



**McKeesport Area School District**  
**Flexible Instruction Days – High School Lesson Plan**

<b>SUBJECT:</b> Algebra 1      Adapted		<b>LESSON TITLE:</b> Polynomials		
<input type="checkbox"/> <b>LESSON 1:</b> 1 <sup>st</sup> or 2 <sup>nd</sup> 9-Weeks	<input type="checkbox"/> <b>LESSON 2:</b> 2 <sup>nd</sup> or 3 <sup>rd</sup> 9-Weeks	<input type="checkbox"/> <b>LESSON 3:</b> 2 <sup>nd</sup> or 3 <sup>rd</sup> 9-Weeks	<input type="checkbox"/> <b>LESSON 4:</b> 2 <sup>nd</sup> or 3 <sup>rd</sup> 9-Weeks	<input checked="" type="checkbox"/> <b>LESSON 5:</b> 3 <sup>rd</sup> or 4 <sup>th</sup> 9-Weeks
<b>STANDARD(S):</b> <ul style="list-style-type: none"><li>• <b>CCSS. A1.1.1.5</b> Simplify expressions involving polynomials.</li></ul>				
<b>INSTRUCTIONAL OUTCOMES:</b> <b>Students will:</b> <ul style="list-style-type: none"><li>• Understand the procedures to follow when adding, subtracting and multiplying polynomials</li><li>• Be able to add and subtract polynomials by following the rules for addition and subtraction and combining like terms and using the distributive property to multiply polynomials</li></ul>				
<b>STUDENT PARTICIPATION</b> ( <i>Lesson steps</i> ): <b>Students will:</b> <ol style="list-style-type: none"><li>1. Review notes on addition, subtraction and multiplication of polynomials</li><li>2. Complete part 1: Addition of polynomials</li><li>3. Complete part 2: Subtraction of polynomials</li><li>4. Complete part 3: Multiplication of polynomials</li><li>5. Optional Complete part 4: Application and advanced multiplication of polynomials</li></ol>				
<b>ACCOMMODATIONS:</b> <b>For struggling learners:</b> <ul style="list-style-type: none"><li>• Provide a calculator for use for those who struggle with basic math facts</li><li>• Provide note card with key steps highlighted in examples of addition, subtraction and multiplication</li><li>• Reduce the number and complexity of questions asked</li></ul> <b>For advanced learners:</b> <ul style="list-style-type: none"><li>• Require students to multiply a binomial by a trinomial and two trinomials together in Part 4 of the handout.</li><li>• Require students to set-up and complete one of the application problems in Part 4 of the handout.</li></ul>				
<b>HANDOUTS</b> ( <i>exact names of ALL accompanying handouts</i> ) & <b>RESOURCES</b> ( <i>materials, websites, books, etc.</i> ) <ul style="list-style-type: none"><li>• Worksheet parts 1 – 4 Working with Polynomials</li><li>• Guided Notes on Polynomials</li></ul>				
<b>EVIDENCE OF LEARNING</b> <b>Students will demonstrate their:</b> <ul style="list-style-type: none"><li>• Understanding of addition, subtraction and multiplication of polynomials</li><li>• By being able to correctly combine like terms in addition, change the signs of all terms in the polynomial being subtracted and combine like terms and use the distributive property correctly to multiply polynomials.</li></ul>				

## Guided Notes on Polynomials

### Addition of Polynomials

To add polynomials together:

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

1. Drop the parentheses  
(Notice the + sign in between the parentheses is not written)

$$2x^3 - x^2 + 1 - 3x^3 + 5x^2 - 2$$

2. Rearrange the terms to put like terms together.  
REMEMBER: Like terms have variable parts that are the same

$$2x^3 - 3x^3 - x^2 + 5x^2 + 1 - 2$$

3. Combine like terms which means to perform the operation indicated by the sign.

$$-x^3 \quad +4x^2 \quad -1$$

4. Final answer

$$-x^2 + 4x - 1$$

### Subtraction of Polynomials

Subtraction is defined to be the addition of the opposite. With that in mind, in order to subtract one polynomial from another, when dropping the parentheses, you must change the signs of each term of the polynomial that is being subtracted.

To subtract one polynomial from another:

$$(-10x^2 - 2x + 5) - (8x^2 - 6x - 4)$$

1. Drop the parentheses, but change the sign of each term in the polynomial that is being subtracted.

$$-10x^2 - 2x + 5 - 8x^2 + 6x + 4$$

2. Rearrange the terms to put like terms together.  
REMEMBER: Like terms have variable parts that are the same.

$$-10x^2 - 8x^2 - 2x + 6x + 5 + 4$$

3. Combine like terms which means

$$-18x^2 \quad +4x \quad +9$$

to perform the operation indicated by the sign.

4. Final answer  $-18x^2 + 4x + 9$

### Multiplication of Polynomials

In order to multiply polynomials, the distributive property is used.

*To multiply a monomial by a polynomial:*  $3xy^2(5x - y + 6)$

1. Multiply the monomial outside the parentheses by each term inside the parentheses  $3xy^2(5x) + 3xy^2(-y) + 3xy^2(6)$

2. Remember when multiplying monomials you multiply coefficients, combine exponents of like bases. This is the final answer.  $3x^2y^2 - 3xy^2 + 6xy^2$

*To multiply a binomial by a binomial:*  $(x + 6)(x - 2)$

1. Multiply the first term on the first binomial by **each** term of the second binomial. Then multiply the second term of the first binomial by the **each** term of the second binomial.  $x(x) + x(-2) + 6(x) + 6(-2)$

2. Remember when multiplying monomials you multiply coefficients, combine exponents of like bases.  $x^2 - 2x + 6x - 12$

3. Combine any like terms to get the final answer.  $x^2 + 4x - 12$

NAME \_\_\_\_\_

## Algebra 1: Polynomials

## Part 1: Addition of Polynomials

Add. Show your work.

$$1. \quad (3x^2 - 8x + 8) + (9x - 6)$$

Step 1: Rewrite

$$3x^2 - 8x + 8 + 9x - 6$$

Step 2: Combine Like Terms with sign in front

$$-8x + 9x \quad 8 - 6$$

$$3x^2 + 1x + 2$$

Step 3: Rewrite with highest exponent first

$$2. \quad (14x^4 - 5x^2 + 3x) + (-9 - 2x + 3x^2)$$

$$14x^4 - 5x^2 + 3x + -9 - 2x + 3x^2$$

$$-5x^2 + 3x^2 \quad 3x - 2x$$

$$14x^4 - 2x^2 + 1x - 9$$

$$3. \quad (-5x^3 - 17x^2 + 1) + (-x^3 + 10x^2 - 4x + 2)$$

Step 1: Rewrite  
 Step 2: Combine Like Terms with sign in front  
 Step 3: Rewrite with highest exponent first

$$4. \quad (9 - 2x + 8x^2) + (x^2 + 6x + 3)$$

$$5. \quad (14x^2y^2 - 5x^4 + 3y^4) + (8x^2y^2 - 10y^4)$$

Step 1: Rewrite  
 Step 2: Combine Like Terms with sign in front  
 Step 3: Rewrite with highest exponent first

## Part 2: Subtraction of Polynomials

Subtract. Show your work.

$$6. \quad (8x^2 + 13x + 4) - (10x^2 + 3x - 8)$$

$$8x^2 + 13x + 4 - 10x^2 - 3x + 8$$

$$8x^2 - 10x^2 \quad 13x - 3x \quad 4 + 8$$

$$-2x^2 + 10x + 12$$

Step 1: Change the sign of everything in second ( ) and rewrite

Step 2: Combine Like Terms with sign in front

Step 3: Rewrite with highest exponent first

$$7. \quad (18x - 3x^4 - 2) - (9x^4 - 2x)$$

8.  $(-6x^3 - 7x^2 + x - 3) - (-1 + 2x - x^2 + x^3)$       9.  $(3x + 4y) - (10x - 11y - 2z)$

Step 1: Change the sign of everything in second ( ) and rewrite

Step 2: Combine Like Terms with sign in front

Step 3: Rewrite with highest

10.  $(-2x^4 + 6x^3 + 15x^2 - x + 14) - (-8x^4 + 5x^2 - x^3 + 7)$

exponent first

Step 1: Change the sign of everything in second ( ) and rewrite

Step 2: Combine Like Terms with sign in front

Step 3: Rewrite with highest exponent first

### Part 3: Multiplication of Polynomials

Multiply. Show your work.

11.  $2x(x+5)$

$2x * x$  and  $2x * 5$

$2x^2 + 10x$

Step 1: Multiply EVERYTHING outside with EVERYTHING inside

Step 2: Combine Like Terms

Step 3: Rewrite with highest exponent first

12.  $-3x(5x^2 - 7x - 4)$

$-15x^3 + 21x^2 + 12x$

13.  $(x-7)(x+4)$

14.  $(3x-8)(2x-9)$

Step 1: Multiply EVERYTHING outside with EVERYTHING inside

Step 2: Combine Like Terms

Step 3: Rewrite with highest exponent first

15.  $(4x-3)(4x+3)$

16.  $(2x+7)(4x+1)$

Step 1: Multiply EVERYTHING outside with EVERYTHING inside

Step 2: Combine Like Terms

Step 3: Rewrite with highest exponent first

Part 4: Extension Problems.

17.  $(x-3)(x^2+4x-6)$

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

**NOT REQUIRED**

19. A rectangle has a side with length  $(x+3)$  inches and a width of  $(x+1)$  inches. Give the area of the rectangle in terms of  $x$ .

