

RD SHARMA

Solutions

Class 9 Maths

Chapter 21

Ex 21.1

Q1. Find the surface area of a sphere of radius:

(i) 10.5cm (ii) 5.6cm (iii) 14cm

Sol.

(i) Given Radius= 10.5 cm

$$\begin{aligned}\text{Surface area} &= 4\pi r^2 \\ &= 4 \times \frac{22}{7} \times (10.5)^2 \\ &= 1386\text{cm}^2\end{aligned}$$

(ii) Given radius= 5.6cm

$$\begin{aligned}\text{Surface area} &= 4\pi r^2 \\ &= 4 \times \frac{22}{7} \times (5.6)^2 \\ &= 394.24\text{cm}^2\end{aligned}$$

(iii) Given radius= 14cm

$$\begin{aligned}\text{Surface area} &= 4\pi r^2 \\ &= 4 \times \frac{22}{7} \times (14)^2 \\ &= 2464\text{cm}^2\end{aligned}$$

Q2. Find the surface area of a sphere of diameter:

(i) 14cm (ii) 21cm (iii) 3.5cm

Sol.

(i) Given Diameter= 14 cm

$$\begin{aligned}\text{Radius} &= \frac{\text{Diameter}}{2} \\ &= \frac{14}{2} = 7\text{cm} \\ \text{Surface area} &= 4\pi r^2 \\ &= 4 \times \frac{22}{7} \times (7)^2 \\ &= 616\text{cm}^2\end{aligned}$$

(ii) Given Diameter= 21cm

$$\text{Radius} = \frac{\text{Diameter}}{2}$$

$$= \frac{21}{2} = 10.5\text{cm}$$

$$\text{Surface area} = 4\pi r^2$$

$$= 4 \times \frac{22}{7} \times (10.5)^2$$

$$= 1386\text{cm}^2$$

(iii) Given diameter= 3.5cm

$$\text{Radius} = \frac{\text{Diameter}}{2}$$

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

$$\text{Surface area} = 4\pi r^2$$

$$= 4 \times \frac{22}{7} \times (1.75)^2$$

$$= 38.5\text{cm}^2$$

Q3. Find the total surface area of a hemisphere and a solid hemisphere each of radius 10cm ($\pi = 3.14$)

Sol.

$$\text{The surface area of the hemisphere} = 2\pi r^2$$

$$= 2 \times 3.14 \times (10)^2$$

$$= 628\text{cm}^2$$

$$\text{The surface area of solid hemisphere} = 3\pi r^2$$

$$= 3 \times 3.14 \times (10)^2$$

$$= 942\text{cm}^2$$

Q4. The surface area of a sphere is 5544cm^2 , find its diameter.

Sol.

$$\text{Surface area of a sphere is } 5544\text{cm}^2$$

$$4\pi r^2 = 5544$$

$$4 \times 3.14 \times (r)^2 = 5544$$

$$r^2 = \frac{5544 \times 7}{88}$$

$$r = \sqrt{21\text{cm} \times 21\text{cm}}$$

$$r = 21\text{cm}$$

$$\text{Diameter} = 2 (\text{radius})$$

$$= 2 (21) = 42\text{cm}$$

Q5. A hemispherical bowl made of brass has inner diameter 10.5cm. Find the cost of tin plating it on the inside at the rate of Rs.4 per 100cm².

Sol.

Inner diameter of hemispherical bowl = 10.5cm

$$\text{Radius} = \frac{10.5}{2} = 5.25\text{cm}$$

Surface area of hemispherical bowl = $2\pi r^2$

$$= 2 \times 3.14 \times (5.25)^2$$

$$= 173.25\text{cm}^2$$

Cost of tin plating 100cm² area = Rs.4

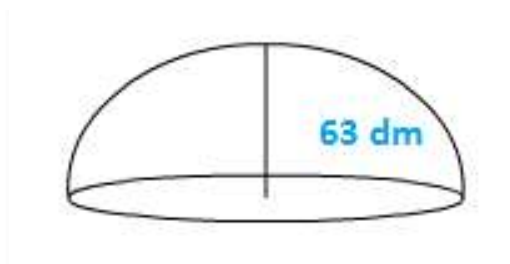
$$\text{Cost of tin plating } 173.25\text{cm}^2 \text{ area} = \text{Rs. } \frac{4 \times 173.25}{100} = \text{Rs. } 6.93$$

Thus, the cost of tin plating the inner side of hemispherical bowl is Rs.6.93

Q6. The dome of a building is in the form of a hemisphere. Its radius is 63dm. Find the cost of painting it at the rate of Rs.2 per sq m.

Sol.

Dome radius = 63dm = 6.3m



Inner surface area of dome = $2\pi r^2$

$$= 2 \times 3.14 \times (6.3)^2$$

$$= 249.48 \text{m}^2$$

Now, cost of $1 \text{m}^2 = \text{Rs.} 2$

Therefore cost of $249.48 \text{m}^2 = \text{Rs.} (249.48 \times 2) = \text{Rs.} 498.96$

Q7. Assuming the earth to be a sphere of radius 6370km, how many square kilometers is the area of the land if three-fourths of the earth's surface is covered by water?

Sol.

$\frac{3}{4}$ th of earth surface is covered by water

Therefore $\frac{1}{4}$ th of earth surface is covered by land

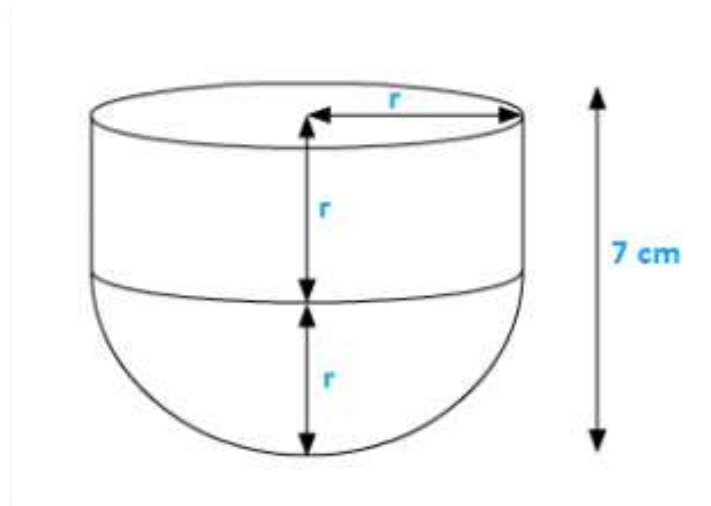
Therefore Surface area covered by land = $\frac{1}{4} \times 4\pi r^2$

$$= \frac{1}{4} \times 4 \times \frac{22}{7} \times (6370)^2$$

$$= 127527400 \text{km}^2$$

Q8. A cylinder of same height and radius is placed on top of a hemisphere. Find the curved surface area of the shape if the length of the shape is 7cm.

Sol.



Given length of the shape = 7cm

But length = r+r

$$2r = 7\text{cm}$$

$$r = 3.5\text{cm}$$

$$\text{Also; } h = r$$

$$\text{Total surface area of shape} = 2\pi rh + 2\pi r^2$$

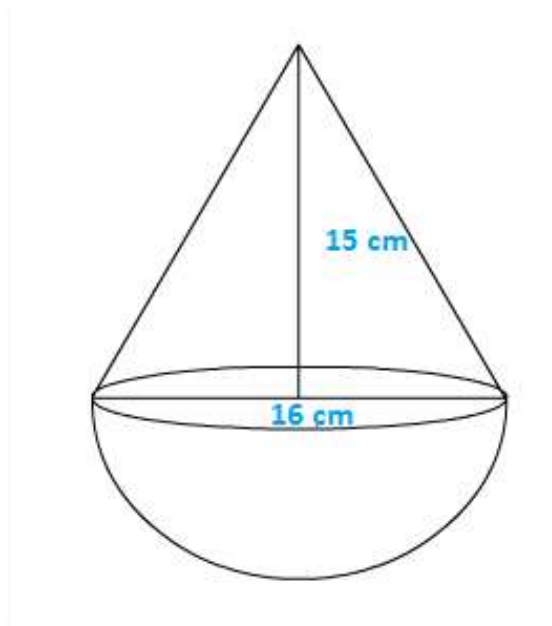
$$= 2\pi r^2 + 2\pi r^2$$

$$= 2\pi r^2 + 2\pi r^2$$

$$= 4 \times \frac{22}{7} \times (3.5)^2 = 154\text{cm}^2$$

Q9. A wooden toy is in the form of a cone surmounted on a hemisphere. The diameter of the base of the cone is 16cm and its height is 15cm. Find the cost of painting the toy at Rs.7 per 100cm^2

Sol.



Diameter of cone = 16cm

Radius of cone = 8cm

Height of cone = 15cm

$$\text{Slant height of cone} = \sqrt{8^2 + 15^2}$$

$$= \sqrt{64 + 225}$$

$$= \sqrt{289} = 17\text{cm}$$

Therefore Total curved surface area of toy

$$= \pi r l + 2\pi r^2$$

$$= \frac{22}{7} \times 8 \times 17 + 2 \times \frac{22}{7} \times 8^2$$

$$= \frac{5808}{7} \text{ cm}^2$$

Now, cost of $100 \text{ cm}^2 = \text{Rs. } 7$

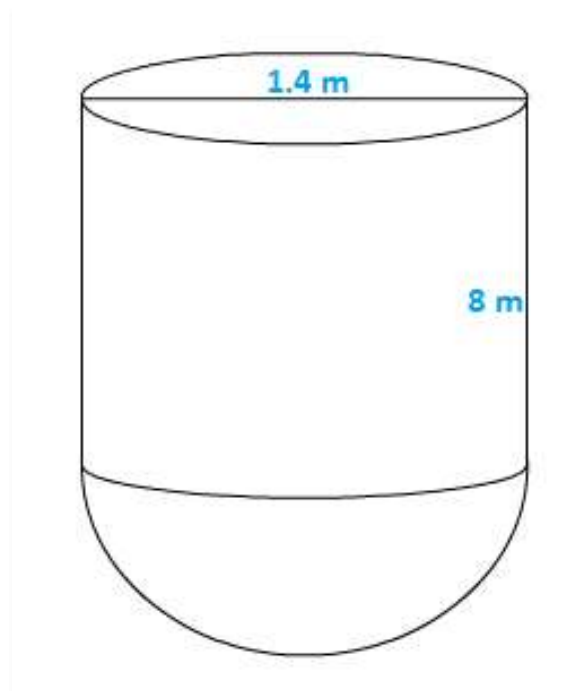
$$1 \text{ cm}^2 = \text{Rs. } \frac{7}{100}$$

$$\text{Hence cost of } \frac{5808}{7} \text{ cm}^2 = \text{Rs. } \frac{5808}{7} \times \frac{7}{100}$$

$$= \text{Rs. } 58.08$$

Q10. a storage tank consists of a circular cylinder with a hemisphere adjoined on either end. If the external diameter of the cylinder be 1.4m and its length is 8m, find the cost of painting it on the outside at the rate of Rs.10 per m^2 .

Sol.



Diameter of a cylinder = 1.4m

$$\text{Therefore radius of cylinder} = \frac{1.4}{2} = 0.7\text{m}$$

Height of cylinder = 8m

$$\text{Therefore surface area of tank} = 2\pi rh + 2\pi r^2$$

$$= 2 \times \frac{22}{7} \times 0.7 \times 8 + 2 \times \frac{22}{7} \times (0.7)^2$$

$$= \frac{176}{5} + \frac{77}{25} = 38.28\text{m}^2$$

Now cost of $1\text{m}^2 = \text{Rs. } 10$

Therefore cost of $38.28\text{m}^2 = \text{Rs. } 382.80$

Q11. The diameter of the moon is approximately one-fourth of the diameter of the earth. Find the ratio of their surface areas.

Sol.

Let the diameter of the earth be d

Then,

Diameter of moon will be $\frac{d}{4}$

Radius of earth = $\frac{d}{2}$

Radius of moon = $\frac{\frac{d}{4}}{2} = \frac{d}{8}$

Surface area of moon = $4\pi\left(\frac{d}{8}\right)^2$

Surface area of earth = $4\pi\left(\frac{d}{2}\right)^2$

Required ratio = $\frac{4\pi\left(\frac{d}{8}\right)^2}{4\pi\left(\frac{d}{2}\right)^2}$

= $\frac{4}{64} = \frac{1}{16}$

Thus the required ratio of the surface areas is $\frac{1}{16}$

Q12. A hemispherical dome of a building needs to be painted. If the circumference of the base of the dome is 17.6cm , find the cost of painting it, given the cost of painting is $\text{Rs. } 5$ per 100cm^2

Sol.

Given that only the rounded surface of the dome to be painted, we would need to find the curved surface area of the hemisphere to know the extent of painting that needs to be done.

Now, circumference of the dome = 17.6cm

Therefore $2\pi r = 17.6$

$2 \times \frac{22}{7} \times r = 17.6\text{m}$

So, the radius of the dome = $2\pi r^2$

= $2 \times \frac{22}{7} \times 2.8 \times 2.8$

$$=49.28\text{m}^2$$

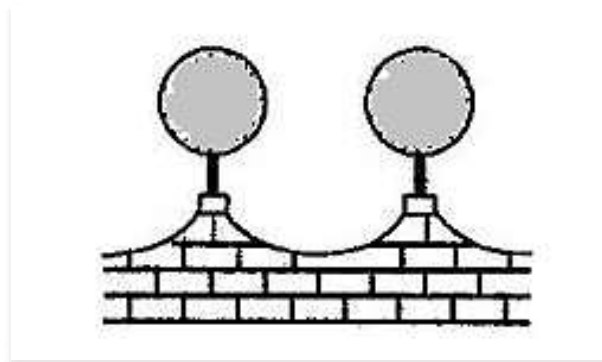
Cost of painting 100cm^2 is Rs.5

So, the cost of painting $1\text{m}^2 = \text{Rs.}500$

Therefore the cost of painting the whole dome = $\text{Rs.} 500 \times 49.28$

$$= \text{Rs.} 24640$$

Q13. The front compound wall of a house is decorated by wooden spheres of diameter 21 cm, placed on small supports as shown in the figure. Eight such spheres are used for this purpose and are to be painted silver. Each support is a cylinder of radius 1.5cm and height 7cm and is to be painted black. Find the cost of paint required if silver paint costs 25 paise per cm^2 .



Sol.

$$\text{Wooden sphere radius} = \frac{21}{2} = 10.5\text{cm}$$

$$\text{Surface area of a wooden sphere} = 4\pi r^2 = 4 \times \frac{22}{7} \times (10.5)^2 = 1386\text{cm}^2$$

$$\text{Radius } r \text{ of cylindrical support} = 1.5\text{cm}$$

$$\text{Height } h \text{ of cylindrical support} = 7\text{cm}$$

Curved surface area of cylindrical support =

$$2\pi rh = 2 \times \frac{22}{7} \times 1.5 \times 7$$

$$= 66\text{cm}^2$$

$$\text{Area of circular end of cylindrical support} = \pi r^2 = \frac{22}{7} \times (1.5)^2 = 7.07\text{cm}^2$$

Area to be painted silver =

$$8(1386 - 7.07)\text{cm}^2$$

$$= 8(1378.93)\text{cm}^2$$

$$= 11031.44\text{cm}^2$$

$$\text{Cost occurred in painting silver colour} = (11031.44 \times 0.25) = \text{Rs.}2757.86$$

$$\text{Area to be painted black} = (8 \times 66)\text{cm}^2 = 528\text{cm}^2$$

Cost occurred in painting black colour= $(528 \times 5.05) = \text{Rs.}26.40$

Therefore total cost in painting = $\text{Rs.}2757.86 + \text{Rs.}26.40 = \text{Rs.}2784.26$