

## 1.4 - Algebraic Expressions

→ An algebraic expression is just a collection of variables and numbers linked together with operations (addition, multiplication, etc.)

EX

$$2x + 3y + (-1)$$

Diagram illustrating the components of the algebraic expression  $2x + 3y + (-1)$ :

- Variables:  $x$  and  $y$  (indicated by arrows pointing to the variables in the terms).
- Coefficients:  $2$  and  $3$  (indicated by arrows pointing to the numbers in front of the variables).
- Constant term:  $-1$  (indicated by an arrow pointing to the constant).

Terms: separated by addition ~~and subtraction~~

$$\hookrightarrow 2x, 3y, -1$$

Note: An algebraic expression is not an equation!

## Simplifying Algebraic Expressions

### ↳ Combining Like Terms

Like terms have the same variables

EX a)  $x^2y$  and  $3x^2y$  are like terms

b)  $-2x^2y$  and  $xy^2$  are not like terms

EX a)  $4x - 2x + 1 = 2x + 1$

b)  $3x + y - 2x + 4y = x + 5y$

c)  $2x^2y - 1 + 4xy - 2x^2y + xy - 2 = 5xy - 3$

EX a)  $2(3x - y) + 3(y - 2x) = 6x - 2y + 3y - 6x$   
 $= 6x + (-6x) + 3y + (-2y)$   
 $= y$

$$\begin{aligned}
 \text{b) } 2x(x+y) - 3(x-2xy) &= 2x(x+y) + (-3)(x-2xy) \\
 &= 2x \cdot x + 2xy + -3x + (-3)(-2xy) \\
 &= 2x^2 + 2xy - 3x + 6xy \\
 &= 2x^2 + 8xy - 3x
 \end{aligned}$$

(2)

$$\begin{aligned}
 \text{c) } 5x - 2x[3 + 2(x-7)] &= 5x - 2x[3 + 2x - 14] \quad \rightarrow \text{innermost parentheses first} \\
 &= 5x + (-2x)[2x + (-11)] \\
 &= 5x + (-2x)(2x) + (-2x)(-11) \\
 &= 5x + (-4x^2) + (22x) \\
 &= 27x - 4x^2
 \end{aligned}$$

## Evaluating Algebraic Expressions

↳ plug in a specific value for the variables

EX: a) Evaluate  $2x - 3$  when  $x = 2$

$$\begin{aligned}
 2 \cdot 2 - 3 &= 4 - 3 \\
 &= 1
 \end{aligned}$$

b) Evaluate  $3x - 2y$  when  $x = 2, y = -1$

$$\begin{aligned}
 3 \cdot 2 - 2(-1) &= 6 - (-2) \quad \rightarrow \text{subtracting a negative is adding} \\
 &= 8
 \end{aligned}$$

c) Evaluate  $\frac{x^2}{x+4}$  when  $x = -2$

$$\frac{(-2)^2}{-2+4} = \frac{(-2)(-2)}{-2+4} = \frac{4}{2} = 2$$

→ we can evaluate an expression at another expr

Ex a) Evaluate  $2x - 3$  at  $x = y - 1$

$$\begin{aligned} 2(y-1) - 3 &= 2y - 2 - 3 \\ &= 2y - 5 \end{aligned}$$

b) Evaluate  $\frac{x-2}{3x+1}$  at  $x = u^2 + 2$

$$\begin{aligned} \frac{(u^2+2)-2}{3(u^2+2)+1} &= \frac{u^2+2-2}{3u^2+6+1} \\ &= \frac{u^2}{3u^2+7} \end{aligned}$$

Ex The area of a rectangle is given by the expression  $lw$  where  $l$  is the length and  $w$  is the width. What is the area of a rectangle with length 2 inches and width 6 inches?

$$(2 \text{ inches})(6 \text{ inches}) = 12 \text{ inches}^2$$

Ex Volume of rectangular solid is given by  $lwh$  where  $l$  is length,  $w$  is width,  $h$  is height. What is the volume if the length is 3 feet, the width is 6 feet and the height is 6 inches?

↳ need consistent units! 6 inches =  $\frac{1}{2}$  foot, so  $h$  is  $\frac{1}{2}$  foot

$$\text{Volume is } (3 \text{ ft})(6 \text{ ft})(\frac{1}{2} \text{ ft}) = \frac{3}{1} \cdot \frac{6}{1} \cdot \frac{1}{2} \text{ ft}^3 = 9 \text{ ft}^3$$