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Comprehensive Formula Sheet: Mensuration

1. 2D Shapes (Plane Mensuration) 2. 3D Shapes (Solid Mensuration)

Triangle

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

Quadrilaterals

- **Rectangle:**
Area = $l \times b$, Perimeter = $2(l + b)$, Diagonal = $\sqrt{l^2 + b^2}$
- **Square:**
Area = a^2 , Perimeter = $4a$, Diagonal = $a\sqrt{2}$
- **Parallelogram:**
Area = base $\times$ height
- **Rhombus:**
Area = $\frac{1}{2} \times d_1 \times d_2$
- **Trapezium:**
Area = $\frac{1}{2}(a + b) \times h$

Circle Sector

- **Area of Circle:** $A = \pi r^2$
- **Circumference:** $C = 2\pi r$
- **Arc Length (l):** $l = \frac{\theta}{360^\circ} \times 2\pi r$
- **Area of Sector:** $A = \frac{\theta}{360^\circ} \times \pi r^2 = \frac{1}{2} \cdot l \cdot r$

Cube

- **Total Surface Area (TSA):** $6a^2$
- **Curved/Lateral Surface Area (LSA):** $4a^2$
- **Volume:** a^3
- **Diagonal:** $a\sqrt{3}$

Cuboid

- **TSA:** $2(lb + bh + hl)$
- **LSA:** $2(l + b)h$
- **Volume:** $l \times b \times h$
- **Diagonal:** $\sqrt{l^2 + b^2 + h^2}$

Cylinder

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

Cone

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

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:** $\frac{2}{3}\pi r^3$