



STATE  
STANDARDS  
MA.6.A.3.2

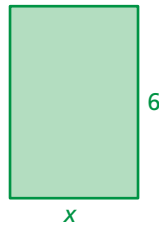
**Essential Question** How can you use multiplication or division to solve an equation?

### 1 ACTIVITY: Writing and Solving Multiplication Equations

Work with a partner. Solve for  $x$ . Check your answer.

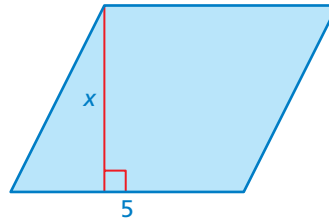
a. Rectangle

Area = 24 square units



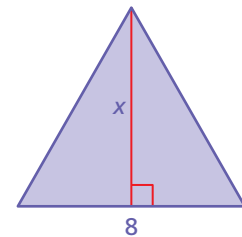
b. Parallelogram

Area = 20 square units



c. Triangle

Area = 28 square units



### 2 EXAMPLE: Using an Equation to Model a Story

The problem is represented by the equation.

**Problem**

Three people go out to lunch. They decide to share the \$12 bill evenly. How much does each person pay?

**Equation**

$$3x = 12$$

- What does  $x$  represent?
- Solve for  $x$ .
- Answer the question.

$$3 \text{ people} \cdot \text{Amount each person pays} = \$12$$

$x$  is the amount each person pays.

$$3x = 12$$

$$\frac{3x}{3} = \frac{12}{3}$$

$$x = 4$$

Solve for  $x$ .

So, each person pays \$4. Answer the question.

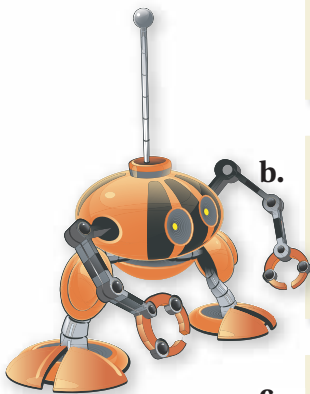
### 3 ACTIVITY: Using Equations to Model a Story

Work with a partner. Each problem is represented by the equation.

- What does  $x$  represent?
- Solve for  $x$ .
- Answer the question.

#### Problem

- a. Three robots go out to lunch. They decide to share the \$11.91 bill evenly. How much does each robot pay?
- b. On Earth, objects weigh 6 times what they weigh on the moon. A robot weighs 96 pounds on Earth. What does it weigh on the moon?
- c. At maximum speed, a robot runs 6 feet in 1 second. How many feet does the robot run in 1 minute?
- d. Four identical robots lie on the ground head-to-toe and measure 14 feet. How tall is each robot?



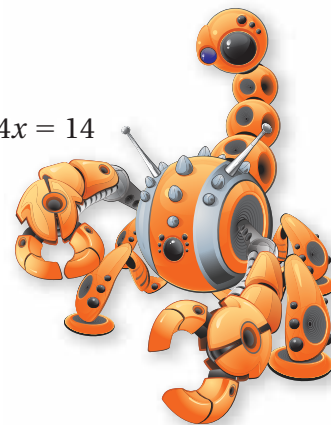
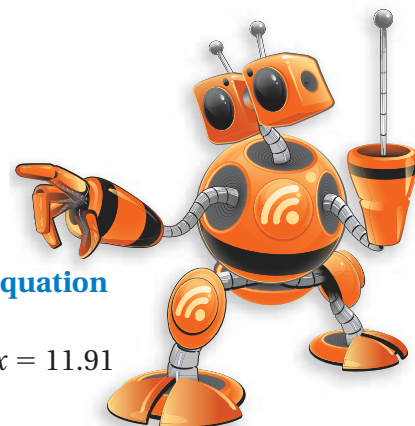
#### Equation

$$3x = 11.91$$

$$6x = 96$$

$$\frac{x}{60} = 6$$

$$4x = 14$$



### What Is Your Answer?

4. Complete each sentence by matching.
- The inverse operation of addition
  - The inverse operation of subtraction
  - The inverse operation of multiplication
  - The inverse operation of division
  - is multiplication.
  - is subtraction.
  - is addition.
  - is division.
5. **IN YOUR OWN WORDS** How can you use multiplication or division to solve an equation? Give two examples to show how your procedure works.

#### Practice

Use what you learned about solving equations to complete Exercises 15–18 on page 294.

**Key Idea**
**Remember**

Inverse operations “undo” each other. Multiplication and division are inverse operations.

**Multiplication Property of Equality**

**Words** If you multiply each side of an equation by the same nonzero number, the two sides remain equal.

**Numbers**  $\frac{8}{4} = 2$

$$\frac{8}{4} \times 4 = 2 \times 4$$

$$8 = 8$$

**Algebra**  $\frac{x}{4} = 2$

$$\frac{x}{4} \cdot 4 = 2 \cdot 4$$

$$x = 8$$

**EXAMPLE 1 Solving Equations Using Multiplication**

a. Solve  $\frac{w}{4} = 12$ .

$$\frac{w}{4} = 12$$

Write the equation.

Undo the division.  $\rightarrow$

$$\frac{w}{4} \cdot 4 = 12 \cdot 4$$

Multiply each side by 4.

$$w = 48$$

Simplify.

••• The solution is  $w = 48$ .

**Check**

$$\frac{w}{4} = 12$$

$$\frac{48}{4} \stackrel{?}{=} 12$$

$$12 = 12 \quad \checkmark$$

b. Solve  $x \div 7 = 5$ .

$$x \div 7 = 5$$

Write the equation.

Undo the division.  $\rightarrow$

$$x \div 7 \cdot 7 = 5 \cdot 7$$

Multiply each side by 7.

$$x = 35$$

Simplify.

••• The solution is  $x = 35$ .

**Check**

$$x \div 7 = 5$$

$$35 \div 7 \stackrel{?}{=} 5$$

$$5 = 5 \quad \checkmark$$

**On Your Own**

Solve the equation. Check your solution.

1.  $\frac{a}{8} = 6$

2.  $z \div 2 = 10$

3.  $9 = \frac{y}{15}$

4. Six friends share a box of pencils. Each person receives two pencils. Write and solve an equation to find the number of pencils in the box.

**Now You're Ready**  
Exercises 7–10

## Key Idea

### Division Property of Equality

**Words** If you divide each side of an equation by the same nonzero number, the two sides remain equal.

**Numbers**  $8 \times 4 = 32$

$$8 \times 4 \div 4 = 32 \div 4$$

$$8 = 8$$

**Algebra**  $4x = 32$

$$\frac{4x}{4} = \frac{32}{4}$$

$$x = 8$$

## EXAMPLE 2 Solving an Equation Using Division

Solve  $5b = 65$ .

$$5b = 65$$

Write the equation.

Undo the multiplication.

$$\frac{5b}{5} = \frac{65}{5}$$

Divide each side by 5.

$$b = 13$$

Simplify.

**Check**

$$5b = 65$$

$$5(13) \stackrel{?}{=} 65$$

$$65 = 65 \quad \checkmark$$

∴ The solution is  $b = 13$ .

## EXAMPLE 3 Using the Formula for Distance

Martin Strel set a world record by swimming 5268 kilometers down the Amazon River at a rate of about 80 kilometers per day. About how many days did it take him to complete his journey?

### Study Tip

When solving a real-life problem, check that each side of your equation has the same units.

$$5268 \text{ km} = \frac{80 \text{ km}}{\text{day}} \cdot t \text{ days}$$

$$d = rt$$

Write formula for distance.

$$5268 = 80t$$

Substitute 5268 for  $d$  and 80 for  $r$ .

$$\frac{5268}{80} = \frac{80t}{80}$$

Divide each side by 80.

$$65.85 = t$$

Simplify.

∴ It took him about 66 days to complete his journey.

## On Your Own

Solve the equation. Check your solution.

5.  $p \cdot 3 = 18$

6.  $12q = 60$

7.  $81 = 9r$

8. A subway train travels at a rate of 50 miles per hour. Write and solve an equation to find the number of minutes it takes the train to travel 10 miles.

 Now You're Ready  
Exercises 11–22


**Vocabulary and Concept Check**

- NUMBER SENSE** What number divided by 12 equals 1?
- WRITING** What property of equality would you use to solve  $\frac{x}{6} = 7$ ? Explain how you would use the property.

Copy and complete the first step in the solution.

3.  $4x = 24$

$$\frac{4x}{\square} = \frac{24}{\square}$$

4.  $\frac{x}{3} = 11$

$$\frac{x}{3} \cdot \square = 11 \cdot \square$$

5.  $8 = n \div 3$

$$8 \cdot \square = (n \div 3) \cdot \square$$

- OPEN-ENDED** Write an equation that can be solved using the Division Property of Equality.


**Practice and Problem Solving**

Solve the equation. Check your solution.

1 7.  $\frac{s}{10} = 7$

8.  $6 = \frac{t}{5}$

9.  $x \div 2 = 8$

10.  $24 = \frac{r}{4}$

2 11.  $3a = 12$

12.  $5 \cdot z = 35$

13.  $40 = 4y$

14.  $42 = 7k$

15.  $7x = 105$

16.  $75 = 6 \cdot w$

17.  $13 = d \div 6$

18.  $9 = v \div 5$


19.  $b \div 12 = 4.5$

20.  $\frac{c}{15} = 8.8$

21.  $12.5 \cdot n = 32$

22.  $3.4m = 20.4$

23. **ERROR ANALYSIS** Describe and correct the error in solving the equation.



$$\begin{aligned} x \div 4 &= 28 \\ \frac{x \div 4}{4} &= \frac{28}{4} \\ x &= 7 \end{aligned}$$

24. **ANOTHER WAY** Show how you can solve the equation  $3x = 9$  by multiplying each side by the reciprocal of 3.

25. **TEACHING** The Urban Teacher Academy Program (UTAP) in Broward County has 150 teachers graduate each year. Write and solve an equation to find the number of years  $y$  it takes for 900 teachers to graduate.

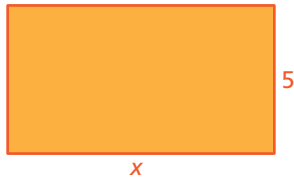


26. **MUSIC** The mean length of a song is 200 seconds. Write and solve an equation to find the total length  $s$  of 350 songs.

Solve for  $x$ . Check your answer.

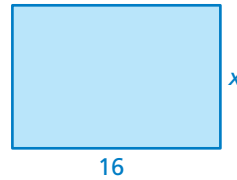
27. Rectangle

Area = 45 square units



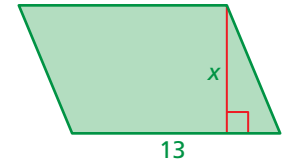
28. Rectangle

Area = 176 square units



29. Parallelogram

Area = 104 square units



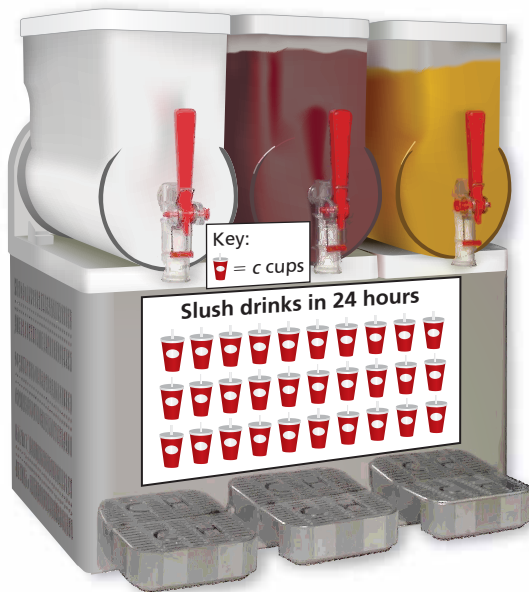
30. **TEST SCORE** On a test, you correctly answer six 5-point questions and eight 2-point questions. You earn 92% of the possible points on the test. How many points  $p$  is the test worth?

31. **CARD GAME** You use index cards to play a homemade game. The object is to be the first to get rid of all your cards. How many cards are in your friend's stack?

Your Cards



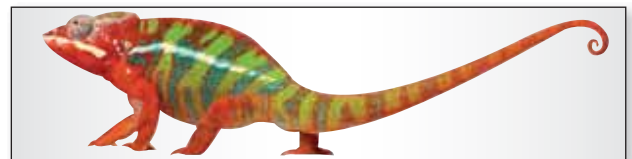
Friend's Cards



32. **FROZEN JUICE DRINKS** A frozen juice machine fills 1440 cups in 24 hours.

- Write and solve an equation to find the number  $c$  of cups each symbol represents.
- To lower costs, the cups are replaced by paper cones that hold 20% less. Write and solve an equation to find the number  $n$  of paper cones that can be filled in 24 hours.

33. **Number Sense** The area of the picture is 100 square inches. Find the length  $4x$  and width  $x$  of the picture.



## Fair Game Review

what you learned in previous grades & lessons

Solve the equation. Check your solution.

34.  $x + 7 = 19$

35.  $t - 12 = 11$

36.  $51 = b - 10$

37.  $22 = 6 + s$

38. **MULTIPLE CHOICE** What is the value of  $a^3$  when  $a = 4$ ?

(A) 12

(B) 43

(C) 64

(D) 81