

Class 10 Mathematics Comprehensive Formula Sheet

Complete Chapter-wise Formulas (Bilingual: English & Romanized Hindi)

Note: To ensure universal accessibility and standard formatting, all mathematical terms are provided in English alongside their Romanized Hindi equivalents (Hinglish), commonly used by students across India.

1. Real Numbers (Vastvik Sankhyayein)

- **Euclid's Division Lemma (Yooklid Vibhajan Prameya):** Given positive integers a and b , there exist unique integers q and r satisfying:

$$a = bq + r, \quad 0 \leq r < b$$

- **Relation between LCM and HCF:** For any two positive integers a and b :

$$\text{HCF}(a, b) \times \text{LCM}(a, b) = a \times b$$

2. Polynomials (Bahupad)

For a quadratic polynomial $P(x) = ax^2 + bx + c$, let α and β be its zeroes (shunyak).

- **Sum of zeroes (Shunyako ka Yog):** $\alpha + \beta = -\frac{b}{a} = -\frac{\text{Coefficient of } x}{\text{Coefficient of } x^2}$
- **Product of zeroes (Shunyako ka Gunaphal):** $\alpha\beta = \frac{c}{a} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$

3. Pair of Linear Equations in Two Variables (Do Char Wale Raikhik Samikaran)

For two equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$:

- **Intersecting Lines (Adwitiya Hal / Unique Solution):** $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
- **Coincident Lines (Anant Hal / Infinitely Many Solutions):** $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
- **Parallel Lines (Koi Hal Nahi / No Solution):** $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

4. Quadratic Equations (Dwighat Samikaran)

For the standard form $ax^2 + bx + c = 0$ ($a \neq 0$):

- **Discriminant (Vivitkar):** $D = b^2 - 4ac$
- **Quadratic Formula (Dwighati Sutra):**

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- **Nature of Roots (Moolo ki Prakriti):**

- If $D > 0$: Two distinct real roots (Do bhinn vastvik mool).
- If $D = 0$: Two equal real roots (Do barabar vastvik mool).
- If $D < 0$: No real roots (Koi vastvik mool nahi).

5. Arithmetic Progressions (Samantar Shredi)

Let a be the first term and d be the common difference (sarv antar).

- **n -th term (n -va pad):** $a_n = a + (n - 1)d$
- **Sum of first n terms (n pado ka yog):**

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

Alternatively, if the last term l is known: $S_n = \frac{n}{2}(a + l)$

6. Coordinate Geometry (Nirdeshank Jyamiti)

- **Distance Formula (Doori Sutra):** Distance between $P(x_1, y_1)$ and $Q(x_2, y_2)$:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

- **Section Formula (Vibhajan Sutra):** Coordinates of point dividing the line segment in ratio $m_1 : m_2$:

$$x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \quad y = \frac{m_1y_2 + m_2y_1}{m_1 + m_2}$$

- **Mid-point Formula (Madhya Bindu):**

$$x = \frac{x_1 + x_2}{2}, \quad y = \frac{y_1 + y_2}{2}$$

7. Trigonometry (Trikonmiti)

In a right-angled triangle, let θ be an acute angle.

- **Trigonometric Ratios (Trikonmitiya Anupat):**

- $\sin \theta = \frac{\text{Perpendicular (Lamba)}}{\text{Hypotenuse (Karna)}}$
- $\cos \theta = \frac{\text{Base (Aadhar)}}{\text{Hypotenuse (Karna)}}$
- $\tan \theta = \frac{\text{Perpendicular (Lamba)}}{\text{Base (Aadhar)}} = \frac{\sin \theta}{\cos \theta}$

- **Trigonometric Identities (Trikonmitiya Sarvsamikayein):**

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

$$1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$$

8. Circles & Areas Related to Circles (Vritt aur Vritton se Sambandhit Kshetrafal)

Let r be the radius and θ be the angle of the sector in degrees.

- **Circumference (Paridhi):** $2\pi r$
- **Area (Kshetrafal):** πr^2
- **Length of an arc of a sector (Trijyakhand ke chaap ki lambai):** $\frac{\theta}{360^\circ} \times 2\pi r$
- **Area of a sector (Trijyakhand ka kshetrafal):** $\frac{\theta}{360^\circ} \times \pi r^2$

9. Surface Areas and Volumes (Prishthi Kshetrafal aur Aytan)

Shape (Aakar)	CSA / LSA (Vakra Prishth)	TSA (Kul Prishth)	Volume (Aytan)
Cuboid (Ghanabh)	$2h(l + b)$	$2(lb + bh + hl)$	$l \times b \times h$
Cube (Ghan)	$4a^2$	$6a^2$	a^3
Cylinder (Bilan)	$2\pi rh$	$2\pi r(r + h)$	$\pi r^2 h$
Cone (Shanku)	πrl ($l = \sqrt{r^2 + h^2}$)	$\pi r(r + l)$	$\frac{1}{3}\pi r^2 h$
Sphere (Gola)	$4\pi r^2$	$4\pi r^2$	$\frac{4}{3}\pi r^3$
Hemisphere (Ardhgola)	$2\pi r^2$	$3\pi r^2$	$\frac{2}{3}\pi r^3$

10. Statistics (Sankhyiki)

- **Mean (Madhya) - Direct Method:**

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$$

- **Mode (Bahulak):**

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

- **Median (Madhyak):**

$$\text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f} \right) \times h$$

- **Empirical Relationship:** $3 \times \text{Median} = \text{Mode} + 2 \times \text{Mean}$

11. Probability (Prayikta)

- **Probability of an Event E :**

$$P(E) = \frac{\text{Number of outcomes favorable to } E \text{ (Anukul parinamo ki sankhya)}}{\text{Total number of possible outcomes (Kul parinamo ki sankhya)}}$$

- **Complementary Event:** $P(E) + P(\text{not } E) = P(E) + P(\bar{E}) = 1$
- The probability of a sure event is 1, and an impossible event is 0. Therefore, $0 \leq P(E) \leq 1$.

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