ Use a multiple of 10 to write 59 as a difference.

$= (\_\_\_\_\_ \times 60) - (8 \times \_\_\_\_\_)$ Use the Distributive Property.

$= \_\_\_\_\_ - \_\_\_\_\_$ Use mental math to multiply.

$= \_\_\_\_\_$ Use mental math to subtract.

Example 2 Complete the equation, and tell which property you used.

A $23 \times \_\_\_\_\_ = 23$

Think: A number times 1 is equal to itself.

Property: _____

_____

B $47 \times 15 = 15 \times \_\_\_\_\_$

Think: Changing the order of factors does not change the product.

Property: _____

_____

MATHEMATICAL PRACTICES

Math Talk **Explain** how you could find the product 3×299 by using mental math.

Name _____

Share and Show

1. Use properties to find $4 \times 23 \times 25$.

$23 \times$ _____ $\times 25$ _____ Property of Multiplication

$23 \times ($ _____ $\times$ _____ $)$ _____ Property of Multiplication

$23 \times$ _____

_____

Use properties to find the sum or product.

2. $89 + 27 + 11$

3. 9×52

4. $107 + 0 + 39 + 13$

Complete the equation, and tell which property you used.

5. $9 \times (30 + 7) = (9 \times$ _____ $) + (9 \times 7)$

6. $0 +$ _____ $= 47$

Math Talk MATHEMATICAL PRACTICES

Describe how you can use properties to solve problems more easily.

On Your Own

Practice: Copy and Solve **Use properties to find the sum or product.**

7. 3×78

8. $4 \times 60 \times 5$

9. $21 + 25 + 39 + 5$

Complete the equation, and tell which property you used.

10. $11 + (19 + 6) = (11 +$ _____ $) + 6$

11. $25 + 14 =$ _____ $+ 25$

12. H.O.T. Show how you can use the Distributive Property to rewrite and find $(32 \times 6) + (32 \times 4)$.

Problem Solving REAL WORLD

13. Three friends' meals at a restaurant cost $13, $14, and $11. Use parentheses to write two different expressions to show how much the friends spent in all. Which property does your pair of expressions demonstrate?

14. Jacob is designing an aquarium for a doctor's office. He plans to buy 6 red blond guppies, 1 blue neon guppy, and 1 yellow guppy. The table shows the price list for the guppies. How much will the guppies for the aquarium cost?

Fancy Guppy Prices	
Blue neon	$11
Red blond	$22
Sunrise	$18
Yellow	$19

SHOW YOUR WORK

15. Sylvia bought 8 tickets to a concert. Each ticket costs $18. To find the total cost in dollars, she added the product 8×10 to the product 8×8, for a total of 144. Which property did Sylvia use?

16. H.O.T. **Sense or Nonsense?** Julie wrote $(15 - 6) - 3 = 15 - (6 - 3)$. Is Julie's equation sense or nonsense? Do you think the Associative Property works for subtraction? **Explain**.

17. **Test Prep** Canoes rent for $29 per day. Which expression can be used to find the cost in dollars of renting 6 canoes for a day?

Ⓐ $(6 + 20) + (6 + 9)$

Ⓑ $(6 \times 20) + (6 \times 9)$

Ⓒ $(6 + 20) \times (6 + 9)$

Ⓓ $(6 \times 20) \times (6 \times 9)$

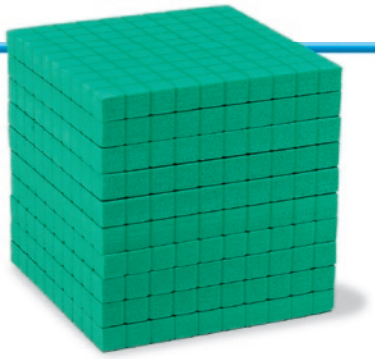
FOR MORE PRACTICE:
Standards Practice Book, pp. P7–P8

Name _____

Powers of 10 and Exponents

Essential Question How can you use an exponent to show powers of 10?

UNLOCK the Problem



Expressions with repeated factors, such as $10 \times 10 \times 10$, can be written by using a base with an exponent. The **base** is the number that is used as the repeated factor. The **exponent** is the number that tells how many times the base is used as a factor.

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

exponent

3 factors

base

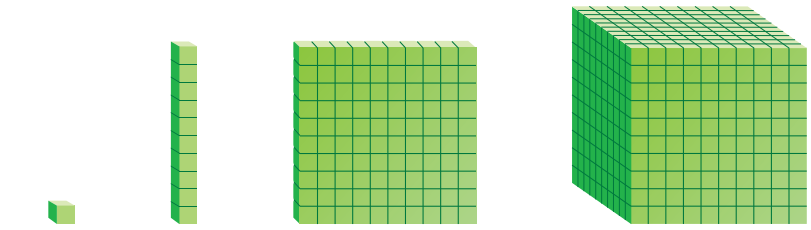
Word form: the third power of ten

Exponent form: 10^3

Activity Use base-ten blocks.

Materials ■ base-ten blocks

What is $10 \times 1{,}000$ written with an exponent?



1 one
1
10^0

10 ones
1×10
10^1

100 ones
$1 \times 10 \times 10$
10^2

1,000 ones
$1 \times 10 \times 10 \times 10$
10^3

- How many ones are in 1? _____
- How many ones are in 10? _____
- How many tens are in 100? _____
  Think: 10 groups of 10 or 10×10
- How many hundreds are in 1,000? _____
  Think: 10 groups of 100 or $10 \times (10 \times 10)$
- How many thousands are in 10,000? _____

In the box at the right, draw a quick picture to show 10,000.

So, $10 \times 1{,}000$ is $10^{\square}$.

Use T for 1,000.

10,000 ones
$1 \times 10 \times 10 \times 10 \times 10$
$10^{\square}$

Example Multiply a whole number by a power of ten.

Hummingbirds beat their wings very fast. The smaller the hummingbird is, the faster its wings beat. The average hummingbird beats its wings about 3×10^3 times a minute. How many times a minute is that, written as a whole number?

Multiply 3 by powers of ten. Look for a pattern.

$3 \times 10^0 = 3 \times 1 =$ _____

$3 \times 10^1 = 3 \times 10 =$ _____

$3 \times 10^2 = 3 \times 10 \times 10 =$ _____

$3 \times 10^3 = 3 \times 10 \times 10 \times 10 =$ _____

So, the average hummingbird beats its wings about _____ times a minute.

MATHEMATICAL PRACTICES

Math Talk **Explain** how using an exponent simplifies an expression.

- What pattern do you see?

_____

_____

Share and Show MATH BOARD

Write in exponent form and word form.

1. 10×10

Exponent form: _____

Word form: _____

_____

2. $10 \times 10 \times 10 \times 10$

Exponent form: _____

Word form: _____

_____

Find the value.

3. 10^2

_____

4. 4×10^2

_____

5. 7×10^3

_____

Name _____

On Your Own

Write in exponent form and word form.

6. $10 \times 10 \times 10$

exponent form: _____

word form: _____

_____

7. $10 \times 10 \times 10 \times 10 \times 10$

exponent form: _____

word form: _____

_____

Find the value.

8. 10^4

_____

9. 2×10^3

_____

10. 6×10^4

_____

Complete the pattern.

11. $7 \times 10^0 = 7 \times 1 =$ _____

$7 \times 10^1 = 7 \times 10 =$ _____

$7 \times 10^2 = 7 \times 100 =$ _____

$7 \times 10^3 = 7 \times 1{,}000 =$ _____

$7 \times 10^4 = 7 \times 10{,}000 =$ _____

12. $9 \times 10^0 =$ _____ $= 9$

$9 \times 10^1 =$ _____ $= 90$

$9 \times 10^2 =$ _____ $= 900$

$9 \times 10^3 =$ _____ $= 9{,}000$

$9 \times 10^4 =$ _____ $= 90{,}000$

13. $12 \times 10^0 = 12 \times 1 =$ _____

$12 \times 10^1 = 12 \times 10 =$ _____

$12 \times 10^2 = 12 \times 100 =$ _____

$12 \times 10^3 = 12 \times 1{,}000 =$ _____

$12 \times 10^4 = 12 \times 10{,}000 =$ _____

14. H.O.T. $10^3 = 10 \times 10^n$ What is the value of n?

Think: $10^3 = 10 \times$ _____ $\times$ _____,

or $10 \times$ _____

The value of n is _____.

15. Write Math **Explain** how to write 50,000 using exponents.

_____

_____

UNLOCK the Problem REAL WORLD

16. Lake Superior is the largest of the Great Lakes. It covers a surface area of about 30,000 square miles. How can you show the estimated area of Lake Superior as a whole number multiplied by a power of ten?

Ⓐ 3×10^2 sq mi

Ⓒ 3×10^4 sq mi

Ⓑ 3×10^3 sq mi

Ⓓ 3×10^5 sq mi

a. What are you asked to find?

_____

b. How can you use a pattern to find the answer?

_____

c. Write a pattern using the whole number 3 and powers of ten.

$3 \times 10^0 = 3 \times 1 =$ _____

$3 \times 10^1 = 3 \times 10 =$ _____

$3 \times 10^2 =$ _____ $=$ _____

$3 \times 10^3 =$ _____ $=$ _____

$3 \times 10^4 =$ _____ $=$ _____

d. Fill in the correct answer choice above.

17. The Earth's diameter through the equator is about 8,000 miles. What is the Earth's estimated diameter written as a whole number multiplied by a power of ten?

Ⓐ 8×10^1 miles

Ⓑ 8×10^2 miles

Ⓒ 8×10^3 miles

Ⓓ 8×10^4 miles

18. The Earth's circumference around the equator is about 25×10^3 miles. What is the Earth's estimated circumference written as a whole number?

Ⓐ 250,000 miles

Ⓑ 25,000 miles

Ⓒ 2,500 miles

Ⓓ 250 miles

FOR MORE PRACTICE:
Standards Practice Book, pp. P9–P10

Name _____

Multiplication Patterns

Essential Question How can you use a basic fact and a pattern to multiply by a 2-digit number?

UNLOCK the Problem REAL WORLD

How close have you been to a bumblebee?

The actual length of a queen bumblebee is about 20 millimeters. The photograph shows part of a bee under a microscope, at 10 times its actual size. What would the length of the bee appear to be at a magnification of 300 times its actual size?

Use a basic fact and a pattern.

Multiply. 300×20

$3 \times 2 = 6$ ← basic fact

$30 \times 2 = (3 \times 2) \times 10^1 = 60$

$300 \times 2 = (3 \times 2) \times 10^2 =$ _____

$300 \times 20 = (3 \times 2) \times (100 \times 10) = 6 \times 10^3 =$ _____

So, the length of the bee would appear to be

about _____ millimeters.

Math Talk MATHEMATICAL PRACTICES

What pattern do you see in the number sentences and the exponents?

- What would the length of the bee shown in the photograph appear to be if the microscope shows it at 10 times its actual size?

_____

Example Use mental math and a pattern.

Multiply. $50 \times 8{,}000$

$5 \times 8 = 40$ ← basic fact

$5 \times 80 = (5 \times 8) \times 10^1 = 400$

$5 \times 800 = (5 \times 8) \times 10^2 =$ _____

$50 \times 800 = (5 \times 8) \times (10 \times 100) = 40 \times 10^3 =$ _____

$50 \times 8{,}000 = (5 \times 8) \times (10 \times 1{,}000) = 40 \times 10^4 =$ _____

Share and Show

MATH BOARD

Use mental math and a pattern to find the product.

1. $30 \times 4{,}000 =$ _____

   - What basic fact can you use to help you find $30 \times 4{,}000$? _____

Use mental math to complete the pattern.

2. $1 \times 1 = 1$

   $1 \times 10^1 =$ _____

   $1 \times 10^2 =$ _____

   $1 \times 10^3 =$ _____

3. $7 \times 8 = 56$

   $(7 \times 8) \times 10^1 =$ _____

   $(7 \times 8) \times 10^2 =$ _____

   $(7 \times 8) \times 10^3 =$ _____

4. $6 \times 5 =$ _____

   $(6 \times 5) \times$ _____ $= 300$

   $(6 \times 5) \times$ _____ $= 3{,}000$

   $(6 \times 5) \times$ _____ $= 30{,}000$

MATHEMATICAL PRACTICES

Math Talk **Explain** how to find $50 \times 9{,}000$ by using a basic fact and pattern.

On Your Own

Use mental math to complete the pattern.

5. $9 \times 5 = 45$

   $(9 \times 5) \times 10^1 =$ _____

   $(9 \times 5) \times 10^2 =$ _____

   $(9 \times 5) \times 10^3 =$ _____

6. $3 \times 7 = 21$

   $(3 \times 7) \times 10^1 =$ _____

   $(3 \times 7) \times 10^2 =$ _____

   $(3 \times 7) \times 10^3 =$ _____

7. $5 \times 4 =$ _____

   $(5 \times 4) \times$ _____ $= 200$

   $(5 \times 4) \times$ _____ $= 2{,}000$

   $(5 \times 4) \times$ _____ $= 20{,}000$

8. $5 \times 7 =$ _____

   $(5 \times 7) \times$ _____ $= 350$

   $(5 \times 7) \times$ _____ $= 3{,}500$

   $(5 \times 7) \times$ _____ $= 35{,}000$

9. $4 \times 2 = 8$

   $(4 \times 2) \times 10^2 =$ _____

   $(4 \times 2) \times 10^3 =$ _____

   $(4 \times 2) \times 10^4 =$ _____

10. $6 \times 7 = 42$

    $(6 \times 7) \times 10^2 =$ _____

    $(6 \times 7) \times 10^3 =$ _____

    $(6 \times 7) \times 10^4 =$ _____

Use mental math and a pattern to find the product.

11. $(6 \times 6) \times 10^1 =$ _____

12. $(7 \times 4) \times 10^3 =$ _____

13. $(9 \times 8) \times 10^2 =$ _____

14. $(4 \times 3) \times 10^2 =$ _____

15. $(2 \times 5) \times 10^3 =$ _____

16. $(2 \times 8) \times 10^2 =$ _____

17. $(6 \times 5) \times 10^3 =$ _____

18. $(8 \times 8) \times 10^4 =$ _____

19. $(7 \times 8) \times 10^4 =$ _____

Name _____

Use mental math to complete the table.

20. 1 roll = 50 dimes **Think:** 50 dimes per roll × 20 rolls = (5 × 2) × (10 × 10)

Rolls	20	30	40	50	60	70	80	90	100
Dimes	10×10^2								

21. 1 roll = 40 quarters **Think:** 40 quarters per roll × 20 rolls = (4 × 2) × (10 × 10)

Rolls	20	30	40	50	60	70	80	90	100
Quarters	8×10^2								

	×	**6**	**70**	**800**	**9,000**
22.	**80**			64×10^3	
23.	**90**				81×10^4

Problem Solving REAL WORLD

Use the table for 24–26.

Arthropod Lengths

Arthropod	Length (in millimeters)
Cluster Fly	9
Crab Spider	5
Fire Ant	4
Tree Hopper	6

24. **What if** you magnified the image of a cluster fly by 9×10^3? What would the length appear to be?

_____

25. If you magnified the image of a fire ant by 4×10^3 and a tree hopper by 3×10^3, which insect would appear longer? How much longer?

SHOW YOUR WORK

_____

26. H.O.T. John wants to magnify the image of a fire ant and a crab spider so they appear to be the same length. How many times their actual sizes would he need to magnify each image?

_____

_____

27. H.O.T. What does the product of any whole-number factor multiplied by 100 always have? **Explain**.

28. **Test Prep** How many zeros are in the product $(5 \times 4) \times 10^4$?

Ⓐ 3

Ⓑ 4

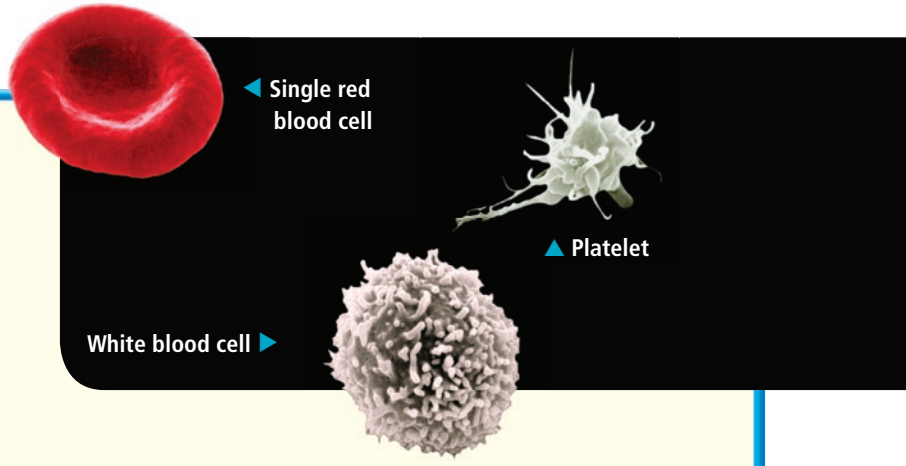
Ⓒ 5

Ⓓ 6

Connect to Health

Blood Cells

Blood is necessary for all human life. It contains red blood cells and white blood cells that nourish and cleanse the body, and platelets that stop bleeding. The average adult has about 5 liters of blood.



Use patterns and mental math to solve.

29. A human body has about 30 times as many platelets as white blood cells. A small sample of blood has 8×10^3 white blood cells. About how many platelets are in the sample?

30. Basophils and monocytes are types of white blood cells. A blood sample has about 5 times as many monocytes as basophils. If there are 60 basophils in the sample, about how many monocytes are there?

31. Lymphocytes and eosinophils are types of white blood cells. A blood sample has about 10 times as many lymphocytes as eosinophils. If there are 2×10^2 eosinophils in the sample, about how many lymphocytes are there?

32. H.O.T. An average person has 6×10^2 times as many red bloods cells as white blood cells. A small sample of blood has 7×10^3 white blood cells. About how many red blood cells are in the sample?

FOR MORE PRACTICE:
Standards Practice Book, pp. P11–P12

Name _____

Mid-Chapter Checkpoint

Vocabulary

Choose the best term for the box.

Vocabulary
base
exponent
period

1. A group of three digits separated by commas in a multidigit number is a _____. (p. 9)
2. An _____ is the number that tells how many times a base is used as a factor. (p. 17)

Concepts and Skills

Complete the sentence.

3. 7 is $\frac{1}{10}$ of _____.
4. 800 is 10 times as much as _____.

Write the value of the underlined digit.

5. 6,5$\underline{8}$1,678 _____
6. 125,$\underline{6}$34 _____
7. 3$\underline{4}$,634,803 _____
8. 2,$\underline{7}$64,835 _____

Complete the equation, and tell which property you used.

9. $8 \times (14 + 7) =$ _____ $+ (8 \times 7)$ _____
10. $7 + (8 + 12) =$ _____ $+ 12$ _____

Find the value.

11. 10^3 _____
12. 6×10^2 _____
13. 4×10^4 _____

Use mental math and a pattern to find the product.

14. $70 \times 300 =$ _____
15. $(3 \times 4) \times 10^3 =$ _____

Fill in the bubble completely to show your answer.

16. DVDs are on sale for $\$24$ each. Which expression can be used to find the cost in dollars of buying 4 DVDs?

Ⓐ $(4 + 20) + (4 + 4)$

Ⓑ $(4 \times 20) + (4 \times 4)$

Ⓒ $(4 + 20) \times (4 + 4)$

Ⓓ $(4 \times 20) \times (4 \times 4)$

17. The Muffin Shop chain of bakeries sold $745{,}305$ muffins last year. Which choice shows that number in expanded form?

Ⓐ $(7 \times 100{,}000) + (45 \times 10{,}000) + (3 \times 100) + (5 \times 10)$

Ⓑ $(7 \times 100{,}000) + (4 \times 10{,}000) + (5 \times 1{,}000) + (5 \times 10)$

Ⓒ $(7 \times 100{,}000) + (4 \times 10{,}000) + (5 \times 1{,}000) + (3 \times 100) + (5 \times 1)$

Ⓓ $(7 \times 100{,}000) + (4 \times 10{,}000) + (3 \times 100) + (5 \times 1)$

18. The soccer field at Mario's school has an area of $6{,}000$ square meters. How can Mario show the area as a whole number multiplied by a power of ten?

Ⓐ 6×10^4 sq m

Ⓑ 6×10^3 sq m

Ⓒ 6×10^2 sq m

Ⓓ 6×10^1 sq m

19. Ms. Alonzo ordered $4{,}000$ markers for her store. Only $\frac{1}{10}$ of them arrived. How many markers did she receive?

Ⓐ 4

Ⓑ 40

Ⓒ 400

Ⓓ $1{,}400$

20. Mark wrote the highest score he made on his new video game as the product of $70 \times 6{,}000$. What was his score?

Ⓐ 420

Ⓑ $4{,}200$

Ⓒ $42{,}000$

Ⓓ $420{,}000$

Name _____

Multiply by 1-Digit Numbers

Essential Question How do you multiply by 1-digit numbers?

UNLOCK the Problem REAL WORLD

Each day an airline flies 9 commercial jets from New York to London, England. Each plane holds 293 passengers. If every seat is taken on all flights, how many people fly on this airline from New York to London in 1 day?

▲ The Queen's Guard protects Britain's Royal Family and their residences.

Use place value and regrouping.

STEP 1 **Estimate:** 293 × 9

Think: 300 × 9 = _____

STEP 2 Multiply the ones.

$$\begin{array}{r} {\scriptstyle 2} \\ 293 \\ \times\ \ 9 \\ \hline 7 \end{array}$$

9 × 3 ones = _____ ones

Write the ones and the regrouped tens.

STEP 3 Multiply the tens.

$$\begin{array}{r} {\scriptstyle 82} \\ 293 \\ \times\ \ 9 \\ \hline 37 \end{array}$$

9 × 9 tens = _____ tens

Add the regrouped tens.

_____ tens + 2 tens = _____ tens

Write the tens and the regrouped hundreds.

STEP 4 Multiply the hundreds.

$$\begin{array}{r} {\scriptstyle 82} \\ 293 \\ \times\ \ 9 \\ \hline 2{,}637 \end{array}$$

9 × 2 hundreds = _____ hundreds

Add the regrouped hundreds.

_____ hundreds + 8 hundreds = _____ hundreds

Write the hundreds.

So, in 1 day, _____ passengers fly from New York to London.

MATHEMATICAL PRACTICES

Math Talk **Explain** how you record the 27 ones when you multiply 3 by 9 in Step 2.

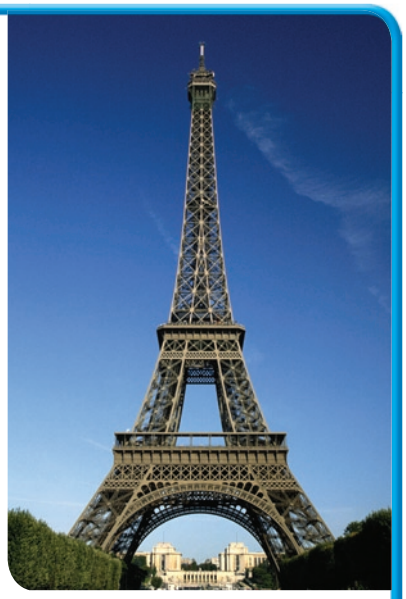
- How can you tell if your answer is reasonable? _____

_____

Example

A commercial airline makes several flights each week from New York to Paris, France. If the airline serves 1,978 meals on its flights each day, how many meals are served for the entire week?

To multiply a greater number by a 1-digit number, repeat the process of multiplying and regrouping until every place value is multiplied.



▲ The Eiffel Tower in Paris, France, built for the 1889 World's Fair, was the world's tallest man-made structure for 40 years.

STEP 1 **Estimate.** 1,978 × 7

Think: 2,000 × 7 = _____

STEP 2 Multiply the ones.

$$\begin{array}{r} {\scriptstyle 5} \\ 1{,}978 \\ \times \quad 7 \\ \hline 6 \end{array}$$

7 × 8 ones = _____ ones

Write the ones and the regrouped tens.

STEP 3 Multiply the tens.

$$\begin{array}{r} {\scriptstyle 55} \\ 1{,}978 \\ \times \quad 7 \\ \hline 46 \end{array}$$

7 × 7 tens = _____ tens

Add the regrouped tens.

_____ tens + 5 tens = _____ tens

Write the tens and the regrouped hundreds.

STEP 4 Multiply the hundreds.

$$\begin{array}{r} {\scriptstyle 6\ 55} \\ 1{,}978 \\ \times \quad 7 \\ \hline 846 \end{array}$$

7 × 9 hundreds = _____ hundreds

Add the regrouped hundreds.

_____ hundreds + 5 hundreds = _____ hundreds

Write the hundreds and the regrouped thousands.

STEP 5 Multiply the thousands.

$$\begin{array}{r} {\scriptstyle 6\ 55} \\ 1{,}978 \\ \times \quad 7 \\ \hline 13{,}846 \end{array}$$

7 × 1 thousand = _____ thousands

Add the regrouped thousands.

_____ thousands + 6 thousands = _____ thousands

Write the thousands. Compare your answer to the estimate to see if it is reasonable.

So, in 1 week, _____ meals are served on flights from New York to Paris.

Name _____

Share and Show

Complete to find the product.

1. 6×796 **Estimate:** $6 \times$ _____ = _____

$$\begin{array}{r} 796 \\ \times\ \ 6 \\ \hline \end{array}$$

Multiply the ones and regroup.

$$\begin{array}{r} {\scriptstyle 3} \\ 796 \\ \times\ \ 6 \\ \hline 6 \end{array}$$

Multiply the tens and add the regrouped tens. Regroup.

$$\begin{array}{r} {\scriptstyle 53} \\ 796 \\ \times\ \ 6 \\ \hline 76 \end{array}$$

Multiply the hundreds and add the regrouped hundreds.

Estimate. Then find the product.

2. Estimate: _____

$$\begin{array}{r} 608 \\ \times\ \ 8 \\ \hline \end{array}$$

3. Estimate: _____

$$\begin{array}{r} 556 \\ \times\ \ 4 \\ \hline \end{array}$$

4. Estimate: _____

$$\begin{array}{r} 1{,}925 \\ \times\ \ 7 \\ \hline \end{array}$$

On Your Own

Estimate. Then find the product.

5. Estimate: _____

$$\begin{array}{r} 794 \\ \times\ \ 3 \\ \hline \end{array}$$

6. Estimate: _____

$$\begin{array}{r} 822 \\ \times\ \ 6 \\ \hline \end{array}$$

7. Estimate: _____

$$\begin{array}{r} 3{,}102 \\ \times\ \ 5 \\ \hline \end{array}$$

H.O.T. **Algebra** **Solve for the unknown number.**

8.
$$\begin{array}{r} 396 \\ \times\ \ 6 \\ \hline 2{,}3\square 6 \end{array}$$

9.
$$\begin{array}{r} 5{,}12\square \\ \times\ \ 8 \\ \hline \square 16 \end{array}$$

10.
$$\begin{array}{r} 8{,}5\square 6 \\ \times\ \ 7 \\ \hline 60{,}03\square \end{array}$$

Practice: Copy and Solve **Estimate. Then find the product.**

11. 116×3

12. 338×4

13. 6×219

14. 7×456

15. $5 \times 1{,}012$

16. $2{,}921 \times 3$

17. $8{,}813 \times 4$

18. $9 \times 3{,}033$

Problem Solving REAL WORLD

H.O.T. What's the Error?

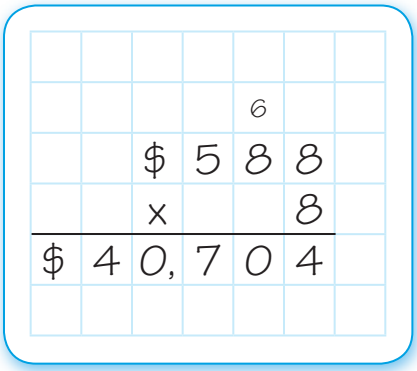
19. The Plattsville Glee Club is sending 8 of its members to a singing contest in Cincinnati, Ohio. The cost will be $588 per person. How much will it cost for the entire group of 8 students to attend?

Both Brian and Jermaine solve the problem. Brian says the answer is $40,074. Jermaine's answer is $4,604.

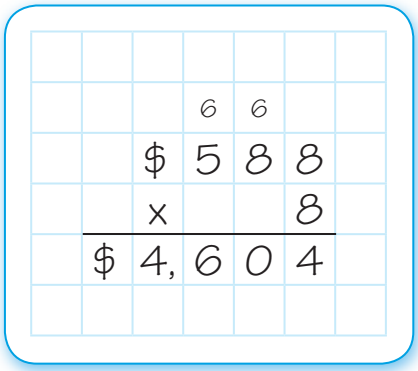
Estimate the cost. A reasonable estimate is _____.

Although Jermaine's answer seems reasonable, neither Brian nor Jermaine solved the problem correctly. Find the errors in Brian's and Jermaine's work. Then, solve the problem correctly.

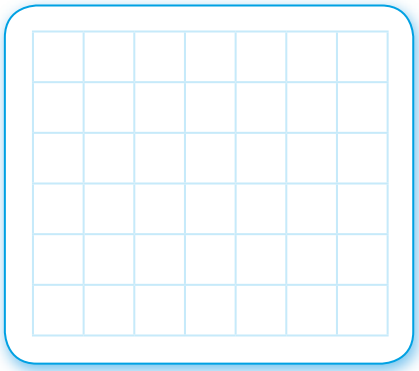
Brian



Jermaine



Correct Answer



- What error did Brian make? **Explain**. _____

_____

_____

- What error did Jermaine make? **Explain**. _____

_____

- How could you predict that Jermaine's answer might be incorrect using your estimate? _____

_____

_____

FOR MORE PRACTICE:
Standards Practice Book, pp. P13–P14

Name _____

Multiply by 2-Digit Numbers

Essential Question How do you multiply by 2-digit numbers?

UNLOCK the Problem REAL WORLD

A tiger can eat as much as 40 pounds of food at a time but it may go for several days without eating anything. Suppose a Siberian tiger in the wild eats an average of 18 pounds of food per day. How much food will the tiger eat in 28 days if he eats that amount each day?

Use place value and regrouping.

STEP 1 **Estimate:** 28×18

Think: $30 \times 20 =$ _____

STEP 2 Multiply by the ones.

$$\begin{array}{r} 28 \\ \times\ 18 \\ \hline \square \end{array}$$

28×8 ones = _____ ones

STEP 3 Multiply by the tens.

$$\begin{array}{r} 28 \\ \times\ 18 \\ \hline \square \\ \square \end{array}$$

28×1 ten = _____ tens, or _____ ones

STEP 4 Add the partial products.

$$\begin{array}{rl} & 28 \\ \times & 18 \\ \hline & \square \quad \leftarrow 28 \times 8 \\ + & \square \quad \leftarrow 28 \times 10 \\ \hline & \square \end{array}$$

So, on average, a Siberian tiger may eat _____ pounds of food in 28 days.

Remember

Use patterns of zeros to find the product of multiples of 10.

$3 \times 4 = 12$

$3 \times 40 = 120$ $\quad 30 \times 40 = 1{,}200$

$3 \times 400 = 1{,}200$ $\quad 300 \times 40 = 12{,}000$

Example

A Siberian tiger sleeps as much as 18 hours a day, or 126 hours per week. About how many hours does a tiger sleep in a year? There are 52 weeks in one year.

STEP 1 **Estimate:** 126 × 52

Think: 100 × 50 = _____

STEP 2 Multiply by the ones.

$$\begin{array}{r} 126 \\ \times\ 52 \\ \hline \end{array}$$

126 × 2 ones = _____ ones

STEP 3 Multiply by the tens.

$$\begin{array}{r} 126 \\ \times\ 52 \\ \hline \\ \end{array}$$

126 × 5 tens = _____ tens, or _____ ones

STEP 4 Add the partial products.

$$\begin{array}{r} 126 \\ \times\ 52 \\ \hline \\ +\ \\ \hline \\ \end{array}$$

← 126 × 2

← 126 × 50

So, a Siberian tiger sleeps about _____ hours in one year.

MATHEMATICAL PRACTICES

Math Talk Are there different numbers you could have used in Step 1 to find an estimate that is closer to the actual answer? **Explain**.

- When you multiply 126 and 5 tens in Step 3, why does its product have a zero in the ones place? **Explain**. _____

_____

Name _____

Share and Show

Complete to find the product.

1.

			6	4
	×		4	3
+				

← 64 × _____

← 64 × _____

2.

			5	7	1
	×			3	8
+					

← 571 × _____

← 571 × _____

Estimate. Then find the product.

3. Estimate: _____

$$\begin{array}{r} 24 \\ \times\ 15 \\ \hline \end{array}$$

4. Estimate: _____

$$\begin{array}{r} 37 \\ \times\ 63 \\ \hline \end{array}$$

5. Estimate: _____

$$\begin{array}{r} 384 \\ \times\ 45 \\ \hline \end{array}$$

On Your Own

Estimate. Then find the product.

6. Estimate: _____

$$\begin{array}{r} 28 \\ \times\ 22 \\ \hline \end{array}$$

7. Estimate: _____

$$\begin{array}{r} 93 \\ \times\ 76 \\ \hline \end{array}$$

8. Estimate: _____

$$\begin{array}{r} 295 \\ \times\ 51 \\ \hline \end{array}$$

Practice: Copy and Solve **Estimate. Then find the product.**

9. 54×31

10. 42×26

11. 38×64

12. 63×16

13. 204×41

14. 534×25

15. 722×39

16. 957×43

Problem Solving REAL WORLD

Use the table for 17–20.

17. How much sleep does a jaguar get in 1 year?

18. In 1 year, how many more hours of sleep does a giant armadillo get than a platypus?

19. H.O.T. Owl monkeys sleep during the day, waking about 15 minutes after sundown to find food. At midnight, they rest for an hour or two, then continue to feed until sunrise. They live about 27 years. How many hours of sleep does an owl monkey that lives 27 years get in its lifetime?

20. Three-toed sloths move very slowly, using as little energy as possible. They sleep, eat, and even give birth upside down. A baby sloth may cling to its mother for as much as 36 weeks after being born. How much of that time is the sloth asleep?

21. **Test Prep** A sloth's maximum speed on the ground is 15 feet in 1 minute. Even though it would be unlikely for a sloth to stay in motion for more than a few moments, how far would a sloth travel in 45 minutes at that speed?

Ⓐ 60 feet

Ⓑ 270 feet

Ⓒ 675 feet

Ⓓ 6,750 feet

Animal Sleep Amounts

Animal	Amount (usual hours per week)
Jaguar	77
Giant Armadillo	127
Owl Monkey	119
Platypus	98
Three-Toed Sloth	101

SHOW YOUR WORK

FOR MORE PRACTICE:
Standards Practice Book, pp. P15–P16

Name _____

Relate Multiplication to Division

Essential Question How is multiplication used to solve a division problem?

You can use the relationship between multiplication and division to solve a division problem. Using the same numbers, multiplication and division are opposite, or **inverse operations.**

$3 \times 8 = 24$
factor factor product

$24 \div 3 = 8$
dividend divisor quotient

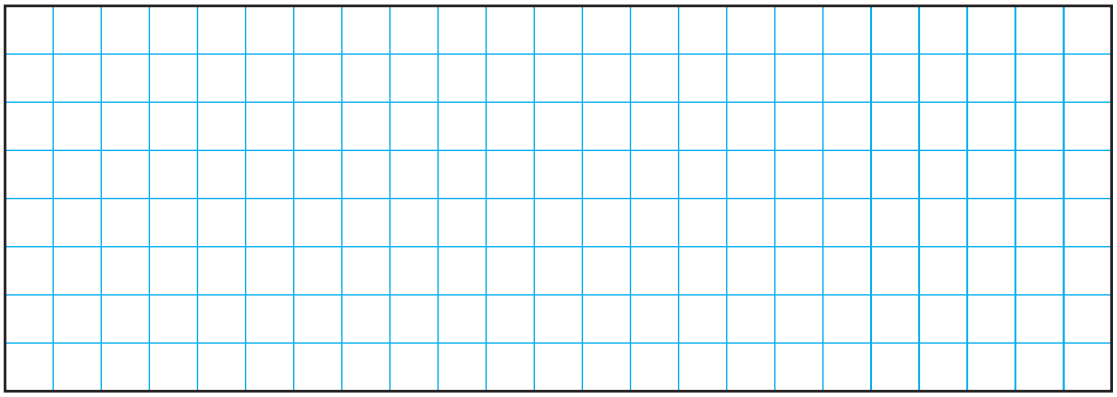
UNLOCK the Problem REAL WORLD

Joel and 5 friends collected 126 marbles. They shared the marbles equally. How many marbles will each person get?

- Underline the dividend.
- What is the divisor? _____

One Way Make an array.

- Outline a rectangular array on the grid to model 126 squares arranged in 6 rows of the same length. Shade each row a different color.



- How many squares are shaded in each row? _____
- Use the array to complete the multiplication sentence. Then, use the multiplication sentence to complete the division sentence.

$6 \times$ _____ $= 126$ $126 \div 6 =$ _____

So, each of the 6 friends will get _____ marbles.

Another Way Use the Distributive Property.

Divide. 52 ÷ 4

You can use the Distributive Property and an area model to solve division problems. Remember that the Distributive Property states that multiplying a sum by a number is the same as multiplying each addend in the sum by the number and then adding the products.

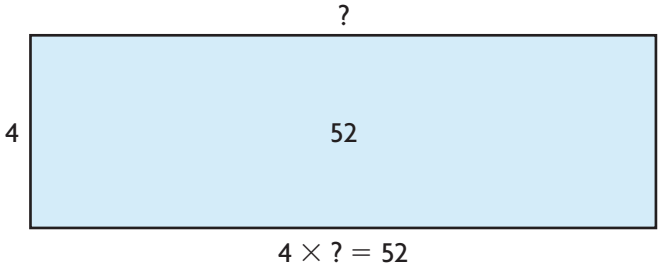
STEP 1

Write a related multiplication sentence for the division problem.

Think: Use the divisor as a factor and the dividend as the product. The quotient will be the unknown factor.

52 ÷ 4 = ▢

4 × ▢ = 52

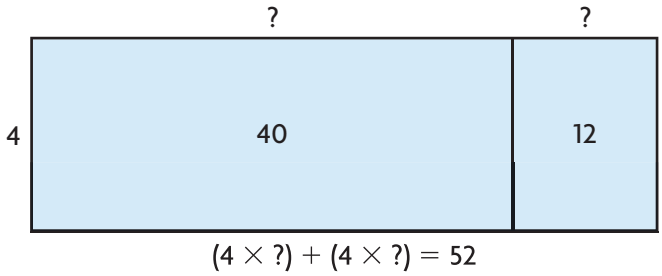


STEP 2

Use the Distributive Property to break apart the large area into smaller areas for partial products that you know.

(40 + 12) = 52

(4 × _____) + (4 × _____) = 52



STEP 3

Find the sum of the unknown factors of the smaller areas.

_____ + _____ = _____

STEP 4

Write the multiplication sentence with the unknown factor that you found. Then, use the multiplication sentence to find the quotient.

4 × _____ = 52

52 ÷ 4 = _____

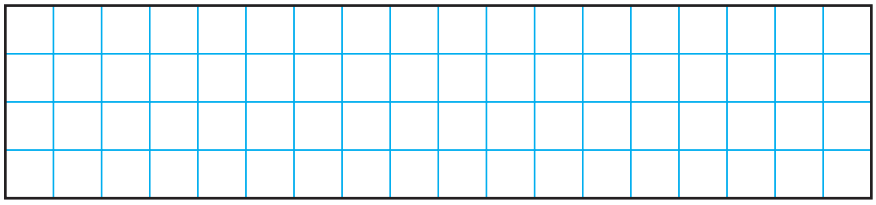
- **Explain** how you can use the Distributive Property to find the quotient of 96 ÷ 8.

Name _____

Share and Show

1. Brad has 72 toy cars that he puts into 4 equal groups. How many cars does Brad have in each group? Use the array to show your answer.

$4 \times$ _____ $= 72$ $\quad 72 \div 4 =$ _____



Use multiplication and the Distributive Property to find the quotient.

2. $108 \div 6 =$ _____

3. $84 \div 6 =$ _____

4. $184 \div 8 =$ _____

MATHEMATICAL PRACTICES

Math Talk **Explain** how using multiplication as the inverse operation helps you solve a division problem.

On Your Own

Use multiplication and the Distributive Property to find the quotient.

5. $60 \div 4 =$ _____

6. $144 \div 6 =$ _____

7. $252 \div 9 =$ _____

H.O.T. **Find each quotient. Then compare. Write <, >, or =.**

8. $51 \div 3 \bigcirc 68 \div 4$

9. $252 \div 6 \bigcirc 135 \div 3$

10. $110 \div 5 \bigcirc 133 \div 7$

Problem Solving

Use the table to solve 11–13.

11. A group of 6 friends share a bag of the 45-millimeter bouncy balls equally among them. How many does each friend get?

12. H.O.T. Mr. Henderson has 2 bouncy-ball vending machines. He buys one bag of the 27-millimeter balls and one bag of the 40-millimeter balls. He puts an equal number of each in the 2 machines. How many bouncy balls does he put in each machine?

13. Lindsey buys a bag of each size of bouncy ball. She wants to put the same number of each size of bouncy ball into 5 party-favor bags. How many of each size of bouncy ball will she put in a bag?

SHOW YOUR WORK

14. **What's the Error?** Sandy writes $(4 \times 30) + (4 \times 2)$ and says the quotient for $128 \div 4$ is 8. Is she correct? **Explain**.

15. **Test Prep** Which of the following can be used to find $150 \div 6$?

Ⓐ $(6 \times 20) + (6 \times 5)$

Ⓑ $(6 \times 10) + (6 \times 5)$

Ⓒ $(2 \times 75) + (2 \times 3)$

Ⓓ $(6 \times 15) + (6 \times 5)$

FOR MORE PRACTICE:
Standards Practice Book, pp. P17–P18

Name _____

Problem Solving • Multiplication and Division

Essential Question How can you use the strategy *solve a simpler problem* to help you solve a division problem?

UNLOCK the Problem REAL WORLD

Mark works at an animal shelter. To feed 9 dogs, Mark empties eight 18-ounce cans of dog food into a large bowl. If he divides the food equally among the dogs, how many ounces of food will each dog get?

Use the graphic organizer below to help you solve the problem.

Read the Problem

What do I need to find?

I need to find _____

_____.

What information do I need to use?

I need to use the number of _____, the number of _____ in each can, and the number of dogs that need to be fed.

How will I use the information?

I can _____ to find the total number of ounces. Then I can solve a simpler problem to _____ that total by 9.

Solve the Problem

- First, multiply to find the total number of ounces of dog food.

  $8 \times 18 =$ _____

- To find the number of ounces each dog gets, I'll need to divide.

  $144 \div$ _____ $= \square$

- To find the quotient, I break 144 into two simpler numbers that are easier to divide.

$144 \div 9 = \square$

$(90 +$ _____ $) \div 9 = \square$

(_____ $\div 9) + ($ _____ $\div 9) = \square$

_____ $+ 6 =$ _____

So, each dog gets _____ ounces of food.

Try Another Problem

Michelle is building shelves for her room. She has a plank 137 inches long that she wants to cut into 7 shelves of equal length. The plank has jagged ends, so she will start by cutting 2 inches off each end. How long will each shelf be?

137 inches

Read the Problem	Solve the Problem
What do I need to find?	
What information do I need to use?	
How will I use the information?	

So, each shelf will be _____ inches long.

MATHEMATICAL PRACTICES

Math Talk **Explain** how the strategy you used helped you solve the problem.

Name _____

Share and Show

MATH BOARD

Tips

UNLOCK the Problem

- Underline what you need to find.
- Circle the numbers you need to use.

1. To make concrete mix, Monica pours 34 pounds of cement, 68 pounds of sand, 14 pounds of small pebbles, and 19 pounds of large pebbles into a large wheelbarrow. If she pours the mixture into 9 equal-size bags, how much will each bag weigh?

SHOW YOUR WORK

First, find the total weight of the mixture.

_____

Then, divide the total by the number of bags. Break the total into two simpler numbers to make the division easier, if necessary.

Finally, find the quotient and solve the problem.

So, each bag will weigh _____ pounds.

2. **What if** Monica pours the mixture into 5 equal-size bags? How much will each bag weigh?

_____

3. Taylor is building doghouses to sell. Each doghouse requires 3 full sheets of plywood which Taylor cuts into new shapes. The plywood is shipped in bundles of 14 full sheets. How many doghouses can Taylor make from 12 bundles of plywood?

_____

4. Eileen is planting a garden. She has seeds for 60 tomato plants, 55 sweet corn plants, and 21 cucumber plants. She plants them in 8 rows, with the same number of plants in each row. How many seeds are planted in each row?

_____

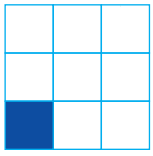
On Your Own

Choose a STRATEGY

- Act It Out
- Draw a Diagram
- Make a Table
- Solve a Simpler Problem
- Work Backward
- Guess, Check, and Revise

5. Starting on day 1 with 1 jumping jack, Keith doubles the number of jumping jacks he does every day. How many jumping jacks will Keith do on day 10?

6. H.O.T. Starting in the blue square, in how many different ways can you draw a line that passes through every square without picking up your pencil or crossing a line you've already drawn? Show the ways.



7. On April 11, Millie bought a lawn mower with a 50-day guarantee. If the guarantee begins on the date of purchase, what is the first day on which the mower will no longer be guaranteed?

8. H.O.T. A classroom bulletin board is 7 feet by 4 feet. If there is a picture of a student every 6 inches along the edge, including one in each corner, how many pictures are on the bulletin board?

9. Dave wants to make a stone walkway. The rectangular walkway is 4 feet wide and 12 feet long. Each 2 foot by 2 foot stone covers an area of 4 square feet. How many stones will Dave need to make his walkway?

10. **Test Prep** Dee has 112 minutes of recording time. How many 4-minute songs can she record?

Ⓐ 28 Ⓒ 18

Ⓑ 27 Ⓓ 17

FOR MORE PRACTICE:
Standards Practice Book, pp. P19–P20

Name _____

Numerical Expressions

Essential Question How can you use a numerical expression to describe a situation?

UNLOCK the Problem REAL WORLD

A **numerical expression** is a mathematical phrase that has numbers and operation signs but does not have an equal sign.

Tyler caught 15 small bass, and his dad caught 12 small bass in the Memorial Bass Tourney in Tidioute, PA. Write a numerical expression to represent how many fish they caught in all.

Choose which operation to use.

You need to join groups of different sizes, so use addition.

15 small bass	plus	12 small bass
↓	↓	↓
15	+	12

So, 15 + 12 represents how many fish they caught in all.

Example 1 Write an expression to match the words.

A Addition

Emma has 11 fish in her aquarium. She buys 4 more fish.

fish	plus	more fish
↓	↓	↓
11	+	4

B Subtraction

Lucia has 128 stamps. She uses 38 stamps on party invitations.

stamps	minus	stamps used
↓	↓	↓
128	−	_____

C Multiplication

Karla buys 5 books. Each book costs $3.

books	multiplied by	cost per book
↓	↓	↓
_____	×	_____

D Division

Four players share 52 cards equally.

cards	divided by	players
↓	↓	↓
_____	÷	_____

MATHEMATICAL PRACTICES

Math Talk **Describe** what each expression represents.

Expressions with Parentheses The meaning of the words in a problem will tell you where to place the parentheses in an expression.

Example 2 Which expression matches the meaning of the words?

- Underline the events for each day.
- Circle the number of days these events happened.

Doug went fishing for 3 days. Each day he put $15 in his pocket. At the end of each day, he had $5 left. How much money did Doug spend by the end of the trip?

Think: Each day he took $15 and had $5 left. He did this for 3 days.

$($15 - $5)$ ← **Think:** What expression can you write to show how much money Doug spends in one day?

$3 \times ($15 - $5)$ ← **Think:** What expression can you write to show how much money Doug spends in three days?

MATHEMATICAL PRACTICES

Math Talk **Explain** how the expression of what Doug spent in three days compares to the expression of what he spent in one day?

Example 3 Which problem matches the expression $20 − ($12 + $3)?

Kim has $20 to spend for her fishing trip. She spends $12 on a fishing pole. Then she finds $3. How much money does Kim have now?

List the events in order.

First: Kim has $20.

Next: _____.

Then: _____.

Do these words match the expression? _____

Kim has $20 to spend for her fishing trip. She spends $12 on a fishing pole and $3 on bait. How much money does Kim have now?

List the events in order.

First: Kim has $20.

Next: _____.

Then: _____.

Do these words match the expression? _____

Share and Show MATH BOARD

Circle the expression that matches the words.

1. Teri had 18 worms. She gave 4 worms to Susie and 3 worms to Jamie.

$(18 - 4) + 3$ $18 - (4 + 3)$

2. Rick had $8. He then worked 4 hours for $5 each hour.

$$8 + (4 \times $5)$$ $($8 + 4) \times 5

Name _____

Write an expression to match the words.

3. Greg drives 26 miles on Monday and 90 miles on Tuesday.

4. Lynda has 27 fewer fish than Jack. Jack has 80 fish.

Write words to match the expression.

5. $34 - 17$

6. $6 \times (12 - 4)$

MATHEMATICAL PRACTICES

Math Talk Is $4 \times 8 = 32$ an expression? **Explain** why or why not.

On Your Own

Write an expression to match the words.

7. José shared 12 party favors equally among 6 friends.

8. Braden has 14 baseball cards. He finds 5 more baseball cards.

9. Isabelle bought 12 bottles of water at $2 each.

10. Monique had $20. She spent $5 on lunch and $10 at the bookstore.

Write words to match the expression.

11. $36 \div 9$

12. $35 - (16 + 11)$

Draw a line to match the expression with the words.

13.

- Fred catches 25 fish. Then he releases 10 fish and catches 8 more.
- Nick has 25 pens. He gives 10 pens to one friend and 8 pens to another friend.
- Jan catches 15 fish and lets 6 fish go.
- Libby catches 15 fish and lets 6 fish go for three days in a row.

- $3 \times (15 - 6)$
- $15 - 6$
- $25 - (10 + 8)$
- $(25 - 10) + 8$

Problem Solving REAL WORLD

Use the rule and the table for 14.

14. Write a numerical expression to represent the total number of lemon tetras that could be in a 20-gallon aquarium.

15. H.O.T. Write a word problem for an expression that is three times as great as $(15 + 7)$. Then write the expression.

16. **What's the Question?** Lu has 3 swordtails in her aquarium. She buys 2 more swordtails.

17. H.O.T. Tammy gives 45 stamps to her 9 friends. She shares them equally among her friends. Write an expression to match the words. How many stamps does each friend get?

18. **Test Prep** Josh has 3 fish in each of 5 buckets. Then he releases 4 fish. Which expression matches the words?

Ⓐ $(3 \times 4) - 5$

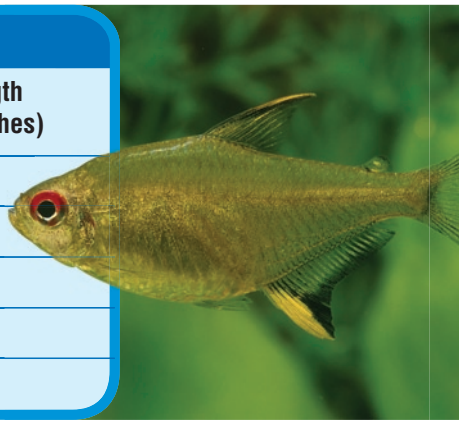
Ⓑ $(5 \times 4) - 3$

Ⓒ $(5 \times 3) - 4$

Ⓓ $(5 - 3) \times 4$

Aquarium Fish

Type of Fish	Length (in inches)
Lemon Tetra	2
Strawberry Tetra	3
Giant Danio	5
Tiger Barb	3
Swordtail	5



▲ The rule for the number of fish in an aquarium is to allow 1 gallon of water for each inch of length.

SHOW YOUR WORK

FOR MORE PRACTICE:
Standards Practice Book, pp. P21–P22

Name _____

Evaluate Numerical Expressions

Essential Question In what order must operations be evaluated to find the solution to a problem?

CONNECT Remember that a numerical expression is a mathematical phrase that uses only numbers and operation symbols.

$(5 - 2) \times 7$ $\quad 72 \div 9 + 16$ $\quad (24 - 15) + 32$

To **evaluate**, or find the value of, a numerical expression with more than one operation, you must follow rules called the **order of operations**. The order of operations tells you in what order you should evaluate an expression.

Order of Operations

1. Perform operations in parentheses.
2. Multiply and divide from left to right.
3. Add and subtract from left to right.

UNLOCK the Problem REAL WORLD

A cake recipe calls for 4 cups of flour and 2 cups of sugar. To triple the recipe, how many cups of flour and sugar are needed in all?

Evaluate $3 \times 4 + 3 \times 2$ to find the total number of cups.

A Heather did not follow the order of operations correctly.

	Heather
○	3 x 4 + 3 x 2 First, I added.
	3 x 7 x 2 Then, I multiplied.
○	
	42

Explain why Heather's answer is not correct.

_____

B Follow the order of operations by multiplying first and then adding.

	Name_____
○	3 x 4 + 3 x 2
○	

So, _____ cups of flour and sugar are needed.

Evaluate Expressions with Parentheses To evaluate an expression with parentheses, follow the order of operations. Perform the operations in parentheses first. Multiply from left to right. Then add and subtract from left to right.

Example

Each batch of cupcakes Lena makes uses 3 cups of flour, 1 cup of milk, and 2 cups of sugar. Lena wants to make 5 batches of cupcakes. How many cups of flour, milk, and sugar will she need in all?

Write the expression. $5 \times (3 + 1 + 2)$

First, perform the operations in parentheses. $5 \times$ (_____)

Then multiply. _____

So, Lena will use _____ cups of flour, milk, and sugar in all.

- H.O.T. **What if** Lena makes 4 batches? Will this change the numerical expression? **Explain**.

_____

Try This! **Rewrite the expression with parentheses to equal the given value.**

A $6 + 12 \times 8 - 3$; value: 141

- Evaluate the expression without the parentheses. _____
- Try placing the parentheses in the expression so the value is 141.

Think: Will the placement of the parentheses increase or decrease the value of the expression?

- Use order of operations to check your work.

$6 + 12 \times 8 - 3$

B $5 + 28 \div 7 - 4$; value: 11

- Evaluate the expression without the parentheses. _____
- Try placing the parentheses in the expression so that the value is 11.

Think: Will the placement of the parentheses increase or decrease the value of the expression?

- Use order of operations to check your work.

$5 + 28 \div 7 - 4$

Name _____

Share and Show MATH BOARD

Evaluate the numerical expression.

1. $10 + 36 \div 9$

Think: I need to divide first.

2. $10 + (25 - 10) \div 5$

3. $9 - (3 \times 2) + 8$

MATHEMATICAL PRACTICES

Math Talk Raina evaluated the expression $5 \times 2 + 2$ by adding first and then multiplying. Will her answer be correct? **Explain**.

On Your Own

Evaluate the numerical expression.

4. $(4 + 49) - 4 \times 10$

5. $5 + 17 - 100 \div 5$

6. $36 - (8 + 5)$

7. $125 - (68 + 7)$

8. $(4 \times 6) - 12$

9. $3 \times (22 - 2)$

10. $23 + (16 - 7)$

11. $(25 - 4) \div 3$

Rewrite the expression with parentheses to equal the given value.

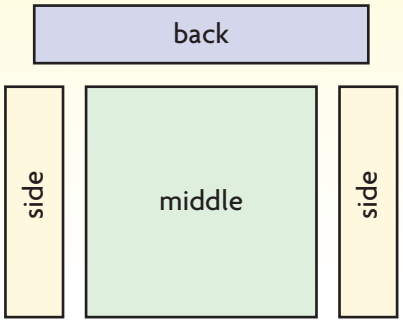
12. $100 - 30 \div 5$
value: 14

13. $12 + 17 - 3 \times 2$
value: 23

14. $9 + 5 \div 5 + 2$
value: 2

UNLOCK the Problem REAL WORLD

15. A movie theater has 4 groups of seats. The largest group of seats, in the middle, has 20 rows, with 20 seats in each row. There are 2 smaller groups of seats on the sides, each with 20 rows and 6 seats in each row. A group of seats in the back has 5 rows, with 30 seats in each row. How many seats are in the movie theater?



a. What do you need to know? _____

_____

b. What operation can you use to find the number of seats in the back group of seats? Write the expression. _____

c. What operation can you use to find the number of seats in both groups of side seats? Write the expression.

_____

d. What operation can you use to find the number of seats in the middle group? Write the expression.

_____

e. Write an expression to represent the total number of seats in the theater.

_____

_____

f. How many seats are in the theater? Show the steps you use to solve the problem.

_____

_____

16. **Test Prep** In the wild, an adult giant panda eats about 30 pounds of food each day. Which expression shows how many pounds of food 6 pandas eat in 3 days?

Ⓐ $3 + (30 \times 6)$

Ⓑ $3 \times (30 \times 6)$

Ⓒ $(30 \times 6) \div 3$

Ⓓ $(30 \times 6) - 3$

17. **Test Prep** Which expression has a value of 6?

Ⓐ $(6 \div 3) \times 4 + 8$

Ⓑ $27 - 9 \div 3 \times (4 + 1)$

Ⓒ $(18 + 12) \times 6 - 4$

Ⓓ $71 - 5 \times (9 + 4)$

FOR MORE PRACTICE:
Standards Practice Book, pp. P23–P24

Name _____

Grouping Symbols

Essential Question In what order must operations be evaluated to find a solution when there are parentheses within parentheses?

UNLOCK the Problem REAL WORLD

Mary's weekly allowance is $8 and David's weekly allowance is $5. Every week they each spend $2 on lunch. Write a numerical expression to show how many weeks it will take them together to save enough money to buy a video game for $45.

- Underline Mary's weekly allowance and how much she spends.
- Circle David's weekly allowance and how much he spends.

Use parentheses and brackets to write an expression.

You can use parentheses and brackets to group operations that go together. Operations in parentheses and brackets are performed first.

STEP 1 Write an expression to represent how much Mary and David save each week.

- How much money does Mary save each week?

Think: Each week Mary gets $8 and spends $2.

(_____)

- How much money does David save each week?

Think: Each week David gets $5 and spends $2.

(_____)

- How much money do Mary and David save together each week? _____

STEP 2 Write an expression to represent how many weeks it will take Mary and David to save enough money for the video game.

- How many weeks will it take Mary and David to save enough for a video game?

Think: I can use brackets to group operations a second time. $45 is divided by the total amount of money saved each week.

_____ ÷ [_____]

Math Talk MATHEMATICAL PRACTICES

Explain why brackets are placed around the part of the expression that represents the amount of money Mary and David save each week.

Evaluate Expressions with Grouping Symbols When evaluating an expression with different grouping symbols (parentheses, brackets, and braces), perform the operation in the innermost set of grouping symbols first, evaluating the expression from the inside out.

Example

John gets $6 for his weekly allowance and spends $4 of it. His sister Tina gets $7 for her weekly allowance and spends $3 of it. Their mother's birthday is in 4 weeks. If they spend the same amount each week, how much money can they save together in that time to buy her a present?

- Write the expression using parentheses and brackets. $4 \times [(\$6 - \$4) + (\$7 - \$3)]$
- Perform the operations in the parentheses first. $4 \times [\_\_\_\_\_ + \_\_\_\_\_]$
- Next perform the operations in the brackets. $4 \times \_\_\_\_\_$
- Then multiply. $\_\_\_\_\_$

So, John and Tina will be able to save _____ for their mother's birthday present.

- H.O.T. **What if** only Tina saves any money? Will this change the numerical expression? **Explain**.

_____

Try This! **Follow the order of operations.**

A $4 \times \{[(5 - 2) \times 3] + [(2 + 4) \times 2]\}$

- Perform the operations in the parentheses. $4 \times \{[3 \times 3] + [\_\_\_\_\_ \times \_\_\_\_\_]\}$
- Perform the operations in the brackets. $4 \times \{9 + \_\_\_\_\_\}$
- Perform the operations in the braces. $4 \times \_\_\_\_\_$
- Multiply. $\_\_\_\_\_$

B $32 \div \{[(3 \times 2) + 7] - [(6 - 4) + 7]\}$

- Perform the operations in the parentheses. $32 \div \{[\_\_\_\_\_ + \_\_\_\_\_] - [\_\_\_\_\_ + \_\_\_\_\_]\}$
- Perform the operations in the brackets. $32 \div \{\_\_\_\_\_ - \_\_\_\_\_\}$
- Perform the operations in the braces. $32 \div \_\_\_\_\_$
- Divide. $\_\_\_\_\_$

Name _____

Share and Show

Evaluate the numerical expression.

1. $12 + [(15 - 5) + (9 - 3)]$

$12 + [10 + \_\_\_\_\_]$

$12 + \_\_\_\_\_$

2. $5 \times [(26 - 4) - (4 + 6)]$

3. $36 \div [(18 - 10) - (8 - 6)]$

On Your Own

Evaluate the numerical expression.

4. $4 + [(16 - 4) + (12 - 9)]$

5. $24 - [(10 - 7) + (16 - 9)]$

6. $16 \div [(13 + 7) - (12 + 4)]$

7. $5 \times [(7 - 2) + (10 - 8)]$

8. $[(17 + 8) + (29 - 12)] \div 6$

9. $[(6 \times 7) + (3 \times 4)] - 28$

10. $3 \times \{[(12 - 8) \times 2] + [(11 - 9) \times 3]\}$

11. $\{[(3 \times 4) + 18] + [(6 \times 7) - 27]\} \div 5$

UNLOCK the Problem REAL WORLD

12. Dan has a flower shop. Each day he displays 24 roses. He gives away 10 and sells the rest. Each day he displays 36 carnations. He gives away 12 and sells the rest. What expression can you use to find out how many roses and carnations Dan sells in a week?

a. What information are you given? _____

_____

_____

b. What are you being asked to do? _____

_____

_____

c. What expression shows how many roses Dan sells in one day? _____

d. What expression shows how many carnations Dan sells in one day? _____

e. Write an expression to represent the total number of roses and carnations Dan sells in one day. _____

f. Write the expression that shows how many roses and carnations Dan sells in a week. _____

13. Evaluate the expression to find out how many roses and carnations Dan sells in a week.

_____

14. **Test Prep** Which expression has a value of 4?

Ⓐ $[(4 \times 5) + (9 + 7)] + 9$

Ⓑ $[(4 \times 5) + (9 + 7)] \div 9$

Ⓒ $[(4 \times 5) - (9 + 7)] \times 9$

Ⓓ $[(4 + 5) + (9 + 7)] - 9$

FOR MORE PRACTICE:
Standards Practice Book, pp. P25–P26

Name _____

Chapter Review/Test

Vocabulary

Vocabulary
Distributive Property
inverse operations

1. The _____ states that multiplying a sum by a number is the same as multiplying each addend in the sum by the number and then adding the products. (p.14)

Concepts and Skills

Complete the sentence.

2. 7,000 is 10 times as much as _____.

3. 50 is $\frac{1}{10}$ of _____.

Complete the equation, and tell which property you used.

4. $4 \times (12 + 14) =$ _____ $+ (4 \times 14)$

5. $45 + 16 =$ _____ $+ 45$

Find the value.

6. 10^2

7. 3×10^4

8. 8×10^3

Estimate. Then find the product.

9. Estimate: _____

$$\begin{array}{r} 579 \\ \times\ \ 6 \\ \hline \end{array}$$

10. Estimate: _____

$$\begin{array}{r} 7{,}316 \\ \times\ \ \ 9 \\ \hline \end{array}$$

11. Estimate: _____

$$\begin{array}{r} 436 \\ \times\ 32 \\ \hline \end{array}$$

Use multiplication and the Distributive Property to find the quotient.

12. $54 \div 3 =$ _____

13. $90 \div 5 =$ _____

14. $96 \div 6 =$ _____

Evaluate the numerical expression.

15. $42 - (9 + 6)$

16. $15 + (22 - 4) \div 6$

17. $6 \times [(5 \times 7) - (7 + 8)]$

GO Online Assessment Options Chapter Test

Fill in the bubble completely to show your answer.

18. Erica's high score on her new video game is $30{,}000$ points. Maria's high score is $\frac{1}{10}$ of Erica's. How many points did Maria score?

Ⓐ 30

Ⓑ 300

Ⓒ $3{,}000$

Ⓓ $30{,}000$

19. Rich makes $\$35$ a week mowing lawns in his neighborhood. Which expression can be used to show how much money he makes in 8 weeks?

Ⓐ $(8 + 30) + (8 + 5)$

Ⓑ $(8 \times 30) + (8 \times 5)$

Ⓒ $(8 + 30) \times (8 + 5)$

Ⓓ $(8 \times 30) \times (8 \times 5)$

20. Mr. Rodriguez bought a supply of 20 reams of printer paper. Each ream contains 500 sheets of paper. How many sheets of printer paper are there?

Ⓐ $1{,}000$

Ⓑ $5{,}000$

Ⓒ $10{,}000$

Ⓓ $100{,}000$

21. Harvester ants are common in the southwestern United States. A single harvester ant colony may have as many as $90{,}000$ members. What is that number written as a whole number multiplied by a power of ten?

Ⓐ 9×10^4

Ⓑ 9×10^3

Ⓒ 9×10^2

Ⓓ 9×10^1

Name _____

Fill in the bubble completely to show your answer.

22. Megan used the following expression to find the quotient of a division problem.

$$(4 \times 12) + (4 \times 6)$$

What was the division problem and the quotient?

Ⓐ $24 \div 4 = 6$

Ⓑ $48 \div 4 = 12$

Ⓒ $64 \div 4 = 16$

Ⓓ $72 \div 4 = 18$

23. It is $1{,}325$ feet from Kinsey's house to her school. Kinsey walks to school each morning and gets a ride home each afternoon. How many feet does Kinsey walk to school in 5 days?

Ⓐ $6{,}725$ feet

Ⓑ $6{,}625$ feet

Ⓒ $6{,}525$ feet

Ⓓ $5{,}625$ feet

24. An adult elephant eats about 300 pounds of food each day. Which expression shows about how many pounds of food a herd of 12 elephants eats in 5 days?

Ⓐ $5 + (300 \times 12)$

Ⓑ $5 \times (300 \times 12)$

Ⓒ $(300 \times 12) \div 5$

Ⓓ $(300 \times 12) - 5$

25. Carla can type 265 characters a minute on her computer keyboard. At that rate, how many characters can she type in 15 minutes?

Ⓐ $2{,}975$

Ⓑ $3{,}875$

Ⓒ $3{,}905$

Ⓓ $3{,}975$

Constructed Response

26. Donavan copied the problem below from the board. He missed one of the numbers needed to show his work. What number is missing in his work? **Explain** how you found the missing number.

$17 \times 5 = (\square + 7) \times 5$

$= (\square \times 5) + (7 \times 5)$

$= 50 + 35$

$= 85$

Performance Task

27. Drew's weekly allowance is $8.00. His friend Jan's weekly allowance is $10. Drew spends $3 a week and Jan spends $4 a week.

A Write two expressions to show how much money each person has at the end of the week. Use parentheses.

Drew has _____.

Jan has _____.

B Drew and Jan decide that they want to put their money together to buy a video game. Write an expression that shows how much they can save each week. **Explain**.

C The video game Drew and Jan want to buy costs $55. Write an expression to show how many weeks it will take them to save enough to buy the video game. Use parentheses and brackets in your expression. Then evaluate the expression.