System of linear equations:

Two or more linear equations together.

Solution to a system of linear equations:

1. Numbers that make BOTH equations true at the same time.

2. The point where the two lines intersect.

Is each ordered pair a solution to the system of equations?

1. $(2, 1)$

$4x + 6y = 14$

$y = 2x - 3$

2. $(-3, 7)$

$b = a - 4$

$b = 2a + 1$

Solving systems of linear equations.

Methods we will use:

- Graphing
- Substitution
- Elimination

Get a sheet of graph paper and a ruler to do the following:
Find the solution to each system of equations by graphing.

1. $y = x + 4$
   $3x + 6y = 6$

2. $y = \frac{1}{2}x$
   $-12x + 6y = 36$

3. $y = \frac{3}{2}x + 1$
   $6x - 4y = 12$

4. $3x + 9y = 18$
   $y - 1 = -\frac{1}{3}(x - 3)$

1. $y = x + 4$

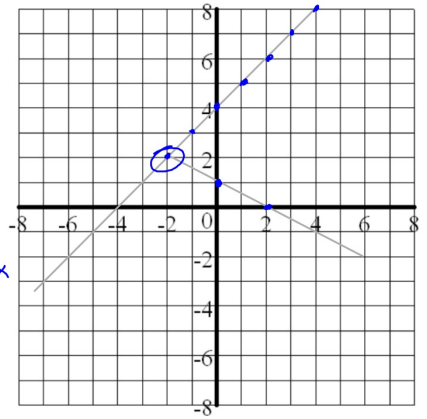
$3x + 6y = 6$

$-3x \quad -3x$

$\frac{6y}{6} = \frac{6 - 3x}{6}$

$y = 1 - \frac{1}{2}x$

$(-2, 2)$



2. $y = \frac{1}{2}x$

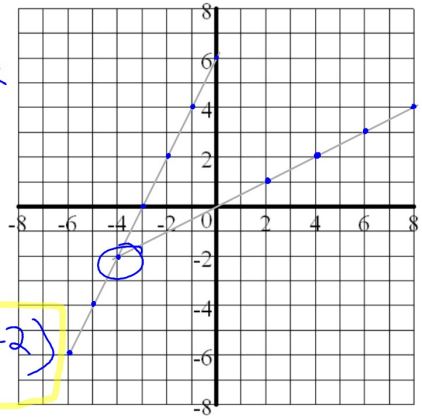
$-12x + 6y = 36 - 12x$

$6y$

$6 + 2x$

1

$(-4, -2)$



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

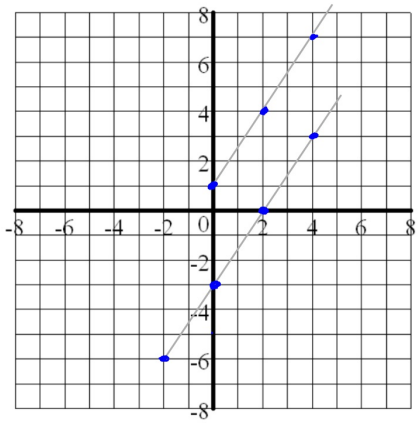
$6x - 4y = 12$

$y = \frac{12 - 6x}{-4}$

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

NO SOL

they are parallel



4. $3x + 9y = 18$

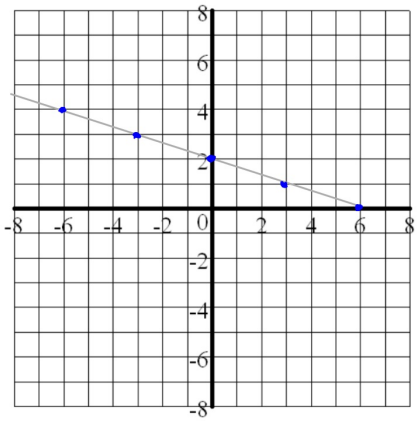
$y - 1 = -\frac{1}{3}(x - 3)$

$y = \frac{18 - 3x}{9} = 2 - \frac{1}{3}x$

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

Many sols

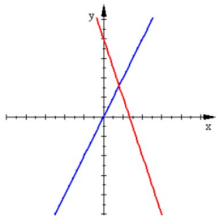
They are the same line



If two lines are graphed together, how many points of intersection can there be?

1. One

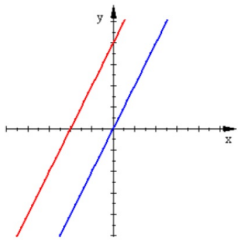
$y = -2x + 8$ and $y = 2x$



They intersect because they have different slopes.

2. None

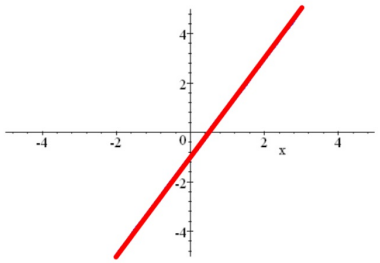
$y = 2x$ and $y = 2x + 8$



Lines are parallel

3. Infinitely Many

$y = 2x - 1$ and $8x - 4y = 4$



They are the same line.

If a system of equations contains two lines that are parallel, then the system of equations has NO solution.

If a system of equations contains two lines that are actually the same line, then the system of equations has infinitely MANY solutions.

If a system of equations contains two lines that intersect, then the system of equations has infinitely ONE solution.

How can you find the number of solutions to a system of linear equations without graphing?

Find the slope and y-intercept of the two lines

Number of solutions to systems of linear equations

# of Solutions	How do you tell without graphing
One Solution:	Lines have a different slope
No solution:	Parallel Lines • same slope • different y-intercept
Many Solutions:	Same lines • same slope • same y-intercept

How many solutions does each system of linear equations have?

1. $y = 2x - 7$
$4x - 8y = 24$
ONE SOL
$\frac{-8y}{-8} = \frac{24-4x}{-8}$
$y = -3 + \frac{1}{2}x$

2. $y = -3x + 1$
$6x + 2y = 8$
$-6x$ $\quad \frac{-6x}{2}$ $\rightarrow$ $y = 4 - 3x$
NO SOL
lines are parallel

3. $y = \frac{4}{5}x + 2$
ONE SOL
$15x + 12y = 36$
$-15x$ $\quad \frac{36-15x}{12}$
$y = 3 - \frac{5}{4}x$

4. $y = -6x + 5$
$12x + 2y = 10$
$-12x$ $\quad \frac{10-12x}{2}$
$y = 5 - 6x$
many solutions
same line