Vocabulary

Choose the best term from the box.

- difference - quotient
- product - sum

1. The answer to a division problem is the __?__.

2. The __?__ of 5 and 7 is 12.

3. To find the __?__ between 16 and 4 you subtract.

4. Multiplying is the same as finding the __?__.

Mixed Practice

Find each answer.

5. $32 \div 4$

6. 35×100

7. $47 + 92$

8. $\frac{1}{4} + \frac{2}{4}$

9. $3.4 - 2.7$

10. $1.9 + 7$

11. $3 + \frac{1}{2}$

12. $75 \div 5$

13. $\$3.75 + \$2.49$

14. $8\frac{5}{8} - 1\frac{2}{8}$

Patterns

Writing to Explain Write an answer for the question.

15. What comes next in the pattern below? Explain how you know.

$$7 \times 10 = 70$$
$$7 \times 100 = 700$$
$$7 \times 1,000 = 7,000$$

Variables and Expressions

How can you translate words into expressions?

What expression shows the weight of the mixed nuts after the weight of the jar is subtracted?

A **variable** is a letter or symbol that represents an unknown amount that can vary, or change.

4 oz
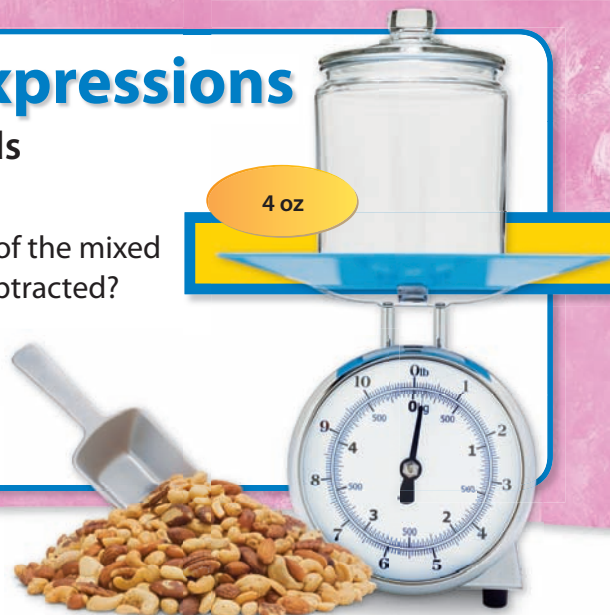
Guided Practice*

Do you know HOW?

In **1** through **4**, use a variable to write an algebraic expression that represents the word phrase.

1. twice the number of people

2. $7 less than the current price

3. 8 more gumballs than Javier has

4. a number of students divided into 2 teams

Do you UNDERSTAND?

5. What would the expression for the weight of the mixed nuts be if the weight of the jar was 8 oz?

6. **Writing to Explain** Why is a variable used in the example at the top?

7. Write two word phrases that could be translated as $25 \times p$.

Independent Practice

For **8** through **11**, translate each algebraic expression into words.

8. $n + 9$ **9.** $x \div 12$ **10.** $y - 4$ **11.** $8m$

For **12** through **20**, write each word phrase as an algebraic expression.

12. subtract a number from 10   **13.** the product of 9 and a number   **14.** add 6 to a number

15. 6 divided by a number   **16.** a number decreased by 12   **17.** 9 plus a number

18. a number added to 4   **19.** the quotient of a number and 8   **20.** 4 less a number

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For another example, see Set A on page 132.

An **algebraic expression** is a mathematical phrase involving variables, numbers, and operations.

Operation	Word Phrase	Algebraic Expression
Addition	a number *plus* 4 a number *added* to 4	$w + 4$
Subtraction	a number *minus* 4 a number *less* 4	$w - 4$
Multiplication	4 *times* a number	$4 \times w$ or $4w$
Division	a number *divided* by 4	$w \div 4$ or $\frac{w}{4}$

Since the weight of the mixed nuts varies, let w represent the total weight of the jar and the mixed nuts.

So, $w - 4$ is the weight of the mixed nuts after the weight of the jar is subtracted.

Problem Solving

21. You and three of your friends are going to share a package of granola bars equally. Write an algebraic expression to show this situation.

22. In January, Winifred had $1,369.57 in her savings account. In December, she had $2,513.34 in her account. How much more money did she have in December than in January?

23. Jeff added $\frac{4}{5}$ cup of water to $\frac{2}{3}$ cup of lemonade concentrate. Is there more water or concentrate?

24. **Writing to Explain** How are the expressions $7 - g$ and $g - 7$ different?

25. **Think About the Process** Nao has 6 fewer CDs than Emily. If c represents the number of CDs Emily has, which expression tells how many CDs Nao has?

A $c + 6$ **C** $6 - c$

B $c - 6$ **D** $6 + c$

26. A person has to be at least 48 inches tall to ride a roller coaster. Jill, who is 12 years old, is taller than 48 inches. Which expression shows Jill's height?

A $(12 + t) - 48$ **C** $(48 - 12) + t$

B $48t$ **D** $48 + t$

27. This drawing of the sculpture of a ball of jeans shows a stand beneath it. If the stand and sculpture measure 18 feet, which equation shows how to find the height of the sculpture?

A $18 + x = 2$ **C** $x - 18 = 2$

B $x + 2 = 18$ **D** $2 - 18 = x$

x

2 ft

28. The largest capitol building in the U.S. is located in Baton Rouge, Louisiana. It is 164 feet taller than the United States Capitol in Washington, D.C. which is x feet tall. Write an expression for the height of the capitol in Baton Rouge.
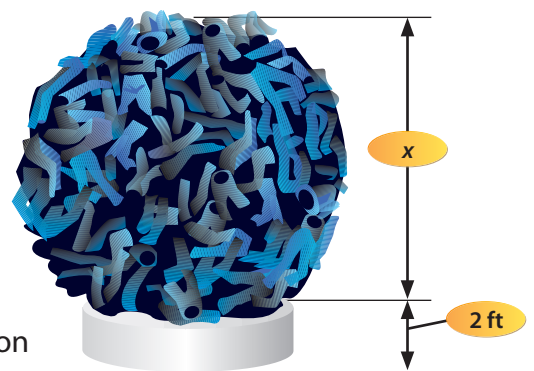
Patterns and Expressions
How can you use patterns to show relationships?

Shawna wanted to buy tickets to the concert for herself and some friends. What is the total cost of all of the tickets?

Let t = the number of tickets purchased.

Other Examples

How can you evaluate an algebraic expression?

In Lesson 5-1 you learned how to write an algebraic expression. Now you will write and evaluate an expression to solve a problem.

Evaluating an Addition Expression

Evaluate $x + 7$ for $x = 6$.
Replace x with 6 in the expression.
$x + 7$
↓
$6 + 7 = 13$

Evaluating a Division Expression

Evaluate $z \div 3$ for $z = 9$.
Replace z with 9 in the expression.
$z \div 3$
↓
$9 \div 3 = 3$

Writing and Evaluating an Expression

After 5 weeks, Sean's plant was h inches tall and Fred's plant was 3 inches taller.

Write an algebraic expression for the height of Fred's plant.

$h + 3$

Evaluate the expression for $h = 3$ and $h = 5$.

h	3	5
$h + 3$	$3 + 3 = 6$	$5 + 3 = 8$

Explain It

1. Explain how you could figure out the height of Fred's plant if you knew the height of Sean's plant.

2. What is the shortest possible height of Fred's plant after 5 weeks?

Shawna made a table.

Number of Tickets	Total Cost (in dollars)
2	8
3	12
4	16
5	20
t	$4 \times t$

+4
+4
+4

Shawna saw a pattern: For each ticket, the total cost increased by $4.

She wrote an algebraic expression to show the relationship between the number of tickets and the total cost.

The total cost of tickets for any number of friends can be represented by the algebraic expression $4 \times t$.

Guided Practice*

Do you know HOW?

1. Megan and Travis have the same birthday, but Travis is 6 years older. In the table, m is Megan's age and $m + 6$ is Travis's age. Complete the table.

m	3	5	▢
$m + 6$	▢	▢	14

Do you UNDERSTAND?

2. When Megan was 5 years old, how old was Travis?

3. What was Megan's age when Travis was 14?

4. **Writing to Explain** If you know Travis's age, how can you find Megan's age?

Independent Practice

In **5** through **19**, evaluate each expression for $n = 5$ and $n = 2$.

5. $\frac{40}{n}$ **6.** $4.5 + n$ **7.** $n \times 16$ **8.** $50 - n$ **9.** $12n$

10. $\frac{30}{n}$ **11.** $8.6 + n$ **12.** $9n$ **13.** $36 - n$ **14.** $8 \times n$

15. $\frac{10}{n}$ **16.** $3n$ **17.** $n + 5$ **18.** $7 - n$ **19.** $\frac{70}{n}$

In **20** through **31**, evaluate each expression for $n = 10$ and $n = 12$.

20. $\frac{n}{2}$ **21.** $n + 4.9$ **22.** $18n$ **23.** $44.7 - n$

24. $n - 5$ **25.** $n + 6.2$ **26.** $10n$ **27.** $33.6 - n$

28. $\frac{60}{n}$ **29.** $3n$ **30.** $n - 8$ **31.** $n + 3.17$

32. Strategy Focus Use the strategy Make a Table to solve the following problem.

There are 3 classrooms in the second grade. There are 24 students in Mrs. Smithfield's room, 27 students in Mr. Rodgers's room, and 21 students in Miss Jones's room. Each student gets 2 tangerines for a snack. How many tangerines does each teacher need?

33. Henry has 7 quarters, 4 dimes, 17 nickels, and 26 pennies in his bank. If he doesn't count the pennies, what is the value of his other coins?

A $2.15

B $2.60

C $3.00

D $3.26

34. A plane can travel 400 miles for each hour it flies. How long will it take you to travel approximately 1,600 miles from Oakland, California, to Beaumont, Texas?

35. Joseph is 50 inches tall. Paul is y inches taller than Joseph, and 3 inches taller than Dan. Write an expression for how much taller Paul is than Joseph.

36. Which number is less than 0.09?

F 0.9   **H** 0.11

G 0.1   **J** 0.01

37. Write an algebraic expression to represent the cost of a CD for m dollars with a $2 off coupon.

38. What is another way to write the expression $\frac{56}{n}$?

39. Writing to Explain Why can a variable be used to represent a number?

40. For a science experiment, you need to mix 4 grams of baking soda for every 25 milliliters of vinegar. How many grams of baking soda do you need to do an experiment with 75 milliliters of vinegar? How did you find the answer?

41. **Think About the Process** A century is a period of time that is 100 years long. Which expression can be used to find the number of years in x centuries?

A $100 + x$ **C** $\frac{100}{x}$

B $100 - x$ **D** $100x$

42. Writing to Explain The size of the hermit crab's shell depends on the size of the crab. Look at the table below. If a 2-inch hermit crab grows 1 inch per year, use words to describe a rule that will show how long a 2-inch crab will grow in x years. Write an expression to find how large this crab will grow in x years.

Length	2	3	4	5	6	7	8	9	10	11	12	
Number of Years	0	1	2	3	4	5	6	7	8	9	10	x

Find the value of each expression for $w = 8$.

1. $w + 8$ **2.** $12 - w$ **3.** $8w$ **4.** $\frac{72}{w}$

5. $6w$ **6.** $\frac{w}{2}$ **7.** $4.98 + w$ **8.** $w - 2.4$

Find the value of each expression for $p = 3.8$.

9. $7.25 - p$ **10.** $4.08 + p$ **11.** $p + 1.2$ **12.** $p - 2.75$

13. $p + p$ **14.** $6 - p$ **15.** $7 + p$ **16.** $p - 3.75$

Find the product. Estimate to check if the answer is reasonable.

17. $\begin{array}{r} 587 \\ \times\ 340 \\ \hline \end{array}$	**18.** $\begin{array}{r} 5{,}950 \\ \times\ \ \ \ 45 \\ \hline \end{array}$	**19.** $\begin{array}{r} 238 \\ \times\ 479 \\ \hline \end{array}$	**20.** $\begin{array}{r} 74 \\ \times\ 60 \\ \hline \end{array}$	**21.** $\begin{array}{r} 8{,}007 \\ \times\ \ \ \ \ 6 \\ \hline \end{array}$
22. $\begin{array}{r} 8{,}118 \\ \times\ \ \ \ 27 \\ \hline \end{array}$	**23.** $\begin{array}{r} 94 \\ \times\ 62 \\ \hline \end{array}$	**24.** $\begin{array}{r} 5{,}750 \\ \times\ \ \ \ \ 3 \\ \hline \end{array}$	**25.** $\begin{array}{r} 1{,}234 \\ \times\ \ \ \ 15 \\ \hline \end{array}$	**26.** $\begin{array}{r} 590 \\ \times\ 64 \\ \hline \end{array}$

Error Search Find each expression that is not correct when $a = 5$. Write it correctly and explain the error.

27. $a + 9 = 14$ **28.** $a - a = 10$ **29.** $6.95 + a = 7$ **30.** $a - 3.7 = 1.3$

Number Sense

Estimating and Reasoning Write whether each statement is true or false. Explain your reasoning.

31. $6 - p$ has a value less than 5, when $p = 1.5$.

32. The sum of 15.26 and 60.56 is greater than 75 but less than 77.

33. The product of 30 and 420 is 600 less than 12,000.

34. The difference of $2{,}624 - 1{,}307$ is 7 less than 1,324.

35. The sum of 16.3 and 11.9 is less than 27.

36. The product of 3 and 6,495 is closer to 21,000 than 18,000.

More Patterns and Expressions

How can you write and evaluate expressions with variables?

Write an expression for finding the total cost of a service call from Matteo's Electrical Repair. Evaluate the expression for service calls that last 2 hours, 4 hours, and 5 hours.

MATTEO'S ELECTRICAL REPAIR

SERVICE CALL CHARGES

$55 Fee Plus   **$65** Per Hour

Another Example **How can you write a word phrase as an algebraic expression?**

Let n stand for the number.

Word Phrase	Algebraic Expression
Five times a number, plus two	$5n + 2$
Two less than five times a number	$5n - 2$
Two more than five times a number	$5n + 2$
Two minus five times a number	$2 - 5n$

Sometimes a word phrase can be interpreted in different ways. The word phrase below can be interpreted in two different ways. Parentheses are used to make the algebraic expression clear.

Word Phrase: Five times a number plus 2

Algebraic Expressions: $(5 \times n) + 2$, or $5 \times (n + 2)$

TIP *Remember that operations inside parentheses are completed first.*

Explain It

1. Why is the comma in the first word phrase above important?

2. How do the parentheses make the expressions $(5 \times n) + 2$ and $5 \times (n + 2)$ different?

The total cost is the fee plus the charge per hour times the number of hours.

Write an expression for the total cost. Use h for the number of hours.

The expression for the total cost in dollars is $55 + 65h$.

Evaluate the expression for various numbers of hours. Substitute each value for h in the expression $55 + 65h$.

For 2 hours: $55 + (65 \times 2) = 55 + 130 = 185$
For 4 hours: $55 + (65 \times 4) = 55 + 260 = 315$
For 5 hours: $55 + (65 \times 5) = 55 + 325 = 380$

The total cost for a 2 hour service call is $185, for a 4 hour service call is $315, and for a 5 hour service call is $380.

Guided Practice*

Do you know HOW?

Write an algebraic expression for each word phrase. Let x stand for the number.

1. Three times a number, plus 10

2. Four less than a number times 2

3. Eight plus a number times 5

4. Forty minus two times a number

Do you UNDERSTAND?

5. How much does Matteo Electrical Repair charge for 3 hours of work?

6. Evaluate $3n + 18$ for $n = 2$.

7. Evaluate $3n + 18$ for $n = 3$.

8. Does $3n + 18$ have the same meaning as $3 \times n + 18$? Explain.

Independent Practice

For **9** through **12**, write an algebraic expression for each phrase. Let n stand for the number.

9. Nine times a number, minus six

10. Seven less than a number times three

11. Four more than a number, times twelve

12. Eight plus a number times sixteen

For **13** through **16**, evaluate the expressions for $p = 21$ and $k = 64$.

13. $3p + 52$ **14.** $10k - 249$ **15.** $432 - 2p$ **16.** $3p + 4k$

For **17** through **20**, evaluate the expressions for $r = 13$ and $h = 52$

17. $(8 + r) \times 3$ **18.** $352 - 4h$ **19.** $5r + 97$ **20.** $9r - 2h$

You walk for 30 minutes each day on a treadmill. You also do a number of weight-lifting exercises. You do each weight-lifting exercise for 5 minutes.

21. Write an expression for the number of minutes you spend exercising each day. Let e represent the number of weight-lifting exercises.

22. How many minutes do you exercise on a day when you do 3 weight-lifting exercises? 6 weight-lifting exercises?

Sasha works in a clothing store. She earns $20 per day, plus a $2 commission for each sale.

23. Write an expression for the amount of money Sasha earns each day. Let s represent the number of sales she makes.

24. How much does Sasha earn per day if she has 12 sales? 19 sales? 32 sales?

For **25** through **27**, use the table at right.

Tip *Distance = rate × time*

25. A plane travels 425 miles per hour. Write an expression to show the distance it travels, if t represents hours.

Travel Times	
From Los Angeles, CA	**Time**
To Dallas, TX	3 hrs
To Tampa, FL	5 hrs

26. How far is it from Los Angeles to Tampa?

27. How far is it from Los Angeles to Dallas?

28. A plane traveled 200 miles before arriving in Los Angeles. It then departed Los Angeles and traveled at a speed of 395 miles per hour. Write an expression for the total distance it will have traveled when it reaches the next stop.

29. Josephine fixes cars at the rate of $50 an hour. She also charges a cleanup fee of $30. Write an expression for her total charges.

30. A human infant can weigh about 8 pounds. A baby humpback whale can weigh over 500 times as much. About how much can a baby humpback whale weigh?

31. All DVDs at the See These video store cost $12. You have a coupon for $2 off the total purchase. Which expression represents the total cost of d videos?

A $2 - 12d$ **B** $12d - 2d$ **C** $12d - 2$ **D** $12 - 2d$

Algebra Connections

Completing Number Sentences

Remember that a number sentence has two numbers or expressions that are connected by the symbols $>$, $<$, or $=$.

Estimation can be used to see if the left or right side is greater.

Copy and complete the comparisons using estimation. Check your answers.

Remember:
$>$ means "is greater than."
$<$ means "is less than."
$=$ means "is equal to."

Example: $6 \times 80 \bigcirc 6 \times 77$

Think Is 6 groups of 80 more than 6 groups of 77?

Since 80 is more than 77, 6 groups of 80 is more than 6 groups of 77. Complete the comparison with "$>$."

$$6 \times 80 > 6 \times 77$$

This means 6 groups of 80 is greater than 6 groups of 77.

Copy and complete. Write $<$, $>$, or $=$ in the circle.

1. $6 \times 50 \bigcirc 51 \times 6$

2. $40 \times 5 \bigcirc 45 \times 5$

3. $56 + 56 \bigcirc 55 \times 2$

4. $7 \times 67 \bigcirc 67 \times 7$

5. $320 \bigcirc 8 \times 43$

6. $8 \times 72 \bigcirc 560$

7. $20 \times 20 \bigcirc 17 \times 18$

8. $5 \times 20 \bigcirc 100$

9. $3 + 48 \bigcirc 3 \times 48$

10. $3 \times 19 \bigcirc 60$

11. $5 \times 20 \bigcirc 19 \times 4$

12. $6 + 18 \bigcirc 6 \times 18$

For **13** through **14**, write a number sentence to help solve each problem.

13. Marina bought a lavender backpack for herself and a green backpack for her brother. Charley bought an orange backpack. Who spent more money?

$9

$20

14. Mr. Wozniak purchased a green backpack. Ms. Chivas purchased 4 lavender backpacks. Who paid more?

15. **Write a Problem** Write a word problem using the prices of the backpacks.
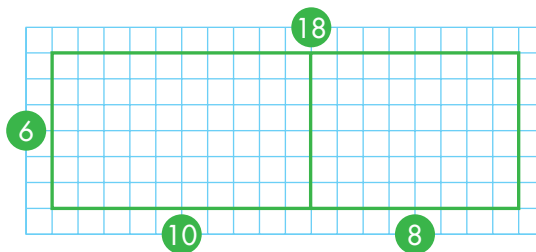
$40

$50

AF 1.3 Know and use the distributive property in equations and expressions with variables.

Distributive Property

How can you use the distributive property to write expressions and solve equations?

What expressions can you write to represent the number of square units inside the rectangle?

Guided Practice*

Do you know HOW?

1. Use the distributive property to complete the equation.

$12 \times 308 = 12 \times (\square + 8)$
$= (12 \times \square) + (\square \times 8)$
$= \square + \square$
$= \square$

2. Show how can you use the distributive property to find the product of 4×105.

3. Show how can you use the distributive property to find the product of 20×32.
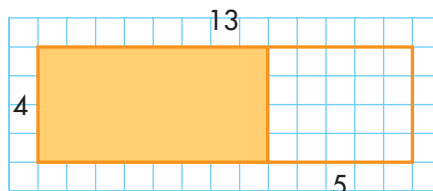
> **Tip** *Remember that operations inside parentheses are completed first.*

Do you UNDERSTAND?

4. Do these expressions name the same number of square units in the shaded area?

$4 \times (13 - 5)$ and $(4 \times 13) - (4 \times 5)$

5. Write the distributive property to state that multiplication distributes over subtraction.

6. Writing to Explain Is $20 - (4 \times 2) = (20 - 4) \times (20 - 2)$? Explain your answer.

Independent Practice

Use the distributive property to complete each equation.

7. $509 \times 11 = (500 + 9) \times 11$
$= (500 \times \square) + (9 \times \square)$
$= \square + 99$
$= \square$

8. $12 \times 47 = 12 \times (50 - \square)$
$= (12 \times \square) - (12 \times 3)$
$= 600 - \square$
$= \square$

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For another example, see Set D on page 133.

Three ways to find the number of square units:

1) Think of 6 rows with 18 in each row.   **6 × 18**

2) Think of 18 as 10 + 8.   **6 × (10 + 8)**

3) Think of the figure in two parts.
The orange part has 6 × 10 square units.
The green part has 6 × 8 square units.
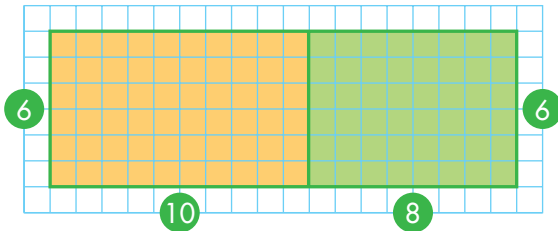
The total is the sum of the two parts.
(6 × 10) + (6 × 8)

Since the expressions name the same number of square units, you can write an equation.

$6 × (10 + 8) = (6 × 10) + (6 × 8)$

The ==distributive property== states: Multiplying a sum (or difference) by a number is the same as multiplying each number in the sum (or difference) by that number and adding (or subtracting) the products.

For **9** through **16**, rewrite each expression using the distributive property. Then find each product.

9. $7 × 86$

10. $7 × 420$

11. $220 × 8$

12. $45 × 60$

13. $80 × 64$

14. $16 × 102$

15. $101 × 23$

16. $390 × 40$

Problem Solving

For **17** through **19**, use the table at the right and the following information.

Wendy brought the lemonade and iced tea for the school picnic. Since more people like lemonade than iced tea, she brought 2 gallons of lemonade for every 10 people. She also brought 5 gallons of iced tea for people who don't like lemonade.

Number of People	Gallons of Lemonade	Total Gallons
10	2	
20		
30		
40		

17. Write an algebraic expression to show how many gallons Wendy would need to bring. Let n represent the number of groups of ten people.

18. How many gallons does she need for 10 people?

19. Fill in the rest of the table.

20. Use the distributive property to find another expression for $3(2x + 7)$.

A $6x + 7$

C $(2x + 7) × 3$

B $3(14x)$

D $6x + 21$

21. Estimation The highest point in California is Mount Whitney, at 14,505 feet. About how many miles is that?

Tip *1 mile = 5,280 feet*

Lesson
5-5

AF 1.3 Grade 6
Apply algebraic order of operations and the commutative, associative, and distributive properties to evaluate expressions; and justify each step in the process.

Order of Operations

How can you evaluate a numerical expression with more than one operation?

Two students evaluated the same expression, but got different answers.

To avoid getting more than one answer, use the order of operations. Rebecca used the correct order.

Find the value of $12 \div 4 + (9 - 2) \times (3 + 5)$.

Rebecca's Way

$36 + 9 \div 3 \times 5$
$36 + 3 \times 5$
$36 + 15$
51

Juan's Way

$36 + 9 \div 3 \times 5$
$45 \div 3 \times 5$
15×5
75

Another Example **How can you evaluate an algebraic expression with more than one operation?**

You can use order of operations when evaluating algebraic expressions.

What is the value of $4v + 2w - 3$, if $v = 5$ and $w = 3$?

Step 1 Replace all of the variables with given values. Remember that $4v$ means $4 \times v$.

Step 2 Using the order of operations, multiply or divide in order from left to right.

Step 3 Add or subtract in order from left to right.

The value of the expression is 23.

$4 \times 5 + 2 \times 3 - 3$

$20 \ + \ 6 - 3$

$26 - 3$

23

Explain It

1. How could the value of a numerical expression such as $4 \times 5 + 2 \times 3 - 3$ be changed?

Guided Practice*

Do you know HOW?

For **1** through **4**, name the operation you should do first.

1. $6 + 27 \div 3$

2. $5 \times 2 + 12 \div 6$

3. $17 - (4 + 3)$

4. $(14 - 7) + (3 + 5)$

Do you UNDERSTAND?

5. In the first example, why was Juan's answer incorrect?

6. Insert parentheses to make the following statement true.
$3 + 5 \times 2 - 10 = 6$

Step 1

In using order of operations, do the operations inside parentheses first.

$12 \div 4 + (9 - 2) \times (3 + 5)$

$12 \div 4 + \quad 7 \quad \times \quad 8$

Remember to rewrite the operations not yet performed.

Step 2

Then, multiply and divide in order from left to right.

$12 \div 4 + 7 \times 8$

$3 \; + \; 56$

Step 3

Finally, add and subtract in order from left to right.

$3 + 56$

59

Independent Practice

For **7** through **18**, find the value of each expression using order of operations.

7. $3 + 7 \times 6 \div 3 - 4$

8. $(29 - 18) + 14 \div 2 + 6$

9. $64 \div 8 \times 2$

10. $(19 - 5) \times 3 + 4$

11. $3(6 + 2) - 12 \times 2$

12. $36 - 5(16 - 11)$

13. $8 \times (3 + 2) - 6$

14. $3 \div (9 - 6) + 4 \times 2$

15. $(3 + 4) \times (3 + 5)$

16. $3 + (2 \times 4 + 6) - 2$

17. $4 \times (3 - 2) + 18$

18. $8 \times 6 - 4 \times 3$

For **19** through **24**, insert parentheses to make each statement true.

19. $30 - 4 \times 2 + 5 = 2$

20. $17 - 8 - 5 = 14$

21. $10 \div 2 - 3 + 1 = 3$

22. $30 - 4 \times 2 + 5 = 57$

23. $17 - 8 - 5 = 4$

24. $10 \div 2 - 3 + 1 = 1$

25. Writing to Explain Would the value of the expression in Exercise 21 be different if no parentheses were used?

For **26** through **34**, evaluate each expression for $x = 16$ and $y = 4$.

26. $3x - 3y$

27. $x \div (2y - 4)$

28. $5y + x \div 8$
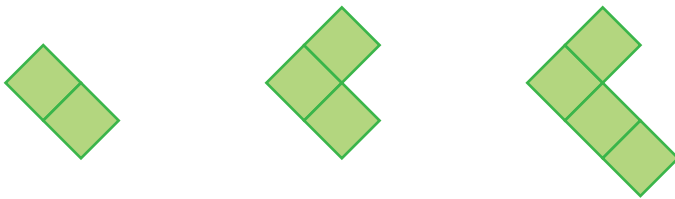
29. $4x - 2y$

30. $y \div (x \div y)$

31. $3y + 2x - 7$

32. $5x - 4y$

33. $x \div y$

34. $2x + 4y - 10$

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35. Draw the next figure in the following pattern.

For **36** through **38**, use the table at the right.

36. The girls' gym teacher needs to purchase 15 softballs, 5 packages of tennis balls, and 2 soccer balls. She plans to collect $1 from each of her 15 students to help pay for the balls. Write and evaluate an expression to show how much more the teacher will have to pay.

Data		
Baseballs	:	$20 per dozen
Softballs	:	$3 each
Basketballs	:	$15 each
Soccer balls	:	$17 each
Tennis balls	:	$4 per package of 3

37. The boys' gym teacher needs to buy 2 dozen baseballs, 4 basketballs, and 24 tennis balls. Write and evaluate an expression to show how much the balls will cost.

38. **Writing to Explain** Did you use parentheses in the expression you wrote for Exercise 36? Why or why not?

39. A small cruise ship has 220 passengers. At the San Diego port, 2 groups of 12 passengers go ashore to shop and 5 groups of 6 passengers go sightseeing. Evaluate $220 - (2 \times 12) - (5 \times 6)$ to find the number of passengers that are left on the ship.

40. **Geometry** California is about 770 miles long and about 250 miles wide. What is its approximate area?

TIP *Area = length $\times$ width.*

41. At a ski lift, 41 people are waiting to board cars that hold 6 people each. How many cars will be completely filled? How many people are left to board the last car?

    A 6; 6   **C** 5; 6

    B 6; 5   **D** 5; 5

42. Mark bought 3 boxes of pencils that contained 20 pencils each and 4 boxes of pens that contained 10 pens each. Which expression represents the total number of pencils and pens Mark bought?

    A $(3 \times 10) + (4 \times 20)$

    B $(3 \times 4) + (10 \times 20)$

    C $(3 \times 20) + (4 \times 10)$

    D $(3 + 20) + (4 + 10)$

43. **Number Sense** True or false? Explain.
$4(3 + 5) - 10 = 4 \times 3 + 5 - 10$

Mixed Problem Solving

A state song is an official symbol of the state it represents. Each of the 50 states, with the exception of New Jersey, has at least one state song. Some of the states chose songs that are famous on their own, while other states chose a song that is known only as a state song. Here are a few examples of some of the state songs:

Data

United States State Songs			
State	Song Title	Year Written	Year Adopted
California	"I Love You, California"	1913	1988
Kentucky	"My Old Kentucky Home"	1853	1928
Oklahoma	"Oklahoma"	1943	1953
Maryland	"Maryland, My Maryland"	1861	1939

For **1** through **5**, use the table above.

1. How many years passed between the time Kentucky's state song was written before it was adopted?

2. About how many decades passed between the writing of *"I Love You, California"* and its adoption?

3. How many years earlier was *"Maryland, My Maryland"* written than *"Oklahoma"*?

4. Put the years each song was adopted in order from least to greatest.

5. **Writing to Explain** A lustrum is a period of 5 years. Richard said that 15 lustrums occurred between California's state song being written and then adopted by the state. Is he correct? Explain.

6. **Strategy Focus** Solve using the strategy Draw a Picture and Write an Equation.

   Tricia ran 5 times as far as Ali. Ali ran 375 meters. How did Tricia run?

Problem Solving

Act It Out and Use Reasoning

Hands-On
unit cubes

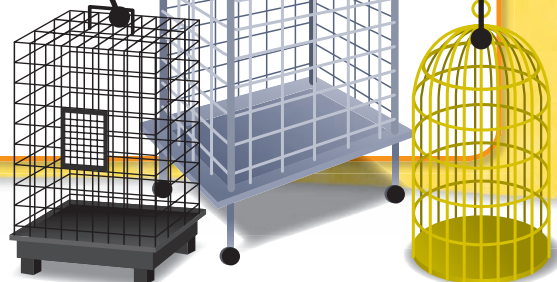3 times as many canaries as parrots

24 parakeets

A children's zoo displays birds in 3 different cages. The zoo has three kinds of birds. There are 36 birds in all. How many of each type of bird are in the zoo?

Use objects to show the birds and then use reasoning to solve the problem.

Guided Practice*

Do you know HOW?

Solve. You can use cubes to act out the problem.

1. The Rodriquez family is donating 25 baseball caps to a charity auction. There are 11 blue caps. There are 2 more white caps than green caps. How many of each color caps are they donating?

Do you UNDERSTAND?

2. If you use 25 cubes to represent all the caps and 11 are used to show the blue caps, how many cubes are left for the white and green caps?

3. **Write a Problem** Write a real-world problem that can be solved by acting it out and using reasoning.

Independent Practice

Solve. Use cubes to act out the problems.

4. Mr. Niles has a box of accessories for clarinets. He has a total of 42 objects. He has 12 mouthpieces. He has four times as many reeds as neck straps. How many of each object does he have?

5. Sylvia has a jewelry collection of bracelets, necklaces, and earrings. She has 16 bracelets. The number of earrings is 2 times the number of necklaces. She has 43 pieces of jewelry in all. How many of each piece of jewelry does she have?

Stuck? Try this....

- What do I know?
- What am I asked to find?
- What diagram can I use to help understand the problem?
- Can I use addition, subtraction, multiplication, or division?
- Is all of my work correct?
- Did I answer the right question?
- Is my answer reasonable?

For another example, see Set F on page 133.

Use objects and show what you know. Let 36 cubes represent all the birds. Use reasoning to make conclusions.

24 parakeets

12 canaries and parrots

There are 24 parakeets and 36 birds in all. That leaves a total of 12 canaries and parrots.

Use 12 cubes. There are 3 times as many canaries as parrots.
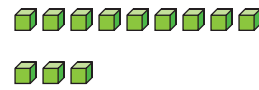
There are 24 parakeets, 9 canaries, and 3 parrots.
$24 + 9 + 3 = 36$, so the answer is correct.

For **6** through **8**, use and complete the table at the right.

6. Brady joined the band. In Group 1, there are a total of 44 students. There are 8 students who play the oboe. There are $\frac{1}{2}$ as many students playing the clarinet as the flute. How many students from Group 1 play each instrument?

7. There are 41 students in Group 2. Twice as many students play the trumpet as play the trombone, but 8 students play the saxophone. How many students in Group 2 play each instrument?

Data	Instrument	Number of Students
	Group 1	44
	Oboe	8
	Clarinet	▢
	Flute	▢
	Group 2	41
	Saxophone	8
	Trumpet	▢
	Trombone	▢

8. Later, 7 students joined Group 2 and 1 student left to join Group 1. Some students decided to play a different instrument. Now 20 students play trombone and 7 more students play trumpet as play saxophone. How many students play each instrument?

9. Jane worked 1.5 hours on Monday, 3 hours on Tuesday, and 4.5 hours on Wednesday. If the pattern continues, how many hours will she work on Friday?

10. Reggie earned $360 in the summer. If he earned $40 per week, how many weeks did he work?

total earned: $360

$40	? number of weeks

amount earned per week

11. The Garden Theater presented a play. A total of 179 people attended in 3 days. The first day, 58 people attended. On the second day, 47 people attended. How many attended on the third day?

179 people

58 people	47 people	x

1st day   2nd day   3rd day
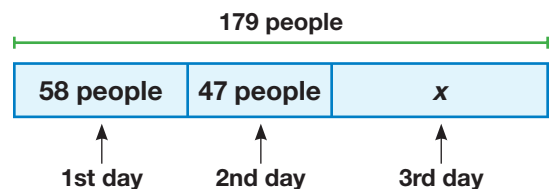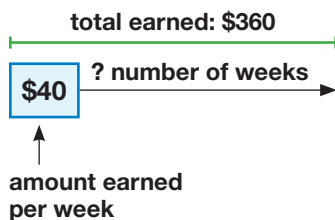
1. Which expression can be used to represent the phrase "three times the amount of money"? (5-1)

A $3 + m$

B $3 - m$

C $3 \times m$

D $3 \div m$

2. If Lisa travels an average of 65 miles per hour for 8 hours, she will travel 8×65 miles. Which of the following is equal to 8×65. (5-4)

A $(8 + 60) \times (8 + 5)$

B $(8 + 60) - (8 + 5)$

C $(8 \times 60) + (8 \times 5)$

D $(8 \times 60) - (8 \times 5)$

3. Ryan had 18 more shots on goal during the soccer season than Peyton, who had 36. Evaluate the expression $x + 18$ for $x = 36$. (5-2)

A 2

B 18

C 52

D 54

4. Jerry has a coupon for $3 off. If p stands for the original price of a shirt, which expression tells Jerry's cost, before tax, when he uses the coupon? (5-1)

A $p \div 3$

B $3 - p$

C $p - 3$

D $p + 3$

5. The expression $f - 3$ represents the number of years Mark has taken piano lessons when Fatima has taken lessons for f years. How many years of lessons will Mark have when Fatima has 9 years? (5-2)

A 27

B 12

C 6

D 3

6. What is the first step in evaluating the expression shown below? (5-5)

$8 - 7 + 12 \div (3 + 1)$

A Add 3 and 1.

B Divide 12 by 3.

C Add 7 and 12.

D Subtract 7 from 8.

7. What value of n makes the equation true? (5-4)

$15 \times 110 = (15 \times 100) + (15 \times n)$

A 10

B 15

C 90

D 110

8. The cost for n students to attend a workshop is $7n + 12$ dollars. What is the cost for 6 students to attend? (5-3)

A $25

B $54

C $126

D $156

9. Tennessee, New Mexico, and Michigan have a total of 27 representatives in the U.S. House of Representatives. Michigan has 15 representatives and Tennessee has 3 times as many as New Mexico. How many representatives does the state of Tennessee have? (5-6)

   A 12

   B 9

   C 6

   D 3

10. The expression $n \div 6$ can represent which of the following phrases? (5-1)

   A n students divided into groups of 6

   B 6 times n students

   C 6 students divided into n groups

   D 6 less than n students

11. What is the value of the expression $6 + (13 - 1) \div 4 + 2$? (5-5)

   A 20

   B 11

   C 8

   D 3

12. Which expression can be used to represent the phrase "3 more than 7 times the number of pages, p"? (5-3)

   A $7p + 3$

   B $p + 3 \times 7$

   C $3p + 7$

   D $7p - 3$

13. The expression $8 - 2x$ can be used to represent which phrase? (5-3)

   A Eight less than two times a number

   B Two less than eight times a number

   C Eight more than two times a number

   D Eight minus two times a number

14. What is the value of $7 + 3m - 2$ when $m = 4$? (5-5)

   A 11

   B 17

   C 20

   D 38

15. Which of the following expressions has a value equal to 3? (5-5)

   A $8 + (4 \div 2) - 1 \times 3$

   B $8 + 4 \div (2 - 1) \times 3$

   C $(8 + 4 \div 2) - 1 \times 3$

   D $(8 + 4) \div 2 - 1 \times 3$

16. The table shows the cost to board Lucy's dog at a kennel. Which expression shows the cost to board the dog for d days? (5-2)

Number of Days	Total Cost
3	$36
4	$48
5	$60

   A $d + 36$

   B $d + 12$

   C $36d$

   D $12d$

Set A, pages 112–113

Translate a word phrase into an algebraic expression.

Five more cards than Steve owns

Step 1	**Step 2**	**Step 3**
Decide what the variable will represent.	What operation should be used? The word *more* is a clue.	Write an algebraic expression.
Let s = cards Steve owns	Addition	$s + 5$

Remember to look for words that give you clues as to what operation to use.

Write an algebraic expression for each.

1. A puzzle costs p less than a magazine. The magazine costs $1.99. How much is the puzzle?

2. The evergreen is twice as tall as a hosta. The hosta is h inches tall. How tall is the evergreen?

Set B, pages 114–116

When you evaluate an algebraic expression, you replace the variable with a given number value.

Evaluating a Division Expression

Evaluate $\frac{t}{6}$ for $t = 18$.

Replace t with 18 in the expression.

$\frac{18}{6}$

Divide.

$\frac{18}{6} = 3$

Remember to replace the variable with the given values and perform the operation.

Evaluate each expression for $d = 2$ and $d = 3$.

1. $\frac{30}{d}$

2. $3.6 + d$

3. $d \times 20$

4. $57 - d$

5. $11d$

Set C, pages 118–120

Write an algebraic expression for the following word phrase. Let n represent the number.

Word Phrase
five less than a number times 3

Algebraic Expression
$3n - 5$

Remember that placing a number next to a variable means multiplication.

Write an algebraic expression for each. Let n represent the number.

1. Four times a number, plus 8

2. Six less than a number times 3

3. Ten more than a number times 4

4. Fifty minus five divided by a number.

Set D, pages 122–123

The Distributive Property states that multiplying a sum by a number is the same as multiplying each number in the sum by the number, and then adding the products.

Use the Distributive Property to find 5×23.

Think of 23 as $20 + 3$.

$5 \times 23 = 5 \times (20 + 3)$
$\qquad = (5 \times 20) + (5 \times 3)$
$\qquad = 100 + 15$
$\qquad = 115$

Remember that you write one of the numbers as a sum, multiply each of those numbers by the other number, and then add the products.

Use the Distributive Property to find each product.

1. 7×45 **2.** 29×9

3. 72×6 **4.** 3×46

5. 5×78 **6.** 29×5

Set E, pages 124–126

When evaluating an expression, you need to use the order of operations. Otherwise, more than one answer is possible.

Evaluate $(8 + 2) \times (3 + 7) + 50$.

Step 1

Do the operations inside the parentheses.

$(8 + 2) \times (3 + 7) + 50$
$= 10 \times 10 + 50$

Step 2

Multiply and divide in order from left to right.

$10 \times 10 + 50$
$= 100 + 50$

Step 3

Add and subtract in order from left to right.

$100 + 50$
$= 150$

Remember that there is an order of operations that you must use when you evaluate an expression with more than one operation. Otherwise, more than one answer is sometimes possible.

Find the value of each expression using the order of operations.

1. $4 + 8 \times 6 \div 2 + 3$

2. $(18 - 3) \div 5 + 4$

3. $8 \times 5 + 7 \times 3 - (10 - 5)$

4. $10 \times 10 + 5 \times 2 - 3 \times 5$

Set F, pages 128–129

Use objects to show what you know and then use reasoning to solve the problem.

A pet shop has a total of 19 dogs, cats, and ferrets. There are 4 ferrets, and twice as many cats as dogs. How many of each kind of pet are in the shop?

Use 19 cubes and let 4 of them represent the ferrets. That leaves 15 cubes to represent the cats and dogs. There must be 10 cats and 5 dogs.

Remember that objects can help you reason through a problem.

1. Kerry has 12 paperweights in her collection. She has twice as many glass paperweights as metal, and 3 are wood. How many of each type of paperweight does she have?