

# ALGEBRAIC TECHNIQUES...

# Brackets, Equations & Inequalities

@whisto\_maths

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

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

- Form Expressions
- Expand and factorise single brackets
- Form and solve equations
- Solve equations with brackets
- Represent inequalities
- Form and solve inequalities

## Keywords

- Simplify:** grouping and combining similar terms
- Substitute:** replace a variable with a numerical value
- Equivalent:** something of equal value
- Coefficient:** a number used to multiply a variable
- Product:** multiply terms
- Highest Common Factor (HCF):** the biggest factor (or number that multiplies to give a term)
- Inequality:** an inequality compares two values showing if one is greater than, less than or equal to another

## Form expressions

For unknown variables, a letter is normally used in its place


More than - ADD

Less than/ difference - SUBTRACT

e.g 4 more than t  $\longrightarrow$   $t + 4$   
 8 less than k  $\longrightarrow$   $k - 8$

Only similar terms can be grouped together

e.g Find the perimeter of this shape  
 (Perimeter = length around outside of shape)

t   
 $t + 2t + 1 + t + 2t + 1 \longrightarrow 6t + 2$

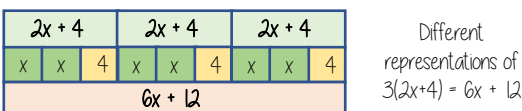
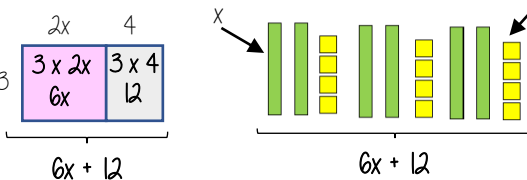
## Directed numbers

$++ \longrightarrow +$   
 $-- \longrightarrow +$   
 $+ - \longrightarrow -$   
 $- + \longrightarrow -$

e.g  $a = -5$  and  $b = 2$   
 $a^2 = a \times a = -5 \times -5 = 25$   
 $b + a = 2 + -5 = -3$

## Multiply single brackets

$3(2x + 4)$



## Factorise into a single bracket

$8x + 4$



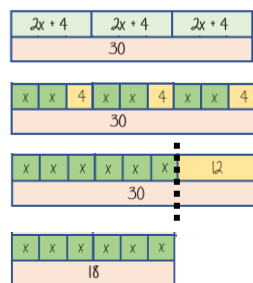
The two values multiply together (also the area) of the rectangle

$8x + 4 \equiv 4(2x + 1)$

Note:  
 $8x + 4 \equiv 2(4x + 2)$   
 This is factorised but the HCF has not been used

## Solve equations with brackets

$3(2x + 4) = 30$



$3(2x + 4) = 30$

Expand the brackets

$6x + 12 = 30$

$-12$

$6x = 18$

$-6$

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

$\frac{x}{3} = 3$

## Simple Inequalities

< less than

$\leq$  Less than or equal to

> More than

$\geq$  More than or equal to

$x < 10$

Say this out loud  
 "x is a value less than 10"

Note:  
 $x < 10$  and  $10 > x$   
 represent the same values

$x + 2 \leq 20$

"my value + 2 is less than or equal to 20"

$x \leq 18$

The biggest the value can be is 18

$10 > x$   
 Say this out loud  
 "10 is more than the value"

## Form and solve inequalities



Two more than treble my number is greater than 11

Find the possible range of values

Form

$x \longrightarrow x3 \longrightarrow +2 \longrightarrow 11$

$3x + 2 > 11$

Solve

$x \longleftarrow -3 \longleftarrow -2 \longleftarrow 11$

$x > 3$

Check

This would suggest any value bigger than 3 satisfies the statement

$3 \times 3 + 2 = 11 \checkmark$

$10 \times 3 + 2 = 32 \checkmark$

## Algebraic constructs

Expression

A sentence with a minimum of two numbers and one maths operation

Equation

A statement that two things are equal

Term

A single number or variable

Identity

An equation where both sides have variables that cause the same answer includes  $\equiv$

Formula

A rule written with all mathematical symbols e.g area of a rectangle  $A = b \times h$