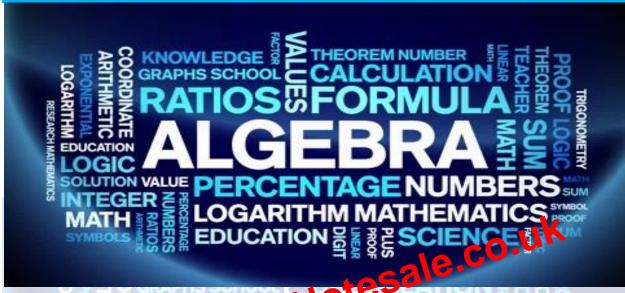
Algebra formulas



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Algebra is a branch of mathematic that substitutes letters for numbers. An algebraic equation depicts a scale, what is done on one side of the scale with a number is also done to either side of the scale. The numbers are constants. Algebra also includes real numbers, complex numbers, matrices, vectors and much more. X, Y, A, B are the most commonly used letters that represent algebraic problems and equations.

Algebra	<u>Algebra</u>	<u>Algebra</u>	<u>Algebra</u>	<u>Algebra</u>	<u>Algebra</u>
Formulas from	Formulas For				
Class 8 to Class	Class 8	Class 9	Class 10	Class 11	Class 12
12					

Important Formulas in Algebra

Here is a list of Algebraic formulas -

- $a^2 b^2 = (a b)(a + b)$
- $(a + b)^2 = a^2 + 2ab + b^2$
- $a^2 + b^2 = (a + b)^2 2ab$

Reference: Books,

"Elementary Algebra" by Charles P. McKeague, Algebra for College Students" by Mark Dugopolski, "Higher Algebra" by Hall & Knight, "College Algebra" by James Stewart, Lothar Redlin, and Saleem Watson, "Schaum's Outline of College Algebra" by Murray Spiegel, Khan Academy (www.khanacademy.org), Paul's Online Math Notes (tutorial.math.lamar.edu)

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- 1. $|x|=a \implies x=a$ or x=-a. $|x|=a \ge x=a$ or x=-a.
- 2. For a,b>0a, b > 0a,b>0: $|a+b| \le |a| + |b|$ (Triangle Inequality). $|a+b| \le |a| + |b|$ \quad $\text{text}\{(\text{Triangle Inequality})\}.|a+b| \leq |a|+|b|(\text{Triangle Inequality}).$
- 3. Quadratic inequality: ax2+bx+c>0 or ax2+bx+c<0, $ax^2+bx+c>0$ \quad \text{or} \quad $ax^2 + bx + c < 0$, $ax^2 + bx + c > 0$ or $ax^2 + bx + c < 0$, solved using sign charts or graphing.

20. Higher-Degree Polynomial Factorization

- 1. Polynomial division:
 - o For P(x)P(x)P(x) divided by (x-a)(x-a)(x-a), the remainder is P(a)P(a)P(a).
- 2. Factor theorem:
 - o If P(a)=0 P(a)=0, then (x-a)(x-a) is a factor of P(x)P(x)P(x).

21. Arithmetic-Geometric Means

- Notesale.co.uk 1. Arithmetic mean (AM) of nnn number $+ann.AM = \frac{a_1 + a_2 + a_1}{a_1 + a_2}$ $\det + a_n \{n\}.AM = na_1 + a_2 + a_3 + a_4 + a_4$
- 2. Geometric mean (GM) of numbers: $\operatorname{Inn.GM} = \operatorname{sgrt}[n]\{a \mid 1 \mid cdot \mid a \mid 2\}$ \cdot \dots \cdo a \ \.GM=na1\a2

22. Modular Arithmetic

Rules for mod operations:

- 1. $(a+b) \mod n = [(a \mod n) + (b \mod n)] \mod n(a+b) \mod n = [(a \mod n) + (b \mod n)]$ $\mod n(a+b)\mod n=[(a\bmod n)+(b\bmod n)]\mod n$.
- 2. $(a \cdot b) \mod n = [(a \mod n) \cdot (b \mod n)] \mod n(a \cdot cdot b) \mod n = [(a \mod n) \cdot cdot (b \mod n)]$ n)] $\mod n(a \cdot b) \mod n = [(a \mod n) \cdot (b \mod n)] \mod n$.

23. Exponential Equations

- 1. If $ax=aya^x = a^yax=ay$, then x=yx = yx=y (if a>0a>0 and $a\ne 1a \setminus neq 1a \cup 1$).
- 2. For equations involving different bases, use logarithms to solve: $ax=b \implies x=\log f \circ ab.a^x$ = b \implies $x = \log_a b.ax = b \Rightarrow x = \log ab$.

24. Advanced Progressions

Reference: Books,

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For a polynomial $P(x)=anxn+an-1xn-1+\cdots+a0$ $P(x) = a_nx^n + a_{n-1}x^{n-1} + \cdot \cdot + a_0$ $P(x)=anxn+an-1xn-1+\cdots+a0$:

Any rational root is of the form:

 $pq, \frac{p}{q}, qp,$

where ppp divides the constant term a0a_0a0 and qqq divides the leading coefficient ana_nan.

38. Advanced Modular Arithmetic

- 1. Fermat's Little Theorem: $ap-1\equiv 1 \pmod{p}$ (if p is prime). $a^{p-1} \pmod{p} \pmod{p} \pmod{p} \pmod{p}$. $ap-1\equiv 1 \pmod{p}$ (if p is prime).
- Euler's Totient Function:
 φ(n)=Number of integers k such that 1≤k≤n and gcd[/o](k,n)=1 \p (i(n)) \text{Number of integers \((k\)) such that \((1 \leq k \leq n\)) and \((\)gcd(k,n)=1.
 ψ(n)=Number of integers k such that 1≤is not d gcd(k,n)=1.

39. Proper as of Absolute Values

- 1. Inequalities involving absolute values: $|x+y| \le |x| + |y|$ (Triangle Inequality). $|x+y| \le |x| + |y|$ (Triangle Inequality).
- 2. Square root property: $|x|=x2.|x| = \sqrt{x^2}.|x|=x2.$

40. Advanced Algebraic Concepts

- 1. **Homogeneous Equations**: For equations where all terms are of the same degree, substitution x=kyx=kyx=ky simplifies the equation.
- 2. **Parametric Equations**: Represent curves using parameters ttt: x=f(t),y=g(t).x=f(t), \quad y=g(t).x=f(t),y=g(t).

41. Advanced Binomial Theorem

1. Expansion of $(a+b)n(a+b)^n(a+b)n$:

 $(a+b)n = \sum k=0 n(nk)an-kbk, (a+b)^n = \sum k=0 ^n (k=0)^n (k)a^{n-k}b^k, (a+b)n=k=0 (kn)an-kbk,$

Reference: Books,