

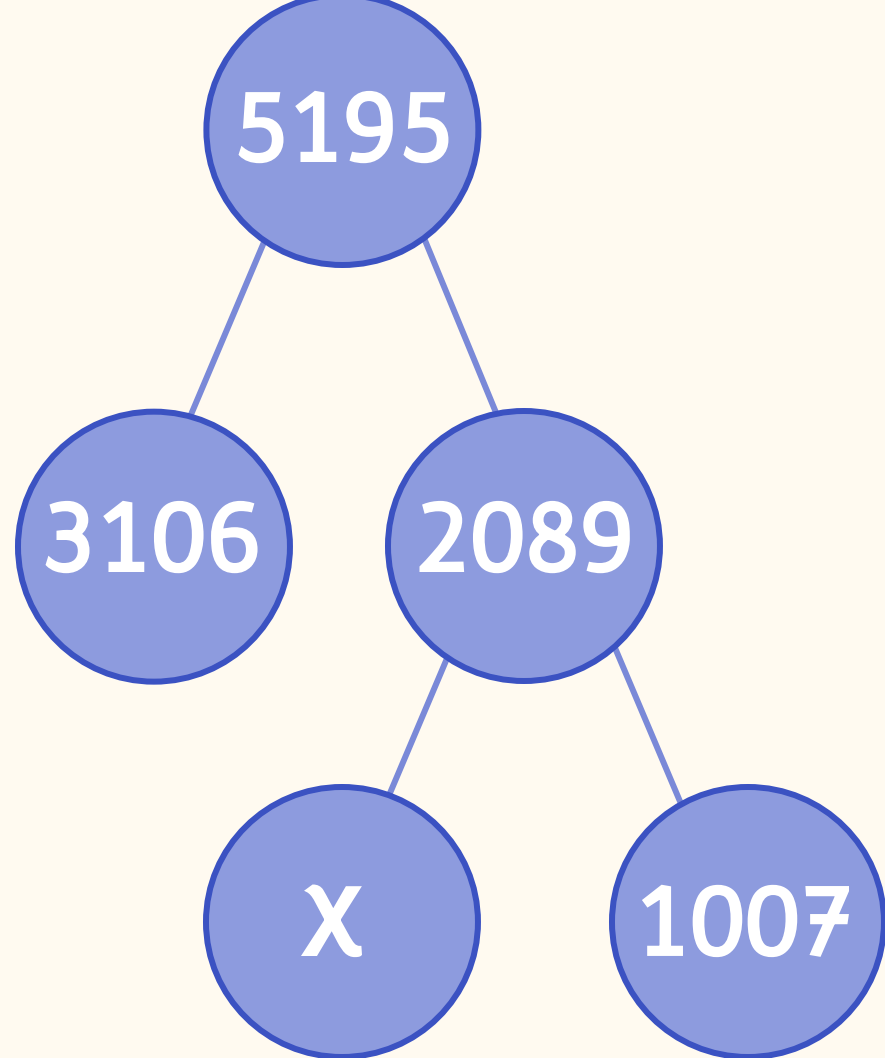
Solving



What do you need to know?

In maths, we sometimes need to solve questions that are missing some numbers. In these questions, the numbers that are missing are usually replaced with letters, which we call **unknowns**. Then, we use the information that we've been given to help us find out the value of those letters or unknowns.

In this addition tree, each number is the sum of the two numbers below it added together. But one of the numbers, labelled x, is missing!



By looking at the information in the tree we can write out the equation:

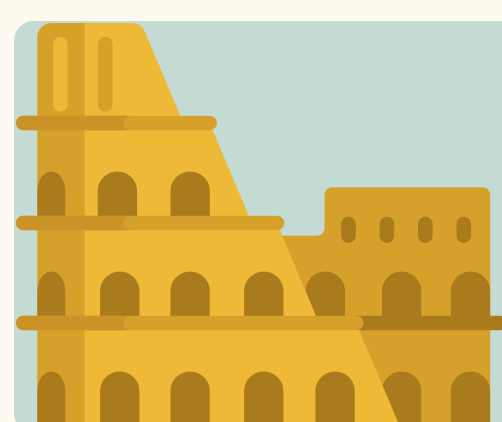
$$x + 1007 = 2089$$

If we subtract 1007 in both sides of our equation, this is the same as saying: $x = 2089 - 1007$

$$\text{So } x = 1082 \quad \checkmark$$



A little pun to help you remember...



For Romans solving was very easy, because x was always equal to 10!

$$X = 10$$



It can be helpful to think of solving equations like **balancing scales** because each side of an equation is always **equal**, or balanced. On the left side of this scale there are six red weights, labelled c, and on the right there are three 10kg weights.



Six red weights are the same weight as three 10kg weights.

Or

$$6c = 10\text{kg} + 10\text{kg} + 10\text{kg}$$

We can simplify this as $6c = 30\text{ kg}$. To find the value of c, we divide each side by 6:

$$6c \div 6 = c$$

$$30\text{ kg} \div 6 = 5\text{ kg}$$

$$\text{So } c = 5\text{ kg} \quad \checkmark$$

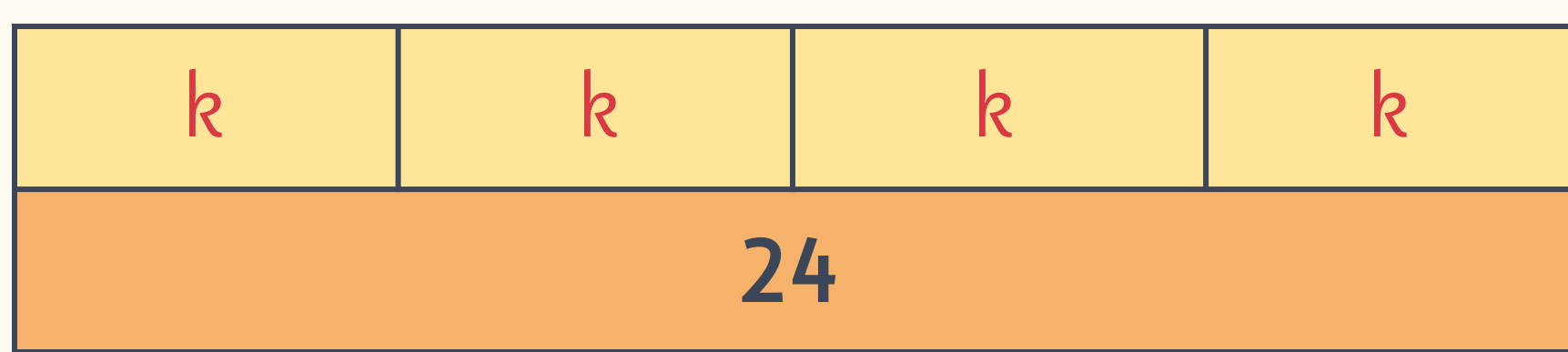
⚠ Watch out!

Equations are always balanced (remember the scales!) so every operation you do, whether that's addition, subtraction, multiplication or division, must be done to **both sides**!



Let's see this in action...

Your friend needs to find the value of k in this bar model. Can you help them?



1) The 4 green boxes are the same size as the purple box so we can write this as:

$$k + k + k + k = 24$$

2) Next, let's collect the ks together:

$$4k = 24$$

3) Finally, to find k we divide each side of the equation by 4:

$$4k \div 4 = k$$

$$24 \div 4 = 6$$

$$k = 6 \quad \checkmark$$



Let's look at a different example:



An explorer is planning an expedition to the jungle and he is working out how many packs of food he will need to take. He uses this formula for calculating the number of packs, where d is the number of days of the expedition:

$$\text{Total packs} = 3d + 5$$

If he takes 38 packs in total, how long is his expedition?

1) First, we need to substitute 38 into the 'Total packs' part of the formula:

$$38 = 3d + 5$$

2) Next, we need to subtract 5 from both sides of the equation:

$$33 = 3d$$

3) Finally we divide each side of the equation by 3:

$$33 \div 3 = 11$$

$$3d \div 3 = d$$

$$11 = d \quad \checkmark$$

So his expedition is 11 days long! I hope he brings enough snacks!



Tips!

When you're solving an equation with unknown numbers, it's important to look at the information that you've been given to help you find the answer. But it's also important to be able to pick out the most relevant information, because sometimes you're given **more than you need**.

A	+	B	10
+		+	
A	+	A	8
8		10	

If you need to find the value of A using this grid, you don't have to worry about B. This is additional information that you don't need at the moment. All we need to do is find the row or column that helps us find A. The first column and the final row only contain A, so let's look at these.

$$A + A = 8.$$

$$\text{We can also write this as } 2A = 8$$

To find A we can now divide each side of the equation by 2, to get:

$$A = 4 \quad \checkmark$$