

# 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

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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*.

