

Algebra

2. Algebraic Expressions – Like or Unlike?

(If you have not done algebra for a while, it may be best to start with *Algebra – 1. From the Specific to the General.*)

Algebra is a method of writing operations in mathematics when we are not dealing directly with specific numbers; that is, it is a way of generalising.

An *algebraic expression* is a way of writing a set of operations involving numbers and symbols. Examples are: 5 , $4x + 3$, $17x^2 - 5x + 2$, $\sqrt{5x} + 7$, and so on.

Algebraic terms are any parts of an algebraic expression which are separated by a $+$ or $-$ sign. For example, in the expression $17x^2 - 5x + 2$, the three terms are: $17x^2$, $-5x$, 2 . (Note that each of these when written on its own is an algebraic expression in its own right.) In the expression $\sqrt{5x} + 7$, the two terms are $\sqrt{5x}$, and 7 .

In a term such as $2x$, 2 is called the *coefficient* of x , and x is called a *variable*, because it may take any value we like, that is, it can *vary*.

Sometimes an expression consists of *like terms* and *unlike terms*. For example, each of the expressions above consists of unlike terms. However, an expression such as $5x + 7 - 3x + 4$ contains the like terms $5x$ and $-3x$, as well as 7 and 4 . We can “collect” these like terms together and find a result: $5x$ and $-3x$ gives $2x$, and $7 + 4$ gives 11 . So our complete expression *simplified* is $2x + 11$.

Here is an expression that also contains some like terms:

$$6x^2 - 1 + 7x^2 - 3x + 5$$

Here the pairs of like terms are $6x^2$ and $7x^2$, and -1 and 5 . ($-3x$ is *unlike* all the other terms.) We can collect the like terms and get $13x^2 - 3x + 4$. (Note that the terms in x^2 are *unlike* the terms in x . This is because x^2 means $x \times x$.)

It doesn't matter what order we write an expression in either, as long as the signs of the terms are correct. For example, we could write $13x^2 - 3x + 4$ as $-3x + 4 + 13x^2$, or as $4 + 13x^2 - 3x$ and so on.

EXERCISES

1. Find the sets of like terms (if any) from each list:

(a) $-1, 5x, 2x^2, 3, -4x^2, -6x$

(b) abc, ab, ba, acb

(c) $-3a, -3ab, -3b$

(d) $-7xy, -7xy^2, -7x^2y, -7x^2y^2$

2. Simplify each of the following algebraic expressions by collecting like terms:

(a) $3x - 2y + 5x - 6y$

(b) $-6 - 4x + 3 - 7x$

(c) $6x^2y - 3x^2y + 2y^2x - 5xy^2$

If you need help with any of the maths covered in this resource (or any other maths topics), you can make an appointment with Learning Development through reception: phone (02) 4221 3977, or Level 2 (top floor), Building 11, or through your campus.



SOLUTIONS TO EXERCISES

1. (a) $-1, 5x, 2x^2, 3, -4x^2, -6x$

The like terms are -1 and 3 , $2x^2$ and $-4x^2$, and $5x$ and $-6x$.

(b) abc, ab, ba, acb

The like terms are abc and acb , ab and ba . Note, abc and acb are identical and ab and ba are also identical. It does not matter in what order we multiply – for example, $3 \times 2 \times 4$ is the same as $3 \times 4 \times 2$.

(c) $-3a, -3ab, -3b$

There are no like terms in this example.

(d) $-7xy, -7xy^2, -7x^2y, -7x^2y^2$

There are no like terms in this example.

2. (a) $3x - 2y + 5x - 6y = 8x - 8y$

(b) $-6 - 4x + 3 - 7x = -3 - 11x$

(c) $6x^2y - 3x^2y + 2y^2x - 5xy^2 = 3x^2y - 3xy^2$

(Note the last two terms in the original expression are like terms, but are written in a different order.)

If you had any trouble with the directed numbers (+ and –), you can refer to *Directed Numbers – Sorting the Positives From the Negatives*.

