

Grade 7 · Two-Step Inequalities · Lesson

Common Core 7.EE.B.4b · mathovore.fr

This grade 7 two step inequalities lesson explains two-step inequalities in one printable page, with definitions, a method and a worked example.

A two-step inequality compares an expression that needs two operations to undo with a number, such as $2x+3>11$. Solve it like a two-step equation: undo the addition or subtraction first, then the multiplication or division. If you multiply or divide both sides by a negative number, reverse the inequality sign.

Grade 7 Common Core: 7.EE.B.4b

Grade 7 Two Step Inequalities Lesson: key facts

- Standard 7.EE.B.4b: solve $px+q>r$ and $px+q<r$ and graph the solution set.
- Undo addition or subtraction first, then multiplication or division.
- Multiplying or dividing by a negative number reverses the inequality sign.
- Use an open circle for $<$ and $>$, and a closed circle for $\leq$ and $\geq$.
- In a word problem, read the solution set in context, for example whole items only.

What is a two-step inequality?

A **two-step inequality** has a variable that is multiplied or divided and also has a number added or subtracted, like $2x+3>11$. Unlike an equation, it has a whole *solution set*: every number that makes the statement true.

Vocabulary

Inequality symbols: $<$ less than, $>$ greater than, $\leq$ less than or equal to, $\geq$ greater than or equal to.

Graph: an open circle for $<$ and $>$, a closed circle for $\leq$ and $\geq$, and a shaded ray toward the solutions.

Figure: Two number lines. Top: open circle at 3 with a shaded ray pointing right for x greater than 3. Bottom: closed circle at 5 with a shaded ray pointing left for x less than or equal to 5

An open circle means the number is not included; a closed circle means it is included.

How do you solve a two-step inequality?

Treat it like a two-step equation. Undo addition or subtraction first, then undo multiplication or division, doing the same thing to both sides.

1. Add or subtract to get the variable term alone.
2. Multiply or divide to get the variable alone.
3. If you multiplied or divided by a negative number, reverse the symbol.
4. Graph the solution and check one number.

Worked example. Solve $3x-5 < 10$. Add 5: $3x < 15$. Divide by 3: $x < 5$. Check $x=4$: $3(4)-5=7 < 10$, which is true.

Figure: Three boxes joined by arrows: $3x$ minus 5 is less than 10, then add 5 to get $3x$ less than 15, then divide by 3 to get x less than 5

Two steps, two inverse operations.

When do you reverse the inequality sign?

Whenever you multiply or divide both sides by a **negative** number. Negative numbers flip the order on the number line, so $-5 < 2$ becomes $5 > -2$ after multiplying by -1 . Adding or subtracting never changes the sign.

Example: $-2x+1 < 9$ gives $-2x < 8$. Dividing by -2 gives $x > -4$, not $x < -4$.

Figure: Two number lines. Top: -5 is to the left of 2 . Bottom, after multiplying by -1 : the points move to 5 and -2 and their order is reversed

Multiplying or dividing by a negative number reverses the order, so the sign flips.

How do you use a two-step inequality in a real situation?

Define the variable, write the inequality, solve it, then decide what the answer means. Jamal has \$50. A cap costs \$12 and each shirt costs \$9, so $12+9s \leq 50$ and $s \leq 4\frac{2}{9}$. Because he cannot buy part of a shirt, the most he can buy is **4 shirts**.

Figure: Four shirts fit (