

# FORMULA SHEET

## 1. Real Number

Square root of any prime number is always irrational

E. g. :  $\sqrt{2}, \sqrt{3}, \sqrt{4} \dots \dots$

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

If P is a prime number and P divides  $A^2$ , then p divides A, where A is positive integer.

## 2. Polynomials

**Standard Form (Quadratic):**  $ax^2 + bx + c$

**Sum of Zeros ( $\alpha + \beta$ ):**  $-\frac{b}{a}$

**Product of Zeros ( $\alpha * \beta$ ):**  $\frac{c}{a}$

**Degrees:** Linear (1), Quadratic (2), Cubic (3).

Monomial : Has only one term. Like :  $3x$  etc

Binomial : Has two terms. Like :  $3x+c$  etc

Trinomial : has three terms. Like :  $2x^2 + 3x + 2$

**Quadratic Polynomial :**

**Standard Form:**  $ax^2 + bx + c$

**Quadratic Formula:**  $x = \frac{-b \pm \sqrt{D}}{2a}$

**Discriminant (D):**  $D = b^2 - 4ac$

- $D > 0$ : Two distinct real roots.
- $D = 0$ : Two equal real roots
- $D < 0$ : No real roots.

### 3. Pair of Linear Equations in Two Variables

Standard Form of Linear Equation in Two Variables

$$Ax + By + c = 0,$$

Where A and B are not both zero.

Or,

$$Ax + By + c = 0, \text{ where } A^2 + B^2 \neq 0$$

$$a_1x + b_1y + c_1 = 0, \text{ where } a_1^2 + b_1^2 \neq 0$$

$$a_2x + b_2y + c_2 = 0, \text{ where } a_2^2 + b_2^2 \neq 0$$

**Condition for Intersecting Lines (Unique Solution):**

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$$

**Condition for Coincident Lines (Infinite Solutions):**

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

**Condition for Parallel Lines (No Solution):**

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

### 4. Quadratic Equation

**Standard Form of Quadratic Equation :**

$$ax^2 + bx + c = 0, \quad a \neq 0$$

$$\text{Sum of Roots : } \alpha + \beta = -\frac{b}{a}$$

$$\text{Product of roots : } \alpha\beta = \frac{c}{a}$$

**Discriminant (D):**  $D = b^2 - 4ac$

- $D > 0$ : Two distinct real roots.
- $D = 0$ : Two equal real roots
- $D < 0$ : No real roots.

**Quadratic Formula:**  $x = \frac{-b \pm \sqrt{D}}{2a}$

## 5. Arithmetic Progression

**General Form of AP :**  $a, a+d, a+2d, a+3d, \dots$

Where, **First Term** is :  $a$

**Common Difference** :  $d$

$$a_2 - a_1 = a_3 - a_2 = a_4 - a_3 = \dots = a_n - a_{n-1} = d$$

$$a_n = a + (n - 1)d$$

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

Where,  $L$  = last term

**If  $a, b, c$  are in AP then,  $b = \frac{a+c}{2}$**

## 6. Triangle

**Similar Figure :**  $\rightarrow$  Same Shape , Not necessarily same size

All Circles are similar

All Squares are similar

All Equilateral triangles are similar

All Congruent Figures are similar

All Similar figure are not congruent

### **Similar Triangles :**

Two Triangles **ABC & DEF** are similar if,

-If there corresponding angles are equal

$$\angle A = \angle D, \angle B = \angle E, \angle C = \angle F$$

& their corresponding sides are in same ratio (proportion)

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$

#### **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 same ratio.

#### **Converse of Basic Proportionality Theorem**

If a line divides any two sides of a triangle in the

The same ratio then the lines is parallel to the third Side.

**Similarity Criteria:** AAA, SSS, SAS, and AA.

## **7. Coordinate Geometry**

Abcissa/x-coordinate : The distance of a point from y axis

Ordinate/Y-coordinate : The distance of a point from x axis

**Distance Formula :**

Distance between points A( $x_1, y_1$ ) and B( $x_2, y_2$ )

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

Or,

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

**Distance From Origin :**

Distance of a point A( $x, y$ ) from origin O(0,0)

$$\text{Distance OA} = \sqrt{x^2 + y^2}$$

**Section Formula :**

$$P(x, y) = \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$$

$$P(x, y) = \frac{kx_2 + x_1}{k+1}, \frac{ky_2 + y_1}{k+1}$$

**Mid-Point Formula :**

$$M(x, y) = \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}$$

**8. Introduction to Trigonometry**

$$\sin \theta = \frac{p}{h}, \cos \theta = \frac{b}{h}, \tan \theta = \frac{p}{b}$$

$$\operatorname{cosec} \theta = \frac{h}{p}, \sec \theta = \frac{h}{b}, \cot \theta = \frac{b}{p}$$

$$\sin \theta = \frac{1}{\operatorname{cosec} \theta}, \cos \theta = \frac{1}{\sec \theta}, \tan \theta = \frac{1}{\cot \theta}$$

$\angle A$	$0^\circ$	$30^\circ$	$45^\circ$	$60^\circ$	$90^\circ$
$\sin \theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan \theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not def
$\operatorname{cosec} \theta$	Not def	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$\sec \theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not def
$\cot \theta$	Not def	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

**Trigonometric Identity :**

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

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

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

## 9. Circle

Tangent : line that intersects the circle at only point.

**Important :**

Diameter is the longest chord

Tangent is perpendicular to the radius through the Point of contact.

A circle has infinitely many tangents.

## 10. Area related to circle

**Area of Circle:**  $\pi r^2$

**Circumference:**  $2\pi r$

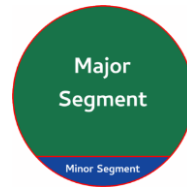
**Area of Sector:**  $\frac{\pi r^2 \theta}{360}$

**Length of Arc:**  $2\pi r * \frac{\theta}{360}$

**Area of Segment:** Area of Sector - Area of Triangle

**Area of major sector** = area of circle – area of minor sector

**Area of major segment** = area of circle – area of minor segment



## 11. Surface Areas and Volumes

Shape	TSA	CSA/LSA	VOLUME
Cube	$6a^2$	$4a^2$	$a^3$
Cuboid	$2(lb+bh+hl)$	$2(l+b)h$	$L \times B \times H$
Cylinder	$2\pi r(r + h)$	$2\pi rh$	$\pi r^2 h$
Sphere	$4\pi r^2$	$4\pi r^2$	$\frac{4}{3}\pi r^3$
Hemisphere	$3\pi r^2$	$2\pi r^2$	$\frac{2}{3}\pi r^3$
Cone	$\pi rl + \pi r^2$ $l = \sqrt{r^2 + h^2}$	$\pi rl$	$\frac{1}{3}\pi r^2 h$

## Chapter 13 - Statistics

### Direct Method

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

### Assumed Mean Method

$$\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$$

### Step Deviation Method

$$\bar{x} = a + \frac{\sum f_i u_i}{\sum f_i} \times h$$

### Mode of Grouped Data

$$l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

### Median of Grouped Data

$$l + \frac{\frac{n}{2} - cf}{f} \times h$$

### Class Marks

$$\frac{\text{Upper Class Limit} - \text{Lower Class Limit}}{2}$$

## 14. Probability

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

$$\text{Range : } 0 \leq P(E) \leq 1$$

$$P(E) + P(\text{not}(E)) = 1$$