

Solving One-Step Equations with Inverse Operations

Grade 6 math · Lesson · Standards: 6.EE.B.5, 6.EE.B.6, 6.EE.B.7

Quick answer: An equation says two expressions are equal, like $x + 7 = 19$. A solution is a value that makes it true. To solve a one-step equation, undo the operation with its inverse: subtract to undo adding, add to undo subtracting, divide to undo multiplying, multiply to undo dividing. Always do the same thing to both sides.

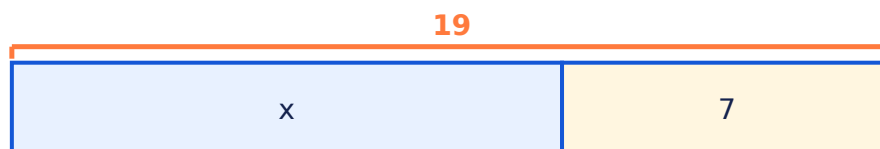
Standards: 6.EE.B.5, 6.EE.B.6, 6.EE.B.7 · **Level:** Grade 6

What is an equation, and what is a solution?

Equation and solution

An **equation** is a statement that two expressions are equal, such as $x + 7 = 19$. A **solution** is a value of the variable that makes the equation true.

To test a value, substitute it and see whether both sides match. Is 12 a solution of $x + 7 = 19$? Since $12 + 7 = 19$, yes. Is 10? Since $10 + 7 = 17$, which is not 19, no.

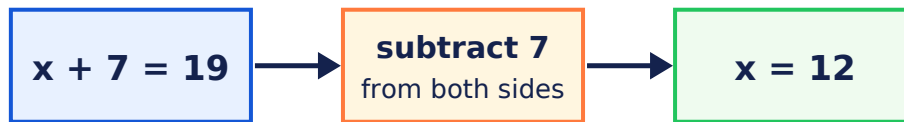


$x + 7 = 19$: the two parts make the whole tape.

How do you solve addition and subtraction equations?

Operations that undo each other are called **inverse operations**. Whatever you do to one side of an equation, do to the other side to keep it balanced.

Equation type	Undo with	Example
$x + p = q$	subtract p	$x + 7 = 19 \rightarrow x = 12$
$x - p = q$	add p	$x - 6 = 9 \rightarrow x = 15$
$px = q$	divide by p	$4x = 28 \rightarrow x = 7$
$x \div p = q$	multiply by p	$x \div 5 = 6 \rightarrow x = 30$



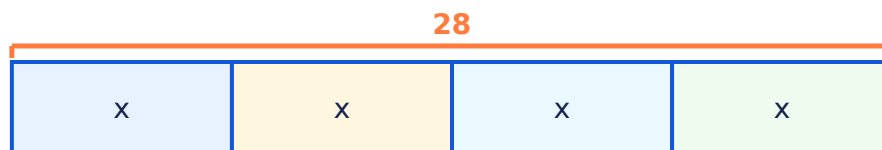
Undo the addition by subtracting 7 on both sides.

Method: solve a one-step equation

1. Identify the operation that is applied to the variable.
2. Apply the inverse operation to both sides.
3. Simplify to get the variable alone.
4. Check by substituting the answer into the original equation.

Worked example

Solve $4x = 28$. The variable is multiplied by 4, so divide both sides by 4: $4x \div 4 = 28 \div 4$, so $x = 7$. Check: $4 \times 7 = 28$.



$4x = 28$: four equal parts share the total 28.

The same steps work with decimals and fractions: $x + 2.5 = 9$ gives $x = 9 - 2.5 = 6.5$, and $\frac{1}{2}x = 6$ gives $x = 12$.

How do you write an equation for a word problem?

1. Choose a letter for the unknown and say what it means.
2. Find the action: adding, taking away, sharing equally, or repeating.
3. Write the equation, solve it, and check that the answer makes sense in the story.

For example, “a hiker walked 3.4 miles and 2.1 miles remain” gives $t = 3.4 + 2.1 = 5.5$ miles for the whole trail.

Common mistake

Changing only one side. Subtracting 7 from the left side of $x + 7 = 19$ without subtracting it from the right side breaks the equation.

Mathbot's tip

Always check your answer by substituting. A correct solution makes both sides equal.

Key points to remember

- A solution makes both sides of the equation equal.
- Inverse operations undo each other: + and −, × and ÷.
- Do the same operation to both sides to keep the equation balanced.
- Check by substituting the answer into the original equation.
- Tape diagrams show addition and equal-group equations.

Solving One-Step Equations with Inverse Operations: frequently asked questions

What does it mean to solve an equation?

To solve an equation means to find the value of the variable that makes it true. For $x + 7 = 19$, the solution is 12 because $12 + 7 = 19$.

Why must you do the same thing to both sides?

An equation is like a balanced scale. If you change only one side, the two sides stop being equal. Doing the same to both sides keeps the balance.

How do you solve an equation like $4x = 28$?

The variable is multiplied by 4, so divide both sides by 4. That gives $x = 7$. Check: 4 times 7 is 28.

Can the solution be a decimal or a fraction?

Yes. The solution of $x + 2.5 = 9$ is 6.5, and the solution of $x + \frac{3}{4} = 2$ is $1\frac{1}{4}$. Use the same inverse operation as with whole numbers.

How do you check a solution?

Substitute the value for the variable in the original equation and simplify both sides. If the two sides are equal, the value is a solution.