

Name _____

Date _____

Module #3:

Worksheet 14c: Solving Linear Systems of Equations: Addition
(Elimination Method)

Elimination Method Using Multiplication:

Some systems of equations cannot be solved simply by adding or subtracting the equations. One or both equations must first be multiplied by a number before the system can be solved by elimination. Consider the following example:

Example 3:

Use elimination to solve the system of equations

$$x + 10y = 3 \text{ and } 4x + 5y = 5.$$

$$\begin{array}{l} x + 10y = 3 \\ 4x + 5y = 5 \end{array} \quad \downarrow$$

Multiply $x + 10y = 3$ by -4 .

Then add the two equations.

$$\begin{array}{r} \implies -4x - 40y = -12 \\ \implies \quad 4x + 5y = 5 \\ \hline \quad \quad -35y = -7 \\ \quad \quad \underline{-35y = -7} \\ \quad \quad -35 \quad -35 \end{array}$$

$$y = 1/5$$

Substitute $1/5$ for y into either original equation. Then solve for x .

$$\begin{array}{r} \implies x + 10y = 3 \\ x + 10(1/5) = 3 \\ x + 2 = 3 \\ x + 2 - 2 = 3 - 2 \quad x = 1 \end{array}$$

The solution of this system is $(1, 1/5)$

Use elimination to solve each system of equations:

6. $3x + 2y = 0$

$3x + 2y = 0$

7. $2x + 3y = 6$

$2x + 3y = 6$

8. $3x - y = 2$

$3x - y = 2$

$3(x - 5y = 17)$ $3x - 15y = 51$

$2(x + 2y = 5)$ $2x + 4y = 10$

$3(x + 2y = 3)$ $3x + 6y = 9$

$$\begin{array}{r} x - 5(3) = 17 \\ x + 15 = 17 \\ x = 2 \end{array} \quad \begin{array}{r} +15y = 51 \\ +15 \quad +15 \\ \hline y = 3 \end{array}$$

$$\begin{array}{r} x + 2(0) = 5 \\ x + 0 = 5 \\ x = 5 \end{array}$$

$$\begin{array}{r} -y = -4 \\ y = 4 \end{array}$$

$$\begin{array}{r} 3x - 7 = 2 \\ 3x = 9 \\ x = 3 \end{array}$$

$$\begin{array}{r} -7y = -7 \\ y = 1 \end{array}$$

(2, 3)

(5, 0)

(3, 7)

$9(4x + 5y = 6)$ $36x + 45y = 54$

$10(4x + 2y = 8)$ $40x + 20y = 80$

$16x + 8y = 32$

$$\begin{array}{r} 4(6x - 7y = -20) \\ 24x - 28y = -80 \\ \hline 58y = 116 \\ y = 2 \end{array}$$

$$\begin{array}{r} 16x - y = 14 \\ 16x - 2 = 14 \\ 16x = 16 \\ x = 1 \end{array}$$

$$\begin{array}{r} 9y = 18 \\ y = 2 \end{array}$$

(-1, 2)

(1, 2)

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Module #3:

**Worksheet 14c: Solving Linear Systems of Equations: Addition
(Elimination Method)**

 **View Tutorial 14a (covers worksheets 14a, b and c)**

→ **Objective:** Use the elimination method (addition & multiplication) in order to solve the system of equations.

Elimination Method Using Addition and Subtraction:

In systems of equations where the coefficient (the number in front of the variable) of the x or y terms are additive inverses, solve the system by adding the equations. Because one of the variables is eliminated, this method is called **elimination**.

Example 2:

Use elimination to solve the system of equations

$$x - 3y = 7 \text{ and } 3x + 3y = 9.$$

Add the two equations.

$$\begin{array}{r} x - 3y = 7 \\ + 3x + 3y = 9 \\ \hline 4x = 16 \\ \frac{4x}{4} = \frac{16}{4} \end{array}$$

$x = 4$

Substitute 4 for x in either original equation. Then solve for y.

$$\begin{array}{r} x - 3y = 7 \\ 4 - 3y = 7 \\ -3y = 3 \\ \frac{-3y}{-3} = \frac{3}{-3} \end{array}$$

$y = -1$

The solution of this system is (4, -1).

Use elimination to solve each system of equations:

1. $2x + 2y = -2$ $3x - 2y = 12$ $2(2) + 2y = -2$ $4 + 2y = -2$ $2y = -6$ $\frac{2y}{2} = \frac{-6}{2}$ $y = -3$ $(2, -3)$

2. $4x - 2y = -1$ $-4x + 4y = -2$ $4x - 2(-1.5) = -1$ $4x + 3 = -1$ $4x = -4$ $\frac{4x}{4} = \frac{-4}{4}$ $x = -1$ $(-1, 1.5)$

3. $x - y = 2$ $x + y = -3$ $x - y = 2$ $-1/2 - y = 2$ $-y = 2 1/2$ $y = -2 1/2$ $(-1/2, -2 1/2)$

4. $6x + 5y = 4$ $6x - 7y = -20$ $6x + 5(2) = 4$ $6x + 10 = 4$ $6x = -6$ $\frac{6x}{6} = \frac{-6}{6}$ $x = -1$ $(-1, 2)$

5. $2x - 3y = 12$ $4x + 3y = 24$ $2(6) - 3y = 12$ $12 - 3y = 12$ $-3y = 0$ $y = 0$ $(6, 0)$