# Solving Unknown Variables

## The Language of Algebra

Algebra is a type of maths that uses variables to represent numbers. In this unit, you will learn more algebraic terms and how to solve for unknown variables within equations.

### Variables

Variables represent numbers or quantities.
The value they represent can *vary*.

EXAMPLE: $x = 8$

### Equations

Equations are made up of two expressions on either side of an equal sign. These expressions do not have to have the same number of terms (numbers or variables).

EXAMPLE:

(3 terms) $2x + 1 = 7$ (1 term)

### Solve

Solving an equation in algebra is to find the unknown value of a variable. This involves balancing.

Balancing is the method of moving terms around.
We want to move all the terms that we know to one side of the equals sign and isolate the unknown variable.

To move a term across the equals sign,
We use the **opposite** math operation and
apply it to **both** sides of the equation.

EXAMPLE: Solve for $x$ if $2x + 1 = 11$.

$$\begin{aligned} 2x + 1 &= 11 \\ 2x + 1 - \mathbf{1} &= 11 - \mathbf{1} \\ 2x &= 10 \\ 2x \div \mathbf{2} &= 10 \div \mathbf{2} \\ \mathbf{x} &= \mathbf{5} \end{aligned}$$

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M8ALG4.1

Instructions: Solve for the variables in the algebraic equations below.

| 1 | Solve for $x$ if $3(2 + \frac{4x}{5}) = 18$ |
|---|---|

Solve for $x$

Check with substitution.

| 2 | Solve for $x$ if $4x - 3 = \frac{7x + 1}{2}$ |
|---|---|

Solve for $x$

Check with substitution.

**3** Solve for $x$ if $\frac{3x+2}{2} = \frac{58 - 3x}{4}$

Solve for $x$

Check with substitution.

**4** Solve for $x$ if $9 - \frac{2x}{7} = \frac{3x}{7} - 1$

Solve for $x$

Check with substitution.

**5** Solve for $x$ if $\frac{7x}{3} + 19 = 45 - \frac{5x}{9}$

Solve for $x$

Check with substitution.

**6** Solve for $x$ if $\frac{-4(6x+11)}{7} = 2(2 - 3x)$

Solve for $x$

Check with substitution.

**7** Solve for $x$ if $\frac{8(x-3)}{5} = \frac{5(3-3x)+3}{-6}$

Solve for $x$

Check with substitution.

**8** Solve for $x$ if $\frac{3(7x-5)}{2} = \frac{7(1+6x)+2}{3}$

Solve for $x$

Check with substitution.

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Instructions: Solve for the variables in the algebraic equations below.

**1** Solve for $x$ if $\frac{12(x+3)}{3} = -12$

Solve for $x$

Check with substitution.

**2** Solve for $x$ if $\frac{2(2x+1)}{3} = \frac{3x}{2}$

Solve for $x$

Check with substitution.

**3** Solve for $x$ if $\frac{7x}{4} + 2x = 2(2x - 1)$

Solve for $x$

Check with substitution.

**4** Solve for $x$ if $\frac{5x + 12}{11} = \frac{4x - 9}{15}$

Solve for $x$

Check with substitution.

**5** Solve for $x$ if $\frac{3(7x+1)-5}{5} = \frac{9x-8}{2}$

Solve for $x$

Check with substitution.

**6** Solve for $x$ if $\frac{2(100-9x)}{7} = 4(x-6)$

Solve for $x$

Check with substitution.

**7** Solve for $x$ if $\frac{2(x-1)}{(x-1)} = 4(2x-3) - 2(2x-1)$

Solve for $x$

Check with substitution.

**8** Solve for $x$ if $\frac{5x-11}{(x+1)} = \frac{3(x+1)}{(x+1)}$

Solve for $x$

Check with substitution.