CLASS 10 MATHS – CHAPTER 12

SURFACE AREAS & VOLUMES – ALL FORMULAE

Basic Idea

- Deals with 3D shapes
- Real-life objects are combinations
- Includes cube, cuboid, cylinder, cone
- Also sphere & hemisphere
- Used in tanks, toys, bottles
- Focus on area & volume

Types of surface area

- CSA → curved surface only
- LSA → side surfaces only
- TSA → total outer surface
- Bases excluded in CSA
- All faces in TSA
- Important for calculations

Cuboid & Cube

- Cuboid TSA = $2(lb + bh + lh)$
- Cuboid LSA = $2h(l + b)$
- Volume = lbh
- Cube TSA = $6l^2$
- Cube LSA = $4l^2$
- Volume = l^3
- All edges equal in cube

Cylinder

- CSA = $2\pi rh$
- TSA = $2\pi r(h + r)$
- Volume = $\pi r^2 h$
- Has 2 circular bases
- Curved surface important
- Used in tanks/pipes
- r = radius, h = height

Cone

- CSA = πrl
- TSA = $\pi r(l + r)$
- Volume = $(1/3)\pi r^2 h$
- Slant height (l) important
- $l = \sqrt{(r^2 + h^2)}$
- One base
- Used in ice-cream cones
- Concept-based

Sphere & Hemisphere

- Sphere SA = $4\pi r^2$
- Sphere volume = $(4/3)\pi r^3$
- Hemisphere CSA = $2\pi r^2$
- Hemisphere TSA = $3\pi r^2$
- Hemisphere volume = $(2/3)\pi r^3$
- No edges
- Fully curved

Combination of Solids

- Combine 2 or more shapes
- Hidden surfaces not counted
- Only visible area included
- Identify overlap
- Subtract common parts
- Add remaining surfaces

Important Combination Cases

- Cylinder + hemispheres
- Cone + hemisphere
- Cube + hemisphere
- Surface = sum of CSA
- Ignore joined surfaces
- Use correct formulas

Volume of Solids

- Volume always adds
- Combined → $V_1 + V_2$
- Hollow → subtract volumes
- Units → cm^3, m^3
- No hidden concept here
- Simple calculation

Volume Cases

- Cylinder + hemisphere
- Cone + hemisphere
- Capsule shape
- Cuboid + half cylinder
- Use formula separately
- Then add volumes

Frustom Of Cone

- Cone cut from top
- Two radii: r_1, r_2
- CSA = $\pi(r_1 + r_2)l$
- TSA = CSA + top & bottom
- Volume = $(1/3)\pi h(...)$
- Used in buckets