

Grade 7 - Two-Step Inequalities - Lesson

Common Core 7.EE.B.4b · maths-pdf.fr/en/

An inequality compares expressions with the symbols $<$, $>$, $\leq$, or $\geq$ and usually has many solutions. To solve a two-step inequality, undo addition or subtraction and then multiplication or division, just as with an equation. Reverse the symbol when you multiply or divide by a negative number, and graph the solution set on a number line.

Grade 7 · Common Core State Standards: **7.EE.B.4b**

Key facts

- Solve $px+q>r$ with the same steps as an equation.
- Reverse the symbol when you multiply or divide both sides by a negative number.
- Use an open circle for $<$ and $>$, and a closed circle for $\leq$ and $\geq$.
- Shade the side of the number line that contains the solutions.
- Interpret the solution set in the context of the problem.

What is an inequality and what is its solution set?

An **inequality** compares two expressions with a symbol such as $<$ or $>$. Unlike an equation, it usually has infinitely many solutions, called the **solution set**.

Symbol	Meaning	Circle
$>$	greater than	open
$\geq$	greater than or equal to	closed
$<$	less than	open
$\leq$	less than or equal to	closed

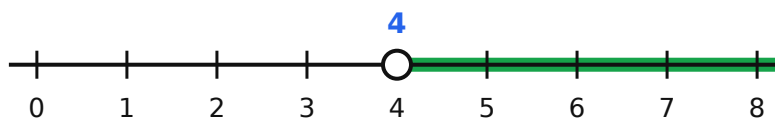
Match the symbol to the circle.

How do you solve $px+q>r$?

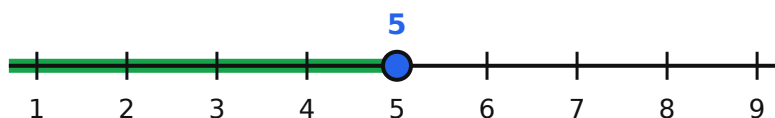
Solve exactly like a two-step equation: undo the addition or subtraction, and then undo the multiplication or division.

Example. $2x+3>11$. Subtract 3: $2x>8$. Divide by 2: $x>4$. Any number greater than 4 works,

such as 4.1 or 10.



The graph of $x > 4$ has an open circle at 4 (4 is not included) and shades to the right.



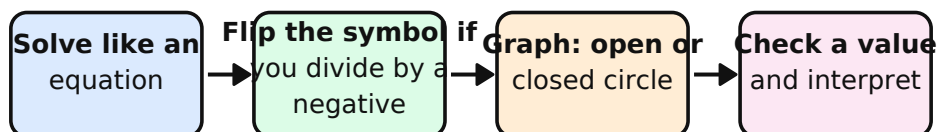
The graph of $x \leq 5$ has a closed circle at 5 (5 is included) and shades to the left.

When do you reverse the inequality symbol?

The negative rule

When you **multiply or divide both sides by a negative number**, reverse the inequality symbol. Adding or subtracting never changes the symbol.

For example, $-2x + 4 < 10$ gives $-2x < 6$. Dividing by -2 reverses the symbol, so $x > -3$. Test: $x = 0$ gives $4 < 10$, which is true, and 0 is greater than -3 .



Only multiplying or dividing by a negative number flips the symbol.

How do you use inequalities in word problems?

Look for phrases: “at most” means $\leq$, “at least” means $\geq$, “fewer than” means $<$, and “more than” means $>$. Then interpret the answer in the story.

Real situations often limit the answer further. A bus cannot carry 3.5 people, so a solution such as $x < 12.6$ means a whole-number answer of at most 12. A negative number of tickets or hours makes no sense either, so always read the solution set against the story. Graph the full set of numbers, and then circle the values that make sense in the problem.

Maya has \$40. Tickets cost \$6 each plus a \$4 fee, so $6t + 4 \leq 40$, which gives $t \leq 6$. She can buy at most 6 tickets, and since tickets must be whole numbers, the possible values are 0, 1, 2, 3,

4, 5, and 6.

A quick way to check any answer is to test one number inside the shaded part and one number outside it. The first must make the original inequality true, and the second must make it false. If both tests agree with the graph, you can trust the solution.

Questions about two-step inequalities

What is the difference between an equation and an inequality?

An equation has one solution or a few. An inequality usually has infinitely many solutions, shown as a shaded part of the number line.

When do you flip the inequality sign?

Flip it only when you multiply or divide both sides by a negative number. For example, $-3x > 9$ becomes $x < -3$.

When do you use an open circle?

Use an open circle for $<$ and $>$ because the endpoint is not a solution. Use a closed circle for $\leq$ and $\geq$ because the endpoint is included.

How do you check a solution to an inequality?

Pick a number from the shaded part and substitute it into the original inequality. The statement must be true. Also test a value outside the set to see that it fails.

What does at least mean?

At least means greater than or equal to. If you need at least 85 dollars, then your total must be ≥ 85 .