

Surface Areas and Volumes - NCERT Examples

Examples 1-7 with independently verified solutions.

CHAPTER

Surface Areas and Volumes

RESOURCE

NCERT Examples

SOURCE

NCERT Mathematics, Reprint 2026-27

PART 1

Verified NCERT questions and solutions

Verified NCERT questions and solutions

Solutions are checked independently and follow the supplied NCERT chapter edition.

NCERT EXAMPLE

Example 1

combined surface area · cone and hemisphere

A playing top is shaped like a cone surmounted by a hemisphere. Its total height is 5 cm and its diameter is 3.5 cm. Find the area to be coloured. Take $\pi = 22/7$.

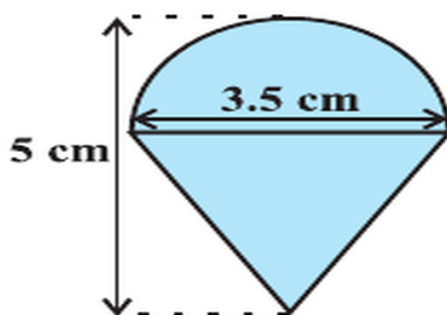


Fig. 12.6

Figure 12-6 from the supplied NCERT chapter.

Solution

Board-exam working:

The common radius is half the diameter.

$$r = \frac{3.5}{2} = 1.75 \text{ cm}$$

Height of the conical part:

$$h = 5 - 1.75 = 3.25 \text{ cm}$$

Slant height of the cone:

$$\begin{aligned} l &= \sqrt{r^2 + h^2} = \sqrt{1.75^2 + 3.25^2} \\ &= \sqrt{13.625} \approx 3.7 \text{ cm} \end{aligned}$$

Only the curved surfaces of the hemisphere and cone are exposed.

$$\begin{aligned} A &= 2\pi r^2 + \pi r l = \pi r(2r + l) \\ &= \frac{22}{7} \times 1.75 \times (3.5 + 3.7) \\ &= 39.6 \text{ cm}^2 \text{ (approximately)} \end{aligned}$$

Final answer

$$39.6 \text{ cm}^2 \text{ (approximately)}$$

NCERT EXAMPLE

Example 2

cube and hemisphere · total surface area

A decorative block is made of a cube of edge 5 cm with a hemisphere of diameter 4.2 cm fixed on top. Find its total surface area. Take $\pi = 22/7$.

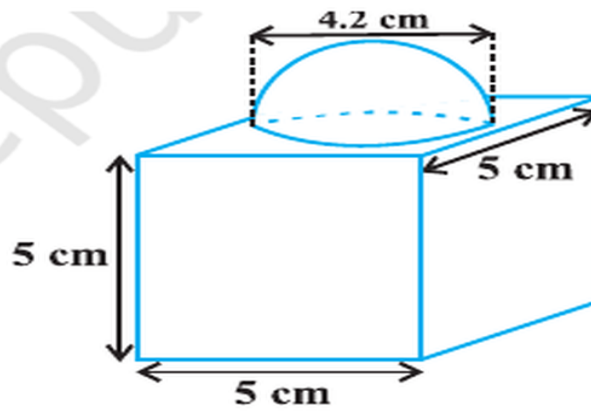


Fig. 12.7

Figure 12-7 from the supplied NCERT chapter.

Solution

Board-exam working:

$$r = \frac{4.2}{2} = 2.1 \text{ cm}$$

The circular part of the cube covered by the hemisphere is not exposed.

$$A = 6a^2 - \pi r^2 + 2\pi r^2$$

$$= 6(5)^2 + \pi(2.1)^2$$

$$= 150 + \frac{22}{7} \times 2.1 \times 2.1$$

$$= 150 + 13.86 = 163.86 \text{ cm}^2$$

Final answer

$$\boxed{163.86 \text{ cm}^2}$$

NCERT EXAMPLE

Example 3

rocket · painted surface area

A wooden toy rocket is a cone mounted on a cylinder. Its total height is 26 cm, the conical part is 6 cm high, the cone diameter is 5 cm and the cylinder diameter is 3 cm. Find the areas painted orange on the cone and yellow on the cylinder. Take $\pi = 3.14$.

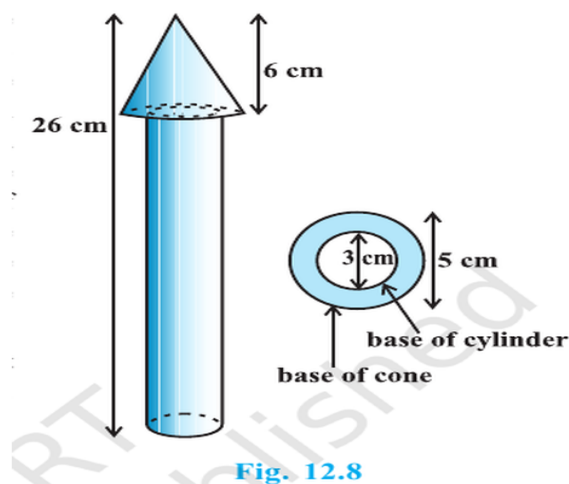


Figure 12-8 from the supplied NCERT chapter.

Solution

Board-exam working:

For the cone:

$$r = 2.5 \text{ cm}, \quad h = 6 \text{ cm}$$

For the cylinder:

$$r' = 1.5 \text{ cm}, \quad h' = 26 - 6 = 20 \text{ cm}$$

Slant height of the cone:

$$l = \sqrt{2.5^2 + 6^2} = \sqrt{42.25} = 6.5 \text{ cm}$$

Orange area = curved area of cone + exposed ring at its base.

$$\begin{aligned}
 A_o &= \pi r l + \pi r^2 - \pi (r')^2 \\
 &= 3.14[(2.5)(6.5) + (2.5)^2 - (1.5)^2] \\
 &= 3.14(20.25) = 63.585 \text{ cm}^2
 \end{aligned}$$

Yellow area = curved area and bottom base of the cylinder.

$$\begin{aligned}
 A_y &= 2\pi r' h' + \pi (r')^2 \\
 &= 3.14(1.5)[2(20) + 1.5] \\
 &= 4.71(41.5) = 195.465 \text{ cm}^2
 \end{aligned}$$

Final answer

$$A_o = 63.585 \text{ cm}^2, \quad A_y = 195.465 \text{ cm}^2$$

NCERT EXAMPLE

Example 4

bird-bath · hemispherical depression

A bird-bath is a cylinder with a hemispherical depression at one end. The cylinder is 1.45 m high and has radius 30 cm. Find its total surface area. Take $\pi = 22/7$.

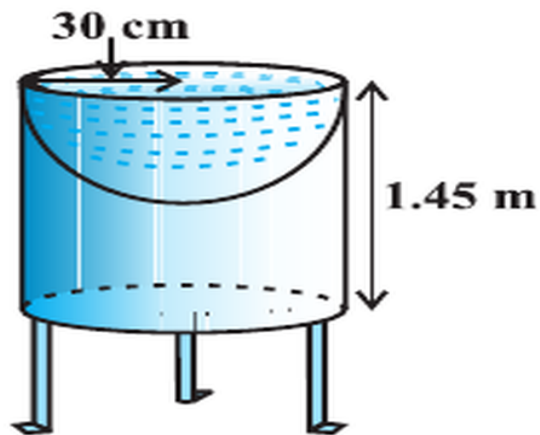


Fig. 12.9

Figure 12-9 from the supplied NCERT chapter.

Solution

Board-exam working:

Use one unit throughout.

$$h = 1.45 \text{ m} = 145 \text{ cm}, \quad r = 30 \text{ cm}$$

The exposed area is the curved surface of the cylinder plus the curved surface of the depression.

$$A = 2\pi rh + 2\pi r^2 = 2\pi r(h + r)$$

$$= 2 \times \frac{22}{7} \times 30 \times (145 + 30)$$

$$= 33000 \text{ cm}^2$$

$$= \frac{33000}{10000} = 3.3 \text{ m}^2$$

Final answer

$$\boxed{3.3 \text{ m}^2}$$

NCERT EXAMPLE

Example 5

industrial shed · combined volume

A shed is a cuboid surmounted by a half-cylinder. Its base is 7 m × 15 m and its cuboidal part is 8 m high. Find the volume of air it can hold. Machinery occupies 300 m^3 and 20 workers occupy 0.08 m^3 each. Find the air left in the occupied shed. Take $\pi = 22/7$.

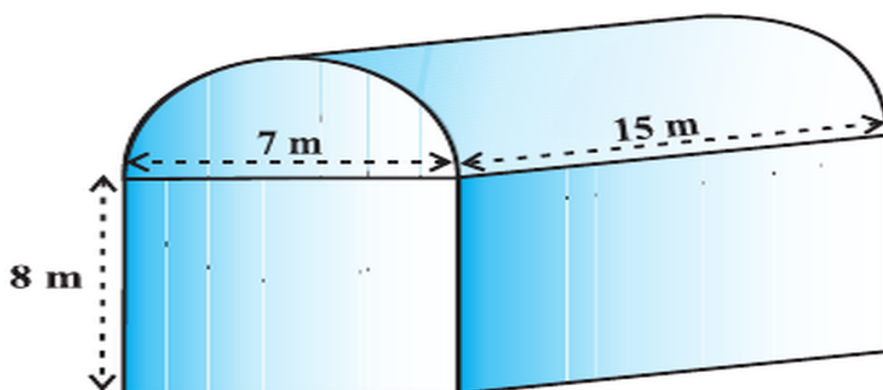


Fig. 12.12

Figure 12-12 from the supplied NCERT chapter.

Solution

Board-exam working:

Cuboid dimensions: 15 m × 7 m × 8 m.

$$V_c = 15 \times 7 \times 8 = 840 \text{ m}^3$$

The half-cylinder has radius $7/2$ m and length 15 m.

$$V_h = \frac{1}{2} \pi r^2 l$$

$$= \frac{1}{2} \times \frac{22}{7} \times \left(\frac{7}{2}\right)^2 \times 15 = 288.75 \text{ m}^3$$

Total empty volume:

$$V = 840 + 288.75 = 1128.75 \text{ m}^3$$

Space occupied by workers:

$$20 \times 0.08 = 1.6 \text{ m}^3$$

Air left after machinery and workers occupy space:

$$1128.75 - (300 + 1.6) = 827.15 \text{ m}^3$$

Final answer

$$V_{\text{empty}} = 1128.75 \text{ m}^3, \quad V_{\text{air}} = 827.15 \text{ m}^3$$

NCERT EXAMPLE

Example 6

glass capacity · hemispherical raised base

A cylindrical glass has inner diameter 5 cm and height 10 cm. Its bottom has a hemispherical raised portion. Find its apparent and actual capacities. Use $\pi = 3.14$.

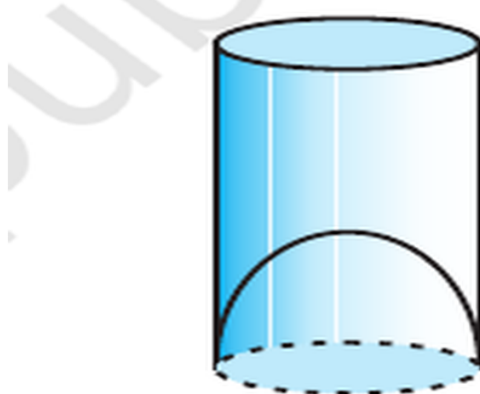


Fig. 12.13

Figure 12-13 from the supplied NCERT chapter.

Solution

Board-exam working:

$$r = \frac{5}{2} = 2.5 \text{ cm}, \quad h = 10 \text{ cm}$$

Apparent capacity is the full cylindrical volume.

$$V_a = \pi r^2 h = 3.14 \times 2.5^2 \times 10 = 196.25 \text{ cm}^3$$

The raised hemisphere occupies:

$$V_h = \frac{2}{3} \pi r^3 = \frac{2}{3} \times 3.14 \times 2.5^3$$

$$\approx 32.71 \text{ cm}^3$$

Actual capacity:

$$V = 196.25 - 32.71 = 163.54 \text{ cm}^3$$

Final answer

$$V_a = 196.25 \text{ cm}^3, \quad V = 163.54 \text{ cm}^3$$

NCERT EXAMPLE

Example 7

toy volume · circumscribing cylinder

A toy is a hemisphere surmounted by a right circular cone. The cone is 2 cm high and the common base diameter is 4 cm. Find the toy's volume. A right circular cylinder circumscribes the toy; find the difference between the cylinder's volume and the toy's volume. Take $\pi = 3.14$.

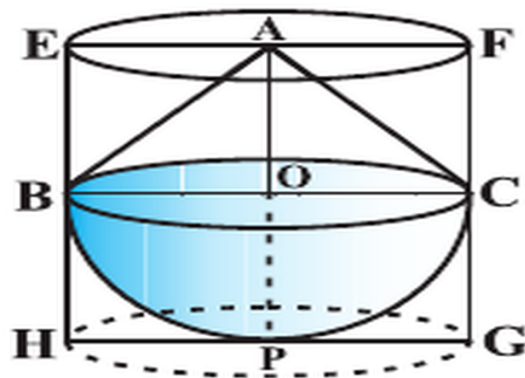


Fig. 12.14

Figure 12-14 from the supplied NCERT chapter.

Solution

Board-exam working:

$$r = \frac{4}{2} = 2 \text{ cm}, \quad h_{\text{cone}} = 2 \text{ cm}$$

Volume of the toy:

$$\begin{aligned} V_t &= \frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 h \\ &= \frac{2}{3}(3.14)(2)^3 + \frac{1}{3}(3.14)(2)^2(2) \\ &= 25.12 \text{ cm}^3 \end{aligned}$$

The circumscribing cylinder has radius 2 cm and height $2 + 2 = 4$ cm.

$$V_c = \pi r^2 H = 3.14 \times 2^2 \times 4 = 50.24 \text{ cm}^3$$

Required difference:

$$V_c - V_t = 50.24 - 25.12 = 25.12 \text{ cm}^3$$

Final answer

$$V_t = 25.12 \text{ cm}^3, \quad V_c - V_t = 25.12 \text{ cm}^3$$