Name Key Period _____

Lesson 6.4 Notes (Elimination using Multiplication)

Objectives:

- Solve systems of equations by using elimination with multiplication.
- Solve real-world problems involving systems of equations.

- **Elimination Method (Multiplication)**:

KeyConcept Solving by Elimination Using Multiplication

Step 1 Multiply at least one equation by a constant to get two equations that contain opposite terms.

Step 2 Add the equations, eliminating one variable. Then solve the equation.

Step 3 Substitute the value from Step 2 into one of the equations and solve for the other variable. Write the solution as an ordered pair.

Examples: Use elimination to solve each system of equations.

1. $\begin{cases} 5x + 6y = -8 \\ 2x + 3y = -5 \end{cases}$ $\xrightarrow{-2}$ $-4x - 6y = 10$

$5x + 6y = -8$
$+\,[-4x - 6y = 10]$
$x = 2$

$5(2) + 6y = -8$
$10 + 6y = -8$
$6y = -18$
$y = -3$

$(2, -3)$

2. $\begin{cases} 9r + q = 13 \\ 3r + 2q = -4 \end{cases}$ $\xrightarrow{-3}$ $-9r - 6q = 12$

$9r + q = 13$
$+\,[-9r - 6q = 12]$
$-5q = 25$
$q = -5$

$9r + (-5) = 13$
$9r = 18$
$r = 2$

3. $\begin{cases} 6x - 2y = 10 \\ 3x - 7y = -19 \end{cases}$ $\xrightarrow{-2}$ $-6x + 14y = 38$

$6x - 2y = 10$
$+\,[-6x + 14y = 38]$
$12y = 48$
$y = 4$

$6x - 2(4) = 10$
$6x - 8 = 10$
$6x = 18$
$x = 3$

$(3, 4)$

Name _____ Period _____

- **Multiply Both Equations to Eliminate a Variable:**

Example: Use elimination to solve each system of equations.

4. $\begin{cases} 4x + 2y = 8 \\ 3x + 3y = 9 \end{cases}$

$3(4x + 2y = 8) \Rightarrow 12x + 6y = 24$

$-2(3x + 3y = 9) \Rightarrow -6x - 6y = -18$

$12x + 6y = 24$

$+ [-6x - 6y = -18]$

$6x = 6$

$x = 1$

$4(1) + 2y = 8$

$2y = 4$

$y = 2$

$(1, 2)$

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

$2(5x - 3y = 6) \Rightarrow 10x - 6y = 12$

$-5(2x + 5y = -10) \Rightarrow -10x - 25y = 50$

$10x - 6y = 12$

$+ [-10x - 25y = 50]$

$-31y = 62$

$y = -2$

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

$5x + 6 = 6$

$5x = 0$

$x = 0$

$(0, -2)$

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

$3(6a + 2b = 2) \Rightarrow 18a + 6b = 6$

$-2(4a + 3b = 8) \Rightarrow -8a - 6b = -16$

$18a + 6b = 6$

$+ [-8a - 6b = -16]$

$10a = -10$

$a = -1$

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

$-6 + 2b = 2$

$2b = 8$

$b = 4$

- **Real-world Application**

7. On average, a family would spend a total of $592.30 to attend two MLB games and one NBA game. The family would spend $691.31 to attend one MLB and two NBA games. Write and solve a system of equations to find the family's costs for each kind of game.

M = MLB N = NBA

$2M + N = 592.30$

$-2(M + 2N = 691.31) \Rightarrow -2M - 4N = -1382.62$

$2M + N = 592.30$

$+ [-2M - 4N = -1382.62]$

$-3N = -790.32$

$N = 263.44$

$M + 2(263.44) = 691.31$

$M + 526.88 = 691.31$

$M = 164.43$

NBA: $263.44

MLB: $164.43