Investigation

Solving Systems of Equations

Inquiry based, discovery activity
1. Are the following points solutions to \( y = 3x - 1 \)? Explain how you know. (hint: plug the values for \( x \) and \( y \) into the equation)
   
   \((1, 2)\):
   \((2, 5)\):

**Graph the line \( y = 3x - 1 \) and then answer the questions below.**

2. Do the points \((1, 2)\) and \((2, 5)\) lie directly **on** the line you graphed of \( y = 3x - 1 \)?

3. Choose a different point on the line \( y = 3x - 1 \) by looking at the graph. Prove algebraically, by plugging in the values for \( x \) and \( y \), that the point you chose is a solution to the line \( y = 3x - 1 \).

4. Based on your answers in #1, #2 and #3, where on the coordinate plane do you think all of the solutions to \( y = 3x - 1 \) will lie? On the line, above the line, or below the line?

5. List one more solution to the equation \( y = 3x - 1 \) by looking at the graph and using your conjecture from #4.

**Now graph \( y = -2x + 4 \) on the same coordinate plane above.**

7. List two solutions to \( y = -2x + 4 \) by looking at the graph and using your conjecture from #4.

8. Do the lines \( y = -2x + 4 \) and \( y = 3x - 1 \) have any points in common? If so, list them here.

9. Is the point you listed in #8 a solution to both of the equations \( y = -2x + 4 \) and \( y = 3x - 1 \)? Explain how you know.

10. Summarize how you can find a solution that satisfies two linear equations simultaneously, by looking at their graphs.
A. Write the solution to each system of equations.

1. Solution: 

2. Solution:

B. Solve each system of equations by graphing.

\[
\begin{align*}
y &= \frac{1}{2}x - 4 \\
y &= -x + 2
\end{align*}
\]

3. Solution: 

\[
\begin{align*}
y &= -\frac{2}{3}x + 2 \\
y &= 2x - 6
\end{align*}
\]

4. Solution:

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1. Are the following points solutions to \( y = 3x - 2 \)? Explain how you know. (hint: plug the values in for \( x \) and \( y \) into the equation)

\[
(1, 1): \\
1 = 3(1) - 2 \\
(2, 4): \\
4 = 3(2) - 2
\]

Yes; these points are both solutions since the equations are true for each set of values.

**Graph the line \( y = 3x - 1 \) and then answer the questions below.**

2. Do the points \((1, 2)\) and \((2, 5)\) lie directly on the line you graphed of \( y = 3x - 1 \)?

Yes

3. Choose a different point on the line \( y = 3x - 1 \) by looking at the graph. Prove algebraically, by plugging in the values for \( x \) and \( y \), that the point you chose is a solution to the line \( y = 3x - 1 \).

\[
(0, -1): -1 = 3(0) - 1
\]

4. Based on your answers in #1, #2 and #3, where on the coordinate plane do you think all of the solutions to \( y = 3x - 1 \) will lie? On the line, above the line, or below the line?

On the line

5. List one more solution to the equation \( y = 3x - 1 \) by looking at the graph and using your conjecture from #4.

\((-1, -4)\)

**Now graph \( y = -2x + 4 \) on the same coordinate plane above.**

6. List two solutions to \( y = -2x + 4 \) by looking at the graph and using your conjecture from #4.

\((2, 0), (0, 4)\)

7. Do the lines \( y = -2x + 4 \) and \( y = 3x - 1 \) have any points in common? If so, list them here.

\((1,2)\)

8. Is the point you listed in #8 a solution to both of the equations \( y = -2x + 4 \) and \( y = 3x - 1 \)? Explain how you know.

Yes, solutions to the equations are points on the lines

9. Summarize how you can find a solution that satisfies two linear equations simultaneously by looking at their graphs.

Look for the point on both lines, where they intersect
A. Write the solution to each system of equations.

1. Solution: \((1,2)\)
2. Solution: \((0,-1)\)

B. Solve each system of equations by graphing.

\[
\begin{align*}
y &= \frac{1}{2}x - 4 \\
y &= -x + 2
\end{align*}
\]

3. Solution: \((4, -2)\)

\[
\begin{align*}
y &= -\frac{2}{3}x + 2 \\
y &= 2x - 6
\end{align*}
\]

4. Solution: \((3, 0)\)
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