

Lesson 3-4

Example 1 Work Backward to Solve a Problem

Solve the following problem by working backward.

Ellen filled the tank of her car with gas to take a trip. She used half of the tank of gas before stopping for lunch. She used 6.5 gallons before stopping to put $8\frac{3}{4}$ more gallons in her car. At this time she had 10.25 gallons of gas in her tank. How many gallons of gas does her tank hold?

Start at the end of the problem and undo each step.

Statement	Undo the Statement
She had 10.25 gallons left	10.25
She added $8\frac{3}{4}$ gallons	$10.25 - 8\frac{3}{4} = 1.5$
She used 6.5 gallons	$1.5 + 6.5 = 8$
She used half of her tank before lunch.	$8 \times 2 = 16$

Her gas tank holds 16 gallons of gas.

Example 2 Solve Using Addition and Division

Solve $-14 - 3k = 13$. Then check your solution.

$$\begin{array}{ll} -14 - 3k = 13 & \text{Original equation} \\ -14 - 3k + 14 = 13 + 14 & \text{Add 14 to each side.} \\ -3k = 27 & \text{Simplify.} \\ \frac{-3k}{-3} = \frac{27}{-3} & \text{Divide each side by } -3. \\ k = -9 & \text{Simplify.} \end{array}$$

Check

$$\begin{array}{ll} -14 - 3k = 13 & \text{Original equation} \\ -14 - 3(-9) =? 13 & \text{Substitute } -9 \text{ for } k. \\ -14 + 27 =? 13 & \text{Multiply.} \\ 13 = 13 & \text{The solution is } -9. \end{array}$$

Example 3 Solve Using Subtraction and Multiplication

Solve $21 - \frac{1}{3}x = 16$. Then check your solution.

$$21 - \frac{1}{3}x = 16 \quad \text{Original equation}$$

$$21 - \frac{1}{3}x - 21 = 16 - 21 \quad \text{Subtract 21 from each side.}$$

$$-\frac{1}{3}x = -5 \quad \text{Simplify.}$$

$$-3\left(-\frac{1}{3}x\right) = -3(-5) \quad \text{Multiply each side by } -3.$$

$$x = 15$$

Check $21 - \frac{1}{3}x = 16$ Original equation

$$21 - \frac{1}{3}(15) = 16 \quad \text{Substitute 15 for } x.$$

$$21 - 5 = 16 \quad \text{Multiply.}$$

$$16 = 16 \quad \text{The solution is 15.}$$

Example 4 Solve Using Multiplication and Addition

Solve $\frac{-r-12}{6} = 7$.

$$\frac{-r-12}{6} = 7 \quad \text{Original equation}$$

$$6\left(\frac{-r-12}{6}\right) = 6(7) \quad \text{Multiply each side by 6.}$$

$$-r - 12 = 42 \quad \text{Simplify.}$$

$$-r - 12 + 12 = 42 + 12 \quad \text{Add 12 to each side.}$$

$$-r = 54 \quad \text{Simplify.}$$

$$-1(-r) = -1(54) \quad \text{Multiply each side by } -1.$$

$$r = -54 \quad \text{The solution is } -54.$$

Example 5 Write and Solve a Multi-Step Equation

Write an equation for the problem below. Then solve the equation.

Thirty-two is eight more than the product of -2 and g .

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$$\underbrace{\text{thirty two}}_{32} \quad \underbrace{\text{is}}_{=} \quad \underbrace{\text{eight}}_{8} \quad \underbrace{\text{more than}}_{+} \quad \underbrace{\text{the product of } -2 \text{ and } g}_{-2g}$$

$$32 = 8 + 2g \quad \text{Original equation}$$

$$32 - 8 = 8 + 2g - 8 \quad \text{Subtract 8 from each side.}$$

$$24 = 2g \quad \text{Simplify}$$

$$\frac{24}{2} = \frac{2g}{2} \quad \text{Divide each side by } -2.$$

$$12 = g \quad \text{Simplify.}$$

The solution is 12.

Example 6 Solve a Consecutive Integer Problem**NUMBER THEORY** Write an equation for the problem below. Then solve the equation and answer the problem.*Find three consecutive integers whose sum is 54.*Let n = the least integerThen $n + 1$ = the next greater integer, and $n + 2$ = the greatest of the three integers.

$$n + (n+1) + (n+2) = 54 \quad \text{Original equation}$$

$$3n + 3 = 54 \quad \text{Simplify.}$$

$$3n + 3 - 3 = 54 - 3 \quad \text{Subtract 3 from each side.}$$

$$3n = 51 \quad \text{Simplify.}$$

$$\frac{3n}{3} = \frac{51}{3} \quad \text{Divide each side by 3.}$$

$$n = 17 \quad \text{Simplify.}$$

$$n + 1 = 17 + 1 \text{ or } 18 \quad n + 2 = 17 + 2 \text{ or } 19$$

The consecutive integers are 17, 18, and 19.