

6-4 Elimination using Multiplication

pg. 357

1. Multiply at least one equation by a constant to get two equations that contain opposite terms (these are the variables you will eliminate).
2. Add the equations, eliminating one variable. Then solve that equation.
3. Substitute the value from step 2 into one of the equations and solve for the other variable.
4. Write the solution as an ordered pair (coordinate point).

$$\begin{array}{r} 5x + 6y = -8 \\ -2x + 3y = -5 \end{array} \cdot 2$$

$$4x - 6y = 10$$

$$\begin{array}{r} 5x + 6y = -8 \\ -4x - 6y = +10 \\ \hline 1x = 2 \end{array}$$

$$(2, -3)$$

$$\begin{array}{r} 5(2) + 6y = -8 \\ 10 + 6y = -8 \\ -10 \quad -10 \\ \hline 6y = -18 \\ \frac{6y}{6} = \frac{-18}{6} \\ y = -3 \end{array}$$

Guided Practice:

1A.) $6x - 2y = 10$

~~$3x - 7y = -19$~~

$-6x + 14y = 38$

New system:

$$\begin{array}{r} 6x - 2y = 10 \\ -6x + 14y = 38 \\ \hline \end{array}$$

$\frac{12y}{12} = \frac{48}{12}$

$y = 4$

$6x - 2(4) = 10$

$6x - 8 = 10$

$6x = 18$

$x = 3$

 $(3, 4)$

1B.) $9r + q = 13$

~~$3r + 2q = -4$~~

~~$-9r - 6q = 12$~~

$9r + q = 13$

$-5q = 25$

$q = -5$

$9r + (-5) = 13$

$9r = 18$

$r = 2$

 $(2, -5)$

Example 2:

$$\begin{array}{r} 3 \quad 4x + 2y = 8 \\ 2 \quad 3x + 3y = 9 \end{array}$$

$$\begin{array}{r} 12x + 6y = 24 \\ -6x - 6y = -18 \\ \hline 6x = 6 \end{array} \quad (1, 2)$$

$$x = 1$$

$$\begin{array}{r} 4(1) + 2y = 8 \\ 4 + 2y = 8 \\ -4 \quad -4 \\ \hline 2y = 4 \\ y = 2 \end{array}$$

Study Tip:

Guided Practice:

$$2A.) \begin{cases} 5x + 3y = 6 \\ 2x + 5y = -10 \end{cases}$$

$$2(5x + 3y = 6)$$

$$10x - 6y = 12$$

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

$$-10x - 25y = 50$$

system

$$\begin{array}{r} 10x - 6y = 12 \\ -10x - 25y = 50 \\ \hline -31y = 62 \end{array}$$

$$y = -2$$

$$5x - 3(-2) = 6$$

$$5x + 6 = 6$$

$$5x = 0$$

$$x = 0$$

$$(0, -2)$$

$$2B.) \begin{cases} 6a + 2b = 2 \\ 4a + 3b = 8 \end{cases}$$

$$\begin{array}{r} 18a + 6b = 6 \\ -8a - 6b = -16 \\ \hline 10a = -10 \end{array}$$

$$10a = -10$$

$$a = -1$$

$$6(-1) + 2b = 2$$

$$-6 + 2b = 2$$

$$2b = 8$$

$$b = 4$$

$$(1, 4)$$

Guided Practice:

$$r \cdot t = d$$

3. A canoeist travels 4 miles downstream in 1 hour. The return trip takes the canoeist 1.5 hours. Find the rate of the boat in still water.

	downstream	$x + y$	$\frac{t}{1}$	$\frac{d}{4}$
	upstream	$x - y$	$\frac{t}{1.5}$	$\frac{d}{4}$

$r \cdot t = d$

Still water:

$$\begin{aligned} 1(x + y) &= 4 &= 1x + 1y = 4 & (+1.5) \\ 1.5(x - y) &= 4 &= 1.5x - 1.5y = 4 & \end{aligned}$$

$$\begin{aligned} &\rightarrow 1.5x + 1.5y = 6 \\ &+ 1.5x - 1.5y = 4 \\ \hline &3.0x = 10 \\ &x = 3\frac{1}{3} \end{aligned}$$

$3\frac{1}{3} \text{ mi/hr.}$

$$\begin{aligned} 1\left(\frac{10}{3}\right) + 1y &= 4 \\ \frac{10}{3} + 1y &= 4 \\ -\frac{10}{3} & \\ \hline y &= \frac{2}{3} \end{aligned}$$

P. 359
#1-5

$$1. \begin{array}{l} 3(2x - y) = (4)3 \\ 7x + 3y = 27 \\ \hline 6x - 3y = 12 \end{array}$$

$(3, 2)$

$$\begin{array}{l} 13x = 39 \\ x = 3 \\ 2(3) - y = 4 \\ 6 - y = 4 \\ -6 - y = -6 \\ -y = -2 \\ y = 2 \end{array}$$

$$2. \begin{array}{l} 2x + 7y = 1 \\ -2(x + 5y) = (2)-2 \\ \hline -2x - 10y = -4 \end{array}$$

$$\begin{array}{l} 2x + 7y = 1 \\ -2x - 10y = -4 \\ \hline -3y = -3 \end{array}$$

$$y = +1$$

$(-3, 1)$

$$\begin{array}{l} 2x + 7(+1) = 1 \\ 2x + 7 = 1 \\ -7 -7 \\ 2x = -6 \\ x = -3 \end{array}$$

$$3.) \quad \begin{aligned} 3(4x+2y) &= (-14) \cdot 3 \\ -2(5x+3y) &= (-17) \cdot -2 \end{aligned}$$

$(-4, 1)$

$$\begin{array}{r} 12x + 6y = -42 \\ -10x - 6y = 34 \\ \hline \end{array}$$

$$2x = -8$$

$$x = -4$$

$$4(-4) + 2y = -14$$

$$\begin{array}{r} -16 + 2y = -14 \\ +16 \quad \quad \quad +16 \end{array}$$

$$2y = 2$$

$$y = 1$$

$$4.) \quad \begin{aligned} 3(9a-2b) &= (-8) \cdot 3 \\ 2(-7a+3b) &= (12) \cdot 2 \end{aligned}$$

$$\begin{array}{r} 27a - 6b = -24 \\ -14a + 6b = 24 \\ \hline \end{array}$$

$$13a = 0$$

$$a = 0$$

$$9(0) - 2b = -8$$

$$-2b = -8$$

$$b = 4$$

$$(0, 4)$$

5.)

r	t	d
· x+y	2 ·	16 ·
· x-y	4 ·	16 ·

r · t = d

$$\begin{aligned} 2(x+y) &= 16 \\ 4(x-y) &= 16 \end{aligned}$$

$$\begin{aligned} 2(2x+2y) &= (16) \\ 4x-4y &= 16 \end{aligned}$$

$$\begin{array}{r} 4x+4y=32 \\ 4x-4y=16 \\ \hline 8x=48 \end{array}$$

Still water
6 hrs

$$\begin{aligned} 2(6)+2y &= 16 \\ 12+2y &= 16 \\ -12 & \quad -12 \\ \hline 2y &= 4 \\ \hline y &= 2 \end{aligned}$$

x=6