

# Y7 Maths Knowledge Organiser Topic 11: Solving Equations 1

What must I be able to do?	Key vocabulary
<ul style="list-style-type: none"> <li>□ Solve linear equations in one unknown</li> <li>➤ Sparx M707, M509, M554</li> </ul>	<p><b>Equation</b> A mathematical statement that two things are equal to each other. It consists of <u>two expressions</u>, one on each side of the <u>equals sign</u>.</p> <p><b>Solve</b> Find the <u>value</u> of the <u>unknown</u> for which the equation is true.</p>

## Solving equations

You solve an equation by doing the **inverse** (opposite) process.

The inverse of adding (+) is subtracting (-).

The inverse of multiplying (x) is dividing (÷).

The inverse of squaring (²) is square rooting (√).

Whatever is done to one side, must be done to other side too.

e.g. Solve  $3x = 12$

$$\begin{array}{l} 3x = 12 \\ \div 3 \quad \swarrow \quad \searrow \\ x = \frac{12}{3} \\ x = 4 \end{array} \quad \begin{array}{l} \text{We know } 3x \text{ means } x \text{ multiplied by } 3, \text{ so} \\ \text{to get the } x \text{ on its own we need to do} \\ \text{the inverse operation, which means} \\ \text{dividing both sides of the equation by } 3 \end{array}$$

Note: answers may not be integers (whole numbers) or even positive!

You need to be careful about the order that you undo an equation when solving.

e.g. Solve  $4x + 2 = 14$

$$\begin{array}{l} 4x + 2 = 14 \\ - 2 \quad \swarrow \quad \searrow \\ 4x = 12 \\ \div 4 \quad \swarrow \quad \searrow \\ x = 3 \end{array} \quad \begin{array}{l} \text{We do the inverse of the} \\ +2 \text{ first as it is the last} \\ \text{operation being applied} \\ \text{to the } x \\ \\ \text{(4 multiplied by } x \text{ plus 2)} \end{array}$$

vs

e.g. Solve  $\frac{x+2}{4} = 12$

$$\begin{array}{l} \frac{x+2}{4} = 12 \\ \times 4 \quad \swarrow \quad \searrow \\ x + 2 = 48 \\ - 2 \quad \swarrow \quad \searrow \\ x = 46 \end{array} \quad \begin{array}{l} \text{This time we cannot do} \\ \text{the inverse of } +2 \text{ first as} \\ \text{it is not the last operation} \\ \text{being applied to the } x \\ \\ \text{(} x \text{ plus 2 divided by 4)} \end{array}$$

## Solving equations with brackets

The easiest way to do most questions involving brackets is to start by multiplying out the brackets. If you then need simplify (collect the like terms) do so, before proceeding to solve as usual.

e.g. Solve  $3(2x + 5) = 51$

$$\begin{array}{l} 6x + 15 = 51 \\ - 15 \quad \swarrow \quad \searrow \\ 6x = 36 \\ \div 6 \quad \swarrow \quad \searrow \\ x = 6 \end{array}$$

Multiply out the bracket. See Algebra essentials knowledge organiser for a reminder of this.

A harder example.

e.g. Solve  $5(4x - 7) + 2x - 3 = 17$

Step 1. Multiply out the bracket.

$$20x - 35 + 2x - 3 = 17$$

Step 2. Collect like terms

$$22x - 38 = 17$$

Step 3. Solve as normal.

$$\begin{array}{l} 22x - 38 = 17 \\ + 38 \quad \swarrow \quad \searrow \\ 22x = 55 \\ \div 22 \quad \swarrow \quad \searrow \\ x = \frac{55}{22} = \frac{5}{2} \end{array}$$

Here, the final answer did not divide exactly (55 is not in the 22 times table). Write the division as a fraction and then cancel it down. It is fine to leave an answer as a fraction when the division is not a whole number. It could also be changed into a decimal, in this case  $5 \div 2 = 2.5$