

Is  $(x, y)$  a solution?  $x$  and  $y$  represent values that can be substituted into an equation

Does the coordinate  $(1, 8)$  lie on the line  $y = 3x + 5$ ?

This coordinate represents  $x = 1$  and  $y = 8$

$$y = 3x + 5$$

$$8 = 3(1) + 5$$

As the substitution makes the equation correct the coordinate  $(1, 8)$  IS on the line  $y = 3x + 5$

Is  $(2, 7)$  on the same line?

$$7 \neq 3(2) + 5$$

No 7 does NOT equal 6+5



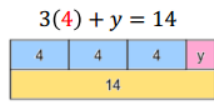
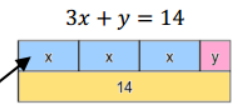
Substituting known variables

A line has the equation  $3x + y = 14$

Two different variables, two solutions

Stephanie knows the point  $x = 4$  lies on that line. Find the value for  $y$ .

$$x = 4$$

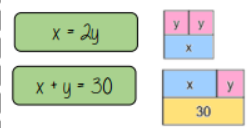


$$12 + y = 14$$

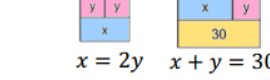
$$-12 \quad -12$$

$$y = 2$$

Substituting in an expression



Substitute  $2y$  in place of the  $x$  variable as they represent the same value



$$3y = 30$$

$$\div 3 \quad \div 3$$

$$y = 10$$

$$x = 2y$$

$$\begin{matrix} 10 & 10 \\ \hline x \end{matrix}$$

$$x = 20$$

Pair of simultaneous equations (two representations)

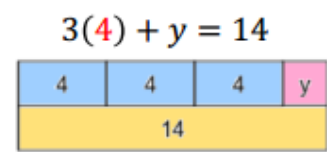
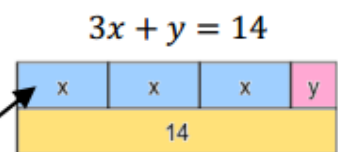
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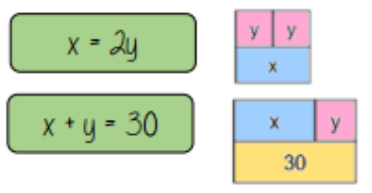


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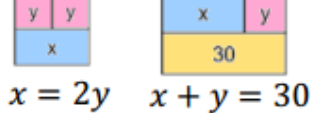
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Pair of simultaneous equations (two representations)

Keywords

**Expression:** numbers, symbols and operators grouped together to show the value of something

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

**Variable:** a symbol for a number we don't know yet or are going to change.

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

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

**Solve:** Find values for the variable(s) that are solutions

**Identity:** An equation where both sides have variables that cause the same answer will have an identity symbol  $\square$ ; cannot be solved

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

**Quadratic:** An expression where the highest exponent of the variable (usually "x") is a square ("x<sup>2</sup>")

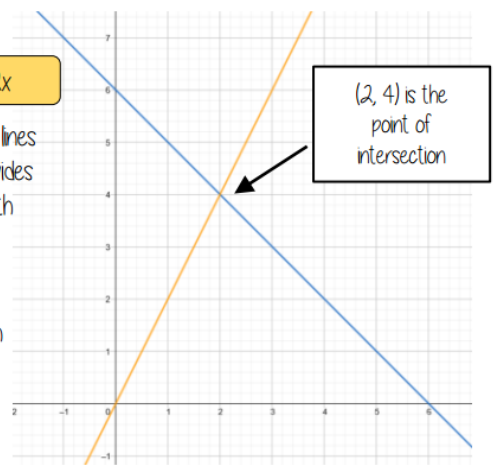
Solve graphically

$$x + y = 6 \quad y = 2x$$

Linear equations are straight lines. The point of intersection provides the  $x$  and  $y$  solution for both equations

The solution that satisfies both equations is

$$x = 2 \text{ and } y = 4$$



## Solutions on a number line



$$x < 1$$

$$x \leq 1$$

$$x > 1$$

$$x \geq 1$$

Both represent values less than 1

Both represent values more than 1

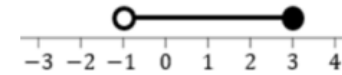
Includes the value 1

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

## Solve by addition

$$\begin{array}{r} 3x + 2y = 16 \\ + 6x - 2y = 2 \\ \hline \end{array}$$

$$\begin{array}{r} 9x = 18 \\ \div 9 \quad \div 9 \\ \hline x = 2 \end{array}$$

$$3x + 2y = 16$$

$$3(2) + 2(y) = 16$$

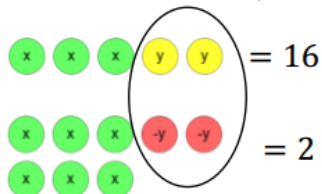
$$6 + 2y = 16$$

$$\begin{array}{r} -6 \quad -6 \\ \hline \end{array}$$

$$2y = 10$$

$$y = 5$$

Addition makes zero pairs

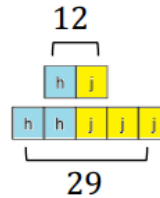


$$x = 2$$

$$y = 5$$

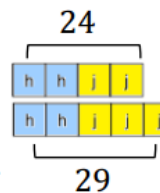
## Solve by adjusting one

$$\begin{array}{r} h + j = 12 \quad \text{No equivalent values} \\ 2h + 3j = 29 \end{array}$$



$$2h + 2j = 24$$

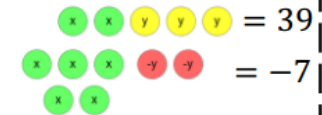
$$2h + 3j = 29$$



By proportionally adjusting one of the equations – now solve the simultaneous equations choosing an addition or subtraction method

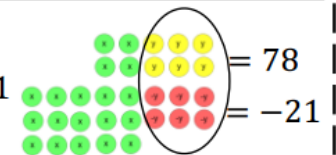
## Solve by adjusting both

$$\begin{array}{r} 2x + 3y = 39 \\ 5x - 2y = -7 \end{array}$$



Use LCM to make equivalent x OR y values. Because of the negative values using zero pairs and y values is chosen choice

$$\begin{array}{r} 4x + 6y = 78 \\ 15x - 6y = -21 \end{array}$$



Now solve by addition

Addition makes zero pairs

Quadratics equations can be solved to find the roots

The roots are where the quadratic graph intersects the x-axis

## Solving Quadratics

There are three ways to solve quadratics:

- Factorising
- The Quadratic Formula
- Completing the Square