Section 5.2: Equivalent Expressions

Learning Targets:

1. Identify like terms.
2. How to combine like terms.
3. Combining like terms in algebraic expressions to simplify the expressions.

Polynomials

- Are made up of _terms_
- _Constant_ terms are just numbers
- _Variable_ terms always have one coefficient (in the front), but can have one or more variables
- The variables each have their own _exponent_

Examples of different terms:

x $2x$ $-x^2$ $-5xy$ $7a^2b$ $-bc^2$

"Like" terms

are groups of **2 or more terms** that share
<u>common characteristics</u>:

- If the terms only have one variable in them, it has to be
the <u>same variable/same exponent</u>
- The terms can have different <u>coefficients</u>,
but the coefficients may also be the same.

Examples of pairs of like terms with one variable:

x and $2x$ 4b and $-5b$

$-3x^2$ and $4x^2$ m^2 and $3m^2$

"Like" terms (cont'd)

- If the terms contain more than one variable, they have to be exactly the same _variables_, and the _exponents_ on all of the variables have to match each other.

Examples of like terms with more than one variable:

xy and $10xy$

$-2a^2b$ and $-3a^2b$

"Like" terms (cont'd)

- _Constant_ terms are always considered to be like terms with other constant terms.

Example:

8 and _-2_ are like terms

½

-0.75

"*Unlike*" terms

- *Terms that do not share the characteristics of like terms.*

Examples of pairs of unlike terms:

$3x$ and $2y$ — different variables

18 and $3m$ — one is a constant term and the other is a variable term

$12ab$ and $5a$ — one has 2 variables and the other has 1 variable

$4x$ and $7x^2$ — the exponts don't match

$-a^2b$ and $8ab^2$ — the exponents don't match

Example:

Each set of terms contains two or more like terms. Identify the like terms:

a) $5b^2$ $3bc$ $\boxed{-2b}$ $7c$ $\boxed{6b}$

b) $\boxed{3x^2}$ $4xy$ $\boxed{-2x^2}$ $\boxed{7x^2}$ $0.5y$

c) $\boxed{3pq}$ $\boxed{11}$ $-4q^2$ $\boxed{-3}$ $\boxed{pq}$

You Try:

a) Give an example of 3 like terms

lots of possibilities

b) Identify the like terms in this list:

6t   (3s) $6t^2$ 6st   (-8s)

Combining Like Terms

Algebraic expressions that contain like terms can be *simplified* by <u>**combining two or more like terms into one term**</u>.

Combining two or more like terms is done by simply _Combining their coefficients_ (*using integer adding rules*) and keeping the variable portion unchanged.

Combining Like Terms

5x and 9x are like terms and can be combined.

Their coefficients are both positive, 5 and 9. Combining 5 + 9 gives us 14.

Therefore, combining 5x and 9x we get

$$14x$$

Combining Like Terms

3b and -8b are like terms and can be combined.

One coefficient is positive, 3, and one coefficient is negative, -8.
Combining 3 + (-8) gives us -5.

Therefore, combining 3b and -8b we get

-5b

Combining Like Terms

$-6y^2$ and $-3y^2$ are like terms and can be combined.

Their coefficients are both negative, -6 and -3.
Combining -6 + (-3) gives us -9.

Therefore, combining $-6y^2$ and $-3y^2$ we get

$$-9y^2$$

Combining Like Terms to Simplify Algebraic Expressions

Rearrange the terms to group the like terms together.
You must move the +/- signs that are in front of each term along with the term.
Then, combine the like terms.

a) $4x - 2x + 3 - 6$

$2x - 3$

Combining Like Terms to Simplify Algebraic Expressions

Rearrange the terms to group the like terms together. You must move the +/- signs that are in front of each term along with the term.
Then, combine the like terms.

b) $(3x^2 + 3x - 1 - x^2 + 4x - 2)$

$$3x^2 - x^2 + 3x + 4x - 1 - 2$$

$$2x^2 + 7x - 3$$

Combining Like Terms to Simplify Algebraic Expressions

Rearrange the terms to group the like terms together. You must move the +/- signs that are in front of each term along with the term.
Then, combine the like terms.

c) $(+4) - x^2 + 2x - 5 + 3x^2 - 2x$

$-x^2 + 3x^2 + 2x - 2x + 4 - 5$

$2x^2 \boxed{+ 0x} - 1$ take out the "zero terms"

$2x^2 - 1$

Classifying polynomials:

In order to call an algebraic expression a "monomial" or "binomial" or "trinomial", etc., we first must make sure the expression does not contain any like terms.

Example:

$4x + 8x$ has two terms but is **NOT** actually a <u>binomial</u> because these are like terms that can be combined

$4x + 8x = 12x$ after combining like terms

This is a **monomial**.

In other words, a **binomial** is a polynomial made up of **TWO UNLIKE TERMS**

And a **trinomial** is a polynomial made up of **THREE UNLIKE TERMS**.

ETC.

So when a problem asks you to "**classify**" a given polynomial, you must combine any like terms before you count the terms to classify the polynomial.

Example:

Combine like terms and then **classify** the polynomial that you have as a result.

a) $(5x - 3x^2 + 2x - x^2)$

$$-3x^2 - x^2 + 5x + 2x$$

$$-4x^2 + 7x$$

binomial

b) $(2x - 6 - 2x + 1)$

$$2x - 2x - 6 + 1$$

$$0x \quad -5$$

$$-5$$

monomial

Check your understanding questions:

pg. 187 - 189
#7, 8, 9, 10, 11, 12

Note: Your textbook sometimes uses the phrase "collect like terms" rather than "combine like terms".

When your textbook says "collect", what you need to do is "combine".