**Important Vocabulary**

Term – A number, variable or product of numbers and variables

Like/similar terms – Two or more terms that have the same variable(s) with the same exponents

Unlike terms – Two or more terms with different variables and/or different powers

Monomial – A single variable or number, or a product of a coefficient and one or more variables with exponents that are whole numbers

Binomial – A polynomial with two terms

Trinomial – A polynomial with three terms

Simplest form – When a polynomial contains no like terms

Standard form – When a polynomial is written with the exponents in descending order

Coefficient – The number being multiplied to the variable (written in front of variable)

Leading coefficient – The coefficient of the variable with the highest degree

Constant – A number that is not attached to any variable

Variable – A letter or symbol used to replace a number

Degree of a polynomial – the degree of the monomial with the greatest exponent

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**Laws of Exponents**

⇒ Anything to the FIRST power is ITSELF

\[ 20^1 = 20 \]

⇒ Anything to the ZERO power is ONE

\[ 20^0 = 1 \]

⇒ When MULTIPLYING exponents that have the same base, ADD the powers

\[ x^2 \cdot x^4 = x^6 \]

⇒ When DIVIDING exponents that have the same base, SUBTRACT the powers

\[ x^{10} \div x^8 = x^2 \]

⇒ When raising an exponent to another power, MULTIPLY the powers.

\[ (x^2)^4 = x^8 \]

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**Polynomial**

An expression made up of variables and constants. The exponents are always WHOLE NUMBERS!!!

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**Adding/Subtracting Polynomials**

1. Distribute
2. Combine like terms
3. Write your answer in standard form

**Tips:**

- Powers NEVER change
- Write in coefficients of 1
  
  EX: \(2x + x = 2x + 1x = 3x\), not 2x
- Be careful when distributing a negative
  
  EX: \((3x + 1) - (2x - 4) = 3x + 1 - 2x + 4\)
- Subtract \(x\) from \(y\) looks like \(y - x\)
- SUM or TOTAL means ADD
- DIFFERENCE means SUBTRACT
- PERIMETER means add up ALL of the sides

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**Multiplying Polynomials**

1. Write in exponents and coefficients of 1
2. Distribute (if necessary)
3. Multiply coefficients
4. Multiply variables by ADDING powers (or if power to a power MULTIPLY)

**Tips:**

- Use the LAWS OF EXPONENTS
- Powers ALMOST ALWAYS change
- PRODUCT means MULTIPLY
- Be careful of integers
- Pay attention to what type of polynomials you start with (never end with more terms than your largest polynomial)
  
  EX: \((4x^1y^2z^3)(2x^2y^3z^2) = 8x^3y^5z^4\)
  
  (mono*mono = mono)
- Expand whenever you see a power
  
  EX: \((5x)^3 = 5x \cdot 5x \cdot 5x = 125x^3\)
  
  EX: \((x + 2)^2 = (x + 2)(x + 2)\)
- AREA and VOLUME means multiply

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**Adding vs. Multiplying**

<table>
<thead>
<tr>
<th>Simplify: (3x^2 + 5x^2)</th>
<th>(3x^2 \cdot 5x^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add coefficients (8x^2)</td>
<td>Multiply coefficients (15x^4)</td>
</tr>
</tbody>
</table>

Powers don't change

Add powers
Factoring Completely

- Remember: we always RE-WRITE and NEVER change the value of an expression.
- Always check by multiplying back through to make sure you get what you started with (or use calculator magic number technique).

<table>
<thead>
<tr>
<th>(binomial)(binomial)</th>
<th>(binomial)²</th>
<th>(binomial)(trinomial)</th>
</tr>
</thead>
<tbody>
<tr>
<td>((x + 3)(x - 7))</td>
<td>((x - 5)²)</td>
<td>((x - 1)(x² + 3x - 2))</td>
</tr>
<tr>
<td>(x(x - 7) + 3(x - 7))</td>
<td>((x - 5)(x - 5))</td>
<td>(x(x² + 3x - 2) - 1(x² + 3x - 2))</td>
</tr>
<tr>
<td>(x² - 7x + 3x - 21)</td>
<td>(x² - 5x - 5x + 25)</td>
<td>(x² - 2x - 1x² - 3x + 2)</td>
</tr>
<tr>
<td>(x² - 4x - 21)</td>
<td>(x² - 10x + 25)</td>
<td>(x² + 3x² - 5x + 2)</td>
</tr>
</tbody>
</table>

Double Distributing (and beyond)

Be careful of INTEGER RULES!

Completing the Square

Example:

\[ x^2 - 8x + 22 \]

\[ \frac{x^2 - 8x + 22}{(x - 4)(x - 4)} + 22 - 16 \]

\[ (x - 4)^2 + 6 \]

\[ x^2 - 8x + 22 \]

is the same as

\[ (x - 4)^2 + 6 \]

Closure

A set is CLOSED under an operation if it produces a member of that same set. Polynomials are closed under addition, subtraction, multiplication but NOT division.

**EXAMPLES:**

- **Addition:** \(3x^2 + 8x² = 11x²\)
- **Subtraction:** \(3x^2 - 8x² = -5x²\)
- **Multiplication:** \(3x^2 \cdot 8x² = 24x⁴\)
- **NON-EXAMPLE:** \(\frac{10x^3}{5x^8} = 2x^{-5} \quad \text{NOT a polynomial}\)