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Worksheet 4-1: Algebraic Expressions

What is a constant?
A Constant is a number representing a quantity or value that does not change.

Examples:

What is a variable?
A variable is a letter or symbol representing a quantity or value that can vary or change.

Examples:

What is an algebraic expression?
Algebraic expression is a mathematical expression containing a variable.

Examples:

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: $2x-y$, $5a-3b$

Constant Term = A Number (A whole number, a decimal number or a fraction)

Forms of Constant Terms: (Can be Positive or Negative)

1. Whole Number Form: $x+1$

2. Decimal Form: $x-0.4$

3. Fraction Form: $y+\frac{1}{7}$

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<u>Variable Term = Coefficient x Variable</u>

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

$$4x^2$$

"Coefficient" is the numerical part of the variable term. → 4

x^2 ← **"Variable" is the alphabetical letter part of the variable term, including any exponent.**

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

<u>Forms of Variable Terms:</u>

1. Product Form: $2y$, x, $-7a$

2. Quotient Form: $\frac{x}{2}$, $-0.79y$, $\frac{3}{4}a$

3. Exponent Form: $4x^2$, $2y^3$, $-x^2y$

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) $y-12$ 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 =

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Worksheet 4-2: 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., $2r$, $7a$, xy, t^2, $8st$ 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, $10m$, $\frac{2y^3}{3}$, $-\frac{3}{4}a$

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

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Classifying Polynomials by Number of Terms

Recall: **Mono**mials have **ONE** term. (Hint: **Mono**poly → one owner)
Binomials have **TWO** terms. (Hint: **Bi**cycles → two wheels)
Trinomials have **THREE** terms. (Hint: **Tri**angles → 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. $3x+5$	☐ Monomial ☐ Binomial ☐ Trinomial ☐ Polynomial
2. $8y$	☐ 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. $64e$	☐ 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. $9b$	☐ Monomial ☐ Binomial ☐ Trinomial ☐ Polynomial
13. $-12x^2+6x-11$	☐ Monomial ☐ Binomial ☐ Trinomial ☐ Polynomial
14. $2ab-8$	☐ 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**.**

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Worksheet 4-3: 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.

e.g., $2x$ and $8y$ are unlike terms. $3y^2$ and $3y$ are unlike terms.

Why? ___________________________ ___________________________

Practice:

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

$4x$	4
$8xyz$	$23y^3z$
$23yz$	$4xyz$
y^3z	$8x$
23	yz

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

$-5x$ $3x^2$ 3 $4x$ -11 $-x$ $3y$ $-3x$ $7x$ 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) $4c^3$