

YEAR 8 — ALGEBRAIC TECHNIQUES...

Brackets, Equations & Inequalities

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

$++ \longrightarrow +$

$-- \longrightarrow +$

$+ - \longrightarrow -$

$- + \longrightarrow -$

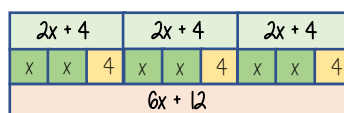
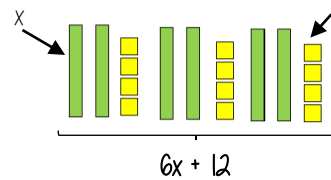
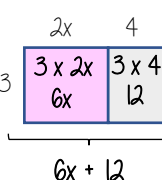
e.g. $a = -5$ and $b = 2$

$a^2 = a \times a = -5 \times -5 = 25$

$b + a = 2 + -5 = -3$

Multiply single brackets

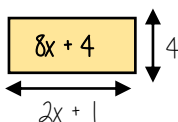
$3(2x + 4)$



Different representations of $3(2x+4) = 6x + 12$

Factorise into a single bracket

$8x + 4$



Try and make this the highest common factor

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

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

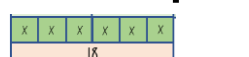
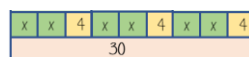
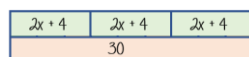
Note:

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

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

-12

$$6x = 18$$

-6

-6

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

$$\begin{matrix} x \\ 3 \end{matrix} \quad x = 3$$

Simple Inequalities

< less than

≤ Less than or equal to

> More than

≥ 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 $A = b \times h$