

## 2-2

## Solving Two-Step Equations



## Vocabulary

## ● Review

1. Circle the equation(s) in which the variable is *isolated*.

$6y = 36$

$\frac{x}{2} + 7 = 19$

$8 + 4 = w$

$y = 3 - \frac{1}{2}$

Draw a line from each equation in Column A to its *solution* in Column B.

Column A

Column B

2.  $4x = 16$

$x = -6$

3.  $5 + x = 17$

$x = 4$

4.  $\frac{x}{3} = -2$

$x = 12$

## ● Vocabulary Builder

**deduce** (noun) dee DOOS

**Other Word Forms:** deducible (adjective), deduction (noun)

**Definition:** When you **deduce** something, you reach a logical conclusion through reasoning.

**Example:** You find that when  $a = 2$ ,  $0a = 0$ ; when  $a = \frac{1}{3}$ ,  $0a = 0$ ; and when  $a = -7$ ,  $0a = 0$ . You **deduce** that for any value of  $a$ ,  $0a$  will equal 0.

## ● Use Your Vocabulary

Place a ✓ in the box if the statement is a logical *deduction*. Place an ✗ if it is NOT a logical *deduction*.

5. A multiple of 5 always ends in 0 or 5. So, 240 is a multiple of 5.

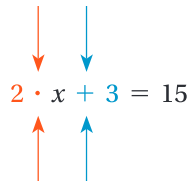
6. If a number is a whole number, it is also a rational number. So, all rational numbers must be whole numbers.

7. Consider  $a + b = 100$  for values of  $a$  and  $b$ . When  $a$  increases,  $b$  decreases. So, when  $b$  increases,  $a$  decreases.

A two-step equation involves two operations. To solve  $2 \cdot x + 3 = 15$ , undo the operations in the *reverse order* of the order of operations.

**Order of Operations**

First multiply. Then add.



**Operations Used to Solve Equations**

Undo multiplication with division after you undo addition. First, undo addition with subtraction.

Circle the first operation you would undo in solving each equation. Then write the inverse operation you would use to undo the circled operation.

8.  $3 \cdot r + 16 = 31$

\_\_\_\_\_

9.  $\frac{1}{2} \cdot d - 7 = 10$

\_\_\_\_\_

10.  $12 = -5y + 2$

\_\_\_\_\_



**Problem 1 Solving a Two-Step Equation**

**Got It?** What is the solution of  $5 = \frac{t}{2} - 3$ ?

11. Circle the first operation you will undo.

addition                  subtraction                  multiplication                  division

12. Circle the second operation you will undo.

addition                  subtraction                  multiplication                  division

13. Which two operations, in order, will you use to solve the equation?

\_\_\_\_\_ then \_\_\_\_\_

14. Now solve the equation.

\_\_\_\_\_

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## Problem 2 Using an Equation as a Model

**Got It?** You are making a bulletin board to advertise community service opportunities in your town. You plan to use one quarter of a sheet of construction paper for each ad and four full sheets for the title banner. You have 18 sheets of construction paper. How many ads can you make?

15. Use the model to complete the equation.

Relate number of sheets  
for the ads plus number of sheets  
for the title is total  
number of sheets

Define Let  $a$  EQ the number of ads that you can make.

Write  $\frac{1}{4}a$  EQ  EQ

16. Circle the operation you can use to undo multiplication by a fraction.

addition of the opposite division by the reciprocal multiplication by the reciprocal

17. Now solve the equation.

18. The number of ads that you can make is  .



## Problem 3 Solving With Two Terms in the Numerator

**Got It?** What is the solution of  $6 = \frac{x-2}{4}$ ?

19. The equation has two operations: subtraction and 9 .

To isolate  $x$ , use addition and 9 .

20. Use the justifications at the right to solve the equation.

$6 = \frac{x-2}{4}$	Write the original equation.
$6 \cdot \square = \frac{x-2}{4} \cdot \square$	Multiply each side by 4.
$\square = x - \square$	Simplify.
$\square + \square = x - \square + \square$	Add 2 to each side.
$\square = x$	Simplify.



## Problem 4 Using Deductive Reasoning

**Got It?** What is the solution of  $\frac{x}{3} - 5 = 4$ ? Justify each step.

21. The equation  $\frac{x}{3} - 5 = 4$  is solved below. Use one of the reasons from the box to justify each step.

$$\frac{x}{3} - 5 = 4$$

Write the original equation.

$$\frac{x}{3} - 5 + 5 = 4 + 5$$

$$\frac{x}{3} = 9$$

$$3 \cdot \frac{x}{3} = 3 \cdot 9$$

$$x = 27$$

Multiply each side by 3.  
Simplify.  
Add 5 to each side.



## Lesson Check • Do you UNDERSTAND?

What properties of equality would you use to solve  $-8 = \frac{s}{4} + 3$ ? What operation would you perform first? Explain.

22. Circle the operations you will undo when you solve  $-8 = \frac{s}{4} + 3$ .

addition

subtraction

multiplication

division

23. Which properties of equality would you use to undo these operations?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

24. What operation would you perform first? Explain.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



## Math Success

Check off the vocabulary words that you understand.

isolated

solution

equation

Rate how well you can solve a two-step equation.

