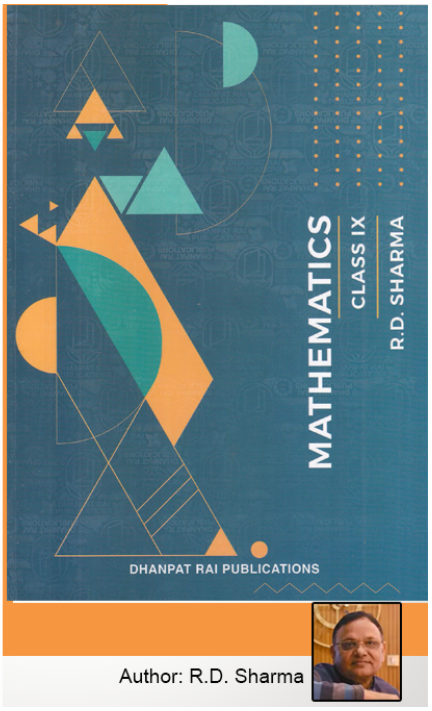
Class 9 - Chapter 21 Surface Area And Volume Of Sphere



RD Sharma Solutions for Class 9 Maths Chapter 21–Surface Area And Volume Of Sphere

Class 9: Maths Chapter 21 solutions. Complete Class 9 Maths Chapter 21 Notes.

RD Sharma Solutions for Class 9 Maths Chapter 21–Surface Area And Volume Of Sphere

RD Sharma 9th Maths Chapter 21, Class 9 Maths Chapter 21 solutions

https://www.indcareer.com/schools/rd-sharma-solutions-for-class-9-maths-chapter-21-surface-area-and-volume-of-sphere/

Exercise 21.1 Page No: 21.8

Question 1: Find the surface area of a sphere of radius:

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

Solution:

Surface area of a sphere = $4\pi r^2$

Where, r = radius of a sphere

(i) Radius = 10.5 cm

Surface area = 4 x 22/7 x $(10.5)^2$

= 1386

Surface area is 1386 cm^2

(ii) Radius= 5.6 cm

Surface area = $4\times22/7\times(5.6)^2$

= 394.24

Surface area is 394.24 cm^2

(iii) Radius = 14 cm

Surface area = $4\times22/7\times(14)^2$

= 2464

Surface area is 2464 cm^2

Question 2: Find the surface area of a sphere of diameter:

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

Solution:

Surface area of a sphere = $4\pi r^2$

Where, r = radius of a sphere

(i) Diameter= 14 cm

So, Radius = Diameter/2 = 14/2 cm = 7 cm

Surface area = $4\times22/7\times(7)^2$

= 616

Surface area is 616 cm^2

(ii) Diameter = 21cm

So, Radius = Diameter/2 = 21/2 cm = 10.5 cm

Surface area= $4\times22/7\times(10.5)^2$

= 1386

Surface area is 1386 cm^2

(iii) Diameter= 3.5cm

So, Radius = Diameter/2 = 3.5/2 cm = 1.75 cm

Surface area = $4\times22/7\times(1.75)^2$

= 38.5

Surface area is 38.5 cm^2

Question 3: Find the total surface area of a hemisphere and a solid hemisphere each of radius 10 cm. (π=3.14)

Solution:

Radius of a hemisphere = Radius of a solid hemisphere = 10 cm (Given)

Surface area of the hemisphere = $2\pi r^2$

= $2\times3.14\times(10)^2\ cm^2$

= 628 cm^2

And, surface area of solid hemisphere = $3\pi r^2$

= $3\times3.14\times(10)^2$ cm^2

= 942 cm^2

Question 4: The surface area of a sphere is 5544 cm^2, find its diameter.

Solution:

Surface area of a sphere is 5544 cm^2

Surface area of a sphere = $4\pi r^2$

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

$4\times22/7\times(r)^2 = 5544$

$r^2 = (5544 \times 7)/88$

$r^2 = 441$

or r = 21cm

Now, Diameter=2(radius) = 2(21) = 42cm

Question 5: A hemispherical bowl made of brass has inner diameter 10.5 cm. Find the cost of tin plating it on the inside at the rate of Rs.4 per 100 cm^2.

Solution:

Inner diameter of hemispherical bowl = 10.5 cm

So, radius = Diameter/2 = 10.5/2 cm = 5.25 cm

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

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

= 173.25

So, Surface area of hemispherical bowl is 173.25 cm^2

Find the cost:

https://www.indcareer.com/schools/rd-sharma-solutions-for-class-9-maths-chapter-21-surface-area-and-volume-of-sphere/

Cost of tin plating 100 cm^2 area= Rs.4 (given)

Cost of tin plating 173.25cm^2 area = Rs. 4×173.25100 = Rs. 6.93

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

Question 6: The dome of a building is in the form of a hemisphere. Its radius is 63 dm. Find the cost of painting it at the rate of Rs. 2 per sq m.

Solution:

Radius of hemispherical dome = 63 dm or 6.3 m

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

=$2\times3.14\times(6.3)^2$

= 249.48

So, Inner surface area of dome is 249.48 m^2

Now find the cost:

Cost of painting 1m^2 = Rs.2 (given)

Therefore, cost of painting 249.48 m^2= Rs. (249.48×2) = Rs.498.96.

Exercise 21.2 Page No: 21.19

Question 1: Find the volume of a sphere whose radius is:

(i) 2 cm (ii) 3.5 cm (iii) 10.5 cm.

Solution:

Volume of a sphere = $4/3\pi r^3$ Cubic Units

Where, r = radius of a sphere

(i) Radius = 2 cm

Volume = $4/3 \times 22/7 \times (2)^3$

= 33.52

Volume = 33.52 cm^3

(ii) Radius = 3.5cm

Therefore volume = $4/3 \times 22/7 \times (3.5)^3$

= 179.666

Volume = 179.666 cm^3

(iii) Radius = 10.5 cm

Volume = $4/3 \times 22/7 \times (10.5)^3$

= 4851

Volume = 4851 cm^3

Question 2: Find the volume of a sphere whose diameter is:

(i) 14 cm (ii) 3.5 dm (iii) 2.1 m

Solution:

Volume of a sphere = $4/3\pi r^3$ Cubic Units

Where, r = radius of a sphere

(i) diameter =14 cm

So, radius = diameter/2 = 14/2 = 7cm

Volume = $4/3 \times 22/7 \times (7)^3$

= 1437.33

Volume = 1437.33 cm^3

(ii) diameter = 3.5 dm

So, radius = diameter/2 = 3.5/2 = 1.75 dm

Volume = $4/3 \times 22/7 \times (1.75)^3$

= 22.46

Volume = 22.46 dm^3

(iii) diameter = 2.1 m

So, radius = diameter/2 = 2.1/2 = 1.05 m

Volume = $4/3 \times 22/7 \times (1.05)^3$

= 4.851

Volume = 4.851 m^3

Question 3: A hemispherical tank has the inner radius of 2.8 m. Find its capacity in liters.

Solution:

Radius of hemispherical tank = 2.8 m

Capacity of hemispherical tank = $2/3\ \pi r^3$

$=2/3 \times 22/7 \times (2.8)^3\ m^3$

= 45.997 m^3[Using $1m^3$ = 1000 liters]

Therefore, capacity in litres = 45997 litres

Question 4: A hemispherical bowl is made of steel 0.25 cm thick. The inside radius of the bowl is 5 cm. Find the volume of steel used in making the bowl.

Solution:

Inner radius of a hemispherical bowl = 5 cm

Outer radius of a hemispherical bowl = 5 cm + 0.25 cm = 5.25 cm

Volume of steel used = Outer volume – Inner volume

$= 2/3 \times \pi \times ((5.25)^3 - (5)^3)$

$= 2/3 \times 22/7 \times ((5.25)^3 - (5)^3)$

= 41.282

Volume of steel used is 41.282 cm^3

Question 5: How many bullets can be made out of a cube of lead, whose edge measures 22 cm, each bullet being 2 cm in diameter?

Solution:

Edge of a cube = 22 cm

Diameter of bullet = 2 cm

So, radius of bullet (r) = 1 cm

Volume of the cube = $(side)^3 = (22)^3\ cm^3 = 10648\ cm^3$

And,

Volume of each bullet which will be spherical in shape = $4/3\pi r^3$

= $4/3 \times 22/7 \times (1)^3\ cm^3$

= $4/3 \times 22/7\ cm^3$

= $88/21\ cm^3$

Number of bullets = (Volume of cube) / (Volume of bullet)

= 10648/88/21

= 2541

Therefore, 2541 bullets can be made.

Question 6: A shopkeeper has one laddoo of radius 5 cm. With the same material, how many laddoos of radius 2.5 cm can be made?

Solution:

Volume of laddoo having radius 5 cm (V1) = $4/3 \times 22/7 \times (5)^3$

= $11000/21\ cm^3$

Also, Volume of laddoo having radius 2.5 cm (V2) = $4/3\pi r^3$

= $4/3\times22/7\times(2.5)^3$ cm^3

= $1375/21$ cm^3

Therefore,

Number of laddoos of radius 2.5 cm that can be made = V1/V2 = 11000/1375 = 8

Question 7: A spherical ball of lead 3 cm in diameter is melted and recast into three spherical balls. If the diameters of two balls be 3/2cm and 2 cm, find the diameter of the third ball.

Solution:

Volume of lead ball with radius 3/2 cm = $4/3\pi r^3$

= $4/3\times\pi\times(3/2)^3$

Let, Diameter of first ball (d1) = 3/2cm

Radius of first ball (r1) = 3/4 cm

Diameter of second ball (d2) = 2 cm

Radius of second ball (r2) = 2/2 cm = 1 cm

Diameter of third ball (d3) = d

Radius of third ball (r3) = d/2 cm

Now,

Volume of lead ball= $\frac{4}{3} \times \pi \times \left(\frac{3}{4}\right)^3 + \frac{4}{3} \times \pi \times (1)^3 + \frac{4}{3} \times \pi \times \left(\frac{d}{2}\right)^3$

$\frac{4}{3} \times \pi \times \left(\frac{3}{2}\right)^3 = \frac{4}{3} \times \pi \times \left(\frac{3}{4}\right)^3 + \frac{4}{3} \times \pi \times (1)^3 + \frac{4}{3} \times \pi \times \left(\frac{d}{2}\right)^3$

$\frac{4}{3}\pi\left[\left(\frac{3}{2}\right)^3\right] = \frac{4}{3}\pi\left[\left(\frac{3}{4}\right)^3 + (1)^3 + \left(\frac{d}{2}\right)^3\right]$

$\frac{27}{8} = \frac{27}{64} + 1 + \frac{d^3}{8}$

$d^3 = 8\left[\frac{27}{8} - \frac{27}{64} - 1\right]$

$\frac{d^3}{8} = \frac{125}{64}$

$\frac{d}{2} = \frac{5}{4}$

$d = \frac{10}{4}$

d= 2.5

So, diameter of third ball is 2.5 cm.

Question 8: A sphere of radius 5 cm is immersed in water filled in a cylinder, the level of water rises 5/3 cm. Find the radius of the cylinder.

Solution:

Radius of sphere = 5 cm (Given)

Let ‘r’ be the radius of cylinder.

We know, Volume of sphere = $4/3\pi r^3$

By putting values, we get

= $4/3\times\pi\times(5)^3$

Height (h) of water rises is 5/3 cm (Given)

Volume of water rises in cylinder = $\pi r^2 h$

https://www.indcareer.com/schools/rd-sharma-solutions-for-class-9-maths-chapter-21-surface-area-and-volume-of-sphere/

Therefore, Volume of water rises in cylinder = Volume of sphere

So, $\pi r^2 h = 4/3\pi r^3$

$\pi r^2 \times 5/3 = 4/3 \times \pi \times (5)^3$

or $r^2 = 100$

or $r = 10$

Therefore, radius of the cylinder is 10 cm.

Question 9: If the radius of a sphere is doubled, what is the ratio of the volume of the first sphere to that of the second sphere?

Solution:

Let r be the radius of the first sphere then 2r be the radius of the second sphere.

Now,

$$\frac{\text{Volume of first sphere}}{\text{Volume of second sphere}} = \frac{\frac{4}{3}\pi r^3}{\frac{4}{3}\pi (2r)^3} = \frac{1}{8}$$

Ratio of volume of the first sphere to the second sphere is 1:8.

Question 10: A cone and a hemisphere have equal bases and equal volumes. Find the ratio of their heights.

Solution:

Volume of the cone = Volume of the hemisphere (Given)

$1/3\pi r^2 h = 2/3\ \pi r^3$

(Using respective formulas)

$r^2 h = 2r^3$

or $h = 2r$

Since, cone and a hemisphere have equal bases which implies they have the same radius.

h/r = 2

or h : r = 2 : 1

Therefore, Ratio of their heights is 2:1

Question 11: A vessel in the form of a hemispherical bowl is full of water. Its contents are emptied in a right circular cylinder. The internal radii of the bowl and the cylinder are 3.5 cm and 7 cm respectively. Find the height to which the water will rise in the cylinder.

Solution:

Volume of water in the hemispherical bowl = Volume of water in the cylinder … (Given)

Inner radius of the bowl (r_1) = 3.5cm

Inner radius of cylinder (r_2) = 7cm

Volume of water in the hemispherical bowl = Volume of water in the cylinder

$2/3\pi r_1^3 = \pi r_2^2 h$[Using respective formulas]

Where h be the height to which water rises in the cylinder.

$2/3\pi(3.5)^3 = \pi(7)^2 h$

or h = 7/12

Therefore, 7/12 cm be the height to which water rises in the cylinder.

Question 12: A cylinder whose height is two thirds of its diameter, has the same volume as a sphere of radius 4 cm. Calculate the radius of the base of the cylinder.

Solution:

Radius of a sphere (R)= 4 cm (Given)

Height of the cylinder = 2/3 diameter (given)

We know, Diameter = 2(Radius)

Let h be the height and r be the base radius of a cylinder, then

h = 2/3× (2r) = 4r/3

Volume of the cylinder = Volume of the sphere

$\pi r^2 h = 4/3\pi R^3$

$\pi \times r^2 \times (4r/3) = 4/3\ \pi\ (4)^3$

$(r)^3 = (4)^3$

or r = 4

Therefore, radius of the base of the cylinder is 4 cm.

Question 13: A vessel in the form of a hemispherical bowl is full of water. The contents are emptied into a cylinder. The internal radii of the bowl and cylinder are respectively 6 cm and 4 cm. Find the height of water in the cylinder.

Solution:

Radius of a bowl (R)= 6 cm (Given)

Radius of a cylinder (r) = 4 cm (given)

Let h be the height of a cylinder.

Now,

Volume of water in hemispherical bowl = Volume of cylinder

$2/3\ \pi\ R^3 = \pi r^2\ h$

$2/3\ \pi\ (6)^3 = \pi(4)^2\ h$

or h = 9

Therefore, height of water in the cylinder 9 cm.

Question 14: A cylindrical tub of radius 16 cm contains water to a depth of 30 cm. A spherical iron ball is dropped into the tub and thus level of water is raised by 9 cm. What is the radius of the ball?

Solution:

https://www.indcareer.com/schools/rd-sharma-solutions-for-class-9-maths-chapter-21-surface-area-and-volume-of-sphere/

Let r be the radius of the iron ball.

Radius of the cylinder (R) = 16 cm (Given)

A spherical iron ball is dropped into the cylinder and thus the level of water is raised by 9 cm.
So, height (h) = 9 cm

From statement,

Volume of iron ball = Volume of water raised in the hub

$4/3\pi r^3 = \pi R^2 h$

$4/3\ r^3 = (16)^2 \times 9$

or $r^3 = 1728$

or r = 12

Therefore, radius of the ball = 12cm.

Exercise VSAQs Page No: 21.25

Question 1: Find the surface area of a sphere of radius 14 cm.

Solution:

Radius of a sphere (r) = 14 cm

Surface area of a sphere = $4\pi r^2$

$= 4 \times (22/7) \times 14^2\ cm^2$

$= 2464\ cm^2$

Question 2: Find the total surface area of a hemisphere of radius 10 cm.

Solution:

Radius of a hemisphere (r) = 10 cm

Total surface area of a hemisphere = $3\pi r^2$

= 3 × (22/7) × 10^2 cm^2

= 942 cm^2

Question 3: Find the radius of a sphere whose surface area is 154 cm^2.

Solution:

Surface area of a sphere = 154 cm^2

We know, Surface area of a sphere = $4\pi r^2$

So, $4\pi r^2 = 154$

4 x 22/7 x r^2 = 154

r^2 = 49/4

or r = 7/2 = 3.5

Radius of a sphere is 3.5 cm.

Question 4: The hollow sphere, in which the circus motor cyclist performs his stunts, has a diameter of 7 m. Find the area available to the motorcyclist for riding.

Solution:

Diameter of hollow sphere = 7 m

So, radius of hollow sphere = 7/2 m = 3.5 cm

Now,

Area available to the motorcyclist for riding = Surface area of a sphere = $4\pi r^2$

= 4 × (22/7) × 3.5^2 m^2

= 154 m^2

Question 5: Find the volume of a sphere whose surface area is 154 cm^2.

Solution:

Surface area of a sphere = 154 cm^2

We know, Surface area of a sphere = $4\pi r^2$

So, $4\pi r^2 = 154$

$4 \times 22/7 \times r^2 = 154$

or $r^2 = 49/4$

or $r = 7/2 = 3.5$

Radius (r) = 3.5 cm

Now,

Volume of sphere = $4/3\ \pi\ r^3$

$= (4/3)\ \pi \times 3.5^3$

= 179.66

Therefore, Volume of sphere is 179.66 cm^3.

Chapterwise RD Sharma Solutions for Class 9 Maths :

https://www.indcareer.com/schools/rd-sharma-solutions-for-class-9-maths-chapter-21-surface-area-and-volume-of-sphere/

About RD Sharma

RD Sharma i*sn't the kind of author you'd bump into at lit fests. But his bestselling books have helped many* CBSE *students lose their dread of* maths. *Sunday Times profiles the tutor turned internet star*

He dreams of algorithms that would give most people nightmares. And, spends every waking hour thinking of ways to explain concepts like 'series solution of linear differential equations'. Meet Dr Ravi Dutt Sharma — mathematics teacher and author of 25 reference books — whose name evokes as much awe as the subject he teaches. And though students have used his thick tomes for the last 31 years to ace the dreaded maths exam, it's only recently that a spoof video turned the tutor into a YouTube star.

R D Sharma had a good laugh but said he shared little with his on-screen persona except for the love for maths. "I like to spend all my time thinking and writing about maths problems. I find it relaxing," he says. When he is not writing books explaining mathematical concepts for classes 6 to 12 and engineering students, Sharma is busy dispensing his duty as vice-principal and head of department of science and humanities at Delhi government's Guru Nanak Dev Institute of Technology.