

8.1 Part 1 Polynomials

A monomial is a number, a variable, or the product of a number and one or more variables with whole number exponents.

Some examples...

$$y \qquad \frac{1}{5} \qquad -2m$$

$$a^2b^5c^3d$$



The degree of a monomial is the ^{add}sum of the exponents of the variables.

EXAMPLES: State the degree of each monomial.

1. $-5x^4y^2$

degree = 6

2. $\frac{2}{3}b^3$

degree = 3

3. 12

degree = 0

4. $7g^2h^1$

degree = 3

5. -10

degree = 0

6. $-9p^1$

degree = 1



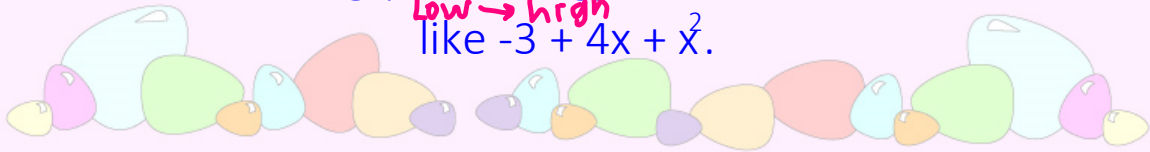
A polynomial is a monomial or a sum or monomials.

binomial- has 2 terms

trinomial- has 3 terms

Polynomials are usually written in standard form, which means that the terms are arranged in decreasing order of the exponents.

For example, $x^2 + 4x - 3$ is in decreasing (descending) order.
 Increasing (ascending) order would look like $-3 + 4x + x^2$.



EXAMPLES: Determine whether each expression is a polynomial.

1. $7x^2y^3 + 6xy - y^5 \rightarrow 7x^{\checkmark 2}y^{\checkmark 3} + 6x^{\checkmark 1}y^{\checkmark 1} + -y^{\checkmark 5}$
 polynomial

2. $\frac{2}{3}g^2 - 1 \rightarrow \frac{2}{3}g^{\checkmark 2} + -1^{\checkmark}$
 polynomial

3. $\frac{-5}{h^3} + 14h$
 quotient not a polynomial

4. 7^{\checkmark}
 polynomial



The degree of a polynomial is the greatest degree of its terms.

EXAMPLES: State the degree of each polynomial.

1. $6g^4h^3 + 7g^2h^9 \longrightarrow \text{degree} = 11$

\downarrow \downarrow
deg = 7 deg = 11

2. $-8x^3 + 4x^2 - \frac{2}{3}x - 15 \longrightarrow -8x^3 + 4x^2 + -\frac{2}{3}x + -15$

\downarrow \downarrow \downarrow \downarrow
deg = 3 deg = 2 deg = 1 deg = 0

degree = 3

Identify the polynomial by degree and by the number of terms.

Polynomial	Degree	Identified by Degree	Identified by # of terms
6	0	constant	monomial
$\overset{\text{deg}=1}{\downarrow} 3x + \underset{\text{deg}=0}{\downarrow} 1$	1	linear	binomial
$\overset{\text{deg}=2}{\uparrow} -x^2 + \overset{\text{deg}=0}{\downarrow} 2x + \underset{\text{deg}=0}{\downarrow} 5$	2	quadratic	trinomial
$\overset{\text{deg}=3}{\uparrow} 4x^3 + \overset{\text{deg}=1}{\uparrow} 8x$	3	cubic	binomial

EXAMPLES: Arrange the terms of each polynomial so that the powers of x are in descending order.
high → low

$$1. \quad 20x^{\textcircled{1}} - 5x^{\textcircled{3}} - 7x^{\textcircled{2}} + 4x^{\textcircled{4}}$$

$$4x^4 - 5x^3 - 7x^2 + 20x$$

$$2. \quad 24x^{\textcircled{2}}y - 12x^{\textcircled{3}}y^2 + 6x^{\textcircled{4}} - 9y^5x^{\textcircled{0}}$$

$$6x^4 - 12x^3y^2 + 24x^2y - 9y^5$$



EXAMPLES: Arrange the terms of each polynomial so that the powers of x are in ascending order.
low → high

$$1. \quad -12x^{\textcircled{2}} + 11x^{\textcircled{5}} - 18x^{\textcircled{1}} - 6x^{\textcircled{3}} + 15x^{\textcircled{0}}$$

$$15 - 18x - 12x^2 - 6x^3 + 11x^5$$

$$2. \quad -8xy^{\textcircled{4}} + 9x^{\textcircled{4}}y - 5x^{\textcircled{3}}y^2 + x^{\textcircled{5}} - 6x^{\textcircled{2}}y^6$$

$$-8xy^4 - 6x^2y^6 - 5x^3y^2 + 9x^4y + x^5$$

