How Many Solutions?
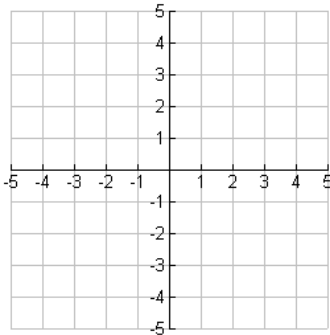*HowManySolutions.tns*

Name _____

Class _____

Problem 1 – Graphing systems of linear equations

Sketch each graph. How many solutions does each system have?
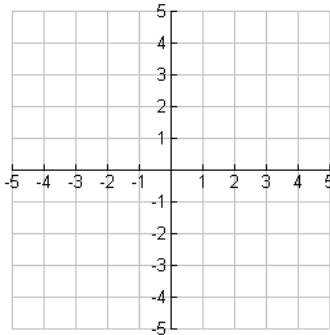
1. $\begin{cases} y = 2x - 3 \\ y = x - 1 \end{cases}$
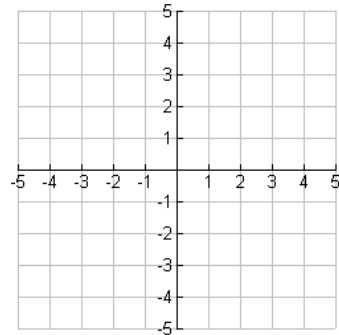
2. $\begin{cases} y = -3x + 3 \\ y = -3x - 1 \end{cases}$

3. $\begin{cases} 4x + 2y = 6 \\ y = -2x + 3 \end{cases}$

Sketch:

Sketch:

Sketch:

Number of solutions:

Number of solutions:

Number of solutions:

These three graphs show all the possible ways two lines can relate to each other.
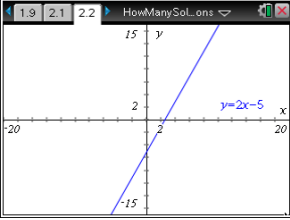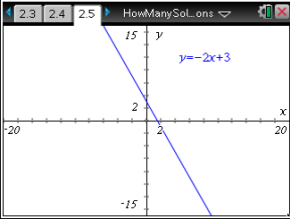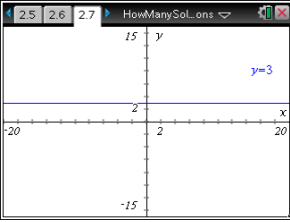
If the two lines…   Then the system has…

- Cross at a single point ⟶ • One solution

- Never cross (are parallel) ⟶ • No solution

- Are really the same line ⟶ • Infinitely many solutions

Problem 2 – Create your own system

Original Line	One Solution	No Solutions	Infinitely Many Solutions
page 2.2 $y=2x-5$ $y =$	$\begin{cases} y = \\ y = \end{cases}$	$\begin{cases} y = \\ y = \end{cases}$	$\begin{cases} y = \\ y = \end{cases}$
page 2.5 $y=-2x+3$ $y =$	$\begin{cases} y = \\ y = \end{cases}$	$\begin{cases} y = \\ y = \end{cases}$	$\begin{cases} y = \\ y = \end{cases}$
page 2.6 $y=x$ $y =$	$\begin{cases} y = \\ y = \end{cases}$	$\begin{cases} y = \\ y = \end{cases}$	$\begin{cases} y = \\ y = \end{cases}$
page 2.7 $y=3$ $y =$	$\begin{cases} y = \\ y = \end{cases}$	$\begin{cases} y = \\ y = \end{cases}$	$\begin{cases} y = \\ y = \end{cases}$

Compare the equations for the lines you drew with the equations of the original line that was drawn for you.

4. Which equations have the same slope as the original equation? Those that form a system with one solution, no solution, or many solutions?

5. Which equations have the same *y*-intercept as the original equation? Those that form a system with one solution, no solution, or many solutions?

6. Which equations are equivalent to the original equation?

7. Why is it sometimes hard to see that two equations in a linear system are equivalent? Give an example.

8. Complete each statement to create some rules about the number of solutions for a linear system of equations.

   • A linear system has no solution if the equations have _____ slopes and _____ *y*-intercepts.

   • A linear system has infinitely many solutions if the equations have _____ slopes and _____ *y*-intercepts.

   • A linear system has one solution if the equations have _____ slopes and _____ *y*-intercepts.

Determine how many solutions each of the following systems has without graphing.

9. $\begin{cases} y = x \\ y = 2x \end{cases}$

10. $\begin{cases} 3x + 4y = 12 \\ 2x + 4y = 8 \end{cases}$

11. $\begin{cases} y = \dfrac{1}{2}x + 1 \\ y = \dfrac{1}{2}x + 8 \end{cases}$

12. $\begin{cases} y = \dfrac{1}{2}x + 2 \\ -2y = -x - 4 \end{cases}$