

Y9 Maths Knowledge Organiser Topic 3: Solving Linear Equations

What must I be able to do?	Key vocabulary	
<p>You may need to revise the following:</p> <ul style="list-style-type: none"> • Year 8 Topic 4: Algebra 2 • Year 7 Topic 6: Algebra 1 <p>Recap content:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Solve linear equations where the unknown appears on only one side <input type="checkbox"/> Solve equations where the unknown appears in the numerator of a fraction <input type="checkbox"/> Solve equations which involve brackets <input type="checkbox"/> Solve equations where the unknown appears on both sides <p style="margin-left: 20px;">➤ Sparx M707, M509, M554, M387, M957</p>	<p>Linear equation</p>	<p>An equation where the <u>highest power is only 1</u>, e.g. does not contain an x^2 or higher power.</p>

Solving equations which require more steps

e.g. $\frac{2x+6}{3} = 7$

The unknown (x) is on one side of the equals sign only. There is a fraction, a constant term and a coefficient all on the left hand side which need to be dealt with.

- Step 1: Remove the fraction by multiplying all terms by the denominator
- Step 2: Do the inverse of the constant
- Step 3: Do the inverse of the coefficient

So...

$$\begin{array}{lcl}
 \frac{2x+6}{3} = 7 & & \\
 \downarrow \times 3 & & \downarrow \times 3 \\
 2x+6 = 21 & & \\
 \downarrow -6 & & \downarrow -6 \\
 2x = 15 & & \\
 \downarrow \div 2 & & \downarrow \div 2 \\
 x = \frac{15}{2} & & \\
 & & \swarrow \\
 & & \text{This could also be} \\
 & & \text{written as } 7\frac{1}{2} \text{ or } 7.5
 \end{array}$$

e.g. $4n - 9 = 6 + n$

The unknown (n) is on both sides of the equals sign. There is also a constant term on both sides and a coefficient of 4 on the left hand side.

- Step 1: Do the inverse of the smallest amount of n
- Step 2: Do the inverse of the constant
- Step 3: Do the inverse of the coefficient

So...

$$\begin{array}{lcl}
 4n - 9 = 6 + n & & \\
 \downarrow -n & & \downarrow -n \\
 3n - 9 = 6 & & \\
 \downarrow +9 & & \downarrow +9 \\
 3n = 15 & & \\
 \downarrow \div 3 & & \downarrow \div 3 \\
 n = 5 & &
 \end{array}$$

e.g. $3(2-w) = 5(1-w)$

The unknown (w) is on both sides of the equals sign. There are brackets on both sides, coefficients on both sides and both w are negative.

- Step 1: Multiply out the brackets
- Step 2: Do the inverse of the smallest amount of w
- Step 3: Do the inverse of the constant
- Step 4: Do the inverse of the coefficient

So...

$$\begin{array}{lcl}
 3(2-w) = 5(1-w) & & \\
 \downarrow \text{expand} & & \downarrow \text{expand} \\
 6 - 3w = 5 - 5w & & \\
 \downarrow +5w & & \downarrow +5w \\
 6 + 2w = 5 & & \\
 \downarrow -6 & & \downarrow -6 \\
 2w = -1 & & \\
 \downarrow \div 2 & & \downarrow \div 2 \\
 w = -\frac{1}{2} & &
 \end{array}$$

-5w is smaller than -3w so we do the inverse of -5w not the inverse of -3w

e.g. $3x - 8 = \frac{5x}{2} + 4$

The unknown (x) is on both sides of the equals sign. There is also a constant term on each side and a fraction to undo.

- Step 1: Remove the fraction by multiplying all terms by the denominator.
- Step 2: Do the inverse of the smallest amount of x
- Step 3: Do the inverse of the constant

So...

$$\begin{array}{lcl}
 3x - 8 = \frac{5x}{2} + 4 & & \\
 \downarrow \times 2 & & \downarrow \times 2 \\
 6x - 16 = 5x + 8 & & \\
 \downarrow -5x & & \downarrow -5x \\
 x - 16 = 8 & & \\
 \downarrow +16 & & \downarrow +16 \\
 x = 24 & &
 \end{array}$$

The +4 is also multiplied by 2