Solving Linear Inequalities with Two Variables

The solution of a linear inequality in two variables is usually displayed as a shaded portion of the coordinate plane. The figure shown below is the graph of the inequality $x - 2y < 2$. The solution set to the inequality is the shaded region.

Steps to solving a linear inequality in two variables:

1) Convert the inequality to slope intercept form (exactly the same as with an equation, but remember to ________________________________)
   **If there is only one variable, ________________________________

2) Graph the line on the coordinate plane
   a. If the inequality sign is $>$ or $<$, then the line is _______________
   b. If the inequality sign is $\geq$ or $\leq$, then the line is _______________

3) Shade the solution set according to the following rules
   a. If the sign is $>$ or $\geq$, shade the region ________ the line
      **(for vertical lines shade the region ________ of the line)
   b. If the sign is $<$ or $\leq$, shade the region ________ the line
      **(for vertical lines shade the region ________ of the line)

What does the shaded area represent?

If a point is in the shaded area, then ________________________________.
If a point is not in the shaded area, then ________________________________.
Examples

\[ y > \frac{2}{3}x \]

\[ 2x - 3y \geq 6 \]

\[ x + 2y > 4 \]

\[ \frac{x}{2} + \frac{y}{3} < 1 \]
Solving Systems of Linear Inequalities in Two Variables

Define: system of linear inequalities:

Steps to solving a system of linear inequalities in two variables:

1) Graph and shade the solution sets for the each given line on the same coordinate plane (using the steps listed above for graphing a linear inequality)

2) The solution set for the system is ____________________________________________________________.

What does the final shaded area represent?

If a point is in the final shaded area, then ________________________________________________________

If a point is not in the final shaded area, then ________________________________________________________

What happens if none of the shaded areas for the given lines intersect? What symbol is used for this case?
Examples

\[ \begin{align*}
  x - y &< 1 \\
  2x + 3y &\geq 12
\end{align*} \]

\[ \begin{align*}
  x + 2y &\leq 4 \\
  y &\geq x - 3
\end{align*} \]
\[ \begin{align*}
x - y &< 2 \\
-2 &\leq x < 4 \\
y &< 3
\end{align*} \]

\[ \begin{align*}
2x + 3y &\geq 6 \\
2x + 3y &< 0
\end{align*} \]