# YEAR 10 — DEVELOPING ALGEBRA…
## Representing solutions of equations and inequalities

## What do I need to be able to do?

By the end of this unit you should be able to:

- Form and solve equations and inequalities
- Represent and interpret solutions on a number line as inequalities
- Draw straight line graphs and find solutions to equations
- Form and solve equations and inequalities with unknowns on both sides

## Keywords

**Solution:** a value we can put in place of a variable that makes the equation true

**Variable:** a symbol for a number we don't know yet

**Equation:** an equation says that two things are equal — it will have an equals sign =

**Expression:** numbers, symbols and operators grouped together to show the value of something
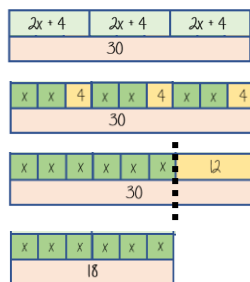
**Identity:** An equation where both sides have variables that cause the same answer includes ≡

**Linear:** an equation or function that is the equation of a straight line

**Intersection:** the point that two lines meet

**Inequality:** an inequality compares two values showing if one is greater than, less than or equal to another.

## Solve equations 🅡

$$3(2x + 4) = 30$$

| 2x + 4 | 2x + 4 | 2x + 4 |
| --- | --- | --- |
| 30 | | |

| x | x | 4 | x | x | 4 | x | x | 4 |
| 30 | | | | | | | | |

| x x x x x x | 12 |
| 30 | |

| x x x x x x |
| 18 |

$$3(2x + 4) = 30$$

Expand the brackets

$$6x + 12 = 30$$
$$-12 \qquad -12$$

$$6x = 18$$
$$-6 \qquad -6$$

| x |
| --- |
| 3 |

$$x = 3$$

Substitute to check your answer. This could be negative or a fraction or decimal

## Form and solve inequalities 🅡

Two more than treble my number is greater than 11

**Form**

$$x \rightarrow \times 3 \rightarrow +2 \rightarrow 11$$

$$3x + 2 > 11$$

**Solve**

$$x \leftarrow \div 3 \leftarrow -2 \leftarrow 11$$

$$x > 3$$

## Solutions on a number line



$$x < 1 \qquad x \leq 1$$

Both represent values less than 1

Includes the value 1
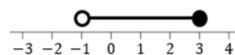
$$x > 1 \qquad x \geq 1$$

Both represent values more than 1

Includes the value 1

● Includes the value it sits above
○ Does NOT include the value it sits above

Values less than or equal to 3 but also more than -1

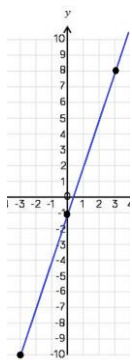$$-1 < x \leq 3$$

This includes the integer values 0,1,2,3

## Plotting straight line graphs 🅡

$$y = 3x - 1$$ → 3 x the x coordinate then − 1

| x | −3 | 0 | 3 |
| --- | --- | --- | --- |
| y | -10 | -1 | 8 |

Draw a table to display this information

This represents a coordinate pair (-3, -10)



You only need two points to form a straight line

Plotting more points helps you decide if your calculations are correct (if they do make a straight line)

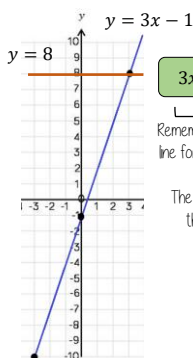Remember to join the points to make a line

## Find solutions graphically

For linear equations there is only one point the graph meets the x value

$$x = 2$$
$$y = 4$$

These two lines will cross at (2,4) because they are just x= and y= they are parallel to axes and meet in one place
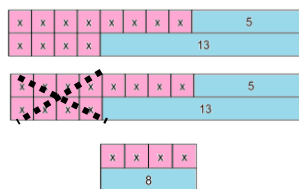


$$y = 3x - 1$$
$$y = 8$$

$$3x - 1 = 8$$

Remember equation of a line format is y = mx + c

The solution is the point the two lines meet

__(3,8)__

## Equations: unknown on both sides 🅡

$$8x + 5 = 4x + 13$$

| x x x x x x x x | 5 |
| 13 | |

| x x x x | x x x x | 5 |
| 13 | | |

| x x x x |
| 8 |

$$8x + 5 = 4x + 13$$
$$-4x \qquad\qquad -4x$$
$$4x + 5 = 13$$
$$-5 \qquad\qquad -5$$
$$4x = 8$$
$$\div 4 \qquad\qquad \div 4$$
$$x = 2$$

## Inequalities: unknown on both sides

$$8x + 5 \leq 4x + 13 \longrightarrow x \leq 2$$



Only value 2 or less will satisfy this inequality