

Basic Maths Formulas

Trigonometry Formulas

- $\sin^{-1}(-x) = -\sin^{-1}x$
- $\tan^{-1}x + \cot^{-1}x = \pi / 2$
- $\sin^{-1}x + \cos^{-1}x = \pi / 2$
- $\cos^{-1}(-x) = \pi - \cos^{-1}x$
- $\cot^{-1}(-x) = \pi - \cot^{-1}x$
- $\sin(90^\circ - A) = \cos A$
- $\cos(90^\circ - A) = \sin A$
- $\tan(90^\circ - A) = \cot A$
- $\cot(90^\circ - A) = \tan A$
- $\sec(90^\circ - A) = \operatorname{cosec} A$
- $\operatorname{cosec}(90^\circ - A) = \sec A$
- $\sin^2 \theta + \cos^2 \theta = 1 \Rightarrow \sin^2 \theta = 1 - \cos^2 \theta \Rightarrow \cos^2 \theta = 1 - \sin^2 \theta$
- $\operatorname{cosec}^2 \theta - \cot^2 \theta = 1 \Rightarrow \operatorname{cosec}^2 \theta = 1 + \cot^2 \theta \Rightarrow \cot^2 \theta = \operatorname{cosec}^2 \theta - 1$
- $\sec^2 \theta - \tan^2 \theta = 1 \Rightarrow \sec^2 \theta = 1 + \tan^2 \theta \Rightarrow \tan^2 \theta = \sec^2 \theta - 1$
- $\sin \theta \operatorname{cosec} \theta = 1 \Rightarrow \cos \theta \sec \theta = 1 \Rightarrow \tan \theta \cot \theta = 1$

Calculus Formulas

- $\int f(x) dx = F(x) + C$
- **Power Rule:** $\int x^n dx = (x^{n+1}) / (n+1) + C$. (Where $n \neq -1$)
- **Exponential Rules:** $\int e^x dx = e^x + C$
- $\int a^x dx = a^x / \ln(a) + C$
- $\int \ln(x) dx = x \ln(x) - x + C$
- **Constant Multiplication Rule:** $\int a dx = ax + C$, where a is the constant.
- **Reciprocal Rule:** $\int (1/x) dx = \ln(x) + C$
- **Sum Rules:** $\int [f(x) + g(x)] dx = \int f(x) dx + \int g(x) dx$
- **Difference Rules:** $\int [f(x) - g(x)] dx = \int f(x) dx - \int g(x) dx$
- $\int k f(x) dx = k \int f(x) dx$, where k is any real number.

- **Integration by parts:** $\int f(x) g(x) dx = f(x) \int g(x) dx - \int [d/dx f(x) \times \int g(x) dx] dx$
- $\int \cos x dx = \sin x + C$
- $\int \sin x dx = -\cos x + C$
- $\int \sec^2 x dx = \tan x + C$
- $\int \operatorname{cosec}^2 x dx = -\cot x + C$
- $\int \sec x \tan x dx = \sec x + C$
- $\int \operatorname{cosec} x \cot x dx = -\operatorname{cosec} x + C$
- $d/dx [f(x) + g(x)] = d/dx [f(x)] + d/dx [g(x)]$
- $d/dx [f(x) - g(x)] = d/dx [f(x)] - d/dx [g(x)]$
- $d/dx [f(x) \times g(x)] = d/dx [f(x)] \times [g(x)] + [f(x)] \times d/dx [g(x)]$
- $d/dx [f(x) / g(x)] = \{d/dx [f(x)] \times [g(x)] - [f(x)] \times d/dx [g(x)]\} / g(x)^2$

Coordinate Geometry Formulas

- Slope of a line (m) = rise/run = $\Delta y / \Delta x = y_2 - y_1 / x_2 - x_1$
- Point-Slope Form $y - y_1 = m(x - x_1)$

Algebra Formulas

- $a \times (b + c) = a \times b + a \times c$ (Distributive property)
- $a + b = b + a$ (Commutative Property of Addition)
- $a \times b = b \times a$ (Commutative Property of Multiplication)
- $a + (b + c) = (a + b) + c$ (Associative Property of Addition)
- $a \times (b \times c) = (a \times b) \times c$ (Associative Property of Multiplication)
- $a + 0 = a$ (Additive Identity Property)
- $a \times 1 = a$ (Multiplicative Identity Property)
- $a + (-a) = 0$ (Additive Inverse Property)
- $a \cdot (1/a) = 1$ (Multiplicative Inverse Property)
- $a \times (0) = 0$ (Zero Property of Multiplication)
- $(a + b)^2 = a^2 + 2ab + b^2$
- $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$

Number System Formulas

- $\sqrt{ab} = \sqrt{a} \sqrt{b}$

- $\sqrt{a/b} = \sqrt{a} / \sqrt{b}$
- $(\sqrt{a} + \sqrt{b})(\sqrt{a} - \sqrt{b}) = a - b$
- $(\sqrt{a} + \sqrt{b})^2 = a + 2\sqrt{ab} + b$
- $(a + \sqrt{b})(a - \sqrt{b}) = a^2 - b$
- $(a + b)(a - b) = a^2 - b^2$

Statistics Formula

- Class-mark = (Upper limit + Lower limit)/ 2
- Mean = Sum of the observations / Total number of observations
- Mode = The observation occurring the most frequent times
- Experimental Probability Formula: The trial counts in which the event (E) has occurred / The sum of trials

Area and Volume Formulas

- Surface Area of a Cuboid = $2(lb + bh + hl)$, where 'l', 'b' and 'h' are the length, breadth, and height respectively.
- Curved Surface Area of a Cone = $1/2 \times l \times 2\pi r = \pi rl$, where 'r' is its base radius and 'l' its slant height, then, 'l' = Square root of $(r^2 + h^2)$
- Surface Area of a Sphere = $4 \pi r^2$
- Volume of a Cuboid = Base Area \times Height = Length \times Breadth \times Height
- Volume of a Cube = a^3 where 'a' is the edge of the cube.
- Volume of a Cylinder = $\pi r^2 h$, where, 'r' and 'h' are radius and height respectively.
- Volume of a Cone = $(1/3)\pi r^2 h$
- Volume of a Sphere = $(4/3)\pi r^3$
- Volume of a Hemisphere = $(2/3)\pi r^3$

Interest Formulas

- Discount = Marked Price - Sale Price
- Simple Interest = (Principal \times Rate \times Time)/100

- Compound Interest Formula = Amount – Principal

Exponent Formulas

- Law of Product: $a^m \times a^n = a^{m+n}$
- Law of Quotient: $a^m/a^n = a^{m-n}$
- Law of Zero Exponent: $a^0 = 1$
- Law of Negative Exponent: $a^{-m} = 1/a^m$
- Law of Power of a Power: $(a^m)^n = a^{mn}$
- Law of Power of a Product: $(ab)^m = a^m b^m$
- Law of Power of a Quotient: $(a/b)^m = a^m/b^m$

Rational Number Formulas

- Additive Identity states $(a/b + 0) = (a/b)$
- Multiplicative Identity states $(a/b) \times 1 = (a/b)$
- Multiplicative Inverse states $(a/b) \times (b/a) = 1$