# Unit 2: Polynomials Guided Notes

Name

Period

\*\*If found, please return to Mrs. Brandley's room, M-8.\*\*

# Concept 1: Terms and Definitions of Polynomials

Word Bank: constant	variable le	eading coefficient	polyno	omial t	erm		
monomial bino	mial tr	inomial	degree	operations			
standard form	degree of a pol	ynomial	coefficient	like terr	ns		
1. A Variable is a symbol for a number we don't know yet.							
Examples: X	X	Non-Example	s: 3	(7)x			
2. Ais a single number or variable, or numbers and variables multiplied together separated by addition or subtraction.							
Examples: $3x + 7$	]	Non-Example	s: 3x+	3			
	2x			5	X		
3. Ais an expression with constant(s) and/or variable(s) that are combined using addition, subtraction, multiplication, and whole number exponents.							
Examples: $3\chi^2$	$7x^{2}-6x+$	Non-Example	s: XY	2-7 -+6			
4. A MONOMIA is a polynomial with one term.							
Examples: $3\chi^2$	7 -60	Non-Example	s: 3x +	$7\chi^2$	5x+		
5. A is two monomials combined together with addition or subtraction. It is a polynomial with two terms.							
Examples:		Non-Example	s:				
X+3	$3x^{2}-2$		$x^2 - 5x$	(+)	3		

0	6. A is three monomials It is a polynomial with three terms.	s combined together with addition or subtraction.
	Examples: $\chi^2 - 5\chi + 1$ Non	n-Examples: 3 x
	$-7x^3 + 2x - 5$	7x-5
	Generally when there are more than three terms in a poly that number of terms. For example if the polynomial has f four terms."	
	within that term.	the sum of all the exponents on the variables
		n-Examples $\sqrt{5-2\sqrt{3}+1}$
	3×85	3×295
	8. When the monomials within a polynomial are organized is said to be in <u>Standard Form</u> .	ed by degree in descending order, the polynomial
	Examples: $3\chi^2 - \chi + 5$ Non	n-Examples $\chi -3\chi^2 + 5$
	$x^6 + 3x^2 - 1$	$3x^2 - 1 + x^6$
	9. The degree of a polynomial is the other polynomial.	degree of the highest degree monomial within
	Examples: X9-X7+2	n-Examples: $(6)$ $\times$ $(7)$ $\times$ $(2)$
	10. A COEFFICIENT is the numer	rical part of a monomial.
	Examples: Nor	n-Examples:
	$3x - 7x^2$	(3x) -7x

11. The <u>Fooling</u> <u>COEFFICIENT</u> highest degree within a polynomial. When the polyne the leading term.	is the numeric part of the monomial with the ynomial is written in standard form, it is the coefficient of
Examples: $5x^2 - 3x + 1$	Non-Examples: $5x^2 - 3x + 1$
12. A <u>CONSTANT</u> is a monominumeric.	al that doesn't include any variables. It is strictly
Examples:	Non-Examples $3\chi^2$
13. Two or more terms of a polynomial that have the	he exact same variables raised to the exact same

exponents in the exact same combinations (once they are simplified) are said to be 1144 term S

Examples: 3x 8 7x

Non-Examples

Qy3 8-9y3

4x2 8-3x

Within a polynomial we can add together two monomials if they are like terms.

that can be performed on polynomials, or more specifically, the terms (or monomials) within the polynomials that are like terms.

Examples:

Non-Examples:

Put the following polynomials in standard form:

15. 
$$-3+4x^5$$

$$16. \ 4 + 8x^3 - 2x^2 + 3x$$

17. 
$$3x^3 - 2 + 8x^5 - 6x^2$$

9x5+3x3-6x2-2

Name each polynomial by degree and number of terms. Identify its' leading coefficient and constant.

Example:  $4x^2 + 5$  2nd degree binomial. LC: 4 C: 5

18.3x4 4th degree monomial LC:3 C:0 19.5x2-6x+1 2nd degree trinomial LC:5 C:1 20. x5-6 6th degree binomial LC: 1 C: 6 21. 9+7x3-4x 3rd degree trinomial LC:7

Remember: integers are the whole numbers and their opposites {...-4, -3, -2, -1, 0, 1, 2, 3, 4...}

- 22. Pick two integers and write them here: \_\_\_\_ and \_\_\_ 5

  - a. Add them: 7 + 3 = 4 b. Subtract them: 7 3 = 10

  - c. Multiply them:  $\frac{7}{x} \times \frac{-3}{3} = \frac{-21}{3}$  d. Divide them:  $\frac{7}{3} \div \frac{-3}{3} = \frac{-7}{3}$
- 23. What does it mean that the integers are closed under addition, subtraction, and multiplication?

When you add, subtract, or multiply any two integers the resulting answer is an integer.

24. What does it mean that the integers are not closed under division? Show an example.

have the answer not be an integer.

Throughout this unit, try to discover if polynomials are closed under any operations and if so, which ones.

### Concept 2: Adding Polynomials

Add the following:

1.7+9 = 
$$10$$
 2.  $3x + (-7x) = -4 \times 3$ .  $-4x^2 + 8x^2 = 4 \times 4$ .  $6x^3 + (-2x^3) = 4 \times 3$ 

5. 
$$(6x^3 - 4x^2 + 3x + 7) + (-2x^3 + 8x^2 - 7x + 9) = 4x^3 + 4x^2 + 4x + 16$$

Try the following examples with your group, with a partner, or by yourself:

6. 
$$(x^3 - 2x^2 + 9x) + (-7x + 9) = x^3 - 2x^2 + 2x + 9$$

7. 
$$(-8x^2 + 3x + 6) + (-2x^3 + 5x^2 + x - 4) = -2x^3 - 3x^2 + 4x + 2$$

8. 
$$(6x^3 - 2x^2 + x + 3) + (-4x^3 + 8x^2 - 5x + 6) = 2x^3 + 6x^2 - 4x + 9$$

9. Are polynomials closed under addition?



NO

#### **Subtracting Polynomials**

Subtract the following:

11. 
$$2x - (-8x) = () \times$$

11. 
$$2x - (-8x) = 12. 3x^2 - 2x^2 - 2x^2 = 12. 3x^2 - 2x^2 - 2x^2$$

13. 
$$(3x^2 + 2x + 7) - (2x^2 - 8x - 3) = \chi^2 + 10 \chi + 10$$

$$x^2 + 10x + 10$$

Try the following examples with your group, with a partner, or by yourself:

$$14.(x^3 - 4x^2 + 9x) - (-7x + 5) = \sqrt{3 - 4x^2 + 16x - 5}$$

15. 
$$(-8x^2 + 3x + 6) - (-5x^3 + 2x^2 + x - 7) = 5x^3 - 10x^2 + 2x + 15$$

$$16. (7x^3 - 2x^2 + 3x + 6) - (9x^3 + 3x^2 - 7x + 2) = -2x^3 - 5x^2 + 10x + 4$$

17. Are polynomials closed under subtraction?

NO

# Concept 3: Multiplying Polynomials

Multiplying Monomials

1. 
$$7 \times 9 = 63$$

3. 
$$3x^5 \times 4 = 12 \times 5$$

1. 
$$7 \times 9 = 63$$
 2.  $x^2 \times x^7 = 2$  3.  $3x^5 \times 4 = 12 \times 6$  4  $6x^3 \times 3x^5 = 16 \times 8$ 

Multiplying a Monomial and Binomial or Trinomial

5. 
$$8(x^3 - 4x) = 8x^3 - 32x$$

$$6.4x^{2}(3x^{3}+6x^{2}-2x+5) = \sqrt{2} \times ^{5} + 24 \times ^{4} - 8 \times ^{3} + 20 \times ^{2}$$

Multiplying Binomials

7. 
$$(x+3)(x-4) = \chi^2 + 3\chi - 4\chi - 12$$

8. 
$$(4x^2 + 4)(3x - 2) = 12x^3 - 9x^2 + 12x - 9$$

Multiplying a Binomial and Trinomial

9. 
$$(x+3)(4x^2+7x-1) = 4x^3+7x^2-x+12x^2+21x-3$$
  
=  $4x^3+19x^2+20x-3$ 

10. 
$$(2x^2+3)(x^2+3x-4) = 2x^4+6x^3-8x^2+3x^2+9x-12$$
  
=  $2x^4+6x^3-5x^2+9x-12$ 

Multiplying Trinomials

11. 
$$(x^2 - 5x + 4)(3x^2 - 2x - 2) = 3x^4 - 17x^3 + 70x^2 + 72x - 8$$

12. 
$$(3x^3 - 2x^2 + 7)(4x^2 + x - 3) = |2 \times 5 - 5 \times 4 - || \times^3 + 34 \times^2 + 7 \times$$

13. Are polynomials closed under multiplication?



NO

## Concept 4: Dividing Polynomials

4th grade Flashback: Long division

Polynomial Long Division

$$4 (20x^{2} + 4x) \div 4$$

$$5x + 1$$

$$4x (20x^{2} + 4x)$$

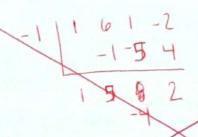
$$20x^{2} + 4x$$

$$20x^{2}$$

$$0 + 4x$$

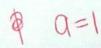
Synthetic Division

Synthetic Division 7. 
$$(20x^2 + 4x + x) \div 4x$$
 8.  $(p^3 + 6p^2 + p - 2) \div (p + 1)$  9.  $(5b^5 - b^4 - 15b + 6) \div (5b - 1)$ 



When can you use synthetic division?

degree polynomial & a=1



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