

Writing and Graphing Inequalities on a Number Line

Grade 6 math · Lesson · Standards: 6.EE.B.5, 6.EE.B.8

Quick answer: An inequality compares two expressions with $<$, $>$, $\leq$ or $\geq$. Unlike an equation, it usually has infinitely many solutions: $x > 3$ is true for every number greater than 3. To graph it on a number line, draw an open circle at 3 and shade right; use a closed circle for $\leq$ or $\geq$, because the endpoint is included.

Standards: 6.EE.B.5, 6.EE.B.8 · **Level:** Grade 6

What do the inequality symbols mean?

Inequality

An **inequality** compares two expressions that are not necessarily equal, using one of four symbols.

Symbol	Meaning	Words that signal it
$x > 5$	greater than 5	more than, over, exceeds
$x < 5$	less than 5	fewer than, under, below
$x \geq 5$	greater than or equal to 5	at least, no less than, minimum
$x \leq 5$	less than or equal to 5	at most, no more than, maximum

How do you tell whether a number is a solution?

A **solution** of an inequality is any value that makes it true. Substitute and compare. For $x + 2 > 7$: the value 6 gives $8 > 7$, which is true, so 6 is a solution. The value 5 gives $7 > 7$, which is false, so 5 is not.

Unlike an equation, an inequality usually has **infinitely many solutions**. Every number greater than 3, such as 3.1, 3.001 or 400, satisfies $x > 3$.

How do you graph an inequality on a number line?

Method: graph an inequality

1. Draw a circle at the number in the inequality.
2. Use an **open circle** for $<$ or $>$ (the number is not a solution) and a **closed circle** for $\leq$ or $\geq$ (the number is a solution).

3. Shade toward the solutions: right for greater, left for less.



$x > 3$: open circle at 3, shade right.



$x \leq 5$: closed circle at 5, shade left.

Worked example

Graph $x \geq -2$. The sign includes -2 , so draw a closed circle at -2 , then shade to the right because the solutions are greater.



$x \geq -2$: closed circle at -2 , shade right.

How do inequalities describe real-world limits?

A sign reading “Riders must be at least 48 inches tall” sets a minimum, so the height h satisfies $h \geq 48$. An elevator sign reading “No more than 800 pounds” sets a maximum, so the weight w satisfies $w \leq 800$.



$h \geq 48$: heights from 48 up.

Common mistake

Using a closed circle for $<$ or $>$. The endpoint is a solution only when the symbol has an equal bar: $\leq$ or $\geq$.

Mathbot's tip

The small end of the symbol points to the smaller number. In $3 < x$, the point is next to 3, so x is greater, the same as $x > 3$.

Key points to remember

- Four symbols: $<$, $>$, $\leq$, $\geq$.
- A solution is any value that makes the inequality true.
- Most inequalities have infinitely many solutions.
- Open circle: endpoint not included. Closed circle: endpoint included.
- Words like at least and at most signal $\geq$ and $\leq$.

Writing and Graphing Inequalities on a Number Line: frequently asked questions

What is the difference between an equation and an inequality?

An equation says two expressions are equal and usually has one solution. An inequality says one is greater or less and usually has infinitely many solutions.

When do you use an open circle?

Use an open circle for $<$ and $>$, because the endpoint itself is not a solution. For $x > 3$, the number 3 does not work because 3 is not greater than 3.

What does at least mean?

At least means the smallest allowed value is the number named, so the sign is $\geq$. If you need at least 12 points, 12 works and so does anything larger.

How can $3 < x$ and $x > 3$ be the same?

Both say that x is greater than 3. The inequality can be read from either side, as long as the symbol still points to the smaller number.

Can an inequality have exactly one solution?

Not the kind studied in this chapter. The solutions of $x > 3$ or $x \leq 5$ form a whole ray of numbers on the number line, so there are infinitely many.