Y8 Mastery Unit 2 - Forming and solving equations

Solving Equations

When we are solving equations, we need to figure out the value of the variable (usually a letter) in the equation.

Variable

$$4x - 7 = 5$$

Equations work like a weighing scale; it must always be balanced/equal. If I remove something from one side, I need to remove the same from the other side to keep it balanced/equal.

One-Step Equations

$$x + 5 = 12$$

This is a one-step equation. There is only one thing happening to the variable (add 5).

We can turn this into a bar model to help us solve it:

x	5

12

This shows that x+5 is equal to (the same as) 12.

x	5
7	5

If we take the 5 away from both bars we can see that x must be 7.

$$x = 7$$

$$x + 5 = 12$$

-5   -5

$$x = 7$$

Keyword/Skill	Definition/Tips
Variable	A symbol for a number we do not know yet, it is usually a letter.
Term	Either a single number or a **variable,** such as 4 or n or 3a or 6y.
Expression	A mathematical statement written using **symbols**, **numbers** or **letters**.
Equation	A statement showing that **two expressions are equal.**
Formula	Shows the **relationship** between **two or more variables.**
Simplifying Expressions	**Collect 'like terms'.** Be careful with negatives. x^2 and x are not like terms.
Substitute	In algebra it means replacing letters with numbers.
Expand	When we **multiply** a **term** across a bracket, e.g. 3(a + 2) = 3a + 6
Factorise	The **inverse** of **expand**. When we divide an **expression** by all **common factors** or **terms**, e.g. 6g + 4 = 2(3g + 2) and $a^2 - 2a = a(a - 2)$

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Two-Step Equations

$$2x + 12 = 28$$

This is a one-step equation. There are two things happening to the variable (multiply by 2 and add 12).

This shows that 2x+12 is equal to (the same as) 28.
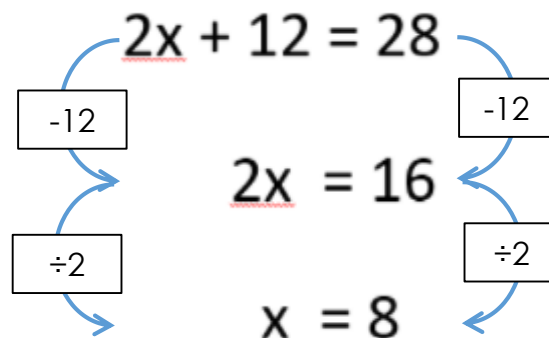
Take the 12 away from both bars.

We can now see that 2 x's are equal (the same as) to 16.

$$2x = 16$$

I have 2 x's so I divide 16 by 2 to work out the value of 1 x.

$$x = 8$$

$$2x + 12 = 28$$
-12 ... -12
$$2x = 16$$
÷2 ... ÷2
$$x = 8$$

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Forming and Solving Equations (challenge)

Here is a four sided shape. The sides are labelled algebraically. We can find an expression for the perimeter by adding up the sides (like we do when finding the perimeter with numbered sides).
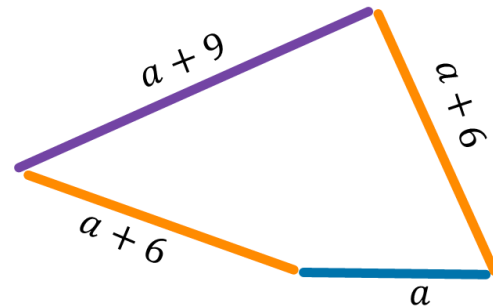
Here are my sides laid out next to each other ready to add together (you don't have to draw the sides, it's the labels that are important).

$$a \; + \; (a + 6) \; + \; (a + 9) \; + \; (a + 6)$$

= 4a + 21 (simplified)

I may then be told that the perimeter of my shape is actually 60cm. I can use this information to form an equation

$$4a + 21 = 60$$

This is a two-step equation that you can then solve (use the section on 'two-step equations' on the previous page).

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