

CBSE Class 10 Maths Formula Master Sheet

Comprehensive Study Material & Revision Guide

Based on the Latest Examination Pattern

1. Real Numbers

- **Fundamental Theorem of Arithmetic:** Every composite number can be expressed (factorised) as a product of primes, and this factorisation is unique, apart from the order in which the prime factors occur.
- **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

For a quadratic polynomial $p(x) = ax^2 + bx + c$, if α and β are its zeroes:

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

Note: A quadratic polynomial with zeroes α and β can be written as: $k[x^2 - (\alpha + \beta)x + \alpha\beta]$, where k is a constant.

3. Pair of Linear Equations in Two Variables

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

Ratio Compare	Com-	Graphical Rep.	Algebraic Interpretation	Consistency
$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$		Intersecting Lines	Exactly one solution (Unique)	Consistent
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$		Coincident Lines	Infinitely many solutions	Consistent (Dependent)
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$		Parallel Lines	No solution	Inconsistent

4. Quadratic Equations

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

- **Discriminant (D):** $D = b^2 - 4ac$
- **Quadratic Formula:** The roots are given by $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- **Nature of Roots:**
 - If $D > 0$: Two distinct real roots.
 - If $D = 0$: Two equal real roots (roots are $-b/2a$).
 - If $D < 0$: No real roots.

5. Arithmetic Progressions (A.P.)

Standard form of an A.P.: $a, a + d, a + 2d, a + 3d, \dots$

- **First term:** a
- **Common difference (d):** $d = a_2 - a_1 = a_3 - a_2$
- **n^{th} term (a_n):** $a_n = a + (n - 1)d$
- **Sum of first n terms (S_n):**
$$S_n = \frac{n}{2} [2a + (n - 1)d] \quad \text{or} \quad S_n = \frac{n}{2}(a + l)$$

where l is the last term.

6. Triangles

- **Basic Proportionality Theorem (Thales Theorem):** If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.
- **Similarity Criteria:** AAA (Angle-Angle-Angle), SAS (Side-Angle-Side), SSS (Side-Side-Side).

7. Coordinate Geometry

Let $P(x_1, y_1)$ and $Q(x_2, y_2)$ be two points.

- **Distance Formula:** $PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- **Distance from Origin $(0, 0)$:** $OP = \sqrt{x^2 + y^2}$
- **Section Formula:** Coordinates of point $R(x, y)$ dividing PQ internally 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:** $x = \frac{x_1 + x_2}{2}, \quad y = \frac{y_1 + y_2}{2}$

8. Introduction to Trigonometry

In a right-angled triangle, with angle θ :

- $\sin \theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$
- $\cos \theta = \frac{\text{Base}}{\text{Hypotenuse}}$
- $\tan \theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{\sin \theta}{\cos \theta}$
- $\operatorname{cosec} \theta = \frac{1}{\sin \theta}$
- $\sec \theta = \frac{1}{\cos \theta}$
- $\cot \theta = \frac{1}{\tan \theta}$

Trigonometric Identities:

- $\sin^2 \theta + \cos^2 \theta = 1$
- $1 + \tan^2 \theta = \sec^2 \theta$
- $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$

Trigonometric Table of Standard Angles:

Angle (θ)	0°	30°	45°	60°	90°
$\sin \theta$	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1
$\cos \theta$	1	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$	0
$\tan \theta$	0	$1/\sqrt{3}$	1	$\sqrt{3}$	Not defined

9. Circles

- The tangent at any point of a circle is perpendicular to the radius through the point of contact.
- The lengths of tangents drawn from an external point to a circle are equal.

10. Areas Related to Circles

For a circle of radius r and angle of sector θ (in degrees):

- **Circumference:** $2\pi r$ — **Area:** πr^2
- **Length of an arc of a sector:** $l = \frac{\theta}{360^\circ} \times 2\pi r$
- **Area of a sector:** $A = \frac{\theta}{360^\circ} \times \pi r^2$
- **Area of segment:** Area of the corresponding sector — Area of the corresponding triangle.

11. Surface Areas and Volumes

- **Cuboid:**

- Lateral Surface Area (LSA) = $2h(l + b)$
- Total Surface Area (TSA) = $2(lb + bh + hl)$
- Volume = $l \times b \times h$

- **Cube (side a):** LSA = $4a^2$, TSA = $6a^2$, Volume = a^3

- **Right Circular Cylinder (radius r , height h):**

- Curved Surface Area (CSA) = $2\pi rh$
- TSA = $2\pi r(r + h)$
- Volume = $\pi r^2 h$

- **Right Circular Cone (radius r , height h , slant height l):**

- $l = \sqrt{r^2 + h^2}$
- CSA = πrl
- TSA = $\pi r(l + r)$
- Volume = $\frac{1}{3}\pi r^2 h$

- **Sphere (radius r):** Surface Area = $4\pi r^2$, Volume = $\frac{4}{3}\pi r^3$

- **Hemisphere (radius r):** CSA = $2\pi r^2$, TSA = $3\pi r^2$, Volume = $\frac{2}{3}\pi r^3$

12. Statistics

- **Mean ($\bar{x}$):**

- Direct Method: $\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$
- Assumed Mean Method: $\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$, where $d_i = x_i - a$

- **Mode:**

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

where l = lower limit of modal class, h = class size, f_1 = frequency of modal class, f_0 = freq of preceding class, f_2 = freq of succeeding class.

- **Median:**

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

where l = lower limit of median class, n = number of observations, cf = cumulative frequency of preceding class, f = frequency of median class, h = class size.

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

13. Probability

- **Theoretical Probability:**

$$P(E) = \frac{\text{Number of outcomes favourable to } E}{\text{Total number of possible outcomes}}$$

- For any event E , $0 \leq P(E) \leq 1$.
- **Complementary Event:** $P(E) + P(\bar{E}) = 1$
- The probability of a sure event is 1, and an impossible event is 0.

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