Mensuration Ultimate Cheat Sheet

Comprehensive 2D and 3D Formula Reference Guide

1. Two-Dimensional Shapes (2D)

1.1 Triangle

* **Area** $= \frac{1}{2} \times \text{base} \times \text{height}$ * **Heron's Formula** : $\sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{a+b+c}{2}$ * **Equilateral Triangle Area** $= \frac{\sqrt{3}}{4}a^2$

1.2 Rectangle Square

* **Rectangle Area** $= l \times b$ * **Rectangle Perimeter** $= 2(l + b)$ * **Rectangle Diagonal** $= \sqrt{l^2 + b^2}$ * **Square Area** $= a^2$ * **Square Perimeter** $= 4a$ * **Square Diagonal** $= a\sqrt{2}$

1.3 Parallelogram Rhombus

* **Parallelogram Area** $=$ base $\times$ height * **Rhombus Area** $= \frac{1}{2} \times d_1 \times d_2$ * **Rhombus Perimeter** $= 4a$

1.4 Trapezium

* **Area** $= \frac{1}{2} \times (a + b) \times h$ (where a and b are parallel sides)

1.5 Circle Sector

* **Circle Area** $= \pi r^2$ * **Circumference** $= 2\pi r$ * **Sector Area** $= \frac{\theta}{360^\circ} \times \pi r^2$ * **Arc Length** $= \frac{\theta}{360^\circ} \times 2\pi r$

2. Three-Dimensional Shapes (3D)

2.1 Cuboid

* **Total Surface Area (TSA)** $= 2(lb + bh + hl)$ * **Lateral Surface Area (LSA)** $= 2(l + b)h$ * **Volume** $= l \times b \times h$ * **Diagonal** $= \sqrt{l^2 + b^2 + h^2}$

2.2 Cube

* **TSA** $= 6a^2$ * **LSA** $= 4a^2$ * **Volume** $= a^3$ * **Diagonal** $= a\sqrt{3}$

2.3 Right Circular Cylinder

* **Curved Surface Area (CSA)** $= 2\pi rh$ * **TSA** $= 2\pi r(r + h)$ * **Volume** $= \pi r^2 h$

2.4 Right Circular Cone

* **Slant Height** $(l) = \sqrt{r^2 + h^2}$ * **CSA** $= \pi rl$ * **TSA** $= \pi r(r + l)$ * **Volume** $= \frac{1}{3}\pi r^2 h$

2.5 Sphere Hemisphere

* **Sphere Surface Area** $= 4\pi r^2$ * **Sphere Volume** $= \frac{4}{3}\pi r^3$ * **Hemisphere CSA** $= 2\pi r^2$ * **Hemisphere TSA** $= 3\pi r^2$ * **Hemisphere Volume** $= \frac{2}{3}\pi r^3$

3. Advanced Shortcuts

3.1 Polygon Formulas

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

3.2 Frustum of a Cone

* Slant height $l = \sqrt{h^2 + (R - r)^2}$ * **CSA** $= \pi(R+r)l$ * **TSA** $= \pi(R + r)l + \pi R^2 + \pi r^2$ * **Volume** $= \frac{1}{3}\pi h(R^2 + r^2 + Rr)$

3.3 Key Conversion Factors

* 1 Litre $= 1000$ cm^3 * 1 m^3 $= 10^6$ cm^3 $= 1000$ Litres * 1 hectare $= 10,000$ m^2

Pro Tip for Exams:

Always check unit consistency before plugging numbers into formulas. For composite figures, break the shape down into standard 2D/3D components and sum their areas/volumes.