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Geometry Comprehensive Cheat Sheet

1. Angles and Lines

- **Complementary Angles:** $\alpha + \beta = 90^\circ$
- **Supplementary Angles:** $\alpha + \beta = 180^\circ$
- **Vertical Angles:** Equal in measure.
- **Alternate Interior Angles:** Equal when lines are parallel.

2. Triangles

Sum of Angles: $\alpha + \beta + \gamma = 180^\circ$

Area Formulas

$$A = \frac{1}{2}bh$$

$$A = \sqrt{s(s-a)(s-b)(s-c)} \quad (\text{Heron's})$$

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

Pythagorean Theorem

For a right-angled triangle:

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

3. Polygons

- **Sum of interior angles:** $(n-2) \times 180^\circ$
- **Each interior angle (regular):** $\frac{(n-2)180^\circ}{n}$
- **Sum of exterior angles:** 360°
- **Number of diagonals:** $\frac{n(n-3)}{2}$

4. Circles

- **Circumference:** $C = 2\pi r$
- **Area:** $A = \pi r^2$
- **Arc Length:** $s = r\theta$ (θ in radians)
- **Sector Area:** $A = \frac{1}{2}r^2\theta$

5. 3D Solids

Shape	Volume	Surface Area
Cylinder	$\pi r^2 h$	$2\pi r h + 2\pi r^2$
Cone	$\frac{1}{3}\pi r^2 h$	$\pi r l + \pi r^2$
Sphere	$\frac{4}{3}\pi r^3$	$4\pi r^2$
Pyramid	$\frac{1}{3}Bh$	$B + \text{Lateral Area}$

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):**

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