Introduction to Graphing Inequalities

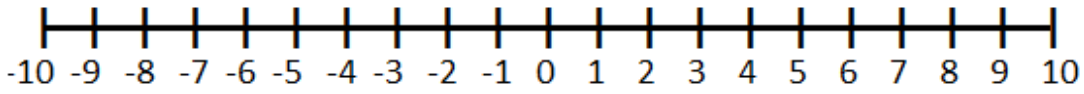
Warm Up Activities

Inequalities on a number line.

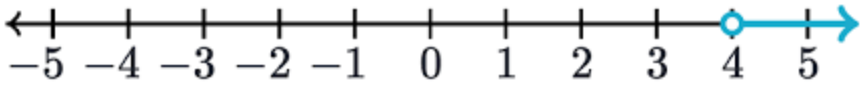
Give me some examples of numbers that satisfy:

a) $x > 1$
b) $x \leq 5$

What would those look like on a number line?



How would we represent the number lines below as inequalities?



Whole Group Discussion

1. a) Graph the relationship: $x + y = 12$, using a table of values

b) Graph the relationship: $x + y^2 = 12$, using a table of values

c) Compare the two graphs (linear vs. non-linear, initial values)

Now we are going to start looking at inequalities, but only linear ones.

2. What if we changed our question to: $x + y \geq 12$

Have students use test points to see which points on the grid would satisfy this inequality.

Eg. Student A picks x = 2, y = 2 □ 2 + 2 is not greater than 12, so that point wouldn't work. Find lots of points that do work and lots that don't. Notice that the ones that do work are all above the line.

Highlight the importance of finding which side of the line is correct and shade that side in. This is a good opportunity to talk about why we shade it □ to represent the infinite number of points.

Don't worry about the "strictly less than or greater than" yet. That's coming up.

Small Group Work

This would be a good opportunity to use random groups and have them work at white boards

Below is a set of equations and inequalities to have the students graph.

You can be flexible giving these out to groups (move faster for some groups, or repeat similar questions for groups that might be struggling).

	Notes
Graph the lines: $x + y = 8$ $y = \frac{2}{3}x + 1$	Hoping that groups will recognize different ways to graph the lines (table of values or slope, y-intercept)
Graph the inequality: $x + y \geq 8$	No need to give a new slip of paper, just change the = to a $\geq$
Graph the inequality: $y \leq \frac{2}{3}x + 1$	This one looks different than the other ones, so make sure that doesn't cause a problem. Students can still just use test points.
Graph the inequality: $x - y \geq 2$	Now we are jumping straight to the inequality. We need the students to recognize that the first step is to graph the line.
Graph the inequality: $y \geq \frac{2}{3}x + 1$	Similar but in y = ax + b form
If groups are still struggling, give them more questions like the previous ones before moving on.	
Graph the inequality: $x - y < 0$	Here we introduce $<$ for the first time. Expect students to ask what they should do differently. Ask them what points would not work any more? This again highlights the importance of the line. They might suggest the dotted/dashed line, but if not, this is the time to explain it (one group at a time).
Graph the inequality: $y > \frac{-3}{4}x + 6$	This question shouldn't add anything the students haven't seen.

Small Group Work- Extensions

Consider using some of these questions with groups that have a good understanding of the work. The goal for the class would have been to understand the previous examples

	Notes
Graph the inequality: $4x + y \geq 8$	This question has some options now. Graph using a table or will groups consider rearranging the equation?
Graph the inequality: $3x + 2y < 8$	Is it more tempting to rearrange now?
Shade in the region that satisfies both of these inequalities: $y \leq -x + 4$ $y \geq 2x - 6$	This should create a region in between the two lines.
Shade in the region that satisfies both of these inequalities: $y \leq \frac{1}{2}x + 4$ $y < -3x + 6$	This should create a region under both lines. Be careful to notice the $<$
Graph the inequality: $x^2 + y < 10$	Try a non-linear inequality.