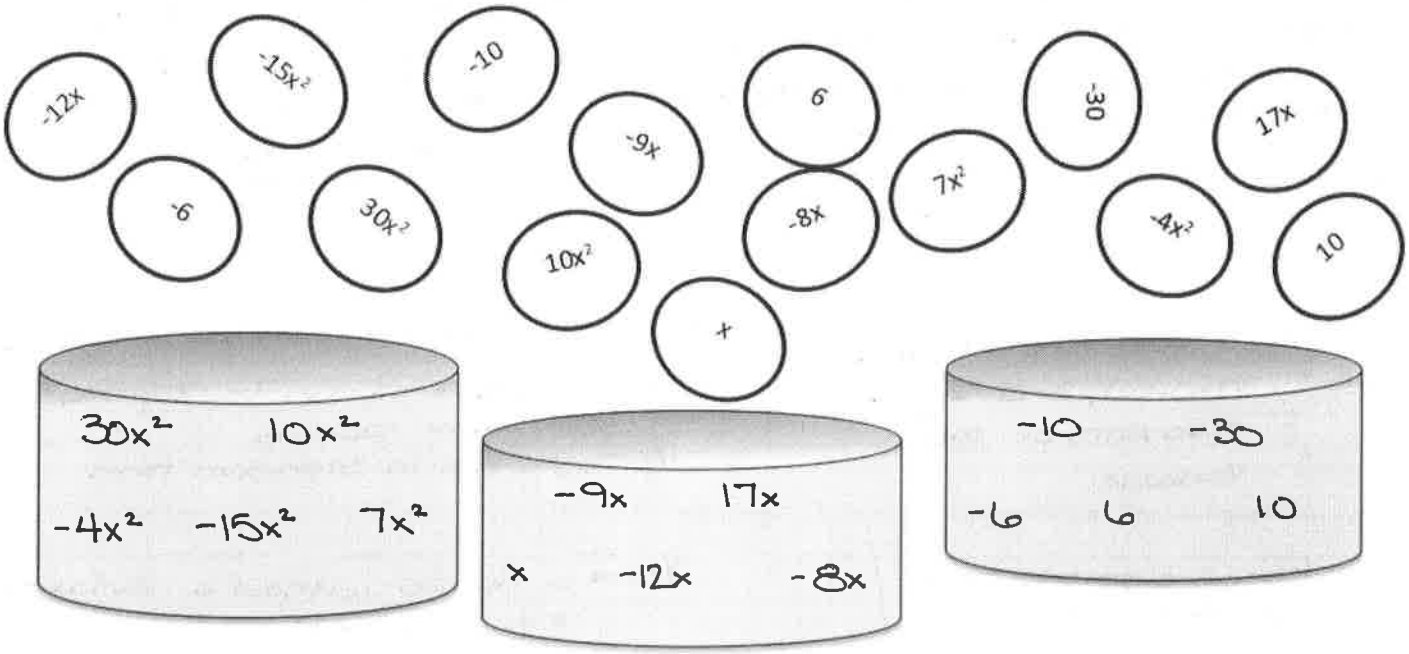
Integrated Math 3
Unit 6: Polynomials
6.0

Name: _____

Date:_____ Period:_____

Part I Objective: *to appropriately classify polynomials and write them in standard form.*

Warm-up: While loading the gumball machine, one of the Oompa Loompas slipped on an Everlasting Gumball and spilled three bags of candy he was carrying! Please help them to sort the gumballs back into the proper bags by placing like terms in the same bag.



Willy Wonka is excited to announce his new Polynomial Bubble Gum! Each massive, long-lasting gumball will be a unique combination of flavors, represented by a polynomial. Combine like terms to write a number sentence representing the set of gumballs that you organized, above.

$28x^2 - 11x - 30$

Review: What do the following prefixes mean?

a. **bi**: two

b. **tri**: three

c. **poly**: many

d. **mono**: one

Vocabulary:

Polynomial: An expression with at least one term, where all exponents of the variable are positive integers.

* Negative, fraction, decimal, or radical exponents of the variable are not allowed.

Parts of a polynomial: $-7x^3+4x^2-6$

$-7x^3$, $4x^2$, -6 are "terms"

Standard Form: Terms with the highest power of the variable are first, then the next lowest power, etc.

Leading Term: $-7x^3$
↳ Degree: 3
↳ Leading Coefficient: -7

Example 1: Are these expressions polynomials? If not, explain why.

a. $-4x^{\frac{1}{3}}+5x^{\sqrt{2}}+\frac{3}{x}-17x^{-9}$

No - there are fractional, radical, and negative exponents of the variable.

b. $-8x^3+x^7\sqrt{10}+\frac{1}{5}x^2+\sqrt{5}$

Yes - there are only positive integer exponents.

* The coefficients can be negative, fractions, decimals, or radicals
* This is not in standard form

c. $z^{44}+z^3+ab^4+c^{19}-2y^{14}$

Yes - all exponents are positive integers

* Different variables are allowed

d. 3

Yes → a number without a variable is a "constant"

* A one term polynomial is a monomial.

Example 2: Classify each as **M** (monomial), **B** (binomial), **T** (trinomial), **P** (polynomial), or **C** (constant).

a. B, P $2x+1$

b. B, P $17x^2+11$

c. P $8x^3+2x^2+3x-7$

d. M, C, P 130

e. T, P $4a^2+7a-10$

f. T, P $10x^3-2x+1$

Example 3: Identify the leading term, leading coefficient and degree for the following.

a. $12v+20-2v^2$

$\Rightarrow -2v^2+12v+20$

Leading Term: $-2v^2$
Leading Coefficient: -2
Degree: 2

b. $-23y+18y^2+2-15y^4$

$\Rightarrow -15y^4+18y^2-23y+2$

Leading Term: $-15y^4$
Leading Coefficient: -15
Degree: 4

Classifying Polynomials

A polynomial can be classified with **two** names.

- Name #1 is determined by: terms
  - Usually this will be a prefix to the suffix "-nomial"
- Name #2 is determined by: degree
  - Degree is determined by the largest exponent you see

	Degree	Number of Terms
0	Constant	-
1	Linear	Monomial
2	Quadratic	Binomial
3	Cubic	Trinomial
4	Quartic	Polynomial
5	Quintic	Polynomial
6	6th degree	Polynomial

Things to note:

- Anything with four or more terms will is classified as a polynomial
- Anything to the 6th degree or higher will be named by the indicated number's degree

Example 4: Classify the following by **degree**:

A.) $7x^3 + 5x + 1$ Cubic

B.) $6y^5 + 9y^2 - 3y + 8$ quintic

C.) $8x - 4$ linear

D.) $9x^2 + 3$ quadratic

★ E.) $-4j^1f^3$ quartic

Example 5: Classify the following by both degree and number of terms!

A.) $x^3 + 1$ Cubic binomial

B.) $x^3 + x^2 + x + 1$ Cubic Polynomial

C.) $x^5 - x^4$ quintic binomial.

Part II Objective: *to simplify polynomials by performing the indicated operations.*

Example 6: Simplify each of the following.

a. $(x+5)(x+4) =$

$= x^2 + 4x + 5x + 20$

$= x^2 + 9x + 20$

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

$2x^3 - 7x^2 + 4$

c. $-3x^2(x^2 + 3x) =$

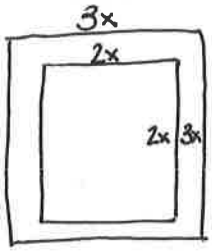
$-3x^4 - 9x^3$

d. $(5n^2 - 7) - (2n^2 + n - 3) =$

$= 5n^2 - 7 - 2n^2 - n + 3$

$= 3n^2 - n - 4$

Example 7: A square poster of length $3x$ is going to have a square painting centered on it. The length of the painting is $2x$. The area of the poster not covered by the painting will be painted black. What is the area of the poster that will be painted black?

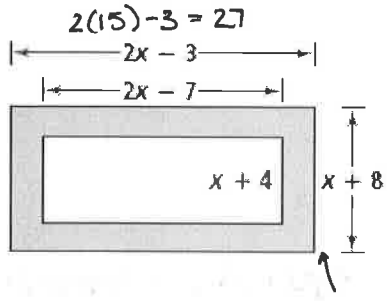


$A_{poster} = 3x \cdot 3x = 9x^2$

$A_{painting} = 2x \cdot 2x = 4x^2$

$A_{black} = A_{poster} - A_{painting} = 9x^2 - 4x^2 = \boxed{5x^2}$

Example 8: The Cutting Edge frame shop makes a mat by cutting out the inside of a rectangular board. Use the diagram to find the length and width of the original board if the area of the mat is 184 in^2.



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

$= 2x^2 + 16x - 3x - 24$

$= 2x^2 + 13x - 24$

$A_{mat} = (2x^2 + 13x - 24) - (2x^2 + x - 28)$

$= 12x + 4$

$(2x-7)(x+4)$

$= 2x^2 + 8x - 7x - 28$

$= 2x^2 + x - 28$

$184 = 12x + 4$

$180 = 12x$

$\boxed{x = 15}$

$(15) + 8 = 23$

Board Length: 27 in.
Board Width: 23 in.