

Using Concrete Models to Solve Systems

A system of linear equations consists of two or more equations with the same variables. To solve a system of equations with two or more variables, find the ordered pair that satisfies all of the equations. You can solve a system of equations by using an algebraic method called *substitution*. This method can be modeled using algebra tiles.

Example Use Concrete Models

Use a concrete model to solve the system $y = x + 1$ and $3x + y = 9$.

Step 1 Let a green tile represent x . Then, since $y = x + 1$, 1 green tile and 1 yellow tile represent y .

$$x = \begin{array}{|c|} \hline x \\ \hline \end{array} \quad y = \begin{array}{|c|} \hline x \\ \hline \end{array} \begin{array}{|c|} \hline 1 \\ \hline \end{array}$$

Step 2 Represent $3x + y = 9$ on the equation mat. On one side of the mat, place three green tiles for $3x$ and substitute 1 green tile and 1 yellow tile for y . On the other side, place 9 yellow tiles.

$$3x + y = 9$$

Step 3 Rewrite $3x + y = 9$ as $4x + 1 = 9$. Remove one yellow tile from each side of the mat. Then separate the remaining yellow tiles on the right into 4 equal groups to match the 4 x -tiles on the left.

$$4x + 1 = 9$$

Each x -tile is paired with 2 yellow tiles. The resulting equation is $x = 2$. Since the value of y is $x + 1$, $y = 2 + 1$ or 3.

Therefore, the solution of the system of equations is $(2, 3)$.

CHECK

$$\begin{array}{l} y = x + 1 \\ 3 = 2 + 1 \quad \checkmark \end{array}$$

$$\begin{array}{l} \text{Original equations} \\ x = 2 \text{ and } y = 3 \end{array}$$

$$\begin{array}{l} 3x + y = 9 \\ 3(2) + 3 = 9 \quad \checkmark \end{array}$$

Exercises

Use a concrete model to solve each system of equations.

1. $y = x$
 $3x + y = 4$

2. $y = 3x$
 $x + 2y = -21$

3. $y = x + 7$
 $x + y = 1$

4. $y = 7 - x$
 $-x + 2y = 8$

5. $y = 3x + 8$
 $-4x + y = 12$

6. $x = y + 5$
 $2x + 2y = -2$

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Answers

- 1.** (1, 1)
- 2.** (-3, -9)
- 3.** (-3, 4)
- 4.** (2, 5)
- 5.** (-4, -4)
- 6.** (2, -3)