

Lesson 8-3

Writing Equations



Interactive Study Guide

See pages 173–174 for:

- Getting Started
- Real-World Link
- Notes



Essential Question

How are equations and inequalities used to describe and solve multi-step problems?



Common Core State Standards

Content Standards
7.EE.4, 7.EE.4a, 8.EE.7,
8.EE.7b

Mathematical Practices
1, 3, 4, 7

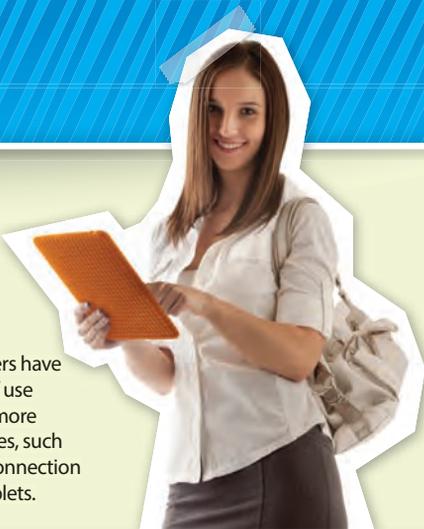
What You'll Learn

- Write two-step equations.
- Solve verbal problems by writing and solving two-step equations.



Real-World Link

Tablet Computers Touch-screen computers have been around for twenty years. Their ease of use and speed are two reasons that more and more consumers are purchasing them. Accessories, such as docking stations, power adapters, and connection kits, help users get the most out of their tablets.



Write Two-Step Equations

A power adapter costs \$5 more than a docking station. The total cost of the accessories is \$63. You can summarize this information by writing an equation.

Words

Docking station plus power adapter costs \$63

Variable

Let d = the cost of the docking station.
So, $d + 5$ = the cost of the power adapter.

Equation

$$d + d + 5 = \$63$$

Example 1



Translate each sentence into an equation.

- a. Zack has 6 shirts. This is 4 less than twice the number of shirts n that Xavier has.

$$6 = 2n - 4$$

- b. Eight more than the quotient of a number y and -3 is -24 .

$$8 + \frac{y}{-3} = -24$$

- c. Jeremy has 13 baseball cards, which is 7 more than one-fifth the number m Michael has.

$$13 = 7 + \frac{1}{5}m$$

Got It? Do these problems to find out.

- 1a. Four more than 0.3 times a number x is -26 . $0.3x + 4 = -26$ $24 = 2n - 6$
1b. Hannah has 24 stickers. This is 6 less than twice the number of stickers n Molly has.
1c. The quotient of a number n and 7, increased by 6, is equal to 12. $\frac{n}{7} + 6 = 12$

Example 2

Juan's father was 29 years old when Juan was born. This year, the sum of their ages is 53. Find their ages.

Let x = Juan's age. Then, $x + 29$ = Juan's father's age.

$$x + x + 29 = 53$$

Write the equation.

$$2x + 29 = 53$$

Distributive Property

$$2x + 29 - 29 = 53 - 29$$

Subtraction Property of Equality

$$2x = 24$$

Simplify.

$$x = 12$$

Mentally divide each side by 2.

Juan is 12 years old. His father is $12 + 29$ or 41 years old.

Equations

Look for the words *is*, *total*, *equals*, or *is equal to* when you translate sentences into equations.

Got It? Do this problem to find out.

2. Deisha saved d dollars last month. This month she saved \$8 more than 3 times the amount she saved last month. She saved a total of \$141. Write and solve an equation to find how much she saved last month. $d + 3d + 8 = 141$; \$33.25

Two-Step Verbal Problems

In some real-world situations, you start with a given amount and then increase the amount at a constant rate.



Example 3

Logan collected pledges for the charity walk-a-thon. He will receive total contributions of \$65.50 plus \$21.75 for every mile that he walks. How many miles will he need to walk to raise \$370?

First, write an equation to model the situation.

Words

\$65.50 plus \$21.75 per mile equals \$370.



Variable

Let m = the number of miles Logan walks.
So, $21.75m$ = contributions for walking m miles.



Equation

$$65.50 + 21.75m = 370$$

$$65.50 + 21.75m = 370$$

Write the equation.

$$65.50 - 65.50 + 21.75m = 370 - 65.50$$

Subtraction Property of Equality

$$21.75m = 304.5$$

Simplify.

$$\frac{21.75m}{21.75} = \frac{304.5}{21.75}$$

Division Property of Equality

$$m = 14$$

Simplify.

Logan needs to walk 14 miles to raise \$370.

Got It? Do this problem to find out.

3. Jasmine bought 6 DVDs, all at the same price. The tax on her purchase was \$5.04, and the total was \$85.74. What was the price of each DVD? \$13.45

Guided Practice



Translate each sentence into an equation. (Example 1)

1. The quotient of a number and 3, less 8, is 16. $\frac{n}{3} - 8 = 16$
2. Tiffani spent \$95 for clothes. This is \$15.80 more than 4 times the amount her sister spent for school supplies. $4s + 15.80 = 95$
3. Morgan has 98 baseball cards in his collection, which is twelve less than the product of $\frac{2}{3}$ and the number of cards Tyler has. $\frac{2}{3}t - 12 = 98$

Solve each problem by writing and solving an equation. (Examples 2 and 3)

4. Kendra pays \$132 for shoes and clothes. The clothes cost \$54 more than the shoes. How much do the shoes cost? $2s + 54 = 132$; \$39
5. During the spring car wash, the Activities Club washed 14 fewer cars than during the summer car wash. They washed a total of 96 cars during both car washes. How many cars did they wash during the spring car wash? $2x - 14 = 96$; 41 cars
6. **Financial Literacy** A gym charges a \$49.95 activation fee and \$17.50 per month for a membership. If you spend \$364.95, for how many months do you have a gym membership? $364.95 = 49.95 + 17.50m$; 18 months

Independent Practice

Go online for Step-by-Step Solutions



Translate each sentence into an equation. (Example 1)

7. Eighteen more than half a number is 8. $\frac{1}{2}x + 18 = 8$
8. The product of a number and 9, less 20, is 7. $9n - 20 = 7$
9. There are 48 soccer teams in the Springtown Association. This is three less than three times the number of teams in the Lyon Association. $3x - 3 = 48$
10. Eileen drove for 85 minutes. This is 21 more minutes than one-third the number of minutes Ethan drove. $\frac{1}{3}n + 21 = 85$

Solve each problem by writing and solving an equation. (Examples 2 and 3)

11. In 2007, Candace Parker, from the University of Tennessee, made 37 more field goals than she did in 2006. She had a total of 497 field goals for those years. How many field goals did she make in 2006? $2g + 37 = 497$; 230 field goals
12. The Marsh family took a vacation that covered a total distance of 1356 miles. The return trip was 284 miles shorter than the first part of the trip. How long was the return trip? $2m - 284 = 1356$; 536 mi
13. Three friends share the cost of renting a game system. Each person also rents one game for \$8.50. If each person pays \$13.25, what is the cost of renting the system? $\frac{x}{3} + 8.50 = 13.25$; \$14.25
14. Suppose you purchase 3 identical T-shirts and a hat. The hat costs \$19.75 and you spend \$56.50 in all. How much does each T-shirt cost? $3t + 19.75 = 56.50$; \$12.25

