Algebra I: 6.4 HW **Name** Answer Key **Period** ______

Using Graphing, Substitution, and Linear Combinations

1. Your best friend comes over to your house for a visit and asks you what you've been doing lately. You decide to talk about all the exciting things you are learning about in Algebra I! Your friend is equally enthusiastic and wants to know more about solving systems of linear equations so he/she asks the following questions:

   a. When is it best to use the graphing method?

   When the system of equations is easy to graph. If you need an estimate or want to display the solution visually. Graphs are also used to predict future results.

   b. How do you know when to solve systems using the substitution method?

   Use the substitution method when its easy to isolate a variable or you have one variable alone. Often used when both equations are in slope-intercept form.

   c. What does it mean to eliminate a variable and why would you want to do it?

   To eliminate a variable means that it cancels out or you get rid of it. You eliminate one variable so you can solve for the value of the other variable.

2. Determine which method is best to use to solve each system of linear equations: *graphing, substitution*, or *elimination.*

   a. $y = 2x - 1$
   $4x - 3y = 8$

   substitution

   b. $y = 3x - 1$
   $y = 4$

   graphing

   c. $3x - 4y = 7$
   $5x - 2y = -3$

   elimination

   d. $y = -2x$
   $y = x + 3$

   graphing or substitution

   e. $2x - y = 4$
   $2x + 3y = 5$

   elimination

   f. $y = 5x + 1$
   $y = 4x - 9$

   substitution or graphing

Write and solve a system of equations for each of the problem situations.

3. Cahaba Cycles costs \$2,400 per month to operate. The store pays an average of \$60 per bike. The average selling price of each bicycle is \$120. Kendall's boss has offered him a bonus for every bike he sells after the store breaks-even. How many bicycles must the store sell each month to break-even?

x = # of bikes

y = total amt of money

Income: $y = 120x$

Expense: $y = 60x + 2400$

Substitution:

$120x = 60x + 2400$

$60x = 2400$

$x = 40$

$y = 120(40) = \$4800$

The store must sell 40 bicycles each month to break-even

4. Producing the musical "Hamilton" costs \$88,000 plus \$5,900 per performance. One sold-out performance earns \$7,500 in revenue. If every performance sells out, how many performances are needed to break-even?

x = # of performances
y = total amt of money
Income: $y = 7500x$
Expense: $y = 5900x + 88000$

Substitution:
$7500x = 5900x + 88000$
$1600x = 88000$
$x = 55$
$y = 7500(55) = \$412{,}500$

Fifty-five performances are needed to break-even.

5. Scientists at UAB are studying the effect of a chemical on various strains of bacteria. Strain A started with 6,000 cells and ***decreased*** at a constant rate of 2,000 cells per hour after the chemical was applied. Strain B started with 2,000 cells and ***decreased*** at a constant rate of 1,000 cells per hour after the chemical was applied. The scientists have asked our Algebra I class to predict when the strains will have the same number of cells.

x = # of hours
y = number of cells in Strain A or B

$y = 6000 - 2000x$
$y = 2000 - 1000x$

Substitution:
$6000 - 2000x = 2000 - 1000x$
$4000 = 1000x$
$4 = x$
$y = 6000 - 2000(4) = 6000 - 8000$
$y = -2000$

It is not possible to have -2000 cells so Strain A and B will never have the same number of cells.

6. At Hoover High School, 117 tickets were pre-sold for the Spring musical with solo performances by Jackson and Haley. Adult tickets cost \$1.25 and children's tickets cost \$0.75. In all, \$129.75 was taken in. How many ~~student~~ children tickets and how many adult tickets were sold?

x = # of children's tickets sold
y = # of adult tickets sold

$x + y = 117$ $\times 75$
$0.75x + 1.25y = 129.75$
$[0.75x + 1.25y = 129.75] \times 100$
$= 75x + 125y = 12975$

Elimination:
$-75x - 75y = -8775$
$75x + 125y = 12975$
$50y = 4200$
$y = 84$
$x = 117 - 84 = 33$

Thirty-three children's tickets and eighty-four adult tickets were sold.

7. At The Whole Scoop Ice Cream Shop, ice cream cones cost \$1.10 and sundaes cost \$2.35. At the end of the night, Robbie had \$294.20 worth of receipts for a total of 172 cones and sundaes. How many cones were sold?

x = # of ice cream cones sold
y = # of sundaes

$1.10x + 2.35y = 294.20$
$x + y = 172$ $\times(-110)$
$[1.10x + 2.35y = 294.20] \times 100$
$= 110x + 235y = 29420$

Elimination:
$110x + 235y = 29420$
$-110x - 110y = -18920$
$125y = 10500$
$y = 84$
$x = 172 - 84 = 88$

There were 88 cones sold.