CLASS 10 MATHS NCERT SOLUTIONS

NCERT Solutions for Class 10 Maths Chapter 12: Surface Areas and Volumes (2026-27) – Free PDF Download

Chapter 12, Surface Areas and Volumes, is one of the highest-weightage chapters in the Class 10 Maths board exam. It combines mensuration formulas from earlier classes (cubes, cuboids, cylinders, cones, spheres, hemispheres) into problems on combinations of solids — a favourite source of 3-5 mark board questions. ...

Contents

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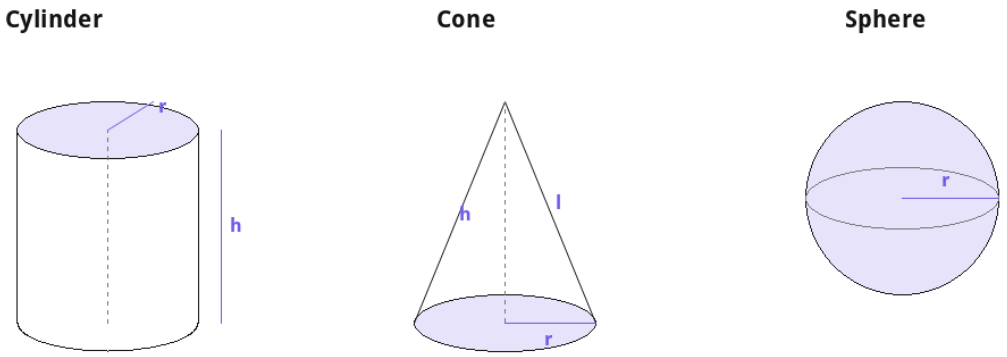
As per the current 2026-27 rationalised NCERT syllabus, this chapter has **two exercises** — 12.1 (Surface Area of a Combination of Solids) and 12.2 (Volume of a Combination of Solids) — 17 questions in total. Some older solution sites online still show a third exercise, 12.3, on converting one solid into another; that exercise was removed in the 2023 rationalisation, so ignore any "12.3" content you find elsewhere — it does not exist in the current book.

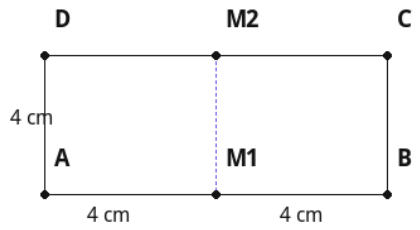


CSA / TSA / Volume formulas for each solid are given above -- this figure just shows what r (radius), h (height) and l (slant height) refer to.

Reference figure — solids covered in this chapter (cylinder, cone, sphere)

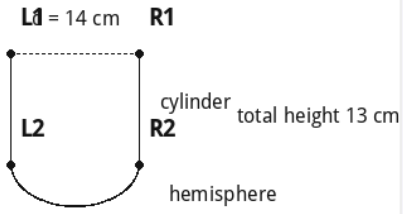
Exercise 12.1 — Surface Areas of Combination of Solids (use π = 22/7 unless stated)

Q1. Two cubes, each of volume 64 cm^3, are joined end to end. Find the surface area of the resulting cuboid.
Solution: Side of each cube, $a^3 = 64 \Rightarrow a = 4$ cm. Joining two cubes end to end gives a cuboid of dimensions 8 cm × 4 cm × 4 cm.
Surface area = 2(lb + bh + hl) = 2(8×4 + 4×4 + 4×8) = 2(32+16+32) = 2×80 = **160 cm^2.**



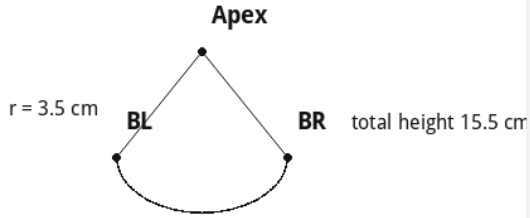
Two 4 cm cubes joined -> cuboid 8×4×4 cm, TSA=160 cm².

Q2. A vessel is a hollow hemisphere mounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel.
Solution: r = 7 cm. Height of cylindrical part = 13 – 7 = 6 cm.
Inner surface area = $2\pi rh + 2\pi r^2 = 2\pi r(h + r) = 2\times(22/7)\times7\times(6+7) = 2\times22\times13 =$ **572 cm².**



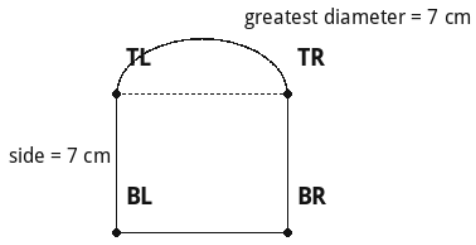
Hollow hemisphere (d=14 cm) mounted by hollow cylinder, total he

Q3. A toy is a cone of radius 3.5 cm mounted on a hemisphere of the same radius. Total height of the toy is 15.5 cm. Find its total surface area.
Solution: r = 3.5 cm, height of cone h = 15.5 – 3.5 = 12 cm. Slant height $l = \sqrt{(r^2+h^2)} = \sqrt{(12.25+144)} = \sqrt{156.25} = 12.5$ cm.
TSA = $\pi rl + 2\pi r^2 = \pi r(l + 2r) = (22/7)\times3.5\times(12.5+7) = 11\times19.5 =$ **214.5 cm².**



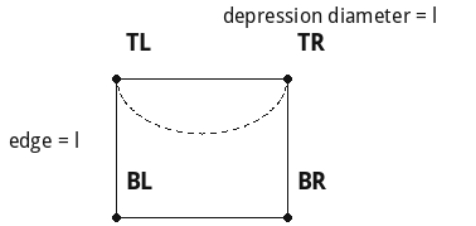
Cone (r=3.5 cm) mounted on hemisphere of same radius; total heig

Q4. A cubical block of side 7 cm is surmounted by a hemisphere. What is the greatest diameter the hemisphere can have, and what is the surface area of the solid?
Solution: Greatest possible diameter = side of cube = 7 cm ⍰ r = 3.5 cm.
Surface area = (surface area of cube) − (base circle of hemisphere) + (curved surface of hemisphere) = $6\times7^2 + \pi r^2$ (since $-\pi r^2+2\pi r^2 = \pi r^2$) = 294 + (22/7×3.5×3.5) = 294 + 38.5 = **332.5 cm².**



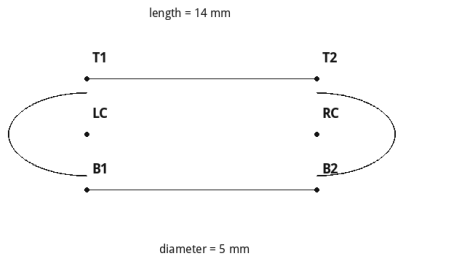
Hemisphere (greatest diameter 7 cm) surmounted on a 7 cm c

Q5. A hemispherical depression is cut from one face of a cubical wooden block of edge l, such that the diameter of the hemisphere equals l. Find the surface area of the remaining solid.
Solution: r = l/2. Surface area = $6l^2 - \pi r^2 + 2\pi r^2 = 6l^2 + \pi r^2 = 6l^2 + \pi(l/2)^2$ = **(6 + π/4)l², i.e. [(24+π)/4]l².**



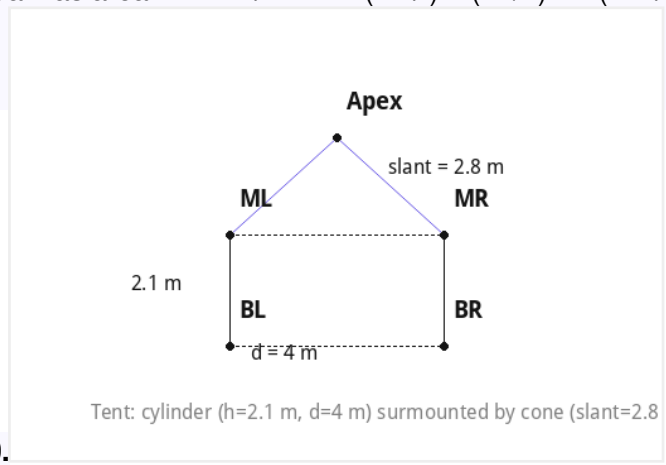
Hemispherical depression (diameter l) cut into top face of cube of e

Q6. A medicine capsule is a cylinder with two hemispheres stuck to its ends. Total length 14 mm, diameter 5 mm. Find its surface area.
Solution: r = 2.5 mm. Cylinder length = 14 − 2×2.5 = 9 mm.
Surface area = $2\pi rh + 2(2\pi r^2) = 2\pi r(h+2r) = 2\times(22/7)\times2.5\times(9+5) = 2\times(22/7)\times2.5\times14$ = **220 mm².**



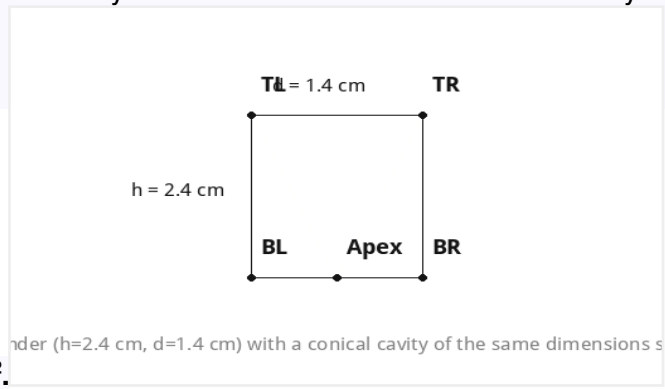
Capsule: cylinder of length 14 mm, diameter 5 mm, with hemispherical ends.

Q7. A tent is a cylinder surmounted by a cone. Cylinder height 2.1 m, diameter 4 m, slant height of the cone 2.8 m. Find the area of canvas used and its cost at ₹500/m².
Solution: r = 2 m. Canvas area = 2πrh + πrl = πr(2h+l) = (22/7)×2×(4.2+2.8) = (22/7)×2×7 = **44 m².** Cost = 44 × 500 = **₹22,000.**



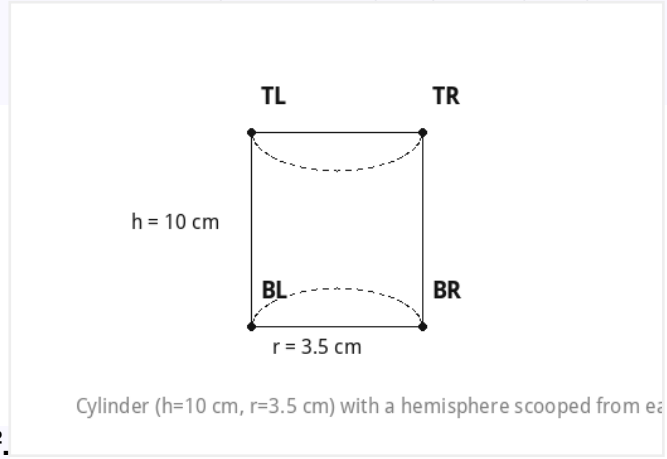
Tent: cylinder (h=2.1 m, d=4 m) surmounted by cone (slant=2.8

Q8. From a solid cylinder of height 2.4 cm and diameter 1.4 cm, a conical cavity of the same height and diameter is hollowed out. Find the total surface area of the remaining solid (nearest cm²).
Solution: r = 0.7 cm. Slant height of cavity l = √(r²+h²) = √(0.49+5.76) = √6.25 = 2.5 cm.
TSA = CSA of cylinder + base circle + CSA of cone cavity = 2πrh + πr² + πrl = 10.56 + 1.54 + 5.5 = 17.6 ≈ **18 cm².**



nder (h=2.4 cm, d=1.4 cm) with a conical cavity of the same dimensions s

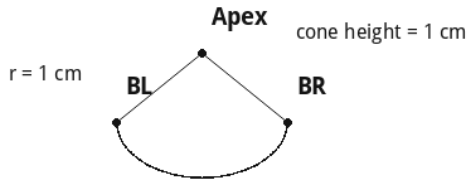
Q9. A wooden article is made by scooping out a hemisphere from each end of a solid cylinder of height 10 cm and base radius 3.5 cm. Find its total surface area.
Solution: TSA = CSA of cylinder + 2×(CSA of hemisphere) = 2πrh + 2(2πr²) = 2πr(h+2r) = 2×(22/7)×3.5×(10+7) = 22×17 = **374 cm².**



Cylinder (h=10 cm, r=3.5 cm) with a hemisphere scooped from ea

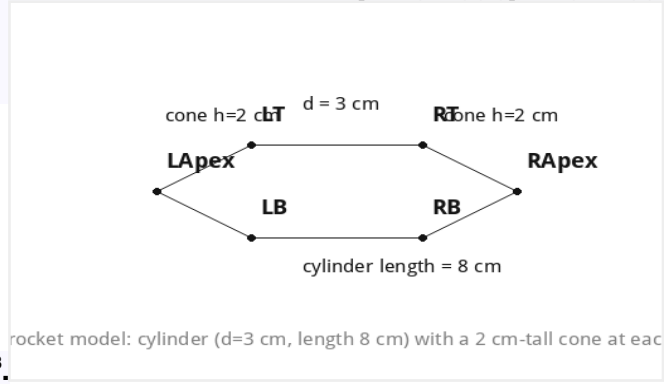
Exercise 12.2 — Volumes of Combination of Solids

Q1. A solid cone stands on a hemisphere, both of radius 1 cm, and the cone's height equals its radius. Find the volume in terms of π.
Solution: Volume = $(1/3)\pi r^2 h + (2/3)\pi r^3 = (1/3)\pi(1)(1) + (2/3)\pi(1) = \pi/3 + 2\pi/3 =$ **π cm³.**



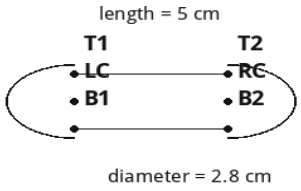
Cone (h=r=1 cm) on hemisphere of radius 1 cm; volume = π cm

Q2. Rachel's model: a cylinder with two cones attached at its ends, diameter 3 cm, total length 12 cm, each cone of height 2 cm. Find the volume of air inside.
Solution: r = 1.5 cm. Cylinder height = 12 – 2×2 = 8 cm. Volume = $\pi r^2[h + (2/3)(2)] = \pi(2.25)(8 + 4/3) =$ $\pi \times 2.25 \times (28/3) = 21\pi = 21 \times 22/7 =$ **66 cm³.**



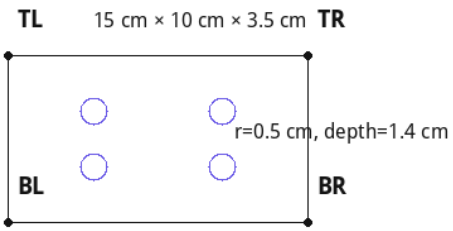
rocket model: cylinder (d=3 cm, length 8 cm) with a 2 cm-tall cone at eac

Q3. A gulab jamun (cylinder with two hemispherical ends), length 5 cm, diameter 2.8 cm, holds sugar syrup up to 30% of its volume. Find the approximate syrup in 45 gulab jamuns.
Solution: r = 1.4 cm, cylinder height = 5 – 2.8 = 2.2 cm. Volume of one = $\pi r^2 h + (4/3)\pi r^3 \approx 25.05$ cm³. For 45 pieces: 45×25.05 ≈ 1127.25 cm³. Syrup (30%) ≈ 0.3×1127.25 ≈ **338 cm³.**



Gulab jamun: cylinder with hemispherical ends, length 5 cm, diamet

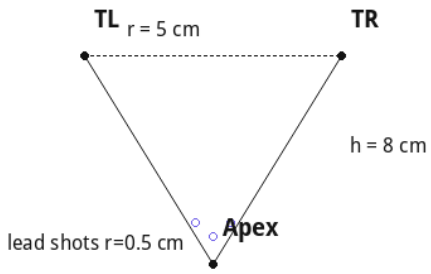
Q4. A wooden pen stand, a cuboid 15 cm × 10 cm × 3.5 cm, has four conical depressions of radius 0.5 cm and depth 1.4 cm each. Find the volume of wood.
Solution: Cuboid volume = 15×10×3.5 = 525 cm³. One cone = $(1/3)\pi(0.25)(1.4) \approx 0.367$ cm³; four cones ≈



Cuboid pen stand (top view) with 4 conical depressions, r=0.5 cm, de

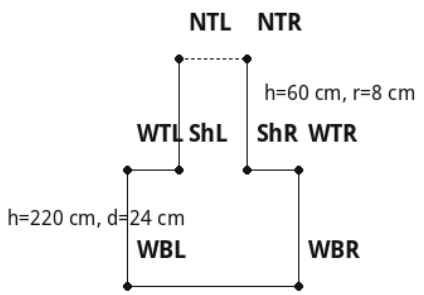
1.47 cm^3. Wood volume = 525 – 1.47 ≈ **523.53 cm^3.**

Q5. An inverted conical vessel, height 8 cm, top radius 5 cm, is filled to the brim. Lead shots of radius 0.5 cm are dropped in, and one-fourth of the water flows out. Find the number of lead shots.
Solution: Cone volume = (1/3)π(25)(8) = 200π/3. Water displaced = (1/4)×200π/3 = 50π/3. One shot's volume = (4/3)π$(0.5)^3$ = π/6. Number of shots = (50π/3)/(π/6) = **100.**



ed cone (r=5 cm, h=8 cm) filled to brim; lead shots (r=0.5 cm) dropped in

Q6. An iron pole is a cylinder of height 220 cm, base diameter 24 cm, surmounted by another cylinder of height 60 cm, radius 8 cm. Find its mass (1 cm^3 iron ≈ 8 g, use π = 3.14).
Solution: Volume = π(144×220 + 64×60) = π×35520 ≈ 3.14×35520 = 111,532.8 cm^3. Mass = 111,532.8×8

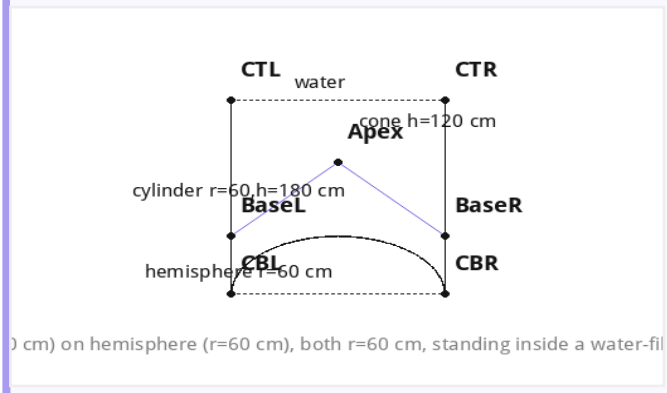


on pole: cylinder (h=220 cm, d=24 cm) surmounted by a narrower cylinde

g = 892,262.4 g ≈ **892.26 kg.**

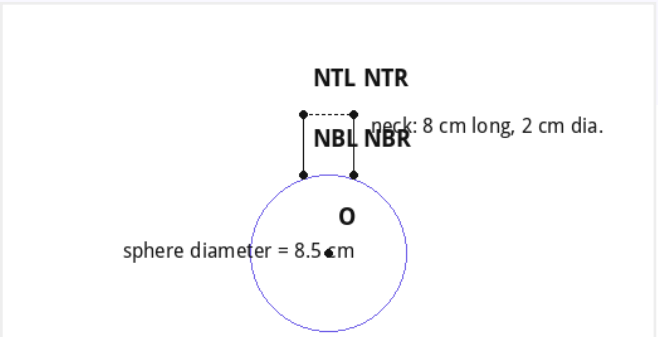
Q7. A cone (h=120 cm, r=60 cm) on a hemisphere (r=60 cm) stands upright, touching the bottom, inside a cylinder full of water (r=60 cm, h=180 cm). Find the water left in the cylinder.

Solution: Cylinder volume = π(3600)(180) = 648000π. Cone + hemisphere = 144000π + 144000π = 288000π. Water left = 648000π – 288000π = 360000π = 360000×22/7 ≈ **1,131,428.57 cm³ (≈1.131 m³).**



) cm) on hemisphere (r=60 cm), both r=60 cm, standing inside a water-fil

Q8. A spherical vessel with a cylindrical neck (8 cm long, 2 cm diameter) and spherical part diameter 8.5 cm is measured by a child to hold 345 cm³. Using π = 3.14, check her answer.
Solution: Sphere volume = (4/3)(3.14)(4.25)³ ≈ 321.39 cm³. Neck volume = 3.14×(1)²×8 = 25.12 cm³. Total ≈ **346.51 cm³** — very close to the child's measured 345 cm³, so her measurement is essentially correct within experimental/rounding error.



Spherical vessel (diameter 8.5 cm) with a cylindrical neck (8 cm long, 2 c

Why This Chapter Matters for Boards

Surface Areas and Volumes typically contributes 6-8 marks to the Class 10 Maths board paper, almost always as one long-answer combination-of-solids question. Examiners particularly like the "convert one shape into another, keeping volume constant" style of reasoning, so make sure the Extra Questions/HOTS companion post below is not skipped — several of its questions are built exactly around that reasoning pattern.

CBSE Exam Weightage

This chapter falls under **Unit VI: Mensuration** in the CBSE Class 10 Maths board exam syllabus. This unit typically carries around **10 marks (12.5%)** of the 80-mark theory paper, based on CBSE's published unit-wise weightage (Question Paper Design). CBSE sets weightage at the unit level rather than chapter-by-chapter, so the exact share from this specific chapter can vary a little between years and sample papers.

Class 10 Mathematics Chapter 12 – Notes and Extra Questions

Along with these NCERT Solutions, students can also use the Class 10 Mathematics Chapter 12 Extra Questions and Class 10 Mathematics Chapter 12 Revision Notes for quick revision and extra practice.