

**EXAMPLE 4** Solve a mixture problem

**ANTIFREEZE** For extremely cold temperatures, an automobile manufacturer recommends that a 70% antifreeze and 30% water mix be used in the cooling system of a car. How many quarts of pure (100%) antifreeze and a 50% antifreeze and 50% water mix should be combined to make 11 quarts of a 70% antifreeze and 30% water mix?

**Solution**

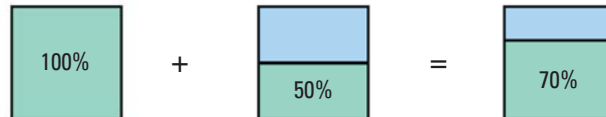
**STEP 1** Write an equation for the total number of quarts and an equation for the number of quarts of antifreeze. Let  $x$  be the number of quarts of 100% antifreeze, and let  $y$  be the number of quarts a 50% antifreeze and 50% water mix.

**Equation 1: Total number of quarts**

$$x + y = 11$$

**Equation 2: Number of quarts of antifreeze**

$x$  quarts of 100% antifreeze       $y$  quarts of 50%–50% mix      11 quarts of 70%–30% mix



$$1 \cdot x + 0.5 \cdot y = 0.7(11)$$

$$x + 0.5y = 7.7$$

The system of equations is:  $x + y = 11$  **Equation 1**

$x + 0.5y = 7.7$  **Equation 2**

**STEP 2** Solve Equation 1 for  $x$ .

$$x + y = 11 \quad \text{Write Equation 1.}$$

$$x = 11 - y \quad \text{Revised Equation 1}$$

**STEP 3** Substitute  $11 - y$  for  $x$  in Equation 2 and solve for  $y$ .

$$x + 0.5y = 7.7 \quad \text{Write Equation 2.}$$

$$(11 - y) + 0.5y = 7.7 \quad \text{Substitute } 11 - y \text{ for } x.$$

$$y = 6.6 \quad \text{Solve for } y.$$

**STEP 4** Substitute 6.6 for  $y$  in the revised Equation 1 to find the value of  $x$ .

$$x = 11 - y = 11 - 6.6 = 4.4$$

► Mix 4.4 quarts of 100% antifreeze and 6.6 quarts of a 50% antifreeze and 50% water mix to get 11 quarts of a 70% antifreeze and 30% water mix.

**DRAW A DIAGRAM**

Each bar shows the liquid in each mix. The green portion shows the percent of the mix that is antifreeze.

**GUIDED PRACTICE** for Example 4

6. **WHAT IF?** How many quarts of 100% antifreeze and a 50% antifreeze and 50% water mix should be combined to make 16 quarts of a 70% antifreeze and 30% water mix?