

Lesson 1–3

Example 1 Verbal to Algebraic Expression

Write an algebraic expression to represent each verbal expression.

- a. the sum of a number and 10 $n + 10$
- b. the square of a number decreased by five times the cube of the same number $n^2 - 5n^3$
- c. the quotient of 6 times a number and 8 $\frac{6n}{8}$
- d. four times the difference of a number and 7 $4(n - 7)$

Example 2 Algebraic to Verbal Sentence

Write a verbal sentence to represent each equation.

- a. $15 = 20 - 5$ Fifteen is equal to the difference of twenty and five.
- b. $p + (-6) = -11$ The sum of a number and -6 is -11.
- c. $\frac{x}{9} = x^3$ A number divided by 9 is equal to that number cubed.

Example 3 Identify Properties of Equality

Name the property illustrated by each statement.

a. $z - n = z - n$

Reflexive Property of Equality

b. If $(-7 + 2) \cdot c = 35$, then $-5c = 35$.

Substitution Property of Equality

Example 4 One-Step Equations

Solve each equation. Check your solution.

a. $g - 2.4 = 3.6$

$$\begin{array}{ll} g - 2.4 = 3.6 & \text{Original equation} \\ g - 2.4 + 2.4 = 3.6 + 2.4 & \text{Add 2.4 to each side.} \\ g = 6 & \text{Simplify.} \end{array}$$

The solution is 6.

CHECK

$$\begin{array}{ll} g - 2.4 = 3.6 & \text{Original equation} \\ 6 - 2.4 = 3.6 & \text{Substitute 6 for } g. \\ 6 = 6 \checkmark & \text{Simplify.} \end{array}$$

b. $\frac{9}{8}n = -81$

$$\frac{9}{8}n = -81 \quad \text{Original equation}$$

$$\frac{8}{9} \left(\frac{9}{8}n \right) = \frac{8}{9}(-81) \quad \text{Multiply each side by } \frac{8}{9}, \text{ the multiplicative inverse of } \frac{9}{8}.$$

$$n = -72 \quad \text{Simplify.}$$

CHECK

$$\frac{9}{8}n = -81 \quad \text{Original equation}$$

$$\frac{9}{8}(-72) = -81 \quad \text{Substitute } -72 \text{ for } n.$$

$$-81 = -81 \quad \checkmark \quad \text{Simplify.}$$

Example 5 Solve a Multi-Step Equation

Solve $-3(5a + 4) + 7(3a - 1) = -43$

$$-3(5a + 4) + 7(3a - 1) = -43 \quad \text{Original equation}$$

$$-15a - 12 + 21a - 7 = -43 \quad \text{Distributive and Substitution Properties}$$

$$6a - 19 = -43 \quad \text{Commutative, Distributive, and Substitution Properties}$$

$$6a = -24 \quad \text{Addition and Substitution Properties}$$

$$a = -4 \quad \text{Division and Substitution Properties}$$

The solution is -4 .

Example 6 Solve for a Variable

SAVINGS To find the amount of money in a savings account use the formula $A = p + prt$. In this formula, A is the amount in the savings account, p is the principal which is the original amount deposited in the account, r is the rate of interest, and t is the time. Solve the formula for t .

$$A = p + prt \quad \text{Formula for the amount in the savings account}$$

$$A - p = p + prt - p \quad \text{Subtract } p \text{ from each side.}$$

$$A - p = prt \quad \text{Simplify.}$$

$$\frac{A - p}{pr} = \frac{prt}{pr} \quad \text{Divide each side by } pr.$$

$$\frac{A - p}{pr} = t \quad \text{Simplify.}$$

Example 7 Apply Properties of Equality**Multiple-Choice Test Item**

If $2x = -\frac{17}{2}$, what is the value of $\frac{4}{3}x$?

A. $-\frac{17}{6}$

B. $-\frac{51}{4}$

C. $-\frac{17}{3}$

D. $-\frac{51}{8}$

Read the Test Item

You are asked to find the value of the expression $\frac{4}{3}x$. Your first thought might be to find the value of x and then evaluate the expression using this value. Notice, however, that you are *not* required to find the value of x . Instead, you can use the Multiplication Property of Equality on the given equation to find the value of $\frac{4}{3}x$.

Solve the Test Item

$$2x = -\frac{17}{2}$$

Original equation.

$$\frac{2}{3}(2x) = \frac{2}{3}\left(-\frac{17}{2}\right)$$

Multiply each side by $\frac{2}{3}$, since $2 \cdot \frac{2}{3} = \frac{4}{3}$.

$$\frac{4}{3}x = -\frac{17}{3}$$

$$\frac{2}{3}\left(-\frac{17}{2}\right) = -\frac{17}{3}$$

The answer is C.

Example 8 Write an Equation

LANDSCAPING Several nurseries donated 1350 flower plants to be used in a new city park. A group of volunteers would like to plant 6 gardens each containing 72 of the plants and then use the remainder of the flowers in large pots that will hold 18 plants each. How many pots will be needed for the flowers?

Explore Let p represent the number of pots that will be needed.

alg2_010308.gif

Plan The number of plants per pot times the number of pots plus 6 of gardens 72 plants each = the total number of plants

$$\underbrace{18}_{\text{plants per pot}} \cdot \underbrace{p}_{\text{times}} + \underbrace{6(72)}_{\text{6 of gardens 72 plants each}} = \underbrace{1350}_{\text{the total number of plants}}$$

Solve

$$\begin{aligned} 18p + 6(72) &= 1350 && \text{Original equation} \\ 18p + 432 &= 1350 && \text{Multiply.} \\ 18p + 432 - 432 &= 1350 - 432 && \text{Subtract 432 from each side.} \\ 18p &= 918 && \text{Simplify.} \\ \frac{18p}{18} &= \frac{918}{18} && \text{Divide each side by 18.} \\ p &= 51 && \text{Simplify.} \end{aligned}$$

The group will need to have 51 pots.

Examine The total number of plants needed to fill 51 pots with 18 plants each is $51(18)$ or 918. Add the other plants to that and the total number of plants is $918 + 432$ or 1350. Thus, the answer is correct.