

Date: _____

Adding and Subtracting Like Terms

A **variable** is a letter or symbol that represents one or more numbers.

Examples: _____

A **term** is a number or a variable, or the product or quotient of numbers and variables.

Examples: _____

A term which does not contain a variable is called a **constant**.

The numerical factor in front of a term is called the **coefficient** of the term.

$$\begin{array}{c}
 \text{Exponent} \qquad \qquad \text{Constant} \\
 5x^2 + 2y - 7 \\
 \text{Coefficient} \qquad \qquad \text{Variable} \\
 \text{Operator}
 \end{array}$$

A **polynomial** is an algebraic expression made up of one or more terms.

Examples of polynomials: $4x$ $3x + 2y$ $4x^2 + 6x^3y^5 - 9x^4$

Like terms are terms that have exactly the same variables raised to exactly the same exponents.

Examples: _____

Unlike terms are terms that have different variables, or the same variable but different exponents.

Examples: _____

A polynomial is in **simplest form** when there are no like terms. To write a polynomial in simplest form, we **collect like terms** and then **simplify by adding the like terms** together.

Simplify the following polynomials by collecting like terms.

a) $10x + 4y - 9x - 3z - 12y - 11z$

b) $5x^3 - 12x^2 + 2x - 9 + 6x^3 - 10x^2 - 2x + 10$

Simplify, then evaluate when $x = 3$. Why is it preferable to simplify before evaluating?

$4x^2 - 2x + 3 + 3x^2 + 6x - 7$

Classifying Polynomials

Certain polynomials are given special names.

Name of Polynomial	Definition	Examples
Monomial	A polynomial having only 1 term	$2x$ 14 $6x^3y^5$
Binomial	A polynomial having 2 terms	$3x - 4y$ $-5x^2 + 4x^3$ $xy + 1$
Trinomial	A polynomial having 3 terms	$4x^3 + 9x^2 - 10x$ $xy - 3x^2y + 9$

Note that a polynomial must be in **simplest form** before a name is assigned to it.

Complete the following table.

Original Polynomial	Polynomial in Simplest Form	Classification (Monomial, Binomial or Trinomial?)
$4 + xy - 7 + 3xy$		
$3x^2 + 4y^2 - 5z^2 - 2x^2 - 3y^2$		
$y + 2y - 5y$		

The **degree of a monomial** is the sum of the exponents over its variables.

Complete the following table.

Monomial	Degree	Monomial	Degree
$4x^3$		$5a^2b^3c$	
$3xy$		-7	

The **degree of a polynomial** is the greatest sum of the exponents over the variables in any one term.

Find the degree of:

a) $3x^2 + 6x^3 - 10x$

b) $9xy^6 - 10x^2y^3 + 12x^4y^6$

c) $x^2y^3 + xy^4 + xy^5$

Degree of polynomial

Degree of polynomial

Degree of polynomial

Classify these polynomials (monomial, binomial or trinomial) and state their degree.

a) $2x - 3y$

b) $4x^2y^6$

c) $6x^3 + 9x^2 - 5x$

d) -12

Writing a Polynomial in Descending Order

By convention, we **order the terms in a polynomial from highest degree to lowest degree (descending order)**.

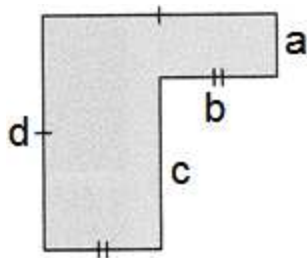
Arrange the following polynomials in descending order.

a) $9x^6 - 14x^7 + 3x^8 - 12 + x^5$

b) $13x^5y^6 - 12x^3y^7 + 11x^9y^3$

Working with Polynomials

Write and simplify an expression for the perimeter of the following figure.



Adding Polynomials

The addition of polynomials can be accomplished by **collecting like terms**. Remove the brackets, collect like terms and add.

a) $(x^3 - 3x^2 + 5x - 9) + (4x^3 - 5x^2 - 8x + 11)$ b) $(-4c + 6c^4 + c^3) + (3c^4 - 2c^3 + 5c^2)$

c) $(3x^2 - 5xy + y^2) + (7x^2 + 11xy - 5y^2)$ d) $(3xyz - 4x^2 + 8) + (5yxz - 6y^2 - 15)$

Subtracting Polynomials

The subtraction of polynomials is accomplished by ADDING the OPPOSITE of the polynomial that is BEING subtracted. Then collect like terms.

a) $(9x^3 - 4x^2 + 10x - 3) - (x^3 - 3x^2 + 5x - 9)$ b) $(6a^2 + 3a - 1) - (2a^2 + 3a + 4)$

c) $(15y^3 - 2y^2 - 8y) - (-3y^2 + y^3)$

d) $(9k^2 - 3k) - (2k^2 - k + 1)$

More Practice

For each term listed in the table below, identify its coefficient and its variable(s). Also indicate which terms are constants.

Term	Coefficient	Variable	Constant?
$3x^2$	3	x	No
-45	-45	None	Yes
$-9xy^4$	-9	x and y	No
15	15		
x^2y^6	1		
$-y^4$	-1		
$5y^2$	5		
$\frac{1}{3}xyz$	$\frac{1}{3}$		

For each term listed in the table below, list two **like terms** and two **unlike terms**.

Term	Like Term	Another Like Term	Unlike Term	Another Unlike Term
$3x^2$	$4x^2$	$-x^2$	$3x$	y^2
$\frac{1}{3}xyz$	xyz	$-3xyz$	$\frac{1}{3}xz$	xy^2z
$x^2y^3z^4$				
$-y^4$				

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