Now that we have our starting matrix, the solution for this system of equations can be found in the following manner.

$$\left[\begin{array}{ccc|c} 1 & 3 & 0 & -2 \\ 0 & 1 & -5 & 21 \\ -2 & -2 & 2 & 0 \end{array}\right] \xrightarrow{2R_1+R_3} \left[\begin{array}{ccc|c} 1 & 3 & 0 & -2 \\ 0 & 1 & -5 & 21 \\ 0 & 4 & 2 & -4 \end{array}\right] \xrightarrow{-4R_2+R_3} \left[\begin{array}{ccc|c} 1 & 3 & 0 & -2 \\ 0 & 1 & -5 & 21 \\ 0 & 0 & 22 & -88 \end{array}\right]$$

$$\xrightarrow{\frac{1}{22}R_3} \left[\begin{array}{ccc|c} 1 & 3 & 0 & -2 \\ 0 & 1 & -5 & 21 \\ 0 & 0 & 1 & -4 \end{array}\right] \xrightarrow{5R_3+R_2} \left[\begin{array}{ccc|c} 1 & 3 & 0 & -2 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & -4 \end{array}\right] \xrightarrow{-3R_2+R_1} \left[\begin{array}{ccc|c} 1 & 0 & 0 & -5 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & -4 \end{array}\right]$$

After performing all of the necessary elementary row operations to place the augmented matrix for this system in reduced row echelon form, we have the following matrix.

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & -5 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & -4 \end{array}\right]$$

If we now write this matrix in system form, we have the following.

$$\begin{cases} x = -5 \\ y = 1 \\ z = -4 \end{cases}$$

This is equivalent to the original system, but in a form that tells us the solution of the system. Therefore, the ordered triple $(-5,1,-4)$ solves this system of equations.

9.R.3 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. When using the method of addition, the solution only needs to be checked in one of the original equations.

2. It's possible for a system of equations to have no solutions.

3. Both the addition method and the substitution method give approximate solutions.

4. The graphing method is helpful in "seeing" the geometric relationship between the lines and finding approximate solutions.

Practice

Solve each system of linear equations.

5. $\begin{cases} 2x + y = 3 \\ 4x + 2y = 7 \end{cases}$

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

7. $\begin{cases} 4x - 2y = 8 \\ 2x - y = 4 \end{cases}$

Write an equation for the line determined by the two given points by using the formula *y* = *mx* + *b* to set up a system of equations with *m* and *b* as the unknowns.

8. $(2, 3), (1, -2)$

Applications

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

9. ***Baseball:*** A minor league baseball team has a game attendance of 4500 people. Tickets cost $5 for children and $8 for adults. The total revenue made at this game was $26,100. How many adults and how many children attended the game?
Let x = number of adults
and y = number of children.
The system that models the problem is $\begin{cases} x + y = 4500 \\ 8x + 5y = 26{,}100 \end{cases}$

10. ***Acid Solutions:*** How many liters each of a 30% acid solution and a 40% acid solution must be used to produce 100 liters of a 36% acid solution?
Let x = amount of 30% solution
and y = amount of 40% solution.
The system that models the problem is $\begin{cases} x + y = 100 \\ 0.30x + 0.40y = 0.36(100) \end{cases}$

Writing & Thinking

11. Explain, in your own words, why the answer to a system with infinite solutions is written as an ordered pair with variables.