Name: ______________________________________ Date: __________________

SOLUTIONS TO LINEAR SYSTEMS AND SOLVING BY GRAPHING
COMMON CORE ALGEBRA I

Systems of equations (and inequalities) are essential to modeling situations with **multiple variables and multiple relationships between the variables**. At the end of the day, though, the solution set of a system of equations can be easily defined:

SOLUTIONS TO A SYSTEM OF EQUATION

1. A point (x, y) is a **solution** to a system if it makes **all equations true.**

2. The **solution set** of a system is the collection of **all** pairs (x, y) that are solutions to the system (see 1).

***Exercise* #1:** Determine if the point $(2, 5)$ is a solution to each of the systems provided. Show the work that leads to your answer for each.

(a) $y = 4x - 3$

$2x + y = 9$

(b) $y - x = 3$

$y = \frac{1}{2}x + 6$

We can solve a system by using a graph. Review this process in the next exercise.

***Exercise* #2:** Consider the system of equations shown below:

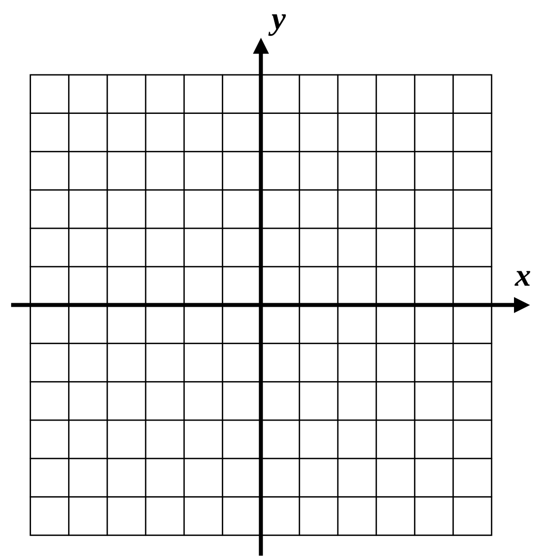
$$y = 2x + 5$$

$$y = 2 - x$$

(a) Graph both equations on the grid shown. Use **TABLES** on your calculator to make the process faster, if necessary. Label each line with its equation.

(b) At what point do the two lines **intersect**?

(c) Show that this point is a solution to the system.



It's easy to see why the method of graphing works if you understand the **truth about graphs**. Remember:

GRAPHS OF EQUATIONS

1. A point (x, y) lies on a graph of an equation if it makes that equation **true**.

2. The graph of an equation is simply the set of all points (x, y) that make the equation **true**.

***Exercise* #3:** So, now you can put the definition of the graph of an equation together with the definition of a system. Fill in the blanks with one of the words shown:

TRUE, INTERSECTION, SOLUTIONS, BOTH

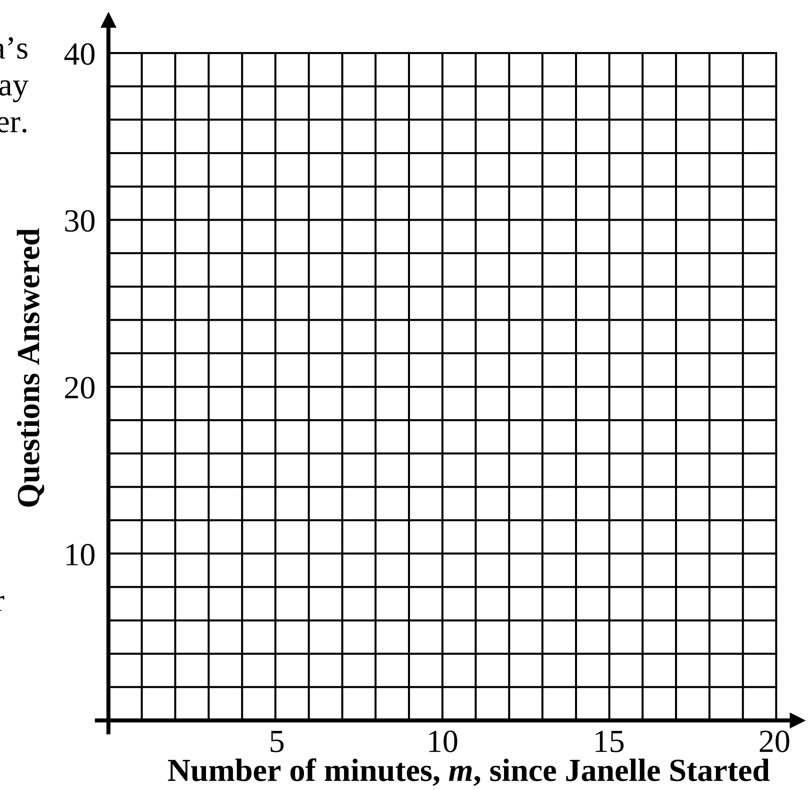
1. To solve a **system of equations graphically** you find the ____________________ of the two graphs.
2. This works because any intersection point must lie on ____________ graphs.
3. Because intersection points lie on both graphs, they must make both equations _____________.
4. Because intersection points make both equations true, they are ______________ to the system of equations.

We will often use this graphical method to solve systems in applied problems. Let's take a look at a modeling problem involving a linear system of equations.

***Exercise* #4:** Janelle and Swetha are taking a 50 question true false test in their history class. Janelle started after Swetha had already finished 12 questions. Janelle answers questions at a rate of two per minute, while Swetha answers them at a rate of 5 questions every 4 minutes. Janelle eventually catches up to Swetha. How many minutes does it take her and what question are they on when Janelle catches up?

(a) Create two linear models for Janelle and Swetha's questions answered since Janelle started. It may help to plot some points on the graph paper. Show the work that you use.

(b) Graph the two equations, using your calculator as needed, and solve the problem.



Name: ____________________ Date: ____________

SOLUTIONS TO SYSTEMS AND SOLVING BY GRAPHING
COMMON CORE ALGEBRA I HOMEWORK

FLUENCY

1. Determine whether each of the following points is a solution to the given system. Justify your answer.

(a) $(3,4)$

$x+y=7$

$y=2x-2$

(b) $(-10,-1)$

$y=\frac{1}{2}x+4$

$y=4x+30$

(c) $(2,14)$

$y=-3x+20$

$y=2x+10$

(d) $\left(2,\frac{3}{2}\right)$

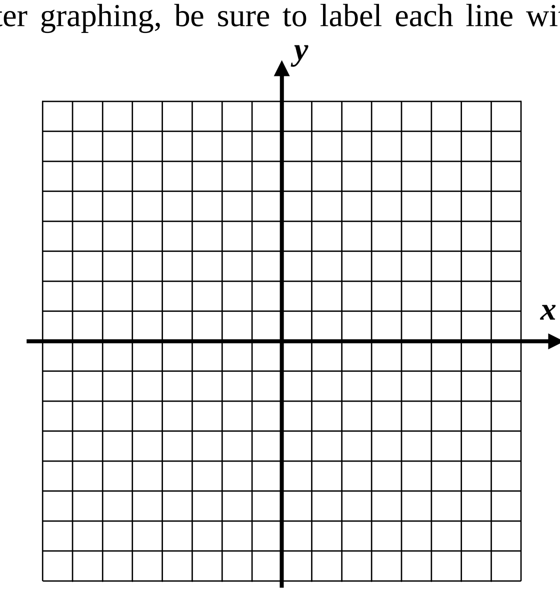
$y=\frac{8-x}{4}$

$y=\frac{5}{4}x-1$

2. Solve the following system of equations graphically. After graphing, be sure to label each line with its equation and state your final solution as a coordinate pair.

$y=\frac{1}{3}x+1$

$x+y=5$



3. Which of the following points solves the system shown below?

(1) $(1,-4)$ (3) $(2,8)$ $y=5x-9$

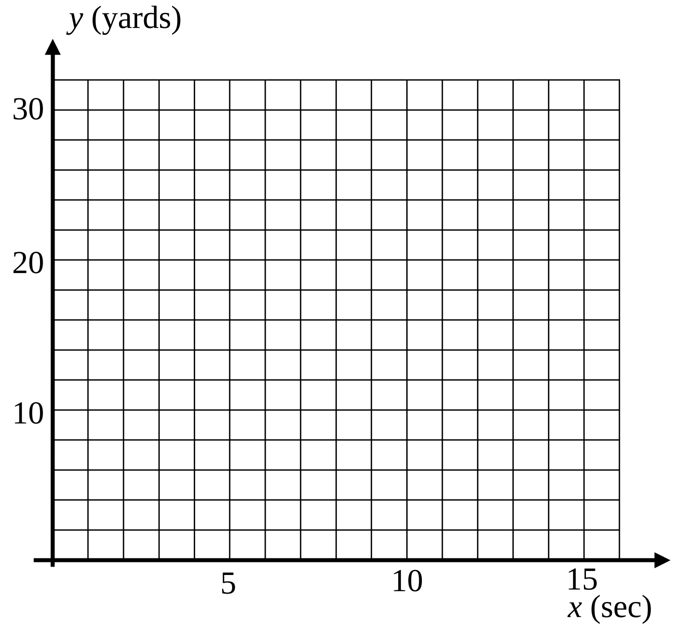
(2) $(3,6)$ (4) $(-3,18)$ $y=-2x+12$

APPLICATIONS

4. Zeke is racing his little brother Niko. They are running a total of 30 yards and Zeke gives Niko a 12 yard head start. Zeke runs 2 yards every second but Niko only runs 1 yard every 2 seconds. If *x* represents the number of seconds they have been racing and *y* represents the distance from the start line then:

(a) Fill out the table below for various distances that Zeke and Niko are from the start line at the given times.

x (sec)	Zeke Distance (yds)	Niko Distance (yds)
0	0	12
2		
6		



(b) Based on your calculations for (a) write equations for both Zeke's distance and Niko's distance from the start line as a function of the time, *x*.

Zeke's Distance: ______________________ Niko's Distance: ______________________

(c) Graph both of these equations on the grid above and determine the number of seconds it takes for Zeke to catch up to Niko. How far are they from the finish line at that point?

REASONING

5. The two lines $y=6x+15$ and $y=mx-4$ intersect at $x=-2$.

(a) What is the *y*-coordinate of their intersection point?

(b) What is the value of *m*?