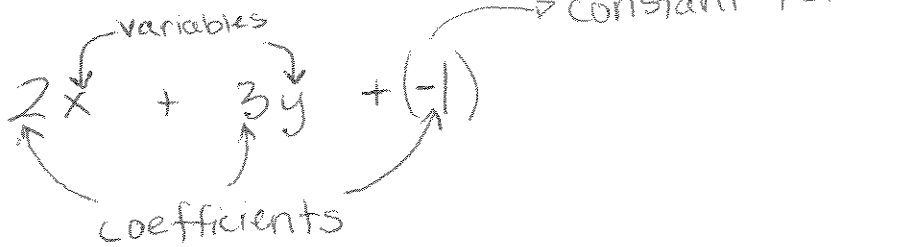
1.4 - Algebraic Expressions

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

Ex



Terms: separated by addition

↳ $2x$, $3y$, -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) $2(3x - y) + 3(y - 2x) = 6x - 2y + 3y - 6x$

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

$= y$

b) $2x(x+y) - 3(x-2xy) = 2x(x+y) + (-3)(x + -2xy)$

$= 2x \cdot x + 2xy + -3x + (-3)(-2xy)$

$= 2x^2 + 2xy - 3x + 6xy$

$= 2x^2 + 8xy - 3x$

c) $5x - 2x[3 + 2(x-7)] = 5x - 2x[3 + 2x - 14]$ → innermost parentheses first

$= 5x + (-2x)[2x + (-11)]$

$= 5x + (-2x)(2x) + (-2x)(-11)$

$= 5x + (-4x^2) + (22x)$

$= 27x - 4x^2$

Evaluating Algebraic Expressions

↳ plug in a specific value for the variables

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

$2 \cdot 2 - 3 = 4 - 3$

$= 1$

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

$3 \cdot 2 - 2(-1) = 6 - (-2)$ → subtracting a negative is adding

$= 8$

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 $x=y-1$

$$2(y-1)-3 = 2y-2-3$$
$$= 2y-5$$

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

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

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

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