

## Algebra 11-2: Solving Systems Using Substitution

### Warm-Up

1. Solve.  $5x - 25 = -8x + 40$

$$\begin{array}{r}
 \cancel{+8x} \quad \cancel{+8x} \\
 13x - 25 = 40 \\
 \hline
 \cancel{+25} \quad \cancel{+25} \\
 \hline
 13x = 65 \\
 \hline
 \frac{13x}{13} = \frac{65}{13} \\
 \boxed{x = 5}
 \end{array}$$

2.  $\frac{1}{2}x - 5 = \frac{3}{4}x + 12$

$$\begin{array}{r}
 \cancel{-\frac{1}{2}x} \quad \cancel{-\frac{1}{2}x} \\
 -5 = \frac{1}{4}x + 12 \\
 \hline
 -12 \quad \quad -12 \\
 \hline
 4 \cdot -17 = \frac{1}{4}x \cdot 4 \\
 \boxed{-68 = x}
 \end{array}$$

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### Solving by Substitution

- One equation must be solved for a variable. For example  $x + y = 14$  is not solved for a variable but  $x = 14 - y$  is solved for x.
- Substitute.
- Solve the equation.
- To get the other variable, plug into an equation to find it.
- Check.

$$x = 14 - y$$

Examples

Solve by substitution.

$$1. \begin{cases} y = 1.5x - 10 \\ x + y = 0 \end{cases}$$

$$\begin{aligned} 1x + (1.5x - 10) &= 0 \\ 2.5x - 10 &= 0 \\ &+10 \quad +10 \end{aligned}$$

Check

$$\begin{aligned} y &= 1.5x - 10 \\ -4 &= 1.5(4) - 10 \\ -4 &= -4 \checkmark \end{aligned} \quad \left| \begin{aligned} 4 + -4 &= 0 \\ 0 &= 0 \checkmark \end{aligned} \right.$$

$$\begin{aligned} 2.5x &= 10 \\ \frac{2.5x}{2.5} &= \frac{10}{2.5} \\ x &= 4 \end{aligned}$$

$$(4, -4)$$

$$\begin{aligned} y &= 1.5x - 10 \\ y &= 1.5(4) - 10 \\ y &= 6 - 10 = -4 \end{aligned}$$

$$2. \begin{cases} y = 5x + 9 \\ y = -3x + 37 \end{cases}$$

$$\begin{aligned} 5x + 9 &= -3x + 37 \\ +3x \quad +3x & \\ \hline 8x + 9 &= 37 \\ -9 \quad -9 & \\ \hline 8x &= 28 \\ \frac{8x}{8} &= \frac{28}{8} \end{aligned}$$

$$x = 3.5$$

$$\begin{aligned} x &= 3.5 \\ y &= 5x + 9 \\ y &= 5(3.5) + 9 \\ y &= 26.5 \end{aligned}$$

$$\begin{matrix} x & y \\ (3.5, 26.5) \end{matrix}$$

Assignment: 11-2 #'s 1-3, 10-15