Unit 5 Review – Systems of Linear Equations and Inequalities
Name: ___________________________  Algebra 1B

Day 1: Solutions to Systems and Solving by Graphing

Warm Up: Determine if the point (2,5) is a solution to each of the systems provided.

(a) \( y = 4x - 3 \)
\( 2x + y = 9 \)

(b) \( y - x = 3 \)
\( y = \frac{1}{2}x + 6 \)

Modeling: Consider the system of equations shown below.

\( y = 2x + 5 \)
\( y = 2 - x \)

(a) Graph both equations on the grid shown. Label each line with its equation.

(b) At what point do the two lines intersect?

(c) Show that this point is the solution to the system.

Independent Task: Solve the following system of equations graphically. State your final solution as a coordinate pair.

\( y = \frac{1}{3}x + 1 \)
\( x + y = 5 \)

Group Task: The quadratic function \( f(x) = x^2 + 2x - 8 \) is shown graphed on the grid below.

(a) What values of \( x \) solve the equation \( x^2 + 2x - 8 = 0 \) based on this graph?

(b) Graph the line \( g(x) = 2x + 1 \) on the grid.

(c) What values of \( x \) solve the equation \( x^2 + 2x - 8 = 2x + 1 \)?
Exit Slip: The functions \( y = x^2 - 2x - 3 \) and \( y = x - 1 \) are graphed on the grid shown below. Which of the following is the solution set of the equation \( x^2 - 2x - 3 = x - 1 \)?

(a) \{-2, 1\}   
(b) \{-3, 0\}   
(c) \{-3, 1\}   
(d) \{-1, 4\}

Homework:

1.) If the quadratic function \( y = -2(x+1)^2 + 8 \) is shown graphed below, then which of the following represents the solutions to:

\[-2(x+1)^2 + 8 = 0\]

(1) \( x = 0, 3 \)   
(2) \( x = -4, 8 \)   
(3) \( x = -2, 2 \)   
(4) \( x = -3, 1 \)

2.) The functions \( y = -x^2 + 4x \) and \( y = 4 - x \) are graphed on the grid shown. Which of the following sets gives all solutions to the equation \(-x^2 + 4x = 4 - x\)?

(1) \( \{0, 3\} \)   
(2) \( \{1, 4\} \)   
(3) \( \{1, 3\} \)   
(4) \( \{0, 4\} \)

3.) Which of the following points solves the system shown below?

(1) \( (1, -4) \)   
(2) \( (3, 6) \)   
(3) \( (2, 8) \)   
(4) \( (-3, 18) \)

\[ y = 5x - 9 \]   
\[ y = -2x + 12 \]
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**Day 2: Solving Systems by Substitution**

**Warm Up:** Consider the system given below, and its solution $x = 4$ and $y = 1$.

(a) Show that (4,1) is a solution to the system.

\[
\begin{align*}
2x + y &= 9 \\
y &= x - 3
\end{align*}
\]

**Modeling:** Based on the system of equations from the previous question...

(b) Substitute $x - 3$ for $y$ in the first equation and show that the point (4,1) is still a solution to this new equation.

(c) Solve the system by finishing substitution.

**Independent Task:** Solve the following systems of equations by substitution.

(a) \[
\begin{align*}
y &= 2x + 5 \\
y &= -3x - 10
\end{align*}
\]

(b) \[
\begin{align*}
4x - 2y &= 16 \\
y &= -5x + 13
\end{align*}
\]

**Group Task:** A rectangle has a perimeter of 42 feet. Its length, $L$, is three feet more than twice its width, $W$.

(a) Create an equation in terms of $L$ and $W$ for the perimeter of the rectangle.
(b) Create an equation that relates $L$ and $W$ based on the length being three feet more than twice the width.

(c) Solve the system of equations that you just created by substitution to find the values of the length and width.

Exit Slip: Given the system shown below do the following:

\[
\begin{align*}
y &= \frac{1}{2}x - 2 \\
y &= -3x + 5 \\
\end{align*}
\]

(a) Solve this system graphically using the grid shown.

(b) Solve this system by substitution. Show your work.

Homework: Solve each of the following systems of equations using substitution.

(a) \[
\begin{align*}
y &= x + 8 \\
y &= 4x - 1 \\
\end{align*}
\]

(b) \[
\begin{align*}
2x + y &= 6 \\
y &= -3x + 5 \\
\end{align*}
\]

(c) \[
\begin{align*}
4x + 3y &= 37 \\
y &= x - 4 \\
\end{align*}
\]

(d) \[
\begin{align*}
x - 5y &= -49 \\
y &= -2x + 1 \\
\end{align*}
\]
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**Day 3: Solving Systems by Elimination**

**Warm Up:** Solve the system of equations given below by substitution.

\[4x + 3y = 37\]
\[y = x - 4\]

**Modeling:** Solve the following systems of equations by *elimination* and check that your answer is a solution to this system.

(a) \[-2x - y = 5\]
\[2x + 5y = 3\]

(b) \[4x + 5y = 12\]
\[-2x + y = 8\]

**Independent Task:** Solve each of the following systems by the method of elimination.

(a) \[x - y = 15\]
\[4x + 2y = 30\]

(b) \[2x + 3y = 16\]
\[5x - 2y = 21\]

**Group Task:** Consider a line that passes through the points \((-2, -11)\) and \((3, 14)\). We want to find its equation in \[y = mx + b\] form.

(a) Substitute both of the known points into \[y = mx + b\] to create a system of two equations with the parameter \(m\) and \(b\).

(b) Solve this system for \(m\) and \(b\), and write the equation of the line.
Exit Slip: Solve the system of equations below, and check:

\[ 5a - 2b = 3 \]
\[ 2a - b = 0 \]

Homework:

1. Solve each of the following systems by the method of elimination.

(a) \[
\begin{align*}
2x + 3y &= 17 \\
5x + 6y &= 32
\end{align*}
\]

(b) \[
\begin{align*}
6x - 7y &= 25 \\
15x + 3y &= 42
\end{align*}
\]

(c) \[
\begin{align*}
2x + 3y &= 6 \\
3x + 5y &= 15
\end{align*}
\]

2. Which of the following represents the intersection of the lines whose equations are given below?

(1) (-1,16) \quad \text{(2)} \quad (3,8) \quad \text{(3)} \quad (4,9) \quad \text{(4)} \quad (0,7)

\[
\begin{align*}
y + 2x &= 14 \\
y - x &= 5
\end{align*}
\]
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Day 4: Modeling with Systems of Equations

Warm Up: 1.) Jonathan has nine bills in his wallet that are all either five or ten dollar bills. (a) Fill out the following table to see the dependence of the two variables and how they then determine how much money Jonathan has. (b) If \( f \) represents the number of $5 bills and \( t \) represents the number of $10 bills, then what does the following expression calculate? Explain.

\[
5f + 10t
\]

<table>
<thead>
<tr>
<th>Number of fives, ( f )</th>
<th>Number of tens, ( t )</th>
<th>Amount of Money, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Modeling:
Based on the information from the previous question...
(c) If Jonathan has a total of $55, set up a system of equations involving \( f \) and \( t \) that could be used to determine how many of each bill he has. Solve the system. Remember that he has 9 total bills.

2.) A local theatre is showing an animated movie. They charge $5 per ticket for a child, and $12 per ticket for an adult. They sell a total of 342 tickets and make a total of $2550. Let \( c \) represent the number of children’s tickets sold and let \( a \) represent the number of adult tickets sold.

(a) Write an equation that represents the fact that 342 tickets were sold.

(b) Write an equation representing the fact that they made a total of $2550.

(c) Solve the system you created in (a) and (b) using the method of Elimination.

Independent Task: Samantha went to a concession stand and bought three pretzels and four sodas and paid a total of $11.25 for them. Ron went to the same stand and bought five pretzels and two sodas and paid a total of $8.25.

(a) Could pretzels have cost $1.75 each and sodas $1.50 each?
(b) Let $x$ equal the unit cost of a pretzel and let $y$ equal the unit cost of a soda. Write a system of equations that models the information given.

c) Solve this system of equations using the elimination method.

**Group Task:**

1.) Ilida went to Minewaska State Park one day this summer. All of the people at the park were either hiking or bike riding. There were 178 more hikers than bike riders. If there were a total of 676 people at the park, how many were hiking and how many were riding their bikes?

2.) A catering company is setting up tables for a big event that will host 764 people. When they set up the tables they need 2 forks for each child and 5 forks for each adult. The company ordered a total of 2,992 forks. Set up a system of equations involving the number of adults, $a$, and the number of children, $c$, and solve to find out how many of each attended the event.

**Exit Slip:** A rectangle has a perimeter of 204 feet. Its length is six feet longer than twice its width. If $L$ stands for the length of the rectangle, and $W$ stands for its width, write a system of equations that models this information given and solve it to find the length and width of this rectangle.

**Homework:**

1.) For a concert, there were 206 more tickets sold at the door than were sold in advance. The tickets sold at the door cost $10 and the tickets sold in advance cost $6. The total amount of sales for both types of tickets was $6,828. How many of each type of ticket was sold?

2.) Eldora and Finn went to an office supply store together. Eldora bought 15 boxes of paper clips and 7 packages of index cards for a total cost of $55.40. Finn bought 12 boxes of paper clips and 10 packages of index cards for a total cost of $61.70. Find the cost of one box of paper clips and the cost of one package of index cards.
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Day 5: Systems of Inequalities

Warm Up: Consider the system of inequalities shown below. Determine if each of the following points is a solution to the system. Show work that justifies your answers.

(a) (3,8)  
(b) (5,9)  

\[ \begin{align*}
    y &\geq 3x - 5 \\
    x + y &> 10
\end{align*} \]

Modeling: Based on the system of inequalities from the previous question...
(c) Graph the solution set to this system of inequalities.

Independent Task: On the graph shown below, graph the solution to the system of inequalities shown below. State a point that lies in the solution set, and one that doesn’t.

\[ \begin{align*}
    y &< -\frac{3}{2}x + 2 \\
    x &\geq -2
\end{align*} \]

Group Task: Consider the system of inequalities shown below.

\[ \begin{align*}
    y &\geq x + 2 \\
    y &\leq x - 3
\end{align*} \]

(a) Graph the solution to the system on the grid.
(b) Why can you not state a point in the solution?
Exit Slip: Which of the following points is a solution to the system of inequalities shown below? Show the work that leads to your answer.

(1) (3,-6)  (2) (-2,10)
(3) (0,2)  (4) (4,10)

\[
\begin{align*}
y & \leq -4x + 2 \\
y & > \frac{x}{2} + 7
\end{align*}
\]

Homework:

1.)

Which of the following points is a solution to the system of inequalities shown below?

(1) (3,5)  (3) (1,-2)  \( y > x + 1 \)
(2) (1,3)  (4) (2,3)  \( y \leq -2x + 7 \)

2.)

A system of inequalities is shown graphed below. Which of the following points lies in the solution set of this system?

(1) (-1,2)  (3) (2,-4)
(2) (1,5)  (4) (4,2)

3.)

Sketch the solution to the system of inequalities shown below:

\[
\begin{align*}
y + 2x & < 6 \\
x & \leq 2
\end{align*}
\]

State a point that lies in the solution set: