

# Introduction to Algebra

*Algebra is great fun - you get to solve puzzles!*

## A Puzzle

What is the missing number?

$$\square - 2 = 4$$

OK, the answer is 6, right? Because  $6 - 2 = 4$ . Easy stuff.

Well, in Algebra we don't use blank boxes, we use a **letter** (usually an x or y, but any letter is fine). So we write:

$$\mathbf{x} - 2 = 4$$

It is really that simple. The letter (in this case an x) just means "we don't know this yet", and is often called the **unknown** or the **variable**.

And when we solve it we write:

$$\mathbf{x} = 6$$

## Why Use a Letter?

*Because:*



it is easier to write "x" than drawing empty boxes (and easier to say "x" than "the empty box").



if there are several empty boxes (several "unknowns") we can use a different letter for each one.

So **x** is simply better than having an empty box. We aren't trying to make words with it! And it doesn't have to be **x**, it could be **y** or **w** ... or any letter or symbol we like.

## How to Solve

Algebra is just like a puzzle where we start with something like " $x - 2 = 4$ " and we want to end up with something like " $x = 6$ ".

But instead of saying "*obviously*  $x=6$ ", use this neat step-by-step approach:

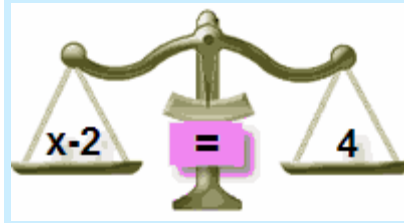
- Work out **what to remove** to get " $x = \dots$ "
- Remove it by **doing the opposite** (adding is the opposite of subtracting)
- Do that to **both sides**

Here is an example:

| We want to remove the "-2"   | To remove it, <b>do the opposite</b> , in this case add 2: | Do it to <b>both sides</b> :  | Which is ... | <i>Solved!</i> |
|------------------------------|--|---|--------------|----------------|
| $x \text{ } \cancel{-2} = 4$ | $\begin{array}{r} x - 2 = 4 \\ +2 \\ \hline 0 \end{array}$ | $\begin{array}{r} x - 2 = 4 \\ +2 \quad +2 \\ \hline 0 \quad 6 \end{array}$ | $x + 0 = 6$  | $x = 6$        |

Why did we add 2 to both sides?

To "keep the balance"...



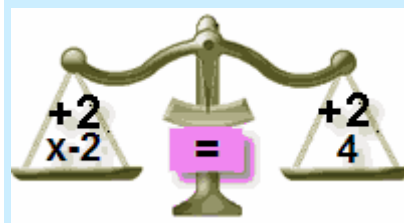
In Balance

Add 2 to Left Side



Out of Balance!

Add 2 to Right Side Also



In Balance Again

Just remember this:

To keep the balance, what we do to **one side** of the "="  
we should also do to the **other side**!

## Another Puzzle

Solve this one:

$$x + 5 = 12$$

|  |                       |
|--|-----------------------|
| Start with:  | $x + 5 = 12$          |
|  |                       |
| What we are aiming for is an answer like " $x = \dots$ ", and the <i>plus 5</i> is in the way of that! |                       |
| We can cancel out the <i>plus 5</i> by doing a <i>subtract 5</i> (because $5-5=0$ )                    |                       |
|  |                       |
| So, let us have a go at subtracting 5 from <b>both sides</b> :   | $x+5 -5 = 12 -5$      |
|  |                       |
| A little arithmetic ( $5-5 = 0$ and $12-5 = 7$ ) becomes:  | $x+0 = 7$             |
|  |                       |
| Which is just:   | $x = 7$               |
|  | <b><i>Solved!</i></b> |
| (Quick Check: $7+5=12$ )   |                       |

## Have a Try Yourself

Now practice on this [Simple Algebra Worksheet](#) and then check your answers on the page after. Try to use the steps we have shown you here, rather than just guessing!

Then read [Introduction to Algebra - Multiplication](#)

<http://www.mathsisfun.com/algebra/introduction.html>