**CCM8 Systems of Equations: Number of Solutions**

A system of equations is when there are two or more equations being considered at one time. To solve a system of equations, you find the points that the equations have in common.

Systems of linear equations can have 0, 1, or an infinite number of solutions.

* Zero Solutions
	+ A system of linear equations has 0 solutions when the equations have no points in common. When graphed, the lines would never cross. Lines that never cross are called parallel lines.
	+ When looking at equations of lines, it is easy to tell if the lines will have 0 solutions. For example, the equations $4x+3y=12$ and $4x+3y=16$ will have 0 solutions because you cannot find a point $(x,y)$ where you multiply 4 to x and 3 to y and get 12 and 16.
	+ Equations that have the same slope like $y=2x+1$ and $y=2x-3$ will also have 0 solutions. The lines start at different places on the y-axis and they have the same slope. Since they have the same rate of change the lines will be at the same angle and will never cross.
* One solution
	+ Systems of equations have one solution if they have one point in common.
	+ The graphs of these equations will cross at one point.
	+ For example, the equations $3x+2y=5$ and$ 2x-4y=-2$, both pass through the point $\left(1,1\right)$ when they are graphed. When $x=1$ is plugged into both equations, the result is$ y=1$.
	+ Another example is shown in the graph below. Where the equations $y=-3x-6$ and $y=2x-1$ both pass through the point (-1,-3).
* Infinite solutions
	+ Systems of equations have an infinite number of solutions if the lines share all of the same points.
	+ When looking at the graph of two lines with an infinite number of solutions, the graphs would look like one is sitting on top of the other and the equations would be equivalent to each other.
	+ $x+y=1$ and $2x+2y=2$ will have an infinite number of solutions. It is easy to tell from the equations that the lines will have an infinite number of solutions because the second equation is the same as the first equation except everything is multiplied by 2.

Examples: How many solutions do the following systems of equations have?

1. $4x+2y=7$ and $4x+2y=1$
2. $y=2x-3$ and $y=3x+1$
3. $y=6x-1$ and $y=6x+10$
4. $6x+3y=9$ and $2x+y=3$

**Independent Practice:** How many solutions do the following systems of equations have?

1. $y=-3x+1$ and $y=-3x+4$
2. $x-4y=2$ and $x-4y=3$
3. $y=5x+2$ and $y=-3x+1$
4. $2x+3y=7$ and $8x+12y=28$