English Spanish

7.3 Solving Equations Using Multiplication or Division

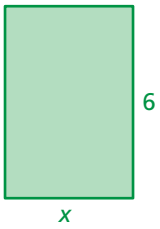
Essential Question How can you use multiplication or division to solve an equation?

1 ACTIVITY: Writing and Solving Multiplication Equations

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

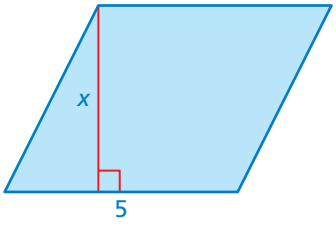
a. Rectangle

Area = 24 square units



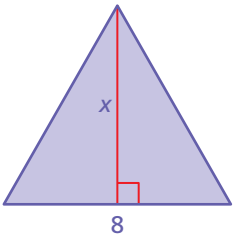
b. Parallelogram

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 people $\cdot$ 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.

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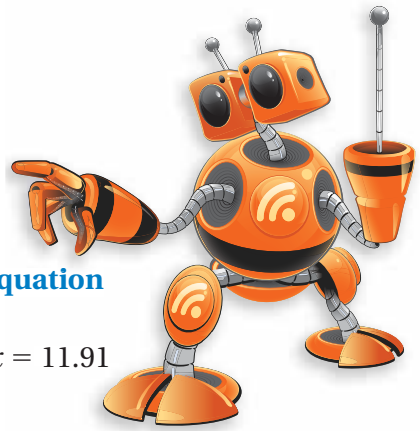
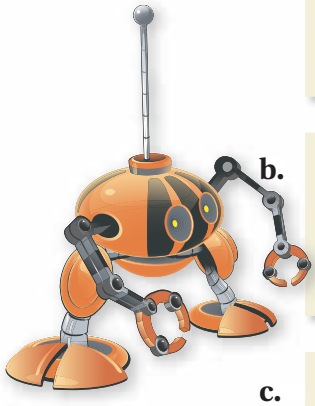
3 ACTIVITY: Using Equations to Model a Story

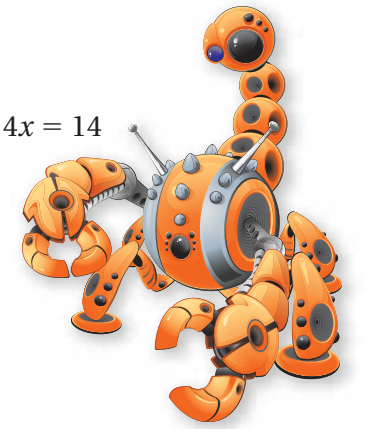
Work with a partner. Each problem is represented by the equation.

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



	Problem	Equation
a.	Three robots go out to lunch. They decide to share the \$11.91 bill evenly. How much does each robot pay?	$3x = 11.91$
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?	$6x = 96$
c.	At maximum speed, a robot runs 6 feet in 1 second. How many feet does the robot run in 1 minute?	$\frac{x}{60} = 6$
d.	Four identical robots lie on the ground head-to-toe and measure 14 feet. How tall is each robot?	$4x = 14$





What Is Your Answer?

4. Complete each sentence by matching.

• The inverse operation of addition	• is multiplication.
• The inverse operation of subtraction	• is subtraction.
• The inverse operation of multiplication	• is addition.
• The inverse operation of division	• 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.

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7.3 Lesson

Check It Out
Lesson Tutorials
BigIdeasMath.com

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. → $\frac{w}{4} \cdot 4 = 12 \cdot 4$ Multiply each side by 4.

$w = 48$ Simplify.

∴ The solution is $w = 48$.

Check

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

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

$12 = 12$ ✓

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

$x \div 7 = 5$ Write the equation.

Undo the division. → $x \div 7 \cdot 7 = 5 \cdot 7$ Multiply each side by 7.

$x = 35$ Simplify.

∴ The solution is $x = 35$.

Check

$x \div 7 = 5$

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

$5 = 5$ ✓

On Your Own

Now You're Ready
Exercises 7–10

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.

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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 $5b = 65$.

Undo the multiplication.

$5b = 65$ Write the equation.

$\frac{5b}{5} = \frac{65}{5}$ Divide each side by 5.

$b = 13$ Simplify.

∴ The solution is $b = 13$.

Check

$5b = 65$

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

$65 = 65$ ✓

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?

$d = rt$ 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.

Study Tip

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

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

On Your Own

Now You're Ready
Exercises 11–22

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.

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7.3 Exercises

Check It Out
Help with Homework
BigIdeasMath.com

Vocabulary and Concept Check

1. **NUMBER SENSE** What number divided by 12 equals 1?

2. **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. $8 = n \div 3$

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

6. **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.

✗
$$x \div 4 = 28$$
$$\frac{x \div 4}{4} = \frac{28}{4}$$
$$x = 7$$

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

25. **SNOWMOBILES** A snowmobile is traveling at a speed of 88 feet per second. Write and solve an equation to find the number of seconds s it takes for the snowmobile to travel 528 feet.

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.

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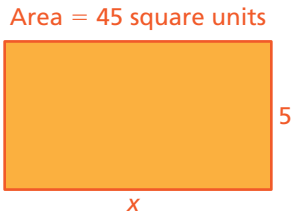
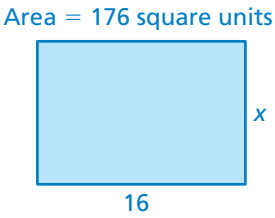
Solve for x. Check your answer.

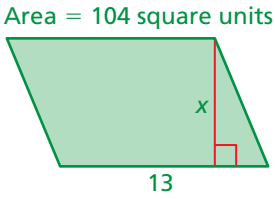
27. Rectangle



28. Rectangle

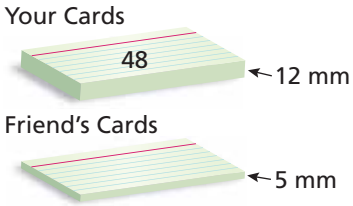


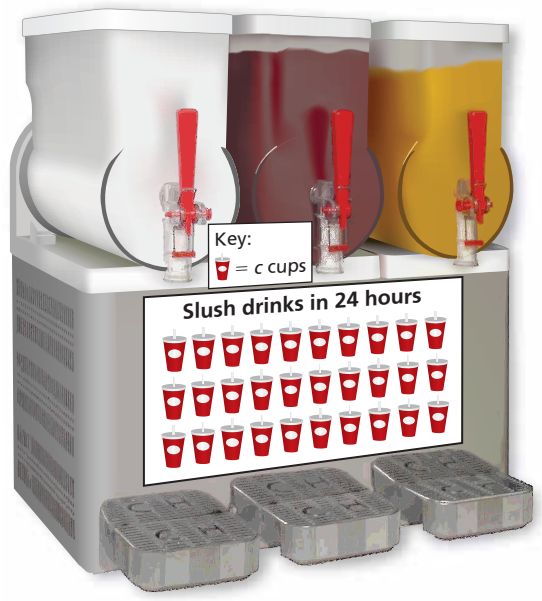
29. Parallelogram



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?



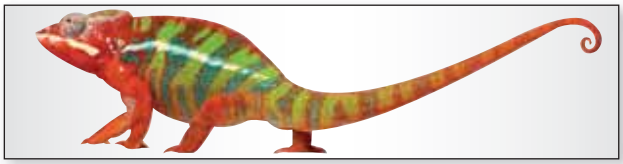


32. **FROZEN JUICE DRINKS** A frozen juice machine fills 1440 cups in 24 hours.

a. Write and solve an equation to find the number c of cups each symbol represents.

b. 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. SECTION 7.2

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 $a = 4$? SKILLS REVIEW HANDBOOK

(A) 12 (B) 43 (C) 64 (D) 81