Chapter 38

SOLVING AND GRAPHING INEQUALITIES

SOLVING INEQUALITIES

While an equation is a mathematical sentence that contains an equal sign, an **INEQUALITY** is a mathematical sentence that contains a sign indicating that the values on each side of it are NOT equal.

EXAMPLES: $x > 4$ $x < 4$ $x \leq 4$ $x \geq 4$

To SOLVE AN INEQUALITY, just follow the same steps as solving an equation.

Solving an inequality is like asking, "Which set of values makes this equation true?"

EXAMPLE: $5x + 6 < 21$

$5x + 6 - 6 < 21 - 6$ (Subtract 6 from both sides.)

$\frac{5x}{5} < \frac{15}{5}$ (Divide to get the variable alone.)

$x < 3$

There's only one difference: Any time you multiply or divide by a negative number, you must reverse the direction of the inequality sign. (Some kids call this **THE FLIPPIN' INEQUALITY RULE**!)

EXAMPLE: Solve for x: $-4x \geq 24$.

$\frac{-4x}{-4} \leq \frac{24}{-4}$

(Divide to get the variable alone, but ALSO, when dividing with a negative number, reverse the inequality sign.)

$x \leq -6$

CHECK YOUR ANSWER!

Because our answer says that x is less than or equal to -6, we can test this by picking any number that is less than or equal to -6.

Test $x = -6$. → $-4(-6) \geq 24$
This is true! $24 \geq 24$ ✓

Test $x = -10$. → $-4(-10) \geq 24$
This is true! $40 \geq 24$ ✓

Therefore, our answer is correct.

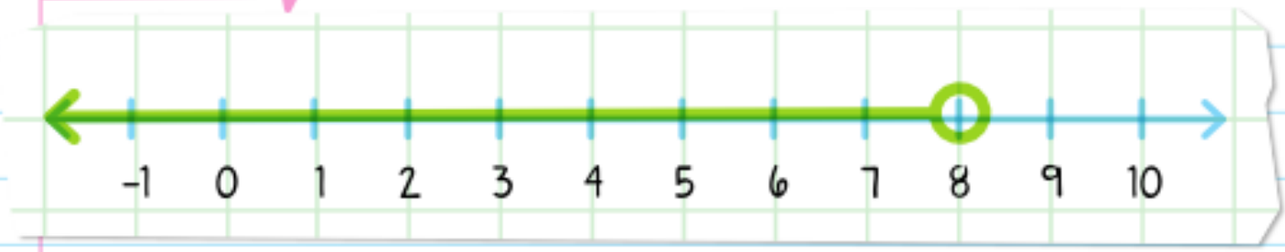
The answer to any inequality is an infinite set of numbers. (The answer $x \leq -6$ literally means ANY number less than or equal to -6, which can go on forever!) But we can still represent this set of numbers with inequality symbols.

GRAPHING INEQUALITIES

In addition to writing inequalities using symbols, we can **GRAPH INEQUALITIES** on a number line as well. Here are the different ways to graph inequalities:

1. If the sentence uses a $<$ or $>$ sign, we indicate that the number is not included with an open circle.

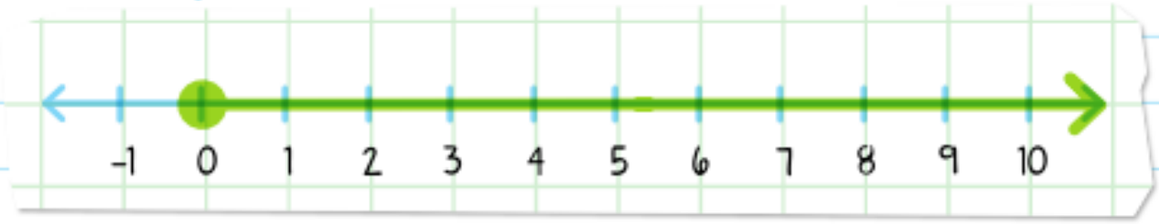
EXAMPLE: Graph $x < 8$.



The number represented by x is less than 8, so 8 is NOT included in the possible numbers. Therefore, the circle is open.

2. If the sentence uses a $\leq$ or $\geq$ sign, we indicate this with a "closed circle" to indicate that the solutions could equal the number itself.

EXAMPLE: Graph $x \geq 0$.



Because x is greater than or equal to 0, 0 is included in the possible numbers. Therefore, the circle is closed.

You'll probably see a question like this on your test:

EXAMPLE: Solve and graph: $-3x+1 \geq 7$.

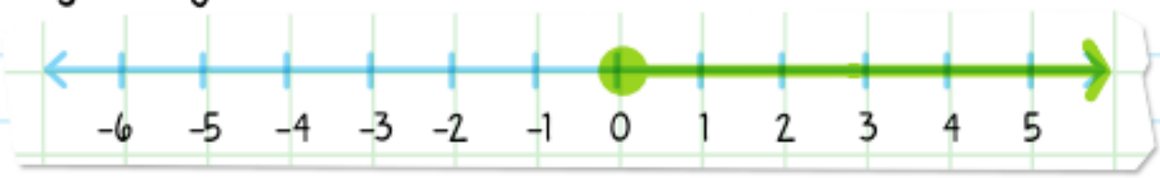
$-3x+1-1 \geq 7-1$ Just solve for x and then graph your answer.

$-3x \geq 6$

$x \leq -2$

CHECK YOUR KNOWLEDGE

1. Graph $x > 3$ on a number line.
2. Graph $y < -3$ on a number line.
3. Graph $m \leq -7$ on a number line.
4. Write the inequality that this number line represents using x as your variable:



5. Write the inequality that this number line represents using x as your variable:

6. Solve and graph: $5x > 45$.
7. Solve and graph: $2x + 1 < 7$.
8. Solve and graph: $7y - 1 \leq 48$.
9. Solve and graph: $8x - 14x < -24$.
10. Solve and graph: $-2(w - 4) \geq 18$.

ANSWERS

CHECK YOUR ANSWERS

1. 

2. 

3. 

4. $x \geq 0$

5. $x < -9$

6. $x > 9$

7. $x < 3$

8. $y \leq 7$

9. $x > 4$

10. $w \leq -5$