

Geometry Master Cheat Sheet

Comprehensive Formulas, Theorems, and Properties

1. Triangles

Properties

* Sum of angles: $\alpha + \beta + \gamma = 180^\circ$ * Exterior angle equals the sum of two opposite interior angles. * Triangle Inequality: $a + b > c$

Area Formulas

* Standard: $A = \frac{1}{2}bh$ * Heron's Formula: $A = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{a+b+c}{2}$ * Trig Area: $A = \frac{1}{2}ab \sin C$

Special Laws

* **Law of Sines:**

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$$

* **Law of Cosines:**

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

2. 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: $\frac{n(n-3)}{2}$ * Area of regular polygon: $A = \frac{1}{2} \cdot P \cdot a$ (where P is perimeter, a is apothem).

3. Circles

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

Circle Theorems

* **Inscribed Angle:** An angle inscribed in a circle is half the central angle that subtends the same arc. *

Power of a Point: $PA \cdot PB = PC \cdot PD$

4. 3D Solids

— Solid — Volume — Surface Area —
 — — Cube — s^3 — $6s^2$ — — Cylinder — $\pi r^2 h$ —
 $2\pi r h + 2\pi r^2$ — — Sphere — $\frac{4}{3}\pi r^3$ — $4\pi r^2$ — —
 Cone — $\frac{1}{3}\pi r^2 h$ — $\pi r l + \pi r^2$ — — Pyramid — $\frac{1}{3}Bh$ —
 — $B + \text{Lateral}$ —

5. 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):**

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

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