Monomial: A constant, a variable, or the product of a constant and one or more variables.

Examples: -6 $\sqrt{10}$ $\dfrac{3}{8}$ x $-abc$ **Not Monomials:** $5m+15$ $-\dfrac{2}{n}$ $\sqrt{6cd}$

$5m$ $-\dfrac{a}{4}$ $8x^3yz^2$ $-\dfrac{5}{3}pq^4rt$ $\sqrt{7cd}$ m^{-3} $|4s|$ 10^w

Binomial: The sum (or difference) of two monomials.

$$a+c \qquad x^2-5 \qquad 8m^3n^5p+rt^2 \qquad -\sqrt{2}\,c-11d^4 \qquad 1+\dfrac{n}{5}$$

Trinomial: The combination by sums and/or differences of three monomials.

Polynomials: A monomial or the combination by sums and/or differences of any number of monomials

Coefficient of a monomial: The constant factor of the monomial.

From the examples above: -6 $\sqrt{10}$ $\dfrac{3}{8}$ 1 -1 5 $-\dfrac{1}{4}$ 8 $-\dfrac{5}{3}$ $\sqrt{7}$

Degree of a Monomial: Total number of variable factors.

xyz $-2x^4$ $10a^2cd^3$ $-\dfrac{7m}{5}$ 6 $\sqrt[3]{126}p^7q$

degree: 3   degree: 4   degree: 6   degree: ___   degree: ___   degree: ___

Degree of a Polynomial: The greatest degree of any single term of the polynomial

Leading Coefficient of a Polynomial: Coefficient of the highest degree term.

x^2-5x+2	$a^2+19acd$	$5m^4+9-mnp$	$8w^3x-x^2y^4-xy^6z^3+6w^2x^2y^2z^2$
degree: 2	degree: 3	degree: ___	degree: ___
lead. Coef.: 1	*lead. Coef.*: 19	*lead. Coef.*: ___	*lead. Coef.*: ___

Decending order   Decending order   Decending order   Decending order
by degree   by degree   by degree   by degree
x^2-5x+2 _____   _____ $-xy^6z^3+6w^2x^2y^2z^2-x^2y^4+8w^3x$

Ascending order   Ascending order   Ascending order   Ascending order
by degree   by degree   by degree   by degree
$2-5x+x^2$ _____   _____ $8w^3x-x^2y^4+6w^2x^2y^2z^2-xy^6z^3$

Opposite Poly.   *Opposite Poly.*   *Opposite Poly.*   *Opposite Poly.*
$-\left(x^2-5x+2\right)$ $-\left(a^2+19acd\right)$ $-\left(5m^4+9-mnp\right)$ $-\left(8w^3x-x^2y^4-xy^6z^3+6w^2x^2y^2z^2\right)$
$-x^2+5x-2$ _____   _____ $-8w^3x+x^2y^4+xy^6z^3-6w^2x^2y^2z^2$

Addition and Subtraction of Polynomials

$4x^5 - x^3 + 2x^2 + 8$ $\qquad\qquad\qquad\qquad\qquad$ $3x^4 - 2x^3 + 4x^2 - 6x - 1$

$\left(4x^5 - x^3 + 2x^2 + 8 \right) + \left(3x^4 - 2x^3 + 4x^2 - 6x - 1 \right)$

$\quad 4x^5 - x^3 + 2x^2 + 8 + 3x^4 - 2x^3 + 4x^2 - 6x - 1$

$$\begin{array}{r} 4x^5 \qquad\quad - x^3 + 2x^2 \qquad\quad + 8 \\ 3x^4 - 2x^3 + 4x^2 - 6x - 1 \\ \hline 4x^5 + 3x^4 - 3x^3 + 6x^2 - 6x + 7 \end{array}$$

$\quad\quad 4x^5 + 3x^4 - 3x^3 + 6x^2 - 6x + 7$

$4x^5 + 3x^4 \underline{-x^3 - 2x^3} \underline{\underline{+2x^2 + 4x^2}} - 6x \underline{\underline{\underline{+8 - 1}}}$

$\quad\quad 4x^5 + 3x^4 - 3x^3 + 6x^2 - 6x + 7$

$\left(4x^5 - x^3 + 2x^2 + 8 \right) - \left(3x^4 - 2x^3 + 4x^2 - 6x - 1 \right)$

$\left(4x^5 - x^3 + 2x^2 + 8 \right) + {}^-1\left(3x^4 - 2x^3 + 4x^2 - 6x - 1 \right)$

$\quad 4x^5 - x^3 + 2x^2 + 8 - 3x^4 + 2x^3 - 4x^2 + 6x + 1$

$\quad\quad 4x^5 - 3x^4 + x^3 - 2x^2 + 6x + 9$

$4x^5 - 3x^4 \underline{-x^3 + 2x^3} \underline{\underline{+2x^2 - 4x^2}} + 6x \underline{\underline{\underline{+8 + 1}}}$

$\quad\quad 4x^5 - 3x^4 + x^3 - 2x^2 + 6x + 9$

$$\begin{array}{r} 4x^5 \qquad\quad - x^3 + 2x^2 \qquad\quad + 8 \\ - \left(3x^4 - 2x^3 + 4x^2 - 6x - 1 \right) \\ \hline \end{array}$$

$$\begin{array}{r} 4x^5 \qquad\quad - x^3 + 2x^2 \qquad\quad + 8 \\ - 3x^4 + 2x^3 - 4x^2 + 6x + 1 \\ \hline 4x^5 - 3x^4 + x^3 - 2x^2 + 6x + 9 \end{array}$$

$2\left(4x^5 - x^3 + 2x^2 + 8 \right) + 8\left(3x^4 - 2x^3 + 4x^2 - 6x - 1 \right)$

$\quad 8x^5 - 2x^3 + 4x^2 + 16 + 24x^4 - 16x^3 + 32x^2 - 48x - 8$

$\quad\quad 8x^5 + 24x^4 - 18x^3 + 36x^2 - 48x + 8$

$5\left(4x^5 - x^3 + 2x^2 + 8 \right) - 6\left(3x^4 - 2x^3 + 4x^2 - 6x - 1 \right)$

$\quad 20x^5 - 5x^3 + 10x^2 + 40 - 18x^4 + 12x^3 - 24x^2 + 36x + 6$

$\quad\quad 20x^5 - 18x^4 + 7x^3 - 14x^2 + 36x + 46$

Multiplication

$$5a \, (\, 6a^3 \, - \, 4a \, + \, 3 \,)$$
$$30a^4 \, - \, 20a^2 \, + \, 15a$$

$$-2x^2 y^3 \, (\, 10x + 4y \, - \, 8x^2 y^4 z \,)$$
$$-20x^3 y^3 \, - \, 8x^2 y^4 \, + \, 16x^4 y^7 z$$

$$(x+5)(x-8)$$
$$x^2 - 8x$$
$$\underline{+ \; 5x \; - \; 40}$$
$$x^2 - 3x \, - \, 40$$

$$(6x+10)(x+7)$$
$$6x^2 + 42x$$
$$\underline{+ \; 10x \; + \; 70}$$
$$6x^2 \, + \, 52x \, + \, 70$$

$$(5a-2c)(3x-4)$$
$$15x^2 - 20x$$
$$\underline{-6x \; + \; 8}$$
$$15x^2 - 26x \, + \, 8$$

$$(\, a \, + \, 5 \,) \, (\, a \, - \, c \, + \, 2 \,)$$

$$(\, 4x \, - \, 3y \,) \, \left(\, 5x^2 \, + \, xy \, - \, 2y^2 \, \right)$$

$$a^2 \, - \, ac \, + \, 2a$$
$$\underline{5a \; - \; 5c \; + \; 10}$$
$$a^2 \, - \, ac \, + \, 7a \, - \, 5c \, + \, 10$$

$$20x^3 + 4x^2 y - 8xy^2$$
$$\underline{- \; 15x^2 y \; - \; 3xy^2 \; + \; 6y^3}$$
$$20x^3 - 11x^2 y - 11xy^2 \, + \, 6y^3$$

$$(\, 6m \, - \, 5n \, + \, 3 \,) \, (\, m \, - \, 2n \, + \, 8 \,)$$

$$\left(\, x^2 \, + \, 6x \, - \, 2 \, \right) \left(\, 3x^2 \, + \, 9x \, - \, 7 \, \right)$$

$$6m^2 \, - \, 12mn \, + \, 48m$$
$$- \; 5mn \quad\quad + \; 10n^2 \; - \; 40n$$
$$\underline{+3m \quad\quad\quad - \; 6n \; + \; 24}$$
$$6m^2 \, - \, 17mn \, + \, 51m \, + \, 10n^2 \, - \, 46n \, + \, 24$$

$$3x^4 \, + \, 9x^3 \, - \, 7x^2$$
$$+ \; 18x^3 \; + \; 54x^2 \; - \; 42x$$
$$\underline{- \; 6x^2 \; - \; 18x \; + \; 14}$$
$$3x^4 \, + \, 27x^3 \, + \, 41x^2 \, - \, 60x \, + \, 14$$

Simplify each expression

1. $20x^3 + 4x^3$

2. $20x^3 - 4x^3$

3. $8y^2 - x^3 + 4y^2 - 2x^3$

4. $8y^2 - x^3 - 4y^2 + 2x^3$

5. $\dfrac{3}{5}x^4 - \dfrac{1}{4}x^2 + 9 - \dfrac{1}{2}x^4 - \dfrac{5}{4}x^2 + 2$

6. $7m^2n - mn + 4m^2n + mn^2 - 3mn - 10mn^2$

7. $(8x - 10) + (x - 6)$

8. $(9x - 1) - (2x - 4)$

9. $(8x + 10) + (x - 6) - (3x - 7)$

10. $2y - (5y + 20)$

11. $(8a^2 - a) - (2a^2 - a + 6) + (9a^2 - 4)$

12. $(w^2 - 2w + 6) + (4w^2 - 7w - 11)$

13. $(3n^2 - n + 6) - (8n^2 - 9n + 1) + (-6n - 3)$

14. $2(-5n + 2) - 3(-2n - 4) + (7n^2 - n - 6)$

15. $4(3x - 5) - (3x - 6) + 9(8x - 2)$

16. $x(x - 2y) + y(x - 4y)$

17. $2a(a - 1) - 4c(3c - 8) + 5(6a + 2)$

18. $5x + 7x(-2x + 10)$

19. $5x - 7x(-2x + 10)$

20. $a(5a - 4c + 2) + 2c(a + 3c - 9) - 4(6a - 3c + 1)$

21. $5(3m - 6n + 4) - m + 8n$

22. $3x^2y(2x - 5y + 1) - xy^2(-6x + y - 2)$