7.3 - 7.4 Solve Linear Systems by Elimination

$$\begin{array}{r} x = 5 \\ +\quad 2x = 10 \\ \hline 3x = 15 \end{array} \qquad \begin{array}{r} 4y = -12 \\ +\quad -3y = 9 \\ \hline y = -3 \end{array}$$

Solve the linear system:

$$\begin{array}{r} 4y + x = 17 \\ +\quad y - x = -2 \\ \hline 5y = 15 \end{array}$$

$y = 3$

$4(3) + x = 17$

$12 + x = 17$

$x = 5$

$(5, 3)$

Solving a Linear System Using the Elimination Method

Step 1 Write equations so like terms are arranged in columns

$3x - y = 22 \longrightarrow 3x - y = 22$

$y + 8x = 11 \longrightarrow 8x + y = 11$ +

Step 2 **Add or subtract** the equations to eliminate one variable

$$\frac{11x}{11} = \frac{33}{11}$$

Step 3 **Solve** the resulting equation for the remaining variable.

$x = 3$

Step 4 Substitute in either original equation to find the value of the eliminated variable.

$3(3) - y = 22$

$9 - y = 22$

$-y = 13$

$x = 3$

$y = -13$

Practice

13. $6x - y = 5$
$3x + y = 4$

$9x = 9$
$x = 1$
$3(1) + y = 4$
$y = 1$
$(1, 1)$

15. $5x - 3y = -14$
$x + 3y = 2$

$6x = -12$
$x = -2$
$5(-2) - 3y = -14$
$-3y = -4$
$y = \frac{4}{3}$
$(-2, \frac{4}{3})$

16. $2x + y = 7$
$x + y = 1$

$x = 6$
$6 + y = 1$
$y = -5$
$(6, -5)$

18. $-5x + 2y = 22$
$3x + 2y = -10$

$-8x = 32$
$x = -4$
$(-4, 1)$
$-5(-4) + 2y = 22$
$2y = 2$
$y = 1$

7.4 Solve Linear Systems by Multiplying First

$2(x = 5)$
$2x = 10$

$\frac{1}{4}(4y = -12)$
$y = -3$

$5x + 2y = 16$ → ×2 → $10x + 4y = 32$
$3x - 4y = 20$ → same → $3x - 4y = 20$

$13x = 52$
$x = 4$

$3(4) - 4y = 20$
$-4y = 8$
$y = -2$
$(4, -2)$

Multiply one equation, then combine

$6x + 5y = 19$ ~~Equation 1~~ Same

$2x + 3y = 5$ ~~Equation 2~~ $\times 3$

$6x + 5y = 19$

$6x + 9y = 15$

$-4y = 4$

$y = -1$

$2x + 3(-1) = 5$

$2x - 3 = 5$

$2x = 8$

$x = 4$

$(4, -1)$

Practice

10. $x + y = 3$

$-2x + 4y = 6$

$2x + 2y = 6$

$6y = 12$

$y = 2$

$x + 2 = 3$

$x = 1$

$(1, 2)$

11. $4x + y = -8$

$3x + 3y = 3$

$\times 3$

$12x + 3y = -24$

$-9x = -27$

$x = -3$

$4(-3) + y = -8$

$-12 + y = -8$

$y = 4$

$(-3, 4)$

12. $3x - y = 10$

$2x + 5y = 35$

$\times 5$

$15x - 5y = 50$

$17x = 85$

$x = 5$

$3(5) - y = 10$

$-y = -5$

$y = 5$

$(5, 5)$

Multiply Both Equations

$2x - 9y = 1$

$7x - 12y = 23$

$\times 7 \rightarrow 14x - 63y = 7$

$\times -2 \rightarrow 14x - 24y = 46$

$-39y = -39$

$y = 1$

$2x - 9(1) = 1$

$2x - 9 = 1$

$2x = 10$

$\times 5$

$(5, 1)$

$4x + 5y = 35 \rightarrow 4x + 15y = 35$

$2y = 3x - 9 \quad -3x + 2y = -9$

$\times 2 \rightarrow 8x + 10y = 70$

$\times 5 \rightarrow -15x + 10y = -45$

$23x = 115$

$x = 5$

$(5, 3)$

$2y = 3(5) - 9$

$2y = 6$

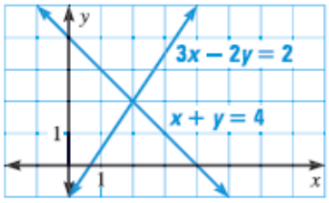
$y = 3$

Baseball Game Two families go to a baseball game. One family purchases two adult tickets and three youth tickets for $33. Another family purchases three adult tickets and two youth tickets for $37. Let x represent the cost in dollars of one adult ticket and let y represent the cost in dollars of one youth ticket.

a. Solve the linear system to find the cost of one adult and one youth ticket.

b. How much would it cost two adults and five youths to attend the game?

Methods for Solving Linear Systems

Graphing (p. 427)		When you want to see the lines that the equations represent
Substitution (p. 435)	$y = 4 - 2x$ $4x + 2y = 8$	When one equation is already solved for x or y
Addition (p. 444)	$4x + 7y = 15$ $6x - 7y = 5$	When the coefficients of one variable are opposites
Subtraction (p. 445)	$3x + 5y = -13$ $3x + y = -5$	When the coefficients of one variable are the same
Multiplication (p. 451)	$9x + 2y = 38$ $3x - 5y = 7$	When no corresponding coefficients are the same or opposites