

Algebra 1 - Solving Linear Equations in One Variable - Lesson

Common Core A-REI.A.1, A-REI.B.3, A-CED.A.1 · maths-pdf.fr/en/

A linear equation in one variable, such as $3x + 5 = 20$, is solved by using inverse operations on both sides until the variable stands alone. Do the same operation to both sides to keep the equation balanced. Equations can have one solution, no solution when a false statement remains, or infinitely many solutions when a true statement remains.

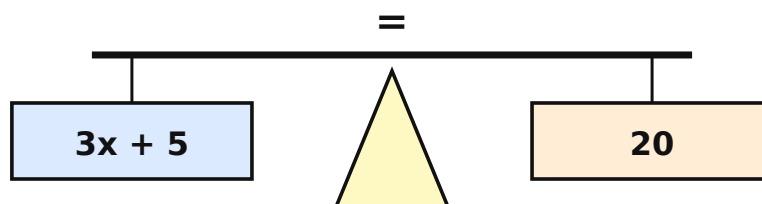
Algebra 1 · Common Core State Standards: **A-REI.A.1, A-REI.B.3, A-CED.A.1**

Key facts

- Do the same operation to both sides of an equation to keep it balanced.
- Undo addition and subtraction first, then multiplication and division.
- With variables on both sides, collect variable terms on one side and constants on the other.
- A false statement such as $6 = 5$ means no solution; a true statement such as $8 = 8$ means infinitely many.
- Check a solution by substituting it into the original equation.

What is a linear equation in one variable?

A **linear equation** in one variable can be written as $ax + b = c$, where a is not zero. Solving it means finding the value of the variable that makes both sides equal. That value is the **solution**.



Whatever you do to one side of an equation, do the same to the other side.

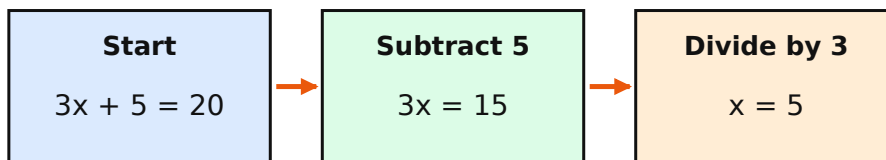
Properties of equality

If two quantities are equal, they stay equal when you add, subtract, multiply, or divide both

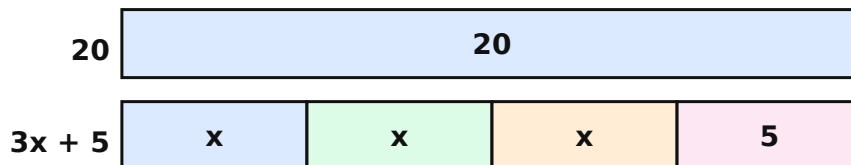
of them by the same number (never divide by 0). Each step produces an equivalent equation with the same solution.

How do you solve a two-step equation?

Undo the operations in the reverse order of the order of operations. First undo addition or subtraction, then undo multiplication or division.



Undo the operations in reverse order.



The tape diagram shows 3 equal parts plus 5 make 20, so each part is 5.

How do you solve an equation with variables on both sides?

1. Distribute and combine like terms on each side.
2. Move the variable terms to one side by adding or subtracting.
3. Move the constants to the other side.
4. Divide by the coefficient of the variable.
5. Check by substituting the solution into the original equation.

Example: Solve $5x - 3 = 2x + 12$. Subtract $2x$ from both sides: $3x - 3 = 12$. Add 3: $3x = 15$. Divide by 3: $x = 5$. Check: $5(5) - 3 = 22$ and $2(5) + 12 = 22$, so the solution is correct.

Can an equation have no solution or infinitely many?

Yes. If the variable terms cancel and a false statement remains, such as $6 = 5$, there is no solution. If a true statement remains, such as $8 = 8$, every real number is a solution.

Result after simplifying	Meaning
$x = 4$	one solution
$6 = 5$ (false)	no solution
$8 = 8$ (true)	infinitely many

Three possible outcomes when you solve a linear equation.

How do you write an equation from a word problem?

Define the variable, translate the words into an expression for each side, and set the sides equal. A savings plan that starts with \$40 and adds \$15 each week reaches \$190 when $40 + 15w = 190$.

Questions about solving linear equations in one variable

What does it mean to solve an equation?

Solving means finding every value of the variable that makes the equation true. For $2x + 1 = 9$ the only solution is $x = 4$, because $2(4) + 1 = 9$.

Why do you do the same thing to both sides?

An equation says two quantities are equal. Applying the same operation to both keeps them equal, like keeping a balance scale level.

How do you solve an equation with a fraction coefficient?

Multiply both sides by the reciprocal of the fraction. For $(\frac{2}{3})x = 12$, multiply both sides by $\frac{3}{2}$ to get $x = 18$.

What does it mean when the variable disappears?

If a false statement such as $6 = 5$ remains, there is no solution. If a true statement such as $8 = 8$ remains, every real number is a solution.

How can you check your answer?

Substitute the solution into the original equation and simplify both sides. If the two sides are equal, the solution is correct.