

# Y9 Maths Knowledge Organiser Topic 6: Subject of a Formula

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| <p><b>What must I be able to do?</b></p> <p>You may need to revise the following:</p> <ul style="list-style-type: none"> <li>• <a href="#">Year 8 Topic 5: Solving Equations 2</a></li> <li>• <a href="#">Year 7 Topic 10: Solving Equations 1</a></li> </ul> <p><b>New content:</b></p> <ul style="list-style-type: none"> <li>□ Change the subject of a formula where the subject only appears once</li> <li>➤ Sparx M184</li> </ul> | <p><b>Key vocabulary</b></p> <p><b>Subject of a formula</b>    The <u>letter</u> which appears on <u>one side</u> of the equation <u>by itself</u>.</p> |
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Changing the subject of a formula

This follows the same rules as when solving equations.

e.g. make  $u$  the subject of the formula

$$\begin{array}{l}
 y = 2u + 3p \\
 \left. \begin{array}{l} -3p \\ \div 2 \end{array} \right\} \begin{array}{l} \\ \\ \end{array} \left. \begin{array}{l} \\ \\ \end{array} \right\} \begin{array}{l} -3p \\ \div 2 \end{array} \\
 y - 3p = 2u \\
 \frac{y - 3p}{2} = u
 \end{array}$$

e.g. make  $c$  the subject of the formula

$$m = 5(c - 1)$$

There are 2 options here:

Method 1: expand the bracket first

$$\begin{array}{l}
 m = 5(c - 1) \\
 \left. \begin{array}{l} \text{expand} \\ +5 \end{array} \right\} \begin{array}{l} \\ \\ \end{array} \left. \begin{array}{l} \\ \\ \end{array} \right\} \begin{array}{l} \text{expand} \\ +5 \end{array} \\
 m = 5c - 5 \\
 m + 5 = 5c \\
 \left. \begin{array}{l} \div 5 \end{array} \right\} \begin{array}{l} \\ \\ \end{array} \left. \begin{array}{l} \\ \\ \end{array} \right\} \begin{array}{l} \\ \\ \div 5 \end{array} \\
 \frac{m + 5}{5} = c
 \end{array}$$

Method 2: divide by the coefficient first

$$\begin{array}{l}
 m = 5(c - 1) \\
 \left. \begin{array}{l} \div 5 \end{array} \right\} \begin{array}{l} \\ \\ \end{array} \left. \begin{array}{l} \\ \\ \end{array} \right\} \begin{array}{l} \\ \\ \div 5 \end{array} \\
 \frac{m}{5} = c - 1 \\
 \left. \begin{array}{l} +1 \end{array} \right\} \begin{array}{l} \\ \\ \end{array} \left. \begin{array}{l} \\ \\ \end{array} \right\} \begin{array}{l} \\ \\ +1 \end{array} \\
 \frac{m}{5} + 1 = c
 \end{array}$$

Tip - examiners tell schools that method 1 usually has a higher success rate in an exam than method 2 does!

What order to do each step in?

The order in which you rearrange a formula is vital.

If you are unsure, consider what to do if you were asked to substitute a value into the formula, and follow the usual rules of BIDMAS.

When rearranging, the inverse needs to be done in the **reverse** of this order.

e.g.  $y = 4(x + 7)$

Make  $x$  the subject of the formula.

If we were to give  $x$  a value e.g. 10, we would do

$$10 + 7 = 17 \text{ (add 7)}$$

$$17 \times 4 = 68 \text{ (multiply by 4)}$$

So making  $x$  the subject we need the inverse operations in the opposite order:

Divide by 4.

Subtract 7

The same applies if we have more complicated functions

e.g.  $y = \sqrt{2x+3}$

Again, if we put  $x = 10$  (or any number) in, we would start by doing

$$10 \times 2 = 20 \text{ (multiply by 2)}$$

$$20 + 3 = 23 \text{ (add 3)}$$

$$\sqrt{23} = 4.795... \text{ (using a calculator) (square root)}$$

So to make  $x$  the subject we need to do the inverse operations in the opposite order

Square (opposite of square root)

Subtract 3

Divide by 2