Graphing disjunctions on a number line

Now that we know how to graph inequalities, we want to say that there are two other types of inequality statements we can sketch on a number line: disjunctions and conjunctions. In this lesson, we'll focus on disjunctions.

Think about disjunctions as "or statements," like

"$x > 5$ or $x < 3$"

If we sketch this inequality statement on a number line, we get

What we see is that there are two separate pieces of the inequality statement, the $x < 3$ portion on the left, then a gap, then the $x > 5$ piece on the right.

This inequality statement tells us that a value of x will satisfy the inequality (the disjunction), as long as it's *either* less than 3 *or* greater than 5. So $x = 2$ would satisfy the disjunction because it satisfies the $x < 3$ piece (even though it doesn't satisfy the $x > 5$ piece), and $x = 6$ would satisfy the disjunction because it satisfies the $x > 5$ piece (even though it doesn't satisfy the $x < 3$ piece).

The only values that don't satisfy this particular disjunction are the values of x that put is in the "gap" we see on the number line between the pieces of the disjunction, specifically values of x between 3 and 5, including 3 and 5 themselves.

Let's look at an example of how to graph a disjunction by splitting the inequality statements into two separate inequalities, graphing each one, and then graphing the overlap.

Example

Graph the disjunction.

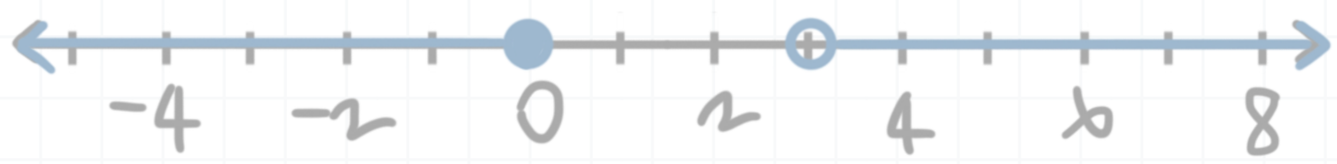
$$x > 3 \text{ or } x \leq 0$$

We need to graph the disjunction of the inequalities $x > 3$ and $x \leq 0$, but first let's see how they can be graphed separately.

The graph of the inequality $x > 3$ has an open circle at 3 (because we have a "greater than" sign), and because of the "greater than" part of the inequality, the arrow goes to the right.

The graph of the inequality $x \leq 0$ has a solid circle at 0 (because we have a "less than or equal to" sign), and because of the "less than" part of the inequality, the arrow goes to the left.

A number is a solution to the compound inequality if the number is a solution to at least one of the inequalities. So the solution, and a sketch of the disjunction on the number line, is



Let's try another example of graphing disjunctions.

Example

Graph the disjunction of the inequalities.

$2x - 1 > 5$ or $x + 3 < 2$

First, we'll solve and graph the two inequalities separately. To begin solving $2x - 1 > 5$, add 1 to both sides.

$$2x - 1 > 5$$

$$2x - 1 + 1 > 5 + 1$$

$$2x > 6$$

Now divide both sides by 2.

$$\frac{2x}{2} > \frac{6}{2}$$

$$x > 3$$

The graph of the inequality $x > 3$ has an open circle at 3 (because we have just a “greater than” sign), and because it’s a “greater than “inequality, the arrow goes to the right.

To begin solving the inequality $x + 3 < 2$, subtract 3 from both sides.

$$x + 3 < 2$$

$$x + 3 - 3 < 2 - 3$$

$$x < -1$$

The graph of the inequality $x < -1$ has an open circle at -1 (because we have a “less than” sign), and because of the “less than” part of the inequality, the arrow goes to the left.

So the graph of the disjunction will be