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Secondary 2H: UNIT 1
Lesson 1

Warm-up:

<p>1. Simplify</p> <p>a. $x^2 \cdot x^4 = x^{2+4} = \boxed{x^6}$</p> <p>b. $(x^3)^5 = x^{3 \cdot 5} = \boxed{x^{15}}$</p>	<p>2. Rewrite the following without negative exponents</p> <p>a. $(5x)^{-3} = \frac{1}{5^3 x^3} = \boxed{\frac{1}{125x^3}}$</p> <p>b. $2x^{-4} = \boxed{\frac{2}{x^4}}$</p>
<p>3. Solve for x</p> $\begin{array}{r} 5x - 3 = 12 \\ +3 \quad +3 \\ \hline 5x = 15 \\ \frac{5x}{5} = \frac{15}{5} \end{array} \quad \boxed{x = 3}$	<p>4. Multiply</p> $x(x+4) = \boxed{x^2 + 4x}$

By the end of this lesson, I can...

- identify the parts of an expression, such as terms, factors, and coefficients, bases, exponents, and constant
- add and subtract polynomials. I can multiply polynomials using the distributive property, and then simplify

1.1 Algebraic Expressions and Their Parts

When we combine numbers and/or variables using addition, subtraction, multiplication, and division, we form an algebraic expression.

The terms of an algebraic expression are those parts that are separated by addition.

⇒ Parts of an algebraic expression:

$$5x^4 + 3x^2y^3 - 2x + 4 \rightarrow \begin{array}{l} \text{constant} \\ \text{term} \end{array}$$

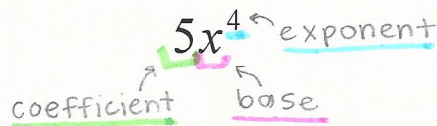
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Terms

Practice:

Identify the terms of each algebraic expression. If applicable, identify the constant term of the expression.

Algebraic Expression	Terms	Constant Term
$10xy + 5$	$10xy, 5$	5
$4h^2 - 3k^2 - 5h + 9m$	$4h^2, -3k^2, -5h, 9m$	NONE
$t^2 - 3t + \frac{1}{t}$	$t^2, -3t, \frac{1}{t}$	NONE
$-7y^2 + 2y - 8$	$-7y^2, 2y, -8$	-8

⇒ Parts of a term:



Practice:

Identify the parts of each term.

Term	Coefficient	Base	Exponent
$9u^8$	9	u	8
$\frac{5}{3}t$	$\frac{5}{3}$	t	1
$\frac{x^4}{2}$	$\frac{1}{2}$	x	4

1.2 Polynomials

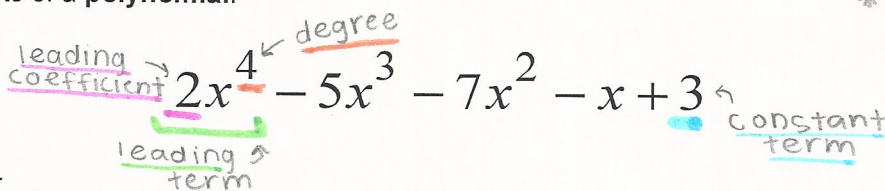
A **polynomial** is a kind of algebraic expression. Polynomials are formed by adding and subtracting terms.

They DO NOT have

- square roots of variables
- fractional powers
- no variable in the denominator

Polynomials	Not Polynomials....WHY??
$x^4 + 4x^3 - 2x^2 - 3$	$5\sqrt{x} + 2$ because of \sqrt{x}
$-6x^5 - 2x + 1$	$3x^{2/3} + 4$ because of $x^{2/3}$ (fractional powers)
$5x^3 - 4$	$\frac{-1}{2x} - 3x^2$ because $\frac{-1}{2x}$

⇒ Parts of a polynomial:



* Note: The exponents go in descending order ALWAYS!!

Practice:

Determine if the following functions are polynomials. If so, state the degree and leading coefficient.

- $f(x) = 3x^{-5} + 17$ Not a polynomial because x is raised to -5 .
- $f(x) = -9 + 2x$ polynomial, degree = 1, leading coefficient = 2
- $f(x) = \sqrt[3]{27x^3 + 8x^6}$ Not a polynomial because of cubed root
- $f(x) = 8$ polynomial, degree = 0, leading coefficient = 8
- $f(x) = 3x^2 + x - \frac{1}{x}$ Not a polynomial because $\frac{1}{x}$

Operations on Polynomials (Addition and Subtraction)

To add or subtract polynomials, we combine like terms.

Practice:

Simplify each expression. Write your answers in standard form. Determine if the result is a polynomial. If it is a polynomial, state the degree, leading term and leading coefficient.

1. $(x^2 - 3x + 7) + (3x^2 + 5x - 3)$

$$= 4x^2 + 2x + 4$$

polynomial, degree: 2

leading term: $4x^2$

leading coefficient: 4

3. $(3a^2 + 4a + 1) - (2a^2 + 7a + 4)$

$$= a^2 - 3a - 3$$

polynomial, degree: 2

leading term: a^2

leading coefficient: 1

2. $(5p^2 - 3) + (2p^2 - 3p^3)$

$$= -3p^3 + 7p^2 - 3$$

polynomial, degree: 3

leading term: $-3p^3$

leading coefficient: -3

4. $(x^3 - 2x^2 - 5x + 1) - (3x^3 - 8x^2 + 2x - 8)$

$$= -2x^3 + 6x^2 - 7x + 9$$

polynomial, degree: 3

leading term: $-2x^3$

leading coefficient: -2

Operations on Polynomials (Multiplication)

To multiply polynomials, we use the distributive property.

In the next problems, remember to distribute both terms of the first expression. (In other words FOIL!)

5. $(x-3)(6x-2)$

$$= 6x^2 - 2x - 18x + 6$$

$$= 6x^2 - 20x + 6$$

6. $(2a-1)(8a-5)$

$$= 16a^2 - 10a - 8a + 5$$

$$= 16a^2 - 18a + 5$$

7. $(2n+2)(6n+1)$

$$= 12n^2 + 2n + 12n + 2$$

$$= 12n^2 + 14n + 2$$

8. $(x-4)(x+4)$

$$= x^2 + 4x - 4x - 16$$

$$= x^2 - 16$$

Find the area of the rectangle below in two different ways.

9.

	$5x$	9
$2x$	$10x^2$	$18x$
4	$20x$	36

$$\text{Area} = 10x^2 + 18x + 20x + 36$$

$$= 10x^2 + 38x + 36$$

Fill in the missing information.

10.

	$3x$	8
	$?$	$?$
x	$3x^2$	$8x$
2	$6x?$	$16?$

$$\text{Area} = 3x^2 + 8x + 6x + 16$$

$$= 3x^2 + 14x + 16$$

Recall that when we square an expression, we multiply it by itself.

So, $(x+2)^2$ is the same as $(x+2)(x+2)$.

Rewrite the following as a product of two expressions and then simplify. (FOIL)

11. $(x-3)^2 = (x-3)(x-3)$

$$= x^2 - 3x - 3x + 9$$

$$= \boxed{x^2 - 6x + 9}$$

12. $(4p-1)^2 = (4p-1)(4p-1)$

$$= 16p^2 - 4p - 4p + 1$$

$$= \boxed{16p^2 - 8p + 1}$$

13. $(6k+5)^2 = (6k+5)(6k+5)$

$$= 36k^2 + 30k + 30k + 25$$

$$= \boxed{36k^2 + 60k + 25}$$

Practice:

Simplify each expression.

1. $3x(2x^2 + 6x - 5)$

$$= \boxed{6x^3 + 18x^2 - 15x}$$

2. $(x^2 + 4)(10x - 3)$

$$= \boxed{10x^3 - 3x^2 + 40x - 12}$$

3. $2x^2(5x - 2) + 3x(7x^2 + 2)$

$$= \underline{10x^3} - \underline{4x^2} + \underline{21x^3} + \underline{6x}$$

$$= \boxed{31x^3 - 4x^2 + 6x}$$

4. $(5x^3 - 1)^2 = (5x^3 - 1)(5x^3 - 1)$

$$= \underline{25x^6} - \underline{5x^3} - \underline{5x^3} + \underline{1}$$

$$= \boxed{25x^6 - 10x^3 + 1}$$

And, finally, something a little different. Watch your bases!

5. $5m^2(3m - 2n) + 4n(3m^2 - n)$

$$= \underline{15m^3} - \underline{10m^2n} + \underline{12m^2n} - \underline{4n^2}$$

$$= \boxed{15m^3 + 2m^2n - 4n^2}$$