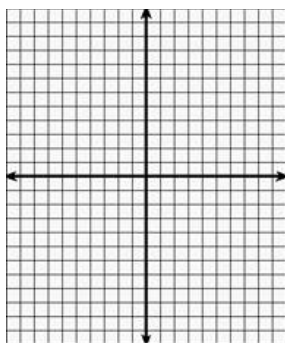# 8.3 Number of Solutions of Linear Systems

When two lines are graphed on the same grid, they do not always have exactly one point of intersection.

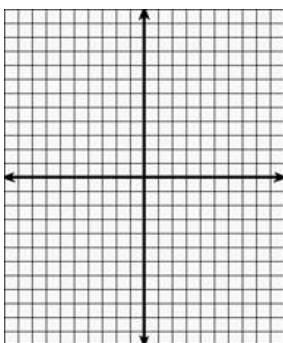Three possible scenarios when graphing a system of linear equations:
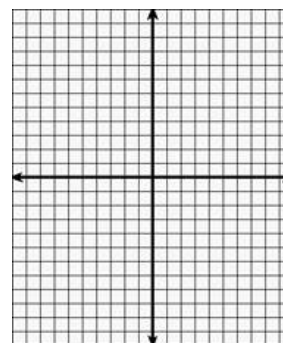
One Solution	**No Solutions**	**Infinite Solution**
-different slopes	-same slope	-same slope
	-different y-intercept	-same y-intercept

	Parallel lines	**Coincidental lines**
		(lines that occupy the same position)

Predict and confirm the number of solutions

Predict the number of solutions. Then justify your answer

a) $y = 2x - 3$

$y = \frac{1}{2}x + 3$

b) $10x - 6y = -12$

$21y = 42 + 35x$

Find C so that the system of equations has no solution.

$6y - 4x = C$

$y = \frac{2}{3}x + 1$

Identify zero and infinite solutions by comparing coefficients.

Find the slope of the following equations:

1. $2x + 3y = 12$

c) $2x + 3y = 20$

2. $2x - 3y = 6$

d) $4x + 6y = 24$

Which equations have the same slope?   Which lines are parallel?   Which lines are coincidental?

Note: You can reduce equations to lowest terms to identify identical lines that have infinite solutions.

$$2x - y = 6 \qquad \text{and} \qquad 12x - 6y = 36$$

Example
Determine, by inspection, whether each linear system has an infinite number of solutions or no solution.

> 1. start with slope...if different, then one solution
> 2. If the slope is the same, but different y-intercept....no solution
> 3. If the slope is the same, and the y-intercept is the same....infinite solutions

a) $2x + 10y - 16 = 0$
    $x + 5y - 8 = 0$

b) $x + 2y + 4 = 0$
    $x + 2y - 6 = 0$

Example
Four vehicles travel on a long, straight stretch of the Trans-Canada Highway.
Their current distances and speeds are shown the table of values.

	Current Distance (km)	Current Speed (Km/h)
Car	40	90
Minivan	25	90
Truck	30	110
RV	40	90

For each pair of vehicles, represent the distance time relationship using a system of linear equations. Suppose the vehicles continue at their current speeds. Identify and interpret the solution to each linear system.

a) the car and the minivan   b) the car and the RV   c) the truck and the RV

Assignment: p454 #1-7, 9,11,12,14