

# POLYNOMIALS: INTRODUCTION

## MONOMIALS:

### EXAMPLES:

$-4$	A number
$y$	A variable
$a^2$	The product of variables
$\frac{1}{2}x^2y$	The product of numbers and variables

### NON-EXAMPLES:

$2^x$	Variable as an exponent
$x^2 + 3$	A sum
$5a^{-2}$	Negative exponent
$\frac{3}{x}$	A quotient

**Examples:** Determine if each expression is a monomial.

1.  $-4xy$       2.  $a^2 - 8$       3.  $\frac{x}{5}$       4.  $7z^{-1}$       5.  $b^7$

**POLYNOMIAL:** A polynomial is a \_\_\_\_\_ or the \_\_\_\_\_ of different monomials.

**Determine which expressions are polynomials:**

6.  $2q$       7.  $d + \frac{c}{d}$       8.  $p + q$       9.  $ab - \frac{a}{4}$       10.  $x^2 + 4x - 8$       11.  $7y^3 - 5y^{-2} + 4y$

## SPECIFIC TYPES OF POLYNOMIALS

<b><u>BINOMIAL:</u></b>	<b><u>TRINOMIAL:</u></b>
<b><u>Examples:</u></b>	<b><u>Examples:</u></b>

**Examples #12 - 19:** Determine if each expression is a monomial, binomial, trinomial, or not a polynomial.

12.  $2m - 7$       13.  $x^2 + 3x - 4 - 5$       14.  $\frac{5}{2x} - 3$       15.  $3y^2 - 6 + 7y$

16.  $3x + 8x - 5x^2$     17.  $8x^3y^2z$     18.  $2a^2 + 3ab - 5ba$     19.  $9r + 11 - 5r^2$

**DEGREE:** Based on the exponents of the variables.

- The **degree of a MONOMIAL:**

- The **degree of a POLYNOMIAL:**

**Examples:** Find the degree of each polynomial.

20.  $5mn^2$

22.  $5a^2 + 3$

24.  $3x^2 - 7x$

21.  $9x^3yz^6$

23.  $-4x^2y^2 + 3x^2 + 12$

25.  $8m^3 - 2m^2n^2 - 11$

**REORDERING TERMS OF A POLYNOMIAL BASED ON DEGREE:**

MOVE TERMS AND KEEP THE SIGN WITH THE TERM

**Example:** Arrange the polynomials in **descending order** according to the powers of the x.

a)  $6x^2 + 5 - 8x - 2x^3$

d)  $3a^3x^2 - a^4 + 4ax^5 + 9a^2x$

b)  $7x^2 - 11x^4 + 8 - 2x^5$

e)  $15x^5 - 2x^2y^2 - 7yx^4 + x^3y$

c)  $25x^6 - 3x^2 + 7x^5 + 15x^8$

**POLYNOMIALS: ADDITION AND SUBTRACTION****WARM UP ACTIVITY: Simplify the following**

1)  $3x - 2y + 4y - 6x$

3)  $4z + 2t + 3z - t$

5)  $8a + 6b + 6a + 2b$

2)  $3x - 12y - 2x^2 + 6y$

4)  $5a + 3b - 2c - 8a$

**ADDING AND SUBTRACTING POLYNOMIALS:**

- When adding and subtracting polynomials, you **COMBINE LIKE TERMS**.
- Be careful of parentheses and positive or negative signs with the operations.

**Exp 1:**  $(3x^2 - 4x + 8) + (2x - 7x^2 - 5)$

**Exp 4:**  $(6y^2 + 8y^4 - 5y) - (9y^4 - 7y + 2y^2)$

**Exp 2:**  $(3n^2 + 13n^3 + 5n) - (7n + 4n^3)$

**Exp 5:**  $(7y^2 + 2y - 3) + (2 - 4y + 5y^2)$

**Example 3:**  $(2b^2 + 8ab^3 + 4b) - (9b - 5ab^3)$

**Exp 6:**  $(3x^2 + 5x + 2) - (4 - 2x) + (5x^2 + 7)$

**PRACTICE PROBLEMS: Simplify each expression**

1.  $x^2 + 2x - 3 + 2x^2 - 7x + 9$

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

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

$$4. (2x^2 + 2x - 4) + (x^2 + 3x + 7)$$

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

$$6. (t^2 - 1) + (2t + 3)$$

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

$$8. (2x^2 + 5xy + 3y^2) + (8x^2 - 7y^2)$$

$$9. (z^2 + 2z - 5) + (3z^2 - z + 4)$$

$$10. (4m - 3n) + (2n + 5m)$$

$$11. (6x + 5) - (3x + 1)$$

$$12. (2a^2 - 3a) + (5b - b^2) + (2a - 8b)$$

$$13. (3z^2 + 5) - (-4z + 2z^2) - (z - 3)$$

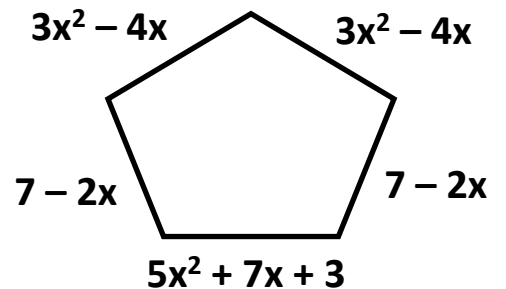
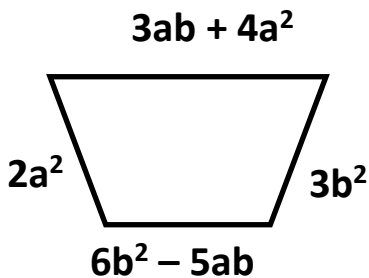
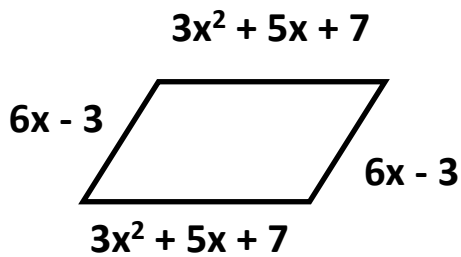
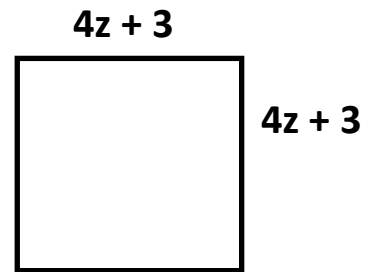
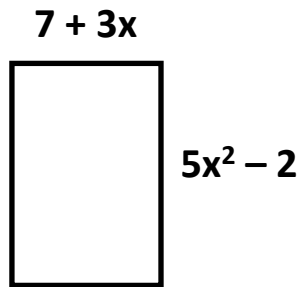
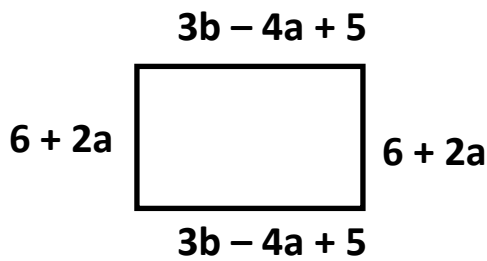
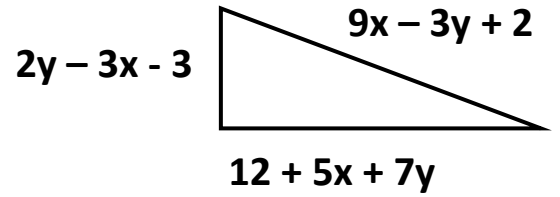
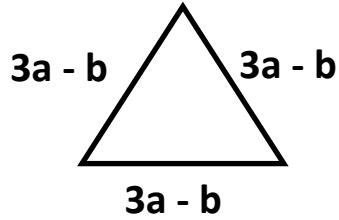
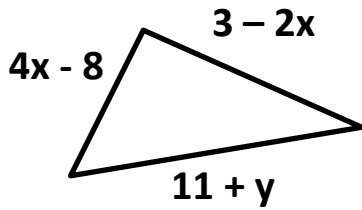
$$14. (3x - 2) - (5x - 4) + (19 + 2x)$$

$$15. (10x^2 + 8x) - (6 + 3x^2) + (2x - 9)$$

$$16. (6m^2 + 7) - (-2m^2) + (2m - 3)$$

**Find the PERIMETER of the shape.**

Equation: Perimeter = Sum of all the sides



**CC Math I Standards: Adding and Subtracting Polynomials WORKSHEET**

**Unit 6**

**NAME:** \_\_\_\_\_

**Find the sum or difference:**

1)  $(x^3 - 7x + 4x^2 - 2) - (2x^2 - 9x + 4)$

2)  $(3a + 2b - 7c) + (6b - 4a + 9c)$

3)  $(5y^2 - 2xy + 6x^2 - 3x + 7y - 9) + (3x^2 - 4x + 5) - (5y^2 - 3y + 6)$

**Word Problems:**

1) Bob mowed  $(2x^2 + 5x - 3)$  yards on Monday,  $(4x - 7)$  yards on Tuesday, and  $(3x^2 + 10)$  yards on Wednesday.

a. How many yards did he mow in the three days?

b. If Bob mowed  $14x^2 + 12x - 3$  yards total for the entire week, how many yards did he mow during the rest of the week?

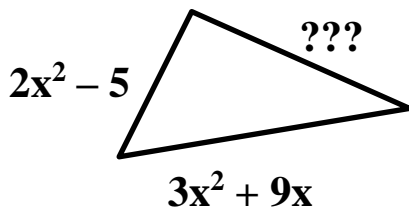
2) Molly has  $(4x + 10)$  dollars and Ron has  $(-5x + 20)$  dollars.

a. How much money do they have altogether?

b. How much more money does Molly have than Ron?

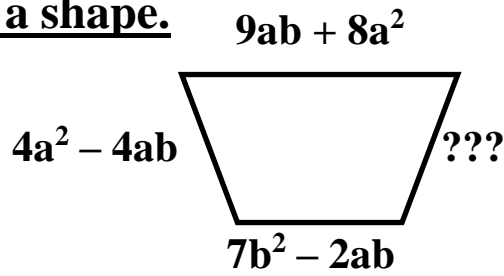
3) Ross has  $(8x - 5)$  tickets for Chuck E Cheese. He is going to play today and wants to buy a prize that is  $(15x + 1)$  tickets. How many tickets must he win to have enough tickets to buy the prize?

**Find the missing side of a shape.**



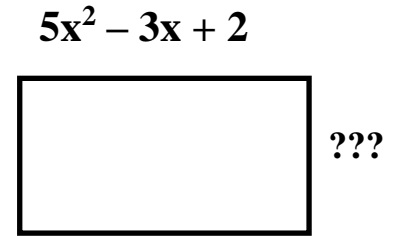
**Perimeter**

$$5x^2 + 7x + 12$$



**Perimeter**

$$9b^2 - 2ab + 12a^2$$



**Perimeter**

$$14x^2 + 4x - 8$$

- 4) The measure of the perimeter of a triangle is  $37s + 42$ . It is known that two of the sides of the triangle have measures of  $14s + 16$  and  $10s + 20$ . Find the length of the third side.
- 5) A triangle has a perimeter of  $10a + 3b + 12$  and has sides of length  $3a + 8$  and  $5a + b$ , what is the length of the third side?
- 6) For a rectangle with length of  $3x + 4$  and perimeter of  $10x + 18$ , what is the width of the rectangle?
- 7) A rectangle has a perimeter of  $12y^2 - 2y + 18$  and has a width of  $4y^2 - y + 6$ . What is the length of the rectangle?

**POLYNOMIALS: Multiplication of Monomial and Polynomial**  
**DISTRIBUTIVE PROPERTY REVIEW**

1)  $-4(2 - 6x)$

2)  $3(5p + q - 3r)$

3)  $-2(-x - 7y)$

**SIMPLIFYING PRACTICE PROBLEMS:**

1)  $(4x + 7x)3$

2)  $12z - 5z + 9z^2$

3)  $-7(-6m + 11m)$

4)  $4(11 - 3x)$

5)  $-5(5a - 3b - 6)$

6)  $-2(x^2 - 8x + 3x^3 - 6)$

7)  $9x - 4(6 - 3x)$

8)  $5(3b - 2a) - 7b$

9)  $12 + 3(7x + 2)$

10)  $6(4y + 3z) - 11z$

11)  $5 + 2(4m - 7n) + 9n$

12)  $12 - 7(3 - 5r) + 8r$



$$13) 19x + 1(2 + 4x) - 18$$

$$14) 2(2x + 6) + 3(5x - 7)$$

$$15) 6(4a - 2b) - 2(9b - 7a)$$

$$16) 5(3x + 2y) - 4(7y + 8z)$$

**LAWS of EXPONENTS REVIEW:**

Multiply Coefficients and Add Exponents of Same Variable

$$1) (3x^2)(7x^3)$$

$$2) 8m^5 \cdot m$$

$$3) t^3 \cdot 6t^7$$

$$4) (4y^4)(-9y^2)$$

$$5) 3r^5 \cdot 2r^2 \cdot 7r^6$$

$$6) (-2p^3r)(11r^4p^6)$$

$$7) (6y^3x)(5y^3)$$

$$8) 7c^5a^3b \cdot 8a^2b^4c$$

$$9) (-3t^3u^2)(-4u^3t)$$

**Using Law of Exponents and Distributive Property:**

$$1) 4x(2x + 6)$$

$$2) 9y^2(5y - 3)$$

$$3) -6a(3a^2 - 7a - 11)$$

$$4) 3z^3(12z + 4z^3 - 1)$$

$$5) 2pq(3p^2 + 6pq + 7q^2)$$

$$6) -5xy^3(-3x^3 + 7y - 2xy)$$

**MULTIPLYING A POLYNOMIAL BY A MONOMIAL:****USE THE DISTRIBUTIVE PROPERTY with VARIABLE TERMS**

Keep track of Coefficients and Exponents of Variables

**Exp 1:**  $y(y + 5)$

**Exp 2:**  $-2n(7 - 5n^2)$

**Exp 3:**  $-7m(3m^2 + 4m + 5)$

**Exp 4:**  $2ab(3a^2 - 2ab + 6b^2)$

**Exp 5:**  $3a^3(2a^2 - 5a + 8)$

**Exp 6:**  $-3x^3y(5yx + 6y^2)$

**BOX METHOD:**  $6y^2(4y^2 - 9y - 7) =$


**Practice.** Simplify each example

1.  $7(2x + 5)$

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

3.  $-5a(6 - 3a^2)$

4.  $2m^2(5m^2 - 7m + 8)$

5.  $3r(-2r^2 + 6r - 5)$

6.  $6x^3y(-x + 7y - 3xy)$

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

8.  $11y(y - 3) + 13y$

9.  $3(x^3 + 4x^2) + 2x(x - 7)$

10.  $4(3d^2 + 5d) - d(d^2 - 7d + 12)$

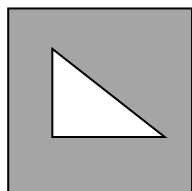
11.  $3(2t^2 - 4t - 15) + 6t(5t + 2)$

**SPECIAL PROBLEMS: Find the area of the shaded region in the simplest form.**

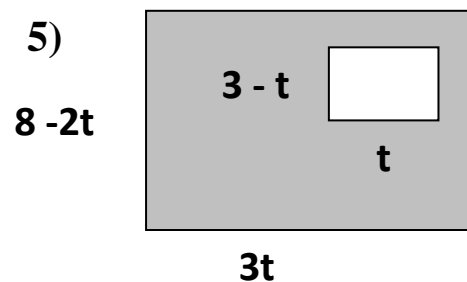
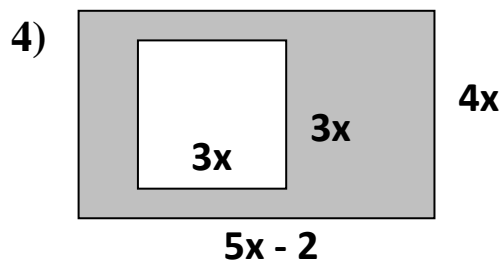
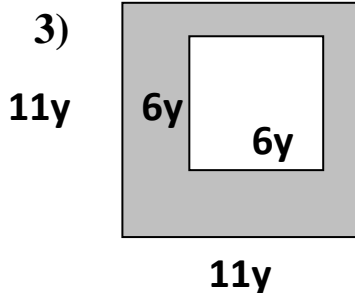
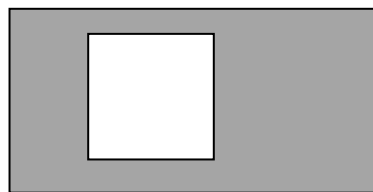
**(BIG SHAPE) – (LITTLE SHAPE “HOLE”) = SHADED REGION**

**EXAMPLES:**

1) A square of side length 8 has a triangle of base 4 and height 3 cut out of it.



2) A rectangle with width of 7 and length of 9 has a square of side length 5 cut out of it.



## POLYNOMIALS: FOIL BOX METHOD Part 1

		<b>BINOMIAL #2</b>	
		<b>F</b> first terms	<b>O</b> outer terms
<b>BINOMIAL #1</b>	<b>I</b> inner terms	<b>L</b> last terms	

**FOIL Box Method:** The box method does the exact same multiplications as our standard FOIL method, but gives it in a graphic organizer.

- Be careful of positive and negatives.
- Combine like terms of boxes to finish.

**Exp 1:**  $(x + 2)(x + 1)$


**Exp 2:**  $(y + 3)(y - 4)$


**Exp 3:**  $(a - 5)(a - 7)$


**Exp 4:**  $(3x + 2)(x + 4)$


**Exp 5:**  $(5b + 9)(b - 4)$


**Exp 6:**  $(2n - 7)(3n + 3)$


**Exp 7:**  $(2x - 5)(2x - 5)$

**Exp 8:**  $(8r^2 - 2r)(5r + 4)$

**Exp 9:**  $(2x + 5y)(7y - 3x)$

**Practice Problems: Multiply the following binomials.**

1.  $(x - 3)(x - 2)$

2.  $(2x + 1)(x + 1)$

3.  $(y + 4)(y - 2)$

4.  $(x - 7)(x - 3)$

5.  $(y - 4)(2y + 3)$

6.  $(4h - 3)(3h + 2)$

7.  $(m - 3)(m + 1)$

8.  $(2a - 3)(a - 2)$

9.  $(3x + 1)(x + 2)$

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

11.  $(3a - b)(2a + 4b)$

12.  $(2x + y)(3x - 2y)$

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

14.  $(x^2 + 6x)(x - 1)$

15.  $(a^2 + 2)(a^5 + 1)$

**POLYNOMIALS: FOIL BOX METHOD Part 2****WARM UP:** Simplify each expression by FOIL

1)  $(3b - 5)(b - 4)$

2)  $(y + 7)(y + 6)$

3)  $(2n + 9)(n - 8)$

**BINOMIAL TIMES TRINOMIAL:** One More Column for 3<sup>rd</sup> term in trinomial**Example 1:**  $(a + 3)(a^2 + 7a + 6)$ 


**Example 2:**  $(4x + 9)(2x^2 - 5x + 3)$ 


**Example 3:**  $(y - 5)(4y^2 - 3y + 2)$ 


**Example 4:**  $(2b + 1)(b^2 - 5b + 4)$ 


**Example 5:**  $(x - 6)(x^2 - 7x - 8)$ **Example 6:**  $(3b^2 - 4b)(2b^2 - b + 7)$