23GET276 - VQAR-II

UNIT II - QUANTITATIVE ABILITY IV

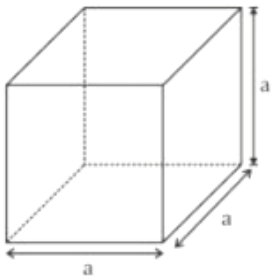
Mensuration

Mensuration is a branch of mathematics that deals with **geometric figures and their measurement**. It deals the parameters like shape, length, volume, area, surface area etc. Mensuration is all about the measurement of the geometrical figures that come under the category of 2D and 3D shapes.

Mensuration Formulas for 2-Dimensional Figures		
Shape	**Area**	**Perimeter**
Circle	πr^2	$2 \pi r$
Square	$(side)^2$	$4 \times side$
Rectangle	length × breadth	2 (length + breadth)
Scalene Triangle	$\sqrt{[s(s-a)(s-b)(s-c)}$, Where, $s = (a+b+c)/2$	a+b+c (sum of sides)
Isosceles Triangle	½ × base × height	2a + b (sum of sides)
Equilateral Triangle	$(\sqrt{3}/4) \times (side)^2$	3 × side
Right Angled Triangle	½ × base × hypotenuse	A + B + hypotenuse, where the hypotenuse is $\sqrt{A^2+B^2}$
Parallelogram	base × height	2(l+b)
Rhombus	½ × diagonal1 × diagonal2	4 × side
Trapezium	½ h(sum of parallel sides)	a+b+c+d (sum of all sides)

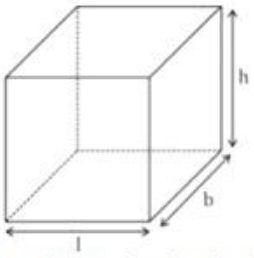
Mensuration Formulas for 3-Dimensional Figures			
Shape	**Area**	**Curved Surface Area (CSA)/ Lateral Surface Area (LSA)**	**Total Surface Area (TSA)**
Cone	$(1/3)\,\pi r^2 h$	$\pi r l$	$\pi r (r + l)$
Cube	$(side)^3$	$4\,(side)^2$	$6\,(side)^2$
Cuboid	length × breadth × height	2 height (length + breadth)	2 (lb +bh +hl)
Cylinder	$\pi r^2 h$	$2\pi r h$	$2\pi rh + 2\pi r^2$
Hemisphere	$(2/3)\,\pi r^3$	$2\,\pi r^2$	$3\,\pi r^2$
Sphere	$4/3\pi r^3$	$4\pi r^2$	$4\pi r^2$

1. Cube Formula



- Volume = $(side)^3 = a^3$
- Lateral surface area = $4a^2$
- Total surface area = $6a^2$
- Diagonal of the cube = $\sqrt{3}\,a$
- Face diagonal of the cube = $\sqrt{2}a$
- Volume of cube = $\left(\sqrt{\frac{total\ surface\ area}{6}}\right)^3$
- In Radius of cube = $\frac{a}{2}$
- Circumradius of cube = $\frac{\sqrt{3}}{2}$ a

2. Cuboid Formula



- Volume of cuboid = l × b × h
- Lateral surface Area = Perimeter of Base × Height Base = 2(l + b) × h
- Total surface area = Lateral surface Area + 2 × Area of base = 2 (lh + bh + lb)
- Diagonal = $\sqrt{l^2 + b^2 + h^2}$
- V = $\sqrt{A_1 \times A_2 \times A_3}$

  $A_1 \Longrightarrow$ Area of base or top = lb

  $A_2 \Longrightarrow$ Area of one side face = bh

  $A_3 \Longrightarrow$ Area of another side face = hl
- To find the total surface area of a cuboid if the sum of all three sides and diagonals are given.

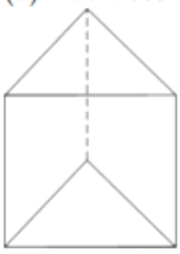
  Total surface area = (sum of all three side)^2 – (Diagonal)^2
- For painting the surface area of a box or to know how much tin sheet is required, we will use, Total surface area.
- To find the length of the longest pole to be placed is a room, we will calculate diagonal i.e. $\sqrt{l^2 + b^2 + h^2}$

3. Prism Formula

- A prism is a solid object with:

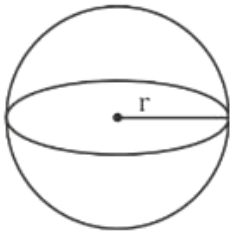
  (a) Identical Ends

  (b) Flat faces



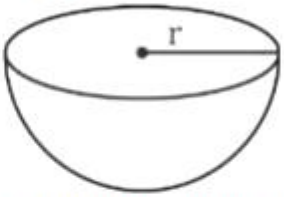
- Volume of Prism = Area of base × height
- Lateral surface area of prism = perimeter of base × height
- Total surface area of = Perimeter of base × height + 2 × area of base

4. Sphere Formula



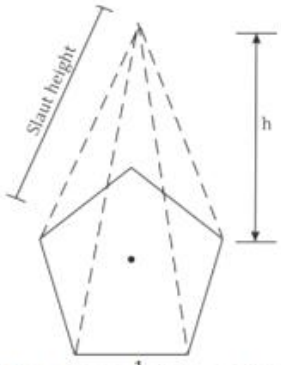
- Volume of sphere = $\frac{4}{3}\pi r^3$
- Surface area of sphere = $4\pi r^2$.
- If a sphere is cut into n parts, then T.S.A of n parts
  $= 4\pi r^2 + n\pi r^2$
- For a spherical shell if R and r are outer and inner radii, Respectively, Then volume of a shell is =
  $\frac{4}{3}\pi(R^3 - r^3)$.

5. Hemisphere Formula



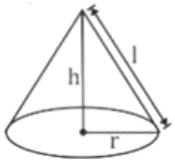
- Volume of hemisphere = $\frac{2}{3}\pi r^3$
- Curved surface area = $2\pi r^2$
- Total surface Area = $3\pi r^2$

6. Pyramids Formula



- Volume $= \frac{1}{3}(area\ of\ base) \times height$
- Curved surface area $= \frac{1}{2} \times (\text{perimeter of base}) \times \text{slant height}$
- Total surface area = curved surface area + area of the base
- Whenever in a question, If we want to find Slant height or height, then we will use inradius of the base not the Radius or side of the base.

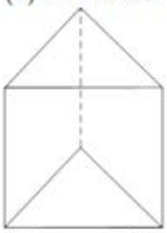
7. Right Circular Cone Formula



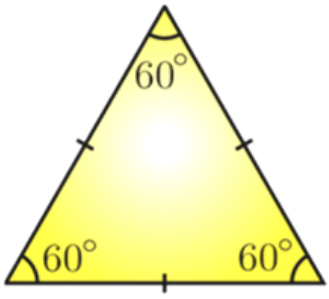
- Slant height, $l = \sqrt{r^2 + h^2}$
- Volume $= \frac{1}{3} \times$ area of base $\times$ height $= \frac{1}{3}\pi r^2 h$
- Curved surface area $= \frac{1}{2}$ (Perimeter of base) $\times$ slant height
  $= \frac{1}{2} \times 2\pi r \times l = \pi r l = \pi r\sqrt{r^2 + h^2}$
- Total surface area = C.S.A + Area of base
  $= \pi r l + \pi r^2 = \pi r(l + r)$
- If cone is formed by sector of a circle then.
  (a) Slant height = radius of circle
  (b) circumference of base of cone = length of arc of sector
- Radius of maximum size sphere in a cone
  $= \frac{h \times r}{l + r}$ $\quad \begin{bmatrix} r \rightarrow radius\ of\ cone \\ l \rightarrow slant\ height\ of\ cone \\ h \rightarrow height\ of\ cone \end{bmatrix}$
- If cone is cut parallel to its base and ratio of heights, radius or slant height of both parts is given as $\rightarrow x : y$.
  Then Ratio of there volume $= x^3 : y^3$

8. Right Circular Cylinder Formula

- A prism is a solid object with:
  (a) Identical Ends
  (b) Flat faces



- Volume of Prism = Area of base × height
- Lateral surface area of prism = perimeter of base × height
- Total surface area of = Perimeter of base × height + 2 × area of base



This triangle has three equal sides and is hence known as an equilateral triangle. As a result, each equilateral triangle angle is 60 degrees.

Area of Equilateral Triangle Formula

The formula for the area of an equilateral triangle (A) is given below,

$A = (\sqrt{3}/4)a^2$

Where a is the length of the sides of an equilateral triangle.