Algebraic Expressions

What is a constant?

A Constant is a number representing a quantity or value that <u>does not</u> change.

What is a variable?

A variable is a letter or symbol representing a quantity or value that can <u>vary</u> or change.

What is an algebraic expression?

Algebraic expression is a mathematical expression containing a variable.

Forms of Algebraic Expressions:

1. One Variable Term : 2x, y

- **2. Variable Term + Constant Term:** 2x + 1, 5 + y
- **3. Variable Term** Constant Term: 2x-1, 5-y
- **4. Variable Term + Variable Term:** 2x + y, 5a + 3b
- **5. Variable Term** Variable Term: 2x y, 5a 3b

<u>Constant Term = A Number</u> (A whole number, a decimal number or a fraction)



Variable Term = Coefficient x Variable

The variable term has two parts: Numerical part (Coefficient) and Letter part (Variable)



****** When the coefficient is 1, we do not write 1 before the variable.

Forms of Variable T	erms:		
1. Product Form:	2y,	b, -7	1a
2. Quotient Form:	$\frac{x}{2}$,	-0.79y,	$\frac{3}{4}b$
3. Exponent Form:	$4x^{2}$,	$2y^{3}$,	$-x^2z$

Practice:

1. For the following algebraic expressions, name the constant term, the variable term and the coefficient of the variable term.

(a) $4x + 1$	Constant term = 1	Variable term = $4x$	Coefficient = 4
(b) <i>y</i> −12	Constant term =	Variable term =	Coefficient =
(c) $-7a + 2.5$	Constant term =	Variable term =	Coefficient =
(d) $7.5b^2 - \frac{1}{7}$	Constant term =	Variable term =	Coefficient =
(e) $\frac{2}{5} + \frac{7}{5}a$	Constant term =	Variable term =	Coefficient =
(f) $-4 - \frac{h^3}{2}$	Constant term =	Variable term =	Coefficient =
(g) $-a^3 + 4$	Constant term =	Variable term =	Coefficient =
(h) $-3x$	Constant term =	Variable term =	Coefficient =

Polynomials

Monomials

The basic building blocks for algebraic expressions are called the **monomials**.

Each term in an algebraic expression is a monomial. A monomial is a number or a variable or the product of numbers and variables.

e.g., 5, 13, 800 are monomials that are numbers.
e.g., *t*, *a*, *x* are monomials that are variables.
e.g., 2*r*, 7*a*, *xy*, *t*², 8*st* are monomials that are products of numbers and variables.

Polynomials

A polynomial is a **monomial** or a **sum of monomials**. A polynomial is formed by **adding or subtracting monomials**.

e.g., 9, y, a + 8, s - t, $x^2 - x + 9$, $a^3 + b^2 + c - d$

Classifying Polynomials by Number of Terms

Polynomials are classified by the number of terms.

Monomials are polynomials that have only one term such as x^2 , 8, 10*m*, $\frac{2y^3}{3}$, $-\frac{3}{4}a$ **Binomials** are polynomials that have **two** terms such as 2x + 4, a - 2b, $s^2 + st$.

Trinomials are polynomials that have **three** terms such as $a^3 + a^2 + a$, $3x^2 + x - 2$, -x + y - 1.

Polynomials that have **four or more** terms are just called polynomials such as $3x^3 + 6x^2 - x + 3$.

Name of Algebraic Expression	Number of Terms
	1
	2
	3
4-Term Polynomial	4
	5
	6
	100

Classifying Polynomials by Number of Terms

Recall:	Monomials have ONE term.	(Hint: Mono poly \rightarrow one owner)
	Bi nomials have TWO terms.	(Hint: Bi cycles \rightarrow two wheels)
	Trinomials have THREE terms.	(Hint: Tri angles \rightarrow three angles)
	Polynomials have FOUR or MORE terms.	(Hint: Poly means many)

Note:

Monomials, binomials and trinomials are all polynomials. They are special names for polynomials with one to three terms. For polynomials with more than three terms (i.e. four or more), we don't have special names for them. They are just all called polynomials.

Practice:

Classify each algebraic expression as monomial, binomial, trinomial or polynomial.

1.	3 <i>x</i> + 5	Monomial	Binomial	Trinomial	Polynomial
2.	8 <i>y</i>	Monomial	Binomial	Trinomial	Polynomial
3.	$5a^2 + 6a - 3$	Monomial	Binomial	Trinomial	Polynomial
4.	$-4z^{2}+10z$	Monomial	Binomial	Trinomial	Polynomial
5.	100	Monomial	Binomial	Trinomial	Polynomial
6.	$x^3 - 9x^2 + 5x - 7$	Monomial	Binomial	Trinomial	Polynomial
7.	$1 - x^2$	Monomial	Binomial	Trinomial	Polynomial
8.	$4s^2 + 2s + 8$	Monomial	Binomial	Trinomial	Polynomial
9.	64 <i>e</i>	Monomial	Binomial	Trinomial	Polynomial
10.	$y^4 + y^3 + y^2 - y + 1$	Monomial	Binomial	Trinomial	Polynomial
11.	$p^2 - q^2$	Monomial	Binomial	Trinomial	Polynomial
12.	9 <i>b</i>	Monomial	Binomial	Trinomial	Polynomial
13.	$-12x^2 + 6x - 11$	Monomial	Binomial	Trinomial	Polynomial
14.	2 <i>ab</i> -8	Monomial	Binomial	Trinomial	Polynomial
15.	$m^2 - 49$	Monomial	Binomial	Trinomial	Polynomial

Answers: 1. binomial; 2. monomial; 3. trinomial; 4. binomial; 5. monomial; 6. polynomial; 7. binomial;
8. trinomial; 9. monomial; 10. polynomial; 11. binomial; 12. monomial; 13. trinomial;
14. binomial; 15. binomial.

Like Terms vs. Unlike Terms

Like terms have the same variables and exponents.				
e.g.,	2y and $8y$ are like terms.	$5x^2$ and x^2 are like terms.		
Why?				
Unlike terms have different variables or different exponents.				
Unlike terms	have different variables or different expone	ents.		
Unlike terms e.g.,	have different variables or different exponent $2x$ and $8y$ are unlike terms.	ents. $3y^2$ and $3y$ are unlike terms.		

Practice:

1. Connect the like terms with a straight line **using a ruler**.

4x	4
8 <i>xyz</i>	$23y^3z$
23 <i>yz</i>	4 <i>xyz</i>
y^3z	8 <i>x</i>
23	yz.

2. Circle terms that are like 3x:

 $-5x \quad 3x^2 \quad 3 \quad 4x \quad -11 \quad -x \quad 3y \quad -3x \quad 7x \quad x^3$

3. Circle terms that are like $-2x^2$:

-5x $3x^2$ -2 4x $-9x^2$ -x $2y^2$ -3x 7x x^3

4. Provide each monomial with a like term and an unlike term.

(a) 9a (b) $-b^2$ (c) $4c^3$