



↓ Download the ExamBhai App : [Click Here](#)

ExamBhai.com — Premium Study Material

COMPREHENSIVE GEOMETRY CHEAT SHEET

1. 2D Shapes, Area & Perimeter

Triangle:

$$\text{Area} = \frac{1}{2}bh = \sqrt{s(s-a)(s-b)(s-c)}$$

where semi-perimeter $s = \frac{a+b+c}{2}$ (Heron's Formula).

Right-Angled Triangle:

$$a^2 + b^2 = c^2 \quad (\text{Pythagorean Theorem})$$

Circle:

$$\text{Area} = \pi r^2, \quad \text{Circumference} = 2\pi r$$

$$\text{Arc Length } (s) = r\theta, \quad \text{Sector Area} = \frac{1}{2}r^2\theta \quad (\theta \text{ in rad})$$

Parallelogram:

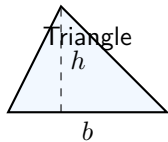
$$\text{Area} = bh$$

Trapezoid:

$$\text{Area} = \frac{a+b}{2} \cdot h$$

Regular Polygon (n-sided, side a):

$$\text{Area} = \frac{na^2}{4 \tan(\pi/n)}, \quad \text{Int. Angle} = \frac{(n-2)180^\circ}{n}$$



2. 3D Surface Area & Volume

Sphere:

$$V = \frac{4}{3}\pi r^3, \quad A = 4\pi r^2$$

Cylinder:

$$V = \pi r^2 h, \quad A_{\text{total}} = 2\pi r(r+h)$$

Cone:

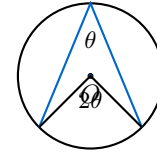
$$V = \frac{1}{3}\pi r^2 h, \quad A_{\text{lateral}} = \pi r l \quad (l = \sqrt{r^2 + h^2})$$

Rectangular Prism:

$$V = lwh, \quad A = 2(lw + lh + wh)$$

Regular Pyramid:

$$V = \frac{1}{3}Bh, \quad (B = \text{Base Area})$$



4. Analytic / Coordinate Geometry

Distance Formula:

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

Midpoint Formula:

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

Slope of a Line:

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \tan \theta$$

Parallel & Perpendicular Lines:

$$m_1 = m_2 \text{ (Parallel)}, \quad m_1 \cdot m_2 = -1 \text{ (Perpendicular)}$$

Distance Point to Line $Ax + By + C = 0$:

$$d = \frac{|Ax_0 + By_0 + C|}{\sqrt{A^2 + B^2}}$$

Equation of Circle:

$$(x-h)^2 + (y-k)^2 = r^2$$

3. Key Circle Theorems

- **Inscribed Angle Theorem:** An angle θ inscribed in a circle is half of the central angle 2θ subtending the same arc.
- **Thales's Theorem:** An angle inscribed in a semicircle is always a right angle (90°).
- **Cyclic Quadrilateral:** Opposite angles sum to 180° ($A + C = 180^\circ$).
- **Intersecting Chords:** $PA \cdot PB = PC \cdot PD$.
- **Tangent-Secant Theorem:** $PT^2 = PA \cdot PB$.

5. Trigonometric Relations

Law of Sines:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R \quad (R = \text{Circumradius})$$

Law of Cosines:

$$c^2 = a^2 + b^2 - 2ab \cos C$$

Centroid (G): Intersection of medians, divides in 2 : 1.

Incenter (I): Intersection of angle bisectors; $r = A/s$.

Circumcenter (O): Intersection of perpendicular bisectors.

Orthocenter (H): Intersection of altitudes.

6. Conic Sections

Parabola:

$$y^2 = 4ax \quad (\text{Focus: } (a, 0), \text{ Directrix: } x = -a)$$

Ellipse:

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \quad (e = \sqrt{1 - b^2/a^2} < 1)$$

Hyperbola:

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 \quad (e = \sqrt{1 + b^2/a^2} > 1)$$