Finally, to find x, we substitute our values for y and z into any of the original equations that contain x.

$$x + 4\left(\frac{47}{14}\right) = 10$$

$$x = \frac{-24}{7}$$

There is only one solution for this system of equations: $\left(\frac{-24}{7}, \frac{47}{14}, \frac{-27}{14}\right)$.

11.R.2 Exercises

Concept Check

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

1. The method of substitution reduces the problem from one of solving two equations in two variables to solving one equation in one variable.

2. The method of substitution is most often used when one of the equations is impossible to graph.

3. The method of substitution is more accurate than the graphing method.

4. When using the method of substitution, you should always solve the first equation for x.

Practice

Use the method of substitution to solve each system.

5. $\begin{cases} x + y = 6 \\ y = 2x \end{cases}$

6. $\begin{cases} 3x - 7 = y \\ 2y = 6x - 14 \end{cases}$

7. $\begin{cases} 4x = y \\ 4x - y = 7 \end{cases}$

8. $\begin{cases} 3y + 5x = 5 \\ y = 3 - 2x \end{cases}$

Applications

Each of the following applications has been modeled using a system of equations. Use the method of substitution to solve each system.

9. ***Rectangles:*** The perimeter of a rectangle is 50 meters and the length is 5 meters longer than the width. Find the dimensions of the rectangle.

Let x = the length and y = the width.

The corresponding modeling system is $\begin{cases} 2x + 2y = 50 \\ x - y = 5 \end{cases}$

10. ***Health & Fitness:*** A fitness center manager is trying to decide whether to charge an enrollment fee of \$25 with a monthly rate of \$50 or an enrollment fee of \$100 with a monthly rate of \$25. After how many months would it be more profitable for the manager to choose the lower enrollment fee and the higher monthly rate? Round up to the nearest month.

The corresponding modeling system is $\begin{cases} y = 50x + 25 \\ y = 25x + 100 \end{cases}$

Writing & Thinking

11. Explain the advantages of solving a system of linear equations

a. by graphing.

b. by substitution.