

Graphing inequalities in the plane

In this lesson we'll move away from the number line and look at how to graph linear inequalities in a coordinate plane.

Two steps for graphing an inequality

To graph a linear inequality, we start by drawing the boundary line.

- The boundary line will be dashed if the inequality is $<$ or $>$, which indicates that the boundary line isn't part of the graph of the inequality.
- The boundary line will be solid if the inequality is \leq or \geq , which indicates that the boundary line is part of the graph of the inequality.

After we draw the boundary line, we'll shade in the side of the line that satisfies the inequality.

- Shade above the line if we have a $>$ or \geq inequality.
- Shade below the line if we have a $<$ or \leq inequality.

Sometimes trying to determine which side of the line to shade can be a little confusing. One technique we can use to make it a little easier is to pick a point that's not on the line and substitute it into the inequality. If the inequality is true, then we shade part of the graph that contains that point.



If the inequality is false, then we shade part of the graph that doesn't contain that point.

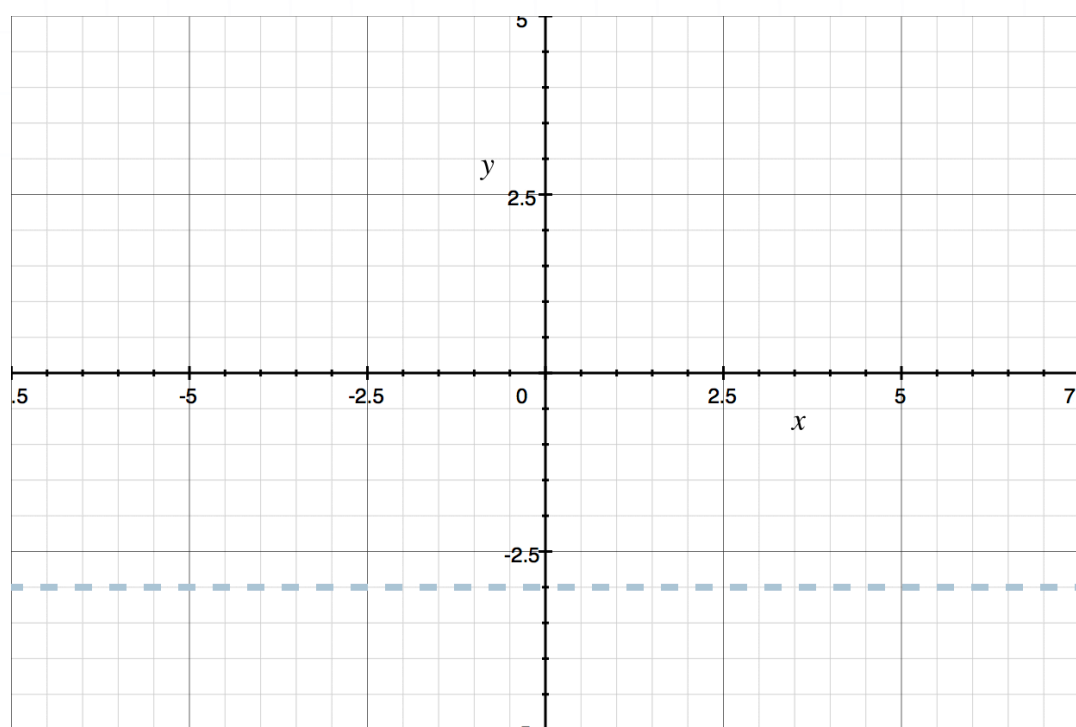
Let's do some examples so that we can get the idea.

Example

Graph the inequality.

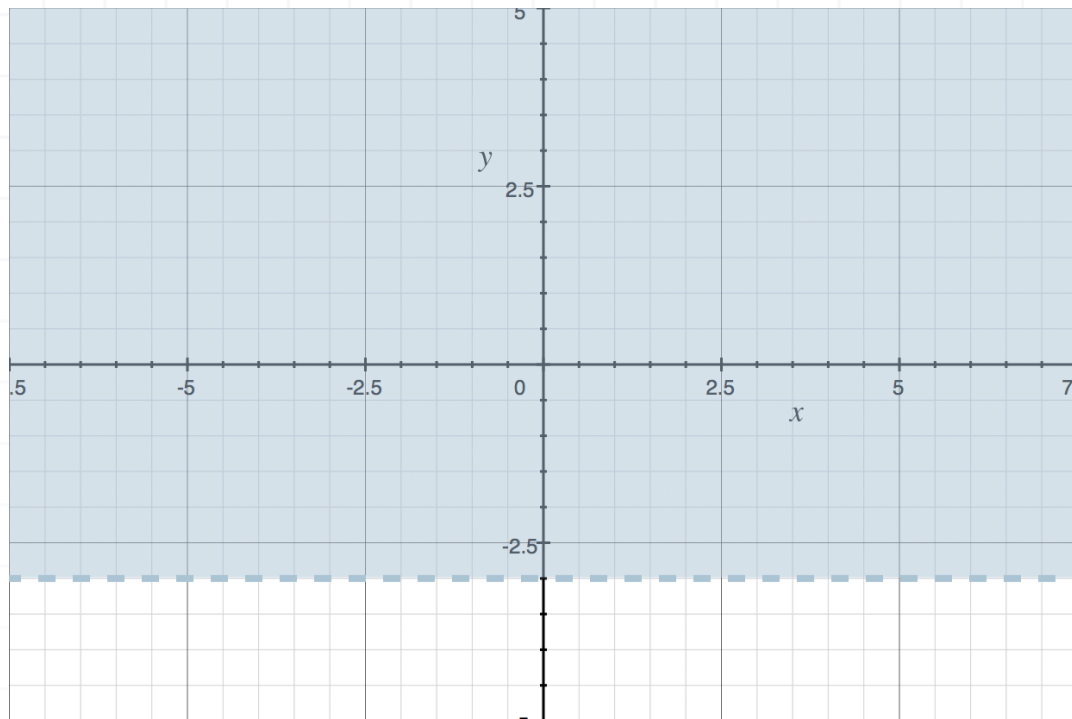
$$y > -3$$

Let's begin by drawing the boundary line $y = -3$ with a dashed line since the sign is $>$.



Now because we have the $>$ symbol, we need to shade above the line.





Let's try another example.

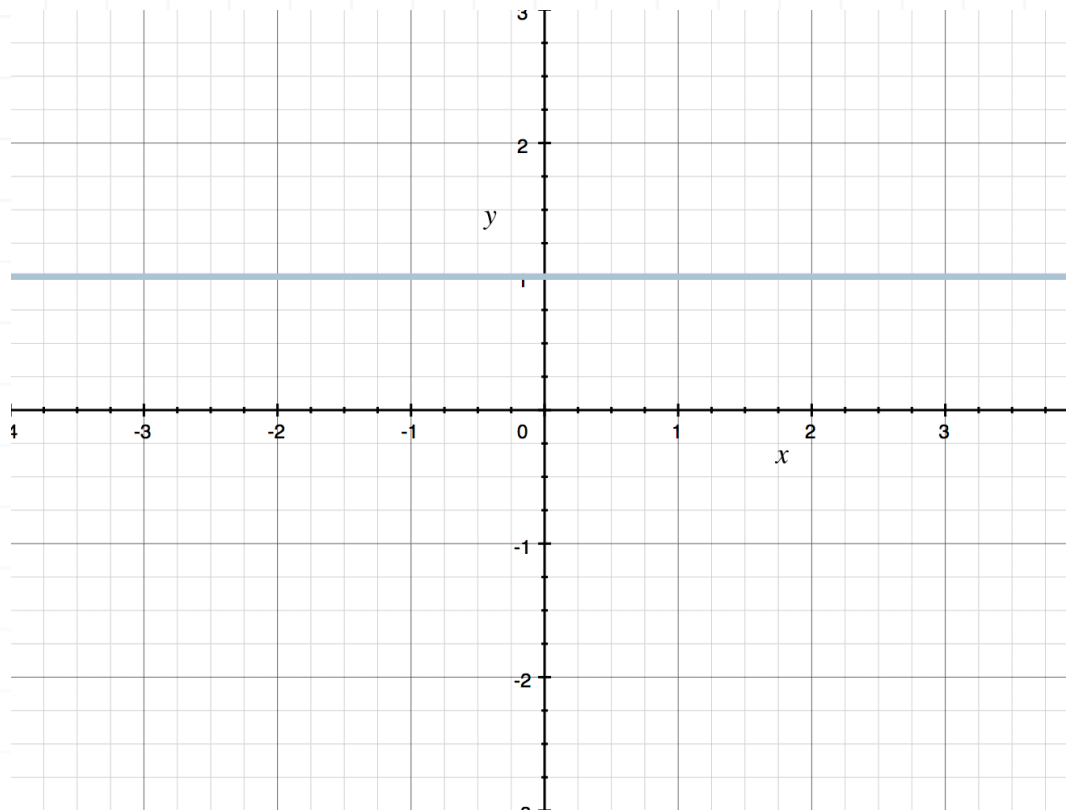
Example

Graph the inequality.

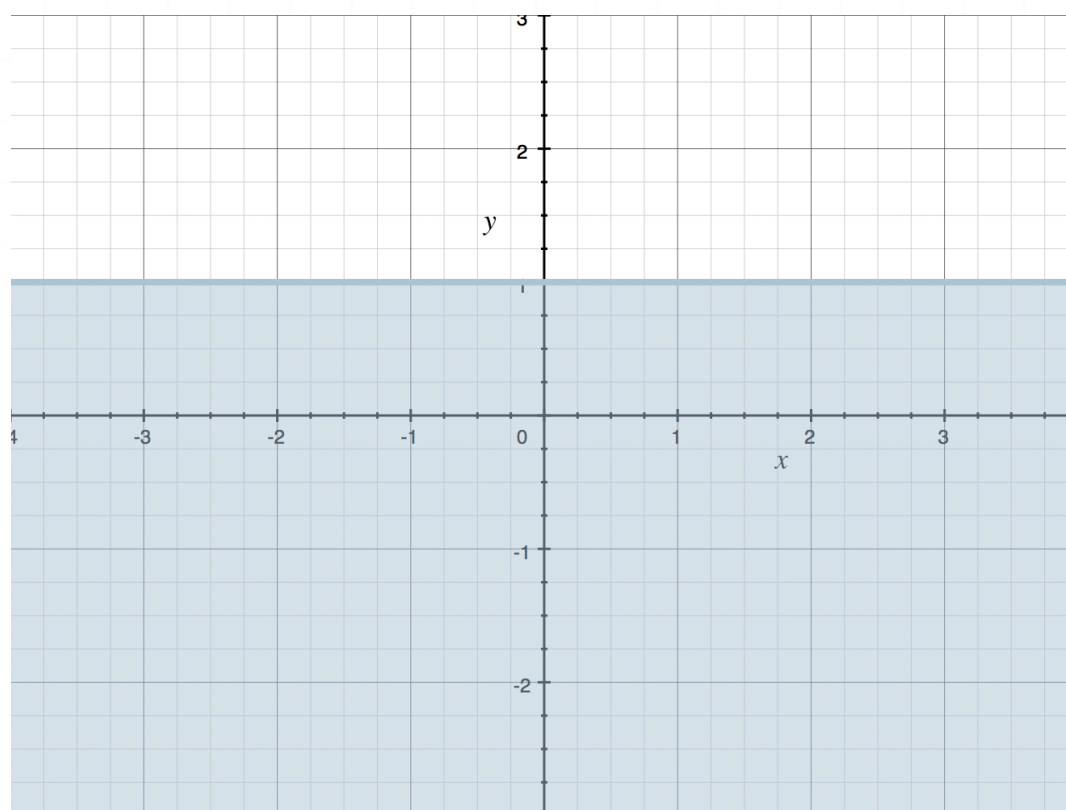
$$y \leq 1$$

This time we start with a solid line at $y = 1$ because we have the \leq sign.





And because we have the \leq sign, we'll shade below the boundary line.



The boundary line in these last two examples has been perfectly horizontal. Now let's look at a linear inequality where the boundary line isn't horizontal.



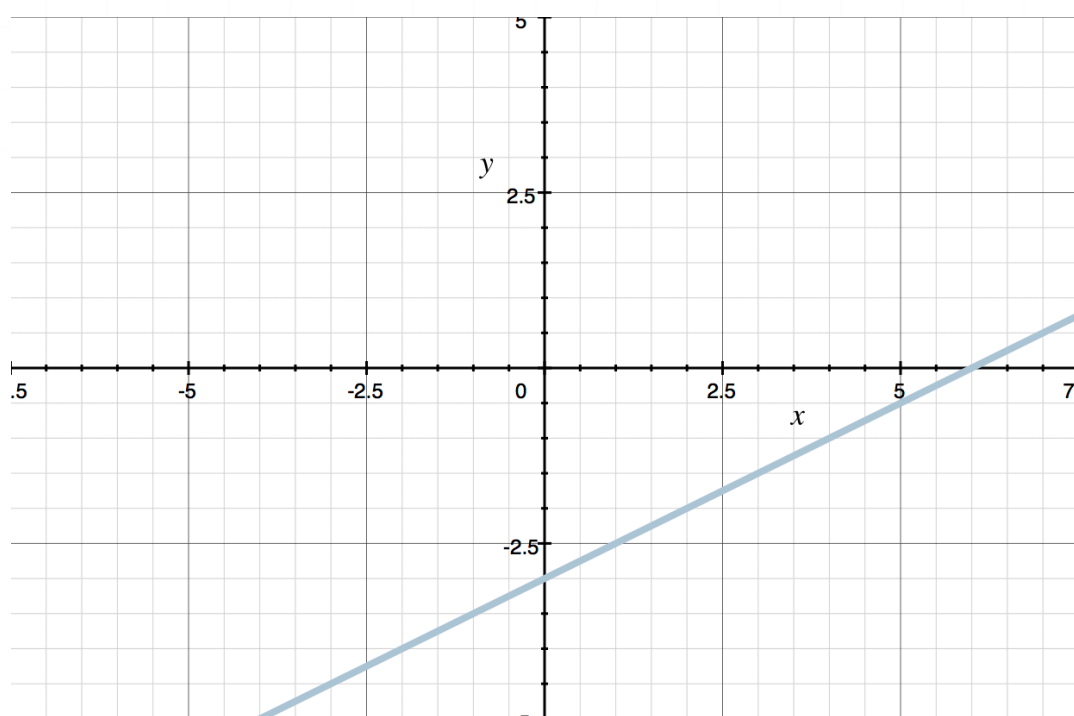
Example

Graph the inequality.

$$y \geq \frac{1}{2}x - 3$$

Begin by drawing the solid boundary line, since we have the \geq symbol. To do this, we'll start with the y -intercept, which has coordinates $(0, -3)$. Then we'll use the slope to count up 1 and over 2 to the right to place a second point at $(2, -2)$.

Then we'll draw a solid line that passes through $(0, -3)$ and $(2, -2)$.



We can shade above the line because we have a \geq symbol. Alternatively, let's pick the point $(0,0)$ and substitute it into the inequality.

$$y \geq \frac{1}{2}x - 3$$



$$0 \geq \frac{1}{2} \cdot 0 - 3$$

$$0 \geq -3$$

Since this inequality is true, we know $(0,0)$ satisfies the inequality and therefore that we need to shade on the side of the line that contains $(0,0)$.

