



Basic Algebra: Brackets, Equations and 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**

eg 4 more than t \longrightarrow $t + 4$
 8 less than k \longrightarrow $k - 8$

Only similar terms can be grouped together

eg Find the perimeter of this shape
 (Perimeter = length around outside of shape)



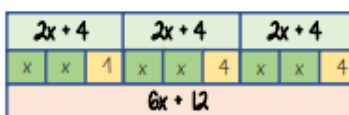
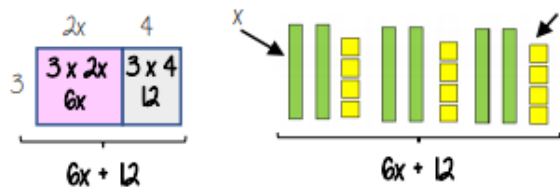
$t + 2t + 1 + t + 2t + 1 \longrightarrow 6t + 2$

Directed numbers

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

eg $a = -5$ and $b = 2$
 $a^2 = a \times a = -5 \times -5 = 25$
 $b + a = 2 + -5 = -3$

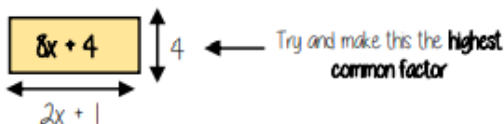
Multiply single brackets



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

Factorise into a single bracket

$$8x + 4$$



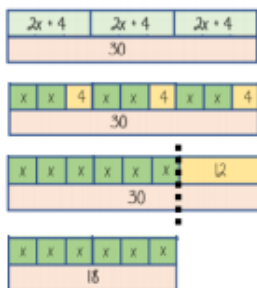
The two values **multiply** together (also the area) of the rectangle

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

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

$$6x + 12 = 30$$

$$-12 \quad -12$$

$$6x = 18$$

$$-6 \quad -6$$

| |
|---|
| x |
| 3 |

 $x = 3$

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

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"

$$10 > x$$

Say this out loud
"10 is more than the value"

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

Form and solve inequalities



Two more than treble my number is greater than 11

Find the possible range of values

Form

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

$$3x + 2 > 11$$

Solve

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

$$x > 3$$

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
eg area of a rectangle $A = b \times h$