Like and unlike terms

Like terms are those whose variables are he same

♡ and 3♡ are **like** terms

the variable is the same

★ 3♡ are **unlike** terms

the variables are NOT the same

Examples and non-examples

Like terms	Un-like terms
y, 7y	y, 7x
$2x^2$, x^2	$2x^2$, $2c^2$
ab, 10ba	ab, 10a
5, -2	5, -2t

Note here ab and ba are commutative operations, so are still like terms

Collecting like terms ≡ symbol

The ≡ symbol means equivalent to

It is used to identify equivalent expressions

Collecting like terms

Only **like terms** can be combined

$4x + 5b - 2x + 10b$

$4x + 5b - 2x + 10b$

$2x + 15b$

Common misconceptions

$2x + 3x^2 + 4x \equiv 6x + 3x^2$

Although they both have the x variable, x2 and x terms are un-like terms so can not be collected

Equivalence

Check equivalence by substitution

e.g. m= 10

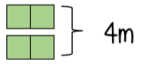
5m	2 x 2m	7m – 3m
5 x 10	2 x (2x10)	(7x10) – (3x10)
= 50	= 2 x 20	= 70 – 30
	= 40	= 40

Equivalent expressions

Repeat this with various values for m to check

5m

2 x 2m



7m – 3m

Substitution into expressions

4y ⟵ 4 lots of 'y'

If y = 7 this means the expression is asking for 4 'lots of' 7

4 x 7 OR 7 + 7 + 7 +7 OR 7 x 4 = 28

e.g. y – 2

= 7 – 2 = 5

Substitution into an expression

$2(x + 3)$

Add 3 to the input then times 2

Put the expression into a function machine

INPUT → + 3 → x 2 → OUTPUT

If x = 10

10 + 3 = 13.... 13 x 2 = 26

Expanding single brackets

Everything outside the bracket must be multiplied by everything inside the bracket, be careful with + and – signs when multiplying

$5(c + 2) = 5c + 10$

$-3(v - 4) = -3v + 12$

$x(x - 5) = x^2 - 5x$

Expand double brackets

Everything in one bracket needs to be multiplied by everything in the other bracket, don't forget to combine like terms.

$(c + 3)(c + 5)$

	c	+ 3
c	c^2	+ 3c
+ 5	+ 5c	+ 15

$(c + 3)(c + 5) = c^2 + 8c + 15$

$(2e - 4)(5e - 3)$

	2e	- 4
5e	$10e^2$	-20e
- 3	-6e	+ 12

$(2e - 4)(5e - 3) = 10e^2 - 26e + 12$

Factorising into a single bracket

When we factorise we find the highest common factor or factors in the terms. The highest common factor is put outside the bracket.

$4b + 6 = 2(2b + 3)$

$2 \times 2 \times b + 2 \times 3$ HCF is 2, 2 goes outside the bracket

$a^2 + 6a = a(a + 6)$

$a \times a + a \times 6$ HCF is a, a goes outside the bracket

$24c^2 - 36c = 12c(2c - 3)$

$12 \times 2 \times c \times c - 12 \times 3 \times c$ HCF is 12c, 12c goes outside the bracket

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Factorising quadratics (no co-efficient)

$$x^2 + 5x + 6$$

To factorise you want it in the form:

$$(x + a)(x + b)$$

Where $a \times b = 6$

And

Where $a + b = 5$

$$(x + 2)(x + 3)$$

Factorising quadratics (with a co-efficient)

$$2x^2 + 9x + 4$$

First multiply your co-efficient by your number term

e.g. $2 \times 4 = 8$

You want it in the form:

$$(2x + a)(2x + b)$$

Where $a \times b = 8$

And

Where $a + b = 9$

$$(2x + 8)(2x + 1)$$

However when we expand this we get $4x^2$ instead of $2x^2$. So we need to divide by our co-efficient of x (2).

$$(2x + 8)(2x + 1)$$

$$\div 2 \downarrow$$

$$(x + 4)(2x + 1)$$

Factorising quadratics (Difference of two squares)

Difference of two squares is a type of quadratic factorisation used when an algebraic expression is made up of a squared term subtracted from another squared term.

$$a^2 - b^2 = (a + b)(a - b)$$

$e.g.$

$4y^2 - 81$

$\sqrt{4y^2} = 2y$ *and* $\sqrt{81} = 9$

Therefore:

$4y^2 - 81 = (2y + 9)(2y - 9)$