M9 - 5.1 - Algebraic Expressions Notes

Coefficient: a number in front of (multiplying) a variable

Coefficient $= 4 \longrightarrow 4x^2 \longleftarrow$ Exponent/Power $= 2$

Letter/Variable/Base $= x$

Exponent: $3^2 = 3 \times 3$
$5^3 = 5 \times 5 \times 5$

Variable: a letter

Like term: Same Letter(s), Same Exponent(s).

Term:	Like Terms:
2	$1, 5, -12, 4, 5, -6, \ldots$
a	$4a, 2a, -5a, 4a, \ldots$
xy	$2xy, -3xy, 4xy, \ldots$
a^2	$a^2, -2a^2, 3a^2, 4a^2, \ldots$
x^2y	$2x^2y, -3x^2y, , \ldots$

$a + 1 = a + 1$ You can only add and subtract like terms.

$x + x^2 = x + x^2$ You cannot add or subtract unlike terms.

Degree of term: The Variable Exponent or Sum of Variable Exponents.

Degree of polynomial: Degree of Leading term.

Leading Term: The Term with the Highest Degree.

Leading Coefficient: Coefficient of Highest Degree Term

Term:	Degree:
x^2	②
$x = x^1$	①
$x^2(y^3)$	⑤
$8 = 8x^0$	⓪

Numbers have a degree of "0"

Polynomial:	Leading Term:	Degree of Polynomial:	
$x^2 - 4$	x^2	②	
$2x^2 - 5x^3$	$-5x^3$	③	
$\sqrt{3}x + 2$	$\sqrt{3}x^1$	①	$\sqrt{3} = 1.73$
$2^{-3}x^2y + 2x + 2$	$2^{-3}x^2y^1$	③	$2^{-3} = \dfrac{1}{8}$

Polynomial: Terms with Variables with Whole Number Exponents. (ie. 0,1,2,3...)

Examples:

Monomial: One term. $2, x, x^2, 2xy, 5z, 10$

Binomial: Two terms. $x + 2, x^2 - 4, xy + 5, 3x^2 + y^2, 2x^2 + x$

Trinomial: Three terms. $x^2 + 5x + 6, a + b + c$

Polynomial: Any # $2, x + 2, x^2 + 5x + 6, a + b + c + d + e$

Polynomial: Monomials, Binomials, Trinomials and more than three terms.

Not Polynomial

$x^{-2}, x^{\pi}, 2^x, \dfrac{1}{x}, \sqrt{x}, logx, sinx$

M9 - 5.2 - Combining Like Terms Notes

Adding and Subtracting Like Terms:

$x + x =$ (2x) $3y + 2y =$ (5y) $x^2 + x^2 =$ (2x^2) $-9xy + 7xy =$ (-2xy)

Add/Subtract Coefficients.

Combine Like Terms

$2 + x + 3 =$
$x + 2 + 3$ Rearrange Order of Terms

(x + 5)   Combine Like Terms

$3x + 1 - x =$
$3x - x + 1$

(2x + 1)

Subtract Coefficients

Rearrange Coefficient!
Combine

$3x - 1x = 2x$
$3 - 1 = 2$

$3 + x^2 + 2x - 1 + 3x^2 + x =$ Rearrange Order of Terms
$x^2 + 3x^2 + 2x + x + 3 - 1$

(4x^2 + 3x + 2)   Combine Like Terms

Highest to Lowest Degree
ie. $x^2 + \#x + \# \ldots$

$x + 3x^2 = 4x^2 \qquad -2x + x = -1x \qquad 3 - 1 = 2$

Combine Like Terms

(5) $- x$ (+ 2) $=$ Circle Like Terms   Remember to Circle the Sign!

(7 - x) $5 + 2 = 7$

(2x) $- 3$ (+ 3x) $=$ Do like term addition and subtraction off to the right.

(5x - 3) $2x + 3x = 5x \qquad 2 + 3 = 5$
Add Coefficients

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

(-3x + 3)

$-2x - x = -3x$
$-2 - 1 = -3$

(5x) $- 2$ (- 2x) $+ 3$ $=$ Square Like Terms

(3x + 1)

$5 - 2 = 3$
$5x - 2x = 3x$

(-3) $- 2x$ (+ 1) $+ 6x$ $=$

(4x - 2)

$-2x + 6x = 4x$
$-2 + 6 = 4$

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

$x^2 + 3x - 2x^2 - 1 - 2x$ Cloud Like Terms

$\cancel{x^2} + \cancel{3x} - \cancel{2x^2} - \cancel{1} - \cancel{2x}$

(-x^2 + x - 1)

$x^2 - 2x^2 = -x^2$
$1 - 2 = -1$

$3x - 2x = 1x$
$3 - 2 = 1$

$-1 = -1$

Remember to cross off terms you have dealt with.

$5xy + 2yx = 7xy$
$\qquad 5 + 2 = 7$

$xy = yx$ They are the same $x^2y^3 = y^3x^2$

$3x^2y^3 - 5y^3x^2 = -2x^2y^3$
$3 - 5 = -2$

M9 - 5.3 - Multiplying/Dividing Polynomials Notes

Multiplying

$a \times a = \boxed{a^2}$ $\qquad$ $2a \times 3a = \boxed{6a^2}$ $\qquad$ $-3x^2y \times 5x^3 = \boxed{-15x^5y}$

Multiply Coefficients
Add Exponents

$2x \times 3x^2 = \boxed{6x^3}$ $\qquad$ $abcd \times efg = \boxed{abcdefg}$

Dividing

$20x^3 \div -5x^2 = \boxed{-4x}$ $\qquad$ $30a^4 \div 6a^2 = \boxed{5a^2}$ $\qquad$ $\dfrac{12x^2}{6x} = \boxed{2x}$

Divide Coefficients
Subtract Exponents

$\dfrac{6x}{2} = \boxed{3x}$ $\qquad$ $\dfrac{8x}{2x} = \boxed{4}$ $\qquad$ $\boxed{\dfrac{x}{x} = 1}$ $\qquad$ $\dfrac{4x}{2x^2} = \boxed{\dfrac{2}{x}}$

$\dfrac{8x + 4}{2} =$

$\dfrac{8x}{2} + \dfrac{4}{2}$ $\qquad$ Separate into two fractions
Divide

$\boxed{4x + 2}$

$$\boxed{\dfrac{a+b}{c} = \dfrac{a}{c} + \dfrac{b}{c}}$$

$\dfrac{9x^2 + 6x}{3x} =$

$\dfrac{9x^2}{3x} + \dfrac{6x}{3x}$

$\boxed{3x + 2}$

$\dfrac{1}{2}(8x + 4) =$

$\dfrac{8x + 4}{2}$ $\qquad$ Distribute

$\boxed{\cdots}$

$-\dfrac{2x + 4}{2} =$

$-\left(\dfrac{2x + 4}{2}\right)$ $\qquad$ Separate into two fractions

$-\left(\dfrac{2x}{2} + \dfrac{4}{2}\right)$ $\qquad$ Divide

$-(x + 2)$

$\boxed{-x - 2}$ $\qquad$ Distribute

$\dfrac{x^3}{x^2} = \dfrac{x \times \cancel{x} \times \cancel{x}}{\cancel{x} \times \cancel{x}} = x$ $\qquad\qquad$ $\dfrac{x^3}{x^2} = x$

$\dfrac{x^2}{x} = \dfrac{x \times \cancel{x}}{\cancel{x}} = x$ $\qquad\qquad$ $\dfrac{x^2}{x} = x$

$\dfrac{x^3}{x} = \dfrac{x \times x \times \cancel{x}}{\cancel{x}} = x^2$ $\qquad\qquad$ $\dfrac{x^3}{x} = x^2$

$\dfrac{x}{x} = 1$ $\qquad\qquad\qquad\qquad\qquad$ $\dfrac{x}{x} = 1$

$\dfrac{x}{x^2} = \dfrac{\cancel{x}^1}{x \times \cancel{x}} = \dfrac{1}{x}$ $\qquad\qquad$ $\dfrac{x}{x^2} = \dfrac{1}{x}$

M9 - 5.4 - Distribution "FOIL" Notes

Expand and Simplify

$2(x+3)$ Distribute/Multiply
$2x+6$

Negative Distribution

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

$5-(x-2)$	Don't Distribute
$5-x+2$	the 5

Backwards Distribution

$(x+2)(3)$
$3x+6$

Expand and Simplify

$(x+2)(x+3)=$ "FOIL" Method

$(x+2)(x+3)=$

F - multiply **First** numbers in brackets
O - multiply **Outside** numbers in brackets
I - multiply **Inside** numbers in brackets
L - multiply **Last** numbers in brackets

$x^2+3x+2x+6=$
x^2+5x+6

Combine like terms.

Quick Method
$(x+2)(x+3)=$
x^2+5x+6

Multiply and combine like
terms in the same step.

Alternative Method:
$(x+2)(x+3)=$
$x(x+3)+2(x+3)$
$x^2+3x+2x+6$
x^2+5x+6

$(x+2)^2$
$(x+2)(x+2)$
$x^2+2x+2x+4$ FOIL
                   Combine
x^2+4x+4 Like Terms

$-(x+2)(x+4)$
$-(x^2+4x+2x+8)$
$-(x^2+6x+8)$
$-x^2-6x-8$

FOIL
Combine
Like Terms
Distribute

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

$2x^2+6x-8$

Expand and Simplify

$(x+3)(x^2-2x+8)$

$(x+3)(x^2-2x+8)$ Triple FOIL

$(x+1)(x+2)(x-3)$ FOIL
$(x^2+2x+1x+2)(x-3)$ Combine
$(x^2+3x+2)(x-3)$ Like Terms
...   Then Triple FOIL

$x^3-2x^2+8x+3x^2-6x+24$
$x^3+x^2+2x+24$ Combine
                    Like Terms

$(x+4)+2(x-1)$
$x+4+2x-2$ Distribute
             Combine
$3x+2$ Like Terms

$(x-2)-(x+1)(x-3)$
$x-2-(x^2-3x+x-3)$
$x-2-(x^2-2x-3)$ FOIL
$x-2-x^2+2x+3$ Distribute
                   Combine
$-x^2+3x+1$ Like Terms

Algebra Tiles $2x-1$

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

| Check |
| by FOIL |

$\times$

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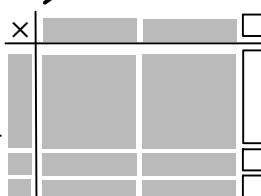
$2x^2+4x-x-2$

$2x^2+3x-2$

Legend
$= x^2$ $= -x^2$
$= x$ $= 1$
$= -x$ $= -1$