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Algebra Formulas

Important Algebraic Formulas from Basics to Advance

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Basic Formulas in Algebra

- $a^2 - b^2 = (a - b)(a + b)$
- $(a + b)^2 = a^2 + 2ab + b^2$
- $a^2 + b^2 = (a + b)^2 - 2ab$
- $(a - b)^2 = a^2 - 2ab + b^2$
- $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$
- $(a - b - c)^2 = a^2 + b^2 + c^2 - 2ab + 2bc - 2ca$
- $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$; $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$
- $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$; $(a + b)^3 = a^3 - b^3 + 3ab(a - b)$
- $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
- $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
- $(a + b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$
- $(a - b)^4 = a^4 - 4a^3b + 6a^2b^2 - 4ab^3 + b^4$
- $a^4 - b^4 = (a - b)(a + b)(a^2 + b^2)$
- $a^5 - b^5 = (a - b)(a^4 + a^3b + a^2b^2 + ab^3 + b^4)$
- $a^n - b^n = (a - b)(a^{n-1} + a^{n-2}b + \cdots + b^{n-2}a + b^{n-1})$
- $(a^m)(a^n) = a^{m+n}$; $(ab)^m = a^m b^m$; $(a^m)^n = a^{mn}$

Algebra Formulas for Class 8

- $(a+b)^2 = a^2 + 2ab + b^2$
- $(a-b)^2 = a^2 - 2ab + b^2$
- $(a-b)(a+b) = a^2 - b^2$
- $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$
- $(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$
- $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$
- $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$
- $(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$
- $(a-b-c)^2 = a^2 + b^2 + c^2 - 2ab + 2bc - 2ca$

Algebra Formulas for Class 9

- $log_a(xy) = log_a x + log_a y$
- $log_a\left(\frac{x}{y}\right) = log_a x - log_a y$
- $log_a x^m = m\, log_a x$
- $log_a a = 1$
- $log_a 1 = 0$

Algebra Formulas for Class 10

The general form of any quadratic equation is **$ax^2 + bx + c = 0$**, where x is variable a, b is coefficient and c is constant.

Formulas for Arithmetic Sequence

For any given arithmetic sequence {a, a + d, a + 2d, ...}

- nth term, $a_n = a + (n - 1)d$
- Sum of the first n terms, $S_n = \frac{n}{2}[2a + (n - 1)d]$

Formulas for Geometric Sequences

For any given geometric sequence {a, ar, ar^2, ...}

- nth term, $a_n = a\,r_{n-1}$
- Sum of the first n terms, $S_n = a.\frac{r^n - 1}{r - 1}$
- Sum of infinite terms when r<1, $S = \frac{a}{1 - r}$

Algebra Formulas for Class 11

The important permutation and combination formulas are,

Factorial Formula

- n! = n × (n – 1) × (n – 2) × ... × 3 × 2 × 1

Permutation Formulas

- ^nP_r = n! / (n – r)!

Combination Formula

- ${}_nC_r = n!/[r!(n-r)!]$

Binomial Theorem

Algebra Formulas for Class 12

The important formulas for students in class 12 include vector algebra formulas. These formulas are discussed below,

Take any three vectors, a, b, and c, then,

- For vector a = xi + yj + zk, then magnitude of $|a| = \sqrt{(x^2 + y^2 + z^2)}$.
- Unit vector along a is a / |a|
- Dot product of two vectors a and b is defined as **a · b = |a| |b| cos θ**

  where θ is the angle between the vectors a and b.
- Cross product of vectors a and b is defined as **a × b = |a| |b| sin θ**

  where θ is the angle between the vectors a and b.
- Scalar Triple Product of three vectors a, b, and c are given by **[a b c] = a · (b × c) = (a × b) · c.**