Geometry Ultimate Formula Sheet

Essential theorems, formulas, and properties for academic excellence

1. Basic Angles Lines

- **Complementary Angles:** $\theta_1 + \theta_2 = 90^\circ$
- **Supplementary Angles:** $\theta_1 + \theta_2 = 180^\circ$
- **Vertically Opposite Angles:** Equal in measure.
- **Alternate Interior Angles:** Equal when lines are parallel.

2. Triangles

- **Sum of Angles:** $\alpha + \beta + \gamma = 180^\circ$
- **Area (General):** Area $= \frac{1}{2}bh$
- **Area (Heron's Formula):**

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

where $s = \frac{a+b+c}{2}$.

- **Area (Trigonometric):**

$$\text{Area} = \frac{1}{2}ab\sin C$$

- **Pythagorean Theorem:** For right triangles,

$$a^2 + b^2 = c^2$$

3. Polygons

- **Sum of Interior Angles:** $S = (n-2) \times 180^\circ$
- **Each Interior Angle (Regular):** $\frac{(n-2)180^\circ}{n}$
- **Sum of Exterior Angles:** 360°
- **Number of Diagonals:** $D = \frac{n(n-3)}{2}$

4. Circles

- **Circumference:** $C = 2\pi r$
- **Area:** $A = \pi r^2$
- **Arc Length:** $s = r\theta$ (θ in radians)
- **Sector Area:** $A = \frac{1}{2}r^2\theta$
- **Power of a Point Theorem:** $PA \cdot PB = PC \cdot PD$

5. 3D Solids

- **Rectangular Prism:**

$$V = lwh, \quad \text{SA} = 2(lw + lh + hw)$$

- **Cylinder:**

$$V = \pi r^2 h, \quad \text{SA} = 2\pi rh + 2\pi r^2$$

- **Cone:**

$$V = \frac{1}{3}\pi r^2 h, \quad \text{SA} = \pi rl + \pi r^2$$

- **Sphere:**

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

6. Coordinate Geometry

- **Distance Formula:**

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

- **Midpoint Formula:**

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

- **Slope (m):**

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

- **Equation of Line:** $y - y_1 = m(x - x_1)$