SOLVING LINEAR SYSTEMS

Using Elimination

LEARNING GOAL

- Solve a linear system of equations using equivalent equations to remove a variable.

MINDS ON…

- Math Magic
  - Write down any ordered pair you want, don't show anybody!!!!
  - Find the sum of your ordered pair, write it down.
  - Find the difference of your ordered pair, write it down.
  - Now let's do some math magic!

BIG IDEAS

- Elimination Strategy
  - A method of removing a variable form a system of linear equations by creating an equivalent system in which the coefficients of one of the variables are the same or opposites.

BIG IDEAS (CONT.)

HOW TO SOLVE USING ELIMINATION:

1. Express both equations in the form ax+by=c.
2. Number the equations. ① and ②
3. Examine the two equations. Choose a variable to eliminate.
4. Multiply one or both equations by a number or numbers that results in a new equation ③, or equations ③ and ④, in which the chosen variable now have the same coefficient.
5. Add the equations (if the signs of the coefficients of the chosen variable are different) or subtract the equations (if the signs of the coefficients of the chosen variable are the same) to eliminate the chosen variable.
6. Substitute the value into one of the original two equations and solve for the remaining variable.
7. State the point of intersection.
8. Verify, if necessary.

EXAMPLE #1

Solve the linear system and verify your solution.

$2x + 3y = 18$ ① $\times(5)$

$5x - 4y = -1$ ② $\times(2)$

Eliminate x.

$10x + 15y = 90$ ③

$-(10x - 8y = -2)$ ④

③ ④

$23y = 92$

$y = 4$

Substitute y=4 into ①.

$2x + 3(4) = 18$

$2x + 12 = 18$

$2x = 6$

$x = 3$

$\therefore$ the point of intersection is (3,4).

Did you get (3,4)?

Equation 1: 2x + 3y = 18

LS	RS
= 2(3)+3(4) = 6+12 = 18	= 18

Equation 2: 5x – 4y = -1

LS	RS
= 5(3)–4(4) = 15–16 = -1	= -1

EXAMPLE #1 (CONT)

- What if you had chosen the other variable? Would you get the same answer? Let's see…

$2x + 3y = 18$ ① $\times(4)$ $\quad 8x + 12y = 72$ ③

$5x - 4y = -1$ ② $\times(3)$ $+ \underline{(15x - 12y = -3)}$ ④

③ + ④

Eliminate y.

$$23x = 69$$

$$x = 3$$

Substitute x=3 into ①.

$$2(3) + 3y = 18$$

$$6 + 3y = 18$$

$$3y = 12$$

$$y = 4$$

$\therefore$ the point of intersection is (3,4).

EXAMPLE #2

Solve the linear system.

$$3x + 2y = 6$$

$$x + 3y = 16$$

Did you get (-2,6)?

EXAMPLE #3

Solve the linear system.

$$x + y = 1$$

$$x - y = -9$$

Did you get (-4,5)?

EXAMPLE #4

Solve the linear system.

$$-2x + 5y = 13$$

$$-2x + 7y = 19$$

Did you get (1,3)?

EXAMPLE #5

Solve the linear system.

$$3x + 2y = 22$$

$$5x - 4y = 22$$

Did you get (6,2)?

CONSOLIDATION

- Should I pick x or y? How and why?

$4x + 2y = 8$ $5x - 3y = 4$	$x + 2y = 3$ $-x + y = -2$
$x + 4y = 7$ $2x - 4y = -3$	$2x + 5y = 6$ $-x + 2y = 3$
$-2x + 3y = 7$ $2x - 5y = -3$	$2x - 3y = -2$ $3x + 3y = 4$

REINFORCEMENT

- Page 55 #6