

# 1.2 Writing Expressions

**Essential Question** Which words correspond to the four operations of addition, subtraction, multiplication, and division?



## 1 ACTIVITY: Words That Imply Addition or Subtraction

Work with a partner.

- a. Copy and complete the table.

| Variable | Phrase                                  | Expression         |
|----------|---|--------------------|
| $n$      | 4 <b>more than</b> a number             | $n + 4$ or $4 + n$ |
| $m$      | The <b>difference</b> of a number and 3 | $m - 3$            |
| $x$      | The <b>sum</b> of a number and 8        |                    |
| $p$      | 10 <b>less than</b> a number            |                    |
| $n$      | 7 units <b>farther</b> away             | $n + 7$ or $7 + n$ |
| $t$      | 8 minutes <b>sooner</b>                 |                    |
| $w$      | 12 minutes <b>later</b>                 |                    |
| $y$      | A number <b>increased</b> by 9          |                    |

Here is a word problem that uses one of the expressions in the table.

*You arrive at the pizza shop 8 minutes sooner than your friend. Your friend arrives at 6:42 P.M. When did you arrive?*



- b. Which expression from the table can you use to solve the problem?  
 c. Write a problem that uses a different expression from the table.

## 2 ACTIVITY: Words That Imply Multiplication or Division

Work with a partner. Match each phrase with an expression.

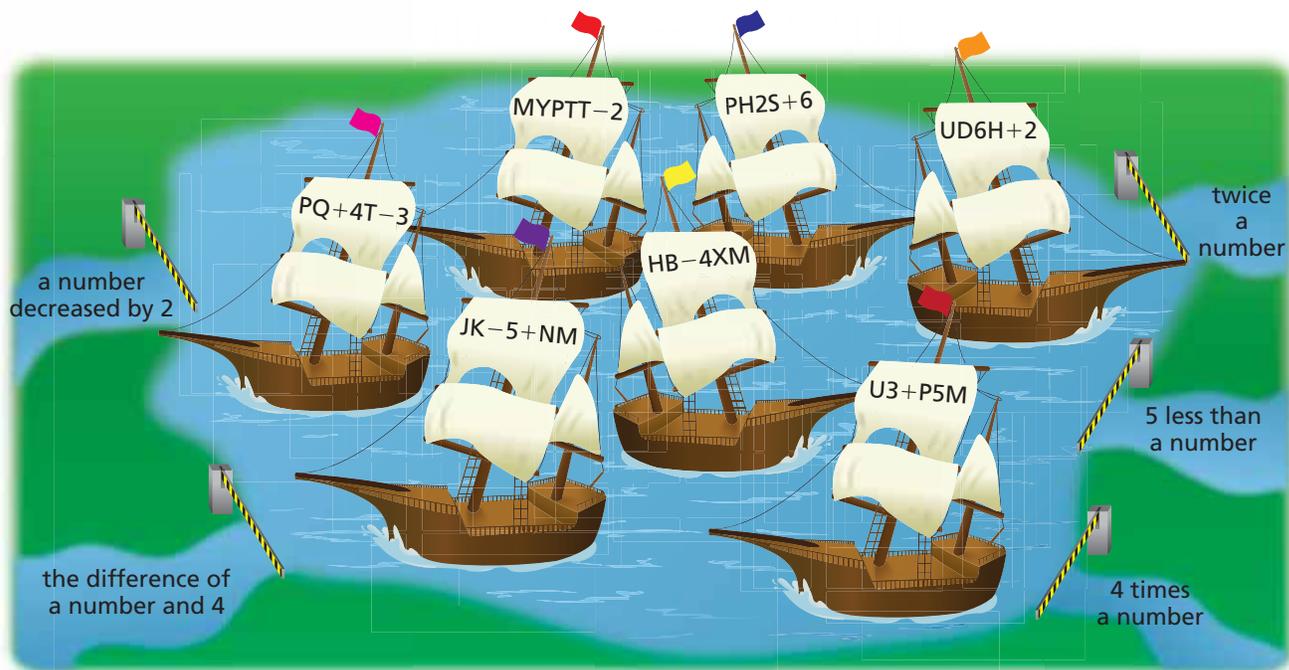
|                                |             |
|--------------------------------|-------------|
| The product of a number and 3  | $n \div 3$  |
| The quotient of 3 and a number | $4p$        |
| 4 times a number               | $n \cdot 3$ |
| A number divided by 3          | $2m$        |
| Twice a number                 | $3 \div n$  |

### 3 ACTIVITY: Find the Intruder

Work with a partner.

A ship can pass through a gate only if the gate expression can be found in its ID number.

For instance, the ID number  $JK-5+NM$  contains the expression  $K-5$ . So the ship is allowed through the gate marked “5 less than a number”.



- Which ships are allowed in the lake? Which are intruders?
- Make up your own “Find the Intruder” game. Trade games with your partner. Solve the game and talk about your solution.

### What Is Your Answer?

- Which words correspond to each operation? In each box, write any words that imply the operation.

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- Write a phrase for each expression.

a.  $n + 6$

b.  $4 - x$

c.  $3x + 1$

d.  $2x$

### Practice

Use what you learned about writing expressions to complete Exercises 9–12 on page 12.

Some words imply math operations.

| Operation             | Addition   | Subtraction   | Multiplication                                      | Division                  |
|-----------------------|--|---|---|---------------------------|
| Key Words and Phrases | added to<br>plus<br>sum of<br>more than<br>increased by<br>total of<br>and | subtracted from<br>minus<br>difference of<br>less than<br>decreased by<br>fewer than<br>take away | multiplied by<br>times<br>product of<br>twice<br>of | divided by<br>quotient of |

### EXAMPLE 1 Writing Numerical Expressions

Write the phrase as an expression.

- a. 8 **fewer than** 21

$$21 - 8$$

The phrase "fewer than" means subtraction.

- b. The **product of** 30 and 9

$$30 \times 9, \text{ or } 30 \cdot 9$$

The phrase "product of" means multiplication.

### EXAMPLE 2 Writing Algebraic Expressions

Write the phrase as an expression.

- a. 14 **more than** a number  $x$

$$x + 14$$

The phrase "more than" means addition.

- b. A number  $y$  **minus** 75

$$y - 75$$

The phrase "minus" means subtraction.

- c. The **quotient of** 3 and a number  $z$

$$3 \div z, \text{ or } \frac{3}{z}$$

The phrase "quotient of" means division.

#### Common Error



When writing expressions involving subtraction or division, order is important. For example, the quotient of a number  $x$  and 2 means  $x \div 2$ , not  $2 \div x$ .

### On Your Own

Write the phrase as an expression.

- The sum of 18 and 35
- 6 times 50
- 25 less than a number  $b$
- A number  $x$  divided by 4
- The total of a number  $t$  and 11
- 100 decreased by a number  $k$

 **Now You're Ready**  
Exercises 3–18

### EXAMPLE 3 Standardized Test Practice

In 2009, the number of members from Florida in the House of Representatives was 3 less than 4 times the number from Alabama. Let  $a$  be the number of members from Alabama. Which expression could be used to find the number of members from Florida?

- (A)  $4a - 3$       (B)  $4a + 3$       (C)  $3 - 4a$       (D)  $4 - 3a$

The phrase "times" means multiplication. So, multiply 4 and  $a$ .

The phrase "less than" means subtraction. So, subtract 3 from  $4a$ .

$4a - 3$

∴ The correct answer is (A).

### EXAMPLE 4 Real-Life Application

You plant a cypress tree that is 10 inches tall. Each year, its height increases by 15 inches.

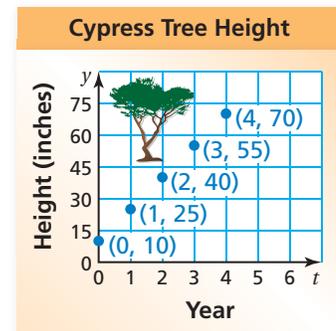
- Make a table and graph that show the height of the tree for 4 years. Then write an expression for the height after  $t$  years.
- What is the height after 9 years?

- The height is *increasing*, so *add*  $15t$  as shown in the table. From the table, you can then graph the ordered pairs.

| Year, $t$ | Height (inches)   |
|-----------|-------------------|
| 0         | 10                |
| 1         | $10 + 15(1) = 25$ |
| 2         | $10 + 15(2) = 40$ |
| 3         | $10 + 15(3) = 55$ |
| 4         | $10 + 15(4) = 70$ |

When  $t$  is 0, the height is 10 inches.

You can see that an expression is  $10 + 15t$ .



∴ So, the height after year  $t$  is  $10 + 15t$ .

- Evaluate  $10 + 15t$  when  $t = 9$ .

$$10 + 15t = 10 + 15(9) = 145$$

∴ After 9 years, the height of the tree is 145 inches.

### On Your Own

- Your friend has 5 more than twice as many game tokens as your sister. Let  $t$  be the number of game tokens your sister has. Write an expression for the number of game tokens your friend has.
- WHAT IF?** In Example 4, what is the height of the cypress tree after 16 years?

## 1.2 Exercises



### Vocabulary and Concept Check

1. **DIFFERENT WORDS, SAME QUESTION** Which is different? Write “both” expressions.

12 more than  $x$

$x$  increased by 12

$x$  take away 12

the sum of  $x$  and 12

2. **OPEN-ENDED** Write a real-world problem represented by the expression  $x \div 3$ .



### Practice and Problem Solving

Write the phrase as an expression.

- 1 2 3. 5 less than 8                      4. the product of 3 and 12                      5. 28 divided by 7  
6. the total of 6 and 10                      7. 3 fewer than 18                      8. 17 added to 15  
9. 13 subtracted from a number  $x$                       10. 5 times a number  $d$   
11. the quotient of 18 and a number  $a$                       12. the difference of a number  $s$  and 6  
13. 7 increased by a number  $w$                       14. a number  $b$  multiplied by 9  
15. the sum of a number  $y$  and 4                      16. the difference of 12 and a number  $x$   
17. twice a number  $z$                       18. a number  $t$  take away 8

**ERROR ANALYSIS** Describe and correct the error in writing the phrase as an expression.

19. the quotient of 8 and a number  $y$                       20. 16 decreased by a number  $x$

  $\frac{y}{8}$

  $x - 16$

21. **DINNER** Five friends share the cost of a dinner equally.  
a. Write an expression for the cost per person.  
b. Make up a total cost and test your expression. Is the result reasonable?
22. **TV SHOW** A television show has 19 episodes per season.  
a. Copy and complete the table.  
b. Write an expression for the number of episodes in  $n$  seasons.

|          |   |   |   |   |   |
|----------|---|---|---|---|---|
| Seasons  | 1 | 2 | 3 | 4 | 5 |
| Episodes |   |   |   |   |   |

Give two ways to write the expression as a phrase.

23.  $n + 6$                       24.  $4w$                       25.  $15 - b$                       26.  $14 - 3z$

Write the phrase as an expression. Then evaluate when  $x = 5$  and  $y = 20$ .

27. 3 less than the quotient of a number  $y$  and 4
28. the sum of a number  $x$  and 4, all divided by 3
29. 6 more than the product of 8 and a number  $x$
30. the quotient of 40 and the difference of a number  $y$  and 16



31. **BOWLING** It costs \$3 to bowl a game and \$2 for shoe rental.

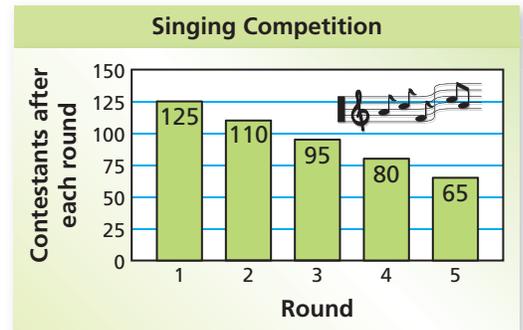
- Make a table for the cost of up to 5 games.
- Draw a graph of the data in your table.
- Write an expression for the cost of  $g$  games.
- Use your expression to find the cost of 8 games.

32. **PUZZLE** Florida has 8 less than 5 times the number of counties in Arizona. Georgia has 25 more than twice the number of counties in Florida.

- Write an expression for the number of counties in Florida.
- Write an expression for the number of counties in Georgia.
- Arizona has 15 counties. How many do Florida and Georgia have?

33. **COMPETITION** There are 140 people in a singing competition. The graph shows the results for the first five rounds.

- Write an expression for the number of people after each round.
- How many people are in the ninth round? Explain your reasoning.



34. **NUMBER SENSE** The difference between two numbers is 8. The lesser number is  $a$ . Write an expression for the greater number.

35. **Reasoning** One number is four times another. The greater number is  $x$ . Write an expression for the lesser number.



## Fair Game Review what you learned in previous grades & lessons

Evaluate the expression. (*Skills Review Handbook*)

36.  $8 + (22 + 15)$       37.  $(13 + 9) + 37$       38.  $(13 \times 6) \times 5$       39.  $4 \times (7 \times 5)$

40. **MULTIPLE CHOICE** A grocery store is making fruit baskets using 144 apples, 108 oranges, and 90 pears. Each basket will be identical. What is the greatest number of fruit baskets the store can make using all the fruit?

(*Skills Review Handbook*)

- (A) 6                      (B) 9                      (C) 16                      (D) 18