Y10 Higher KLT 1 Representing solutions of equations and inequalities

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

$y = 3x + 5$

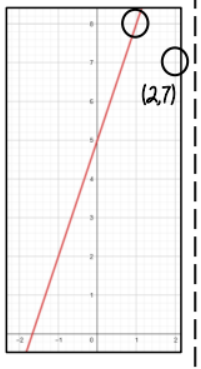
$8 = 3(1) + 5$

Os 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.

$x = 4$

$3x + y = 14$

$3(4) + y = 14$

$12 + y = 14$

$-12 \quad -12$

$y = 2$

Substituting in an expression

$x = 2y$

$x + y = 30$

Pair of simultaneous equations (two representations)

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

$x = 2y$

$x + y = 30$

$3y = 30$

$\div 3 \quad \div 3$

$y = 10$

$x = 2y$

$x = 20$

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 ≡ ; 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^2")

Solve graphically

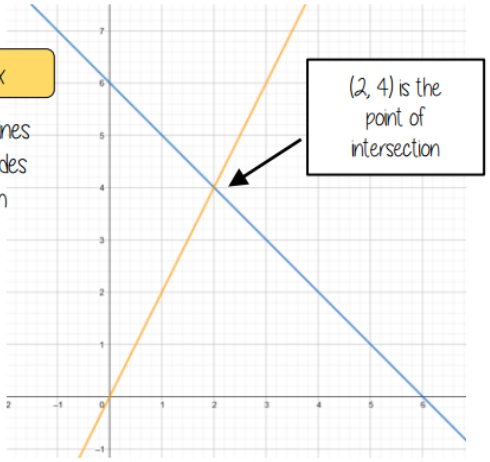
$x + y = 6$

$y = 2x$

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

$x = 2$ and $y = 4$



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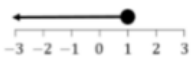
Solutions on a number line

$x < 1$

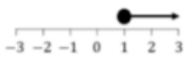


$x \leq 1$

Both represent values less than 1

Includes the value 1

$x > 1$



$x \geq 1$

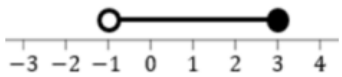
Both represent values more than 1

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



$-1 < x \leq 3$

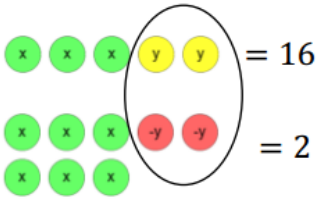
This includes the integer values 0,1,2,3

Solve by addition

$$3x + 2y = 16$$
$$+\ 6x - 2y = 2$$
$$9x = 18$$
$$\div 9 \qquad \div 9$$
$$x = 2$$

$$3x + 2y = 16$$
$$3(2) + 2(y) = 16$$
$$6 + 2y = 16$$
$$-6 \qquad -6$$
$$2y = 10$$
$$y = 5$$

Addition makes zero pairs



$= 16$

$= 2$

$= 18$

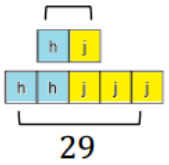
x $= 2$

y $= 5$

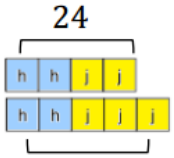
Solve by adjusting one

$$h + j = 12$$
$$2h + 3j = 29$$

No equivalent values



$$2h + 2j = 24$$
$$2h + 3j = 29$$



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

Solve by adjusting both

$$2x + 3y = 39$$
$$5x - 2y = -7$$

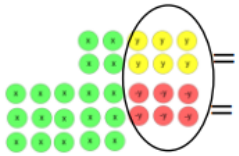
$= 39$

$= -7$

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

$$4x + 6y = 78$$
$$15x - 6y = -21$$

Now solve by addition



$= 78$

$= -21$

Addition makes zero pairs

Solving Quadratics

Quadratics equations can be solved to find the roots

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

There are three ways to solve quadratics:

- Factorising
- The Quadratic Formula
- Completing the Square