Name: _____   Date: _____

Student Exploration: Solving Linear Systems (Slope-Intercept Form)

Vocabulary: slope-intercept form, solution, substitution method, system of linear equations

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

1. Joe's favorite basketball team is the Tigers. Joe's favorite basketball team is in first place

    right now. What can you conclude? _____

2. If $y = x + 4$ and $y = 3x + 2$, what must be true about $x + 4$ and $3x + 2$? _____

    Why? _____

Gizmo Warm-up

In the *Solving Linear Systems (Slope-Intercept Form)* Gizmo, you can use graphing or algebra to solve **systems of linear equations** like $y = x + 4$ and $y = 3x + 2$.

On the **CONTROLS** tab, select the top equation. Set **m** to 1 and **b** to 4 to graph the equation $y = x + 4$. Then select the bottom equation. Set **m** to 3 and **b** to 2 to graph the equation $y = 3x + 2$. (To quickly set the value of a slider, type the number into the text box to the right of the slider and press **Enter**.)
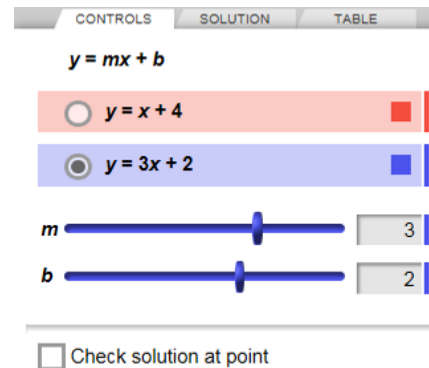
1. Mouseover the purple intersection point. What are the coordinates?   (_____, _____)

2. In the space to the right, substitute the coordinates of the intersection point (the *x*-coordinate for *x*, and the *y*-coordinate for *y*) into each equation and simplify.

    Is each equation true? _____

3. The **solution** of an equation contains the value or values that make the equation true. Select **Check solution at point**. Drag the green point on top of the purple point.

    What do you notice? _____

Activity A:	Get the Gizmo ready:
Solving by graphing	• On the **CONTROLS** tab, be sure **Check solution at point** is turned on.

1. Consider the system $y = -2x + 7$ and $y = 4x - 5$. (Do not graph the system in the Gizmo yet.) These equations are in **slope-intercept form**, which is $y = mx + b$, where m is the slope, and b is the y-intercept.

x	$y = -2x + 7$	$y = 4x - 5$
0		
1		

   A. Fill in the table to find the y-value of each equation for each given x-value.

   B. Plot the points for $y = -2x + 7$ on the grid to the right. Draw a line through the points to graph $y = -2x + 7$. Then plot the points for $y = 4x - 5$ and draw a line through the points to graph $y = 4x - 5$.

   C. Graph $y = -2x + 7$ and $y = 4x - 5$ in the Gizmo. Drag the green point to each of the points you plotted on the grid.
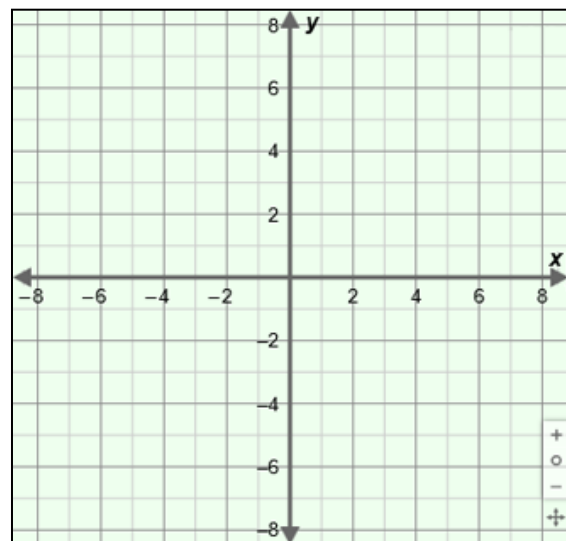
   Do any of these points represent

   solutions of both equations? _____

   D. Mouseover the purple intersection point and plot it on the grid.

   What are the coordinates of the purple intersection point?   (_____ , _____)

   E. In the space to the right, substitute the coordinates of the intersection point into each equation and simplify.

   Is each equation true? _____

   Drag the green point to this point to check.

   F. Which point represents a solution of both equations?   (_____ , _____)

   G. Do you think there are other (x, y) points that are solutions of this system? _____

   Why or why not? _____

   _____

**(Activity A continued on next page)**

Activity A (continued from previous page)

2. On the **CONTROLS** tab, turn off **Check solution at point**. Consider the system of equations $y = 4x + 6$ and $y = 4x - 8$.

   A. Sketch the graphs of $y = 4x + 6$ and $y = 4x - 8$ on the grid to the right. (First graph the y-intercept, b, then use the slope, m, to find another point on the line.) Graph the system in the Gizmo to check.
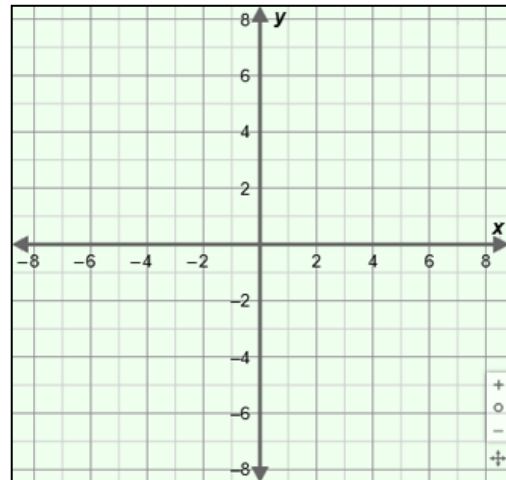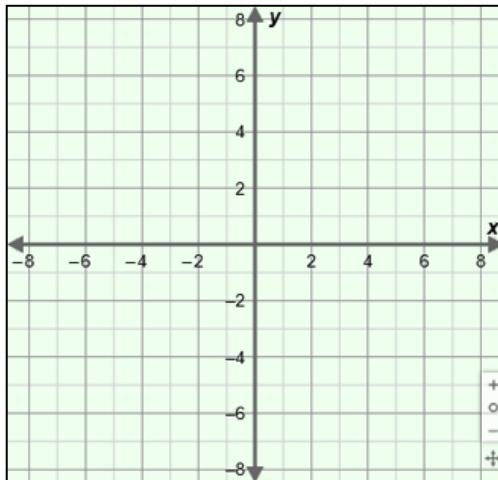
   B. How are the two lines related? _____

   _____

   _____
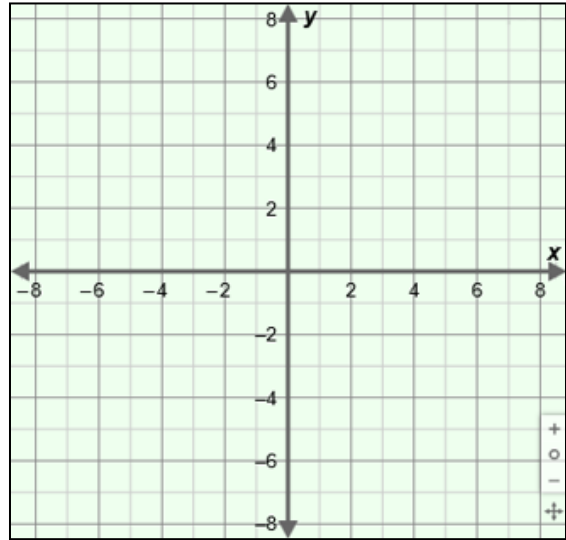
   C. Do you think this system has any solutions? _____ Explain. _____

   _____

3. Graph each system of equations by hand. Then use the graph to find the solution. If the system has a solution, substitute the coordinates into each equation and simplify. Show your work in the space below the graphs. Check your answers in the Gizmo.

   A. $y = x + 5$
      $y = -2x - 1$ Solution: _____

   B. $y = -3x + 2$
      $y = -3x + 4$ Solution: _____

Activity B:	Get the Gizmo ready:	
Solving with substitution	• On the **CONTROLS** tab, be sure **Check solution at point** is turned off.	

1. Consider the system of equations $y = x + 2$ and $y = -2x + 8$. One way to find the solution of this system is to use a graph. Graph the system in the Gizmo.

   What is the solution of this system? (____, ____) Why? _____

   _____

2. You can also use an algebraic method called the **substitution method** to solve the system $y = x + 2$ and $y = -2x + 8$.

   A. If $y = x + 2$ and $y = -2x + 8$, what do you know about $x + 2$ and $-2x + 8$?

      _____

   B. Express the relationship between $x + 2$ and $-2x + 8$ as a single equation.

      _____

      You just used substitution, because you substituted $x + 2$ for y in $y = -2x + 8$.

   C. Solve $x + 2 = -2x + 8$ for x. Show your work in the space to the right.

   D. In the space to the right, substitute the x-value above into $y = x + 2$ and simplify.

      What is the value of y? _____

   E. In the space to the right, substitute the x-value into $y = -2x + 8$ and simplify.

      What is the solution? (____, ____)

      Select the **SOLUTION** tab to check your work.

   F. Does it matter which equation in the system you use to find the y-value? _____

      Explain. _____

      _____

(Activity B continued on next page)

Activity B (continued from previous page)

3. Consider the system of equations $y = -x + 3$ and $y = 4x + 8$.

    A. Use the substitution method to find the solution of this system. Show your work to the right.

    B. What is the solution of this system? (_____, _____) Check in the Gizmo.

4. Consider the system of equations $y = 3x + 1$ and $y = 3x - 4$.

    A. Use the substitution method to find the solution of this system. Show your work to the right.

    B. Is the last line above true? _____ What does that tell you about the solution

    of this system? _____

    Check your answer in the Gizmo.

    C. Experiment with more systems in the Gizmo. In general, when does a linear system

    have no solution? _____

    _____

5. Use the substitution method to solve each system of equations. Show your work in the space below each system. Then use the Gizmo to check your answers.

    A. $y = x + 3$
       $y = 2x + 8$ Solution: _____

    B. $y = -4x + 1$
       $y = -4x - 5$ Solution: _____