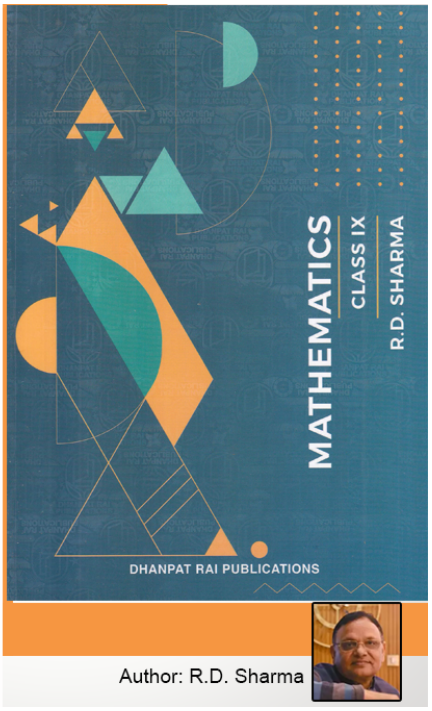
Class 9 - Chapter 19
Surface Area and Volume of A Right Circular Cylinder



RD Sharma Solutions for Class 9 Maths Chapter 19–Surface Area and Volume of A Right Circular Cylinder

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RD Sharma 9th Maths Chapter 19, Class 9 Maths Chapter 19 solutions

Exercise 19.1 Page No: 19.7

Question 1: Curved surface area of a right circular cylinder is 4.4 m^2. If the radius of the base of the cylinder is 0.7 m. Find its height.

Solution:

Radius of the base of the cylinder = r = 0.7 m (Given)

Curved surface area of cylinder = C.S.A = 4.4m^2 (Given)

Let 'h' be the height of the cylinder.

We know, curved surface area of a cylinder = 2πrh

Therefore,

2πrh = 4.4

2 x 3.14 x 0.7 x h = 4.4[using π=3.14]

or h = 1

Therefore the height of the cylinder is 1 m.

Question 2: In a hot water heating system, there is a cylindrical pipe of length 28 m and diameter 5 cm. Find the total radiating surface in the system.

Solution:

Height of cylinder (h) = Length of cylindrical pipe = 28 m or 2800 cm (Given)[1 m = 100 cm]

Diameter of circular end of pipe = 5 cm (given)

Let 'r' be the radius of circular end, then r = diameter/2 = 5/2 cm

We know, Curved surface area of cylindrical pipe = 2πrh

= 2 x 3.14 x 5/2 x 2800[using π = 3.14]

= 44000

Therefore, the area of radiating surface is 44000 cm^2.

Question 3: A cylindrical pillar is 50 cm in diameter and 3.5 m in height. Find the cost of painting the curved surface of the pillar at the rate of Rs 12.50 per m^2.

Solution:

Height of cylindrical pillar (h) = 3.5 m

Radius of circular end of pillar (r) = 50/2 cm = 25 cm = 0.25 m[As radius = half of the diameter] and [1 m = 100 cm]

Curved surface area of cylindrical pillar = 2πrh

= 2 x 3.14 x 0.25 x 3.5

= 5.5

Curved surface area of cylindrical pillar is 5.5 m.

Find the cost:

Cost of whitewashing 1m^2 is Rs 12.50 (Given)

Cost of whitewashing 5.5 m^2 area = Rs. 12.50 x 5.5 = Rs. 68.75

Thus the cost of whitewashing the pillar is Rs 68.75.

Question 4: It is required to make a closed cylindrical tank of height 1 m and the base diameter of 140 cm from a metal sheet. How many square meters of the sheet are required for the same?

Solution:

Height of cylindrical tank (h) = 1 m

Base radius of cylindrical tank (r) = diameter/2 = 140/2 cm = 70 cm = 0.7 m[1 m = 100 cm]

Now,

Area of sheet required = Total surface area of tank (TSA) = 2πr(h + r)

=2 x 3.14 x 0.7(1 + 0.7)

= 7.48

Therefore, 7.48 m^2 metal sheet is required to make required closed cylindrical tank.

Question 5: A solid cylinder has a total surface area of 462 cm^2. Its curved surface area is one-third of its total surface area. Find the radius and height of the cylinder.

Solution:

Total surface area of a cylinder = 462 cm^2 (Given)

As per given statement:

Curved or lateral surface area = 1/3 (Total surface area)

⇒ $2\pi rh = 1/3(462)$

⇒ $2\pi rh = 154$

⇒ $h = 49/2r$ ….(1)[Using $\pi = 22/7$]

Again,

Total surface area = 462 cm^2

$2\pi r(h + r) = 462$

$2\pi r(49/2r + r) = 462$

or $49 + 2r^2 = 147$

or $2r^2 = 98$

or $r = 7$

Substitute the value of r in equation (1), and find the value of h.

$h = 49/2(7) = 49/14 = 7/2$

Height (h) = 7/2 cm

Answer: Radius = 7 cm and height = 7/2 cm of the cylinder

Question 6: The total surface area of a hollow cylinder which is open on both the sides is 4620 sq.cm and the area of the base ring is 115.5 sq.cm and height is 7 cm. Find the thickness of the cylinder.

Solution:

Given:

Total surface area of hollow cylinder = 4620 cm^2

Height of cylinder (h) = 7 cm

Area of base ring = 115.5 cm^2

To find: Thickness of the cylinder

Let 'r_1' and 'r_2' are the inner and outer radii of the hollow cylinder respectively.

Then, $\pi r_2^2 - \pi r_1^2 = 115.5$ …….(1)

And,

$2\pi r_1 h + 2\pi r_2 h + 2(\pi r_2^2 - \pi r_1^2) = 4620$

Or $2\pi h (r_1 + r_2) + 2 \times 115.5 = 4620$

(Using equation (1) and h = 7 cm)

or $2\pi 7 (r_1 + r_2) = 4389$

or $\pi (r_1 + r_2) = 313.5$ ….(2)

Again, from equation (1),

$\pi r_2^2 - \pi r_1^2 = 115.5$

or $\pi(r_2 + r_1)(r_2 - r_1) = 115.5$[using identity: a^2 – b^2 = (a – b)(a + b)]

Using result of equation (2),

$313.5 (r_2 - r_1) = 115.5$

or $r_2 - r_1 = 7/19 = 0.3684$

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Therefore, thickness of the cylinder is 7/19 cm or 0.3684 cm.

Question 7: Find the ratio between the total surface area of a cylinder to its curved surface area, given that height and radius of the tank are 7.5 m and 3.5 m.

Solution:

Height of cylinder (h) = 7.5 m

Radius of cylinder (r) = 3.5 m

We know, Total Surface Area of cylinder (T.S.A) = $2\pi r(r+h)$

And, Curved surface area of a cylinder(C.S.A) = $2\pi rh$

Now, Ratio between the total surface area of a cylinder to its curved surface area is

T.S.A/C.S.A = $2\pi r(r+h)/2\pi rh$

= $(r + h)/h$

= $(3.5 + 7.5)/7.5$

= 11/7.5

= 22/15 or 22:15

Therefore the required ratio is 22:15.

Exercise 19.2 Page No: 19.20

Question 1: A soft drink is available in two packs- (i) a tin can with a rectangular base of length 5 cm and width 4 cm, having a height of 15 cm and (ii) a plastic cylinder with circular base of diameter 7 cm and height 10 cm, Which container has greater capacity and by how much?

Solution:

(i) Dimensions of a cubical tin can:

Length (L) = 5 cm

Breadth (B) = 4 cm

Height (H) = 15 cm

Capacity of the tin can = Volume of Tin Can = l x b x h cubic units = (5 x 4 x 15) cm^3 = 300 cm^3

(ii) Radius of the circular end of the plastic cylinder (R) = diametr/2 = 7/2 cm = 3.5 cm

Height of plastic cylinder (H) = 10 cm

Capacity of plastic cylinder = Volume of cylindrical container = πR^2H = 22/7 × $(3.5)^2$ × 10 cm^3 = 385 cm^3

From (i) and (ii) results, the plastic cylinder has greater capacity.

Difference in capacity = (385 – 300) cm^3 = 85 cm^3

Question 2: The pillars of a temple are cylindrically shaped. If each pillar has a circular base of radius 20 cm and height 10 m. How much concrete mixture would be required to build 14 such pillars?

Solution:

In this case, we have to find the volume of the cylinders.

Given:

Radius of the base of a cylinder = 20 cm

Height of cylinder = 10 m = 1000 cm[1m = 100 cm]

Volume of the cylindrical pillar = πR^2H

= $(22/7 \times 20^2 \times 1000)$ cm^3

= 8800000/7 cm^3 or 8.87 m^3

Therefore, volume of 14 pillars = 14 x 8.87 m^3 = 17.6 m^3

Question 3: The inner diameter of a cylindrical wooden pipe is 24 cm and its outer diameter is 28 cm. The length of the pipe is 35 cm. Find the mass of the pipe, if 1 cm^3 of wood has a mass of 0.6 gm.

Solution:

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Let r and R be the inner and outer radii of cylindrical pipe.

Inner radius of a cylindrical pipe (r) = 24/2 = 12 cm

Outer radius of a cylindrical pipe (R) = 24/2 = 14 cm

Height of pipe (h) = length of pipe = 35 cm

Mass of pipe = volume x density = $\pi(R^2 - r^2)h$

= $22/7(14^2 - 12^2)35$

= 5720

Mass of pipe is 5720 cm^3

Mass of 1 cm^3 wood = 0.6 gm (Given)

Therefore, mass of 5720 cm^3 wood = 5720 x 0.6 = 3432 gm = 3.432 kg

Question 4: If the lateral surface of a cylinder is 94.2 cm^2 and its height is 5 cm, find:

i) radius of its base (ii) volume of the cylinder

[Use π = 3.141]

Solution:

Lateral surface of the cylinder = 94.2 cm^2

Height of the cylinder = 5 cm

Let 'r' be the radius.

(i) Lateral surface of the cylinder = 94.2 cm^2

$2 \pi rh = 94.2$

or 2 x 3.14 x r x 5 = 94.2

or r = 3 cm

(ii) Volume of the cylinder = $\pi r^2 h$

= (3.14 x 3^2 x 5) cm^3

= 141.3 cm^3

Question 5: The capacity of a closed cylindrical vessel of height 1 m is 15.4 liters. How many square meters of the metal sheet would be needed to make it?

Solution:

Given, The capacity of a closed cylindrical vessel of height 1 m is 15.4 liters.

Height of the cylindrical vessel = 15.4 litres = 0.0154 m^3[$1m^3$ = 1000 litres]

Let 'r' be the radius of the circular ends of the cylinders, then

$\pi r^2 h = 0.0154\ m^3$

3.14 x r^2 x 1 = 0.0154 m^3

or r = 0.07 m

Again,

Total surface area of a vessel = $2\pi r(r+h)$

= $2(3.14(0.07)(0.07+1))\ m^2$

= 0.470 m^2

Question 6: A patient in a hospital is given soup daily in a cylindrical bowl of diameter 7 cm. If the bowl is filled with soup to a height of 4 cm, how much soup the hospital has to prepare daily to serve 250 patients?

Solution:

Radius of cylindrical bowl (R) = diameter/2 = 7/2 cm = 3.5 cm

Height = 4 cm

Now,

Volume of soup in 1 bowl = $\pi r^2 h$

= $22/7 \times 3.5^2 \times 4\ cm^3$

= 154 cm^3

Volume of soup in 250 bowls = (250 x 154) cm^3

= 38500 cm^3

= 38.5 liters

Thus, hospital has to prepare 38.5 liters of soup daily in order to serve 250 patients.

Question 7: A hollow garden roller, 63 cm wide with a girth of 440 cm, is made of 4 cm thick iron. Find the volume of the iron.

Solution:

The outer circumference of the roller = 440 cm

Thickness of the roller = 4 cm and

Its height (h) = 63 cm

Let 'R' be the external radius and 'r' be the inner radius of the roller.

Circumference of roller = $2\pi R = 440$

Or $2\pi R = 440$

$2 \times 22/7 \times R = 440$

or R = 70

And, inner radius 'r' is given as

$\Rightarrow r = R - 4$

$\Rightarrow r = 70 - 4$

$\Rightarrow r = 66$

Inner radius is 66 cm

Now, volume of the iron is given as

$V = \pi(R^2 - r^2)h$

$V = 22/7\ (70^2 - 66^2)63$

$V = 107712$

Therefore, required volume is 107712 cm^3.

Question 8: A solid cylinder has a total surface area of 231 cm^2. Its curved surface area is 2/3 of the total surface area. Find the volume of the cylinder.

Solution:

Total surface area = 231 cm^2

As per given statement: Curved surface area = 2/3(Total surface area)

Curved surface area = 2/3 x 231 = 154

So, Curved surface area = 154 cm^2 …(1)

We know, Curved surface area of cylinder = $2\pi rh + 2\pi r^2$

Or $2\pi rh + 2\pi r^2 = 231$ …..(2)

Here $2\pi rh$ is the curved surface area, so using (1), we have

$\Rightarrow 154 + 2\pi r^2 = 231$

$\Rightarrow 2\pi r^2 = 231 - 154$

$\Rightarrow 2 \times 22/7 \times r^2 = 77$

$\Rightarrow r^2 = 49/4$

or r = 7/2

Find the value of h:

CSA = 154 cm^2

$\Rightarrow 2\pi rh = 154$

$\Rightarrow 2 \times 22/7 \times 7/2 \times h = 154$

$\Rightarrow h = 154/22$

⇒ h = 7

Now,

Find Volume of the cylinder:

$V = \pi r^2 h$

= 22/7 x 7/2 x 7/2 x 7

= 269.5

The volume of the cylinder is 269.5 cm^3

Question 9: The cost of painting the total outside surface of a closed cylindrical oil tank at 50 paise per square decimetre is Rs 198. The height of the tank is 6 times the radius of the base of the tank. Find the volume corrected to 2 decimal places.

Solution:

Let 'r' be the radius of the tank.

As per given statement: Height (h) = 6(Radius) = 6r dm

Cost of painting for 50 paisa or Rs 1/2 per dm^2 = Rs 198 (Given)

⇒ $2\pi r(r+h) \times 1/2 = 198$

⇒ $2 \times 22/7 \times r(r+6r) \times 1/2 = 198$

⇒ r = 3 dm

And, h = (6 x 3) dm = 18 dm

Now,

Volume of the tank = $\pi r^2 h = 22/7 \times 9 \times 18 = 509.14$ dm^3

Question 10: The radii of two cylinders are in the ratio 2 : 3 and their heights are in the ratio 5 : 3. Calculate the ratio of their volumes and the ratio of their curved surfaces.

Solution:

Let the radius of the cylinders be 2x and 3x and the height of the cylinders be 5y and 3y.

Question 11: The ratio between the curved surface area and the total surface area of a right circular cylinder is 1:2. Find the volume of the cylinder, if its total surface area is 616 cm^2.

Solution:

Total surface area (T.S.A) = 616 cm^2 (given)

Let r be the radius of cylinder and h be the radius of cylinder.

As per given statement:

(curved surface area / (total surface area) = 1/2

or CSA = 12 TSA

CSA = 12 x 616 = 308

⇒ CSA = 308 cm^2

Now,

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

⇒ 616 = CSA + $2\pi r^2$

⇒ 616 = 308 + $2\pi r^2$

⇒ $2\pi r^2$ = 616 – 308

⇒ $2\pi r^2$ = 308/2π

⇒ r^2 = 49

or r = 7 cm …(1)

As, CSA = 308 cm^2

2πrh = 308

⇒ 2 x 22/7 x 7 x h = 308

(using (1))

⇒ h = 7 cm

Now,

Volume of cylinder = $\pi r^2 h$

= 22/7 x 7 x 7 x 7

= 1078

Therefore, Volume of cylinder is 1078 cm^3.

Question 12: The curved surface area of a cylinder is 1320 cm^2 and its base had diameter 21 cm. Find the height and volume of the cylinder.

Solution:

Curved surface area of a cylinder = 1320 cm^2

Let, r be the radius of the cylinder and h be the height of the cylinder.

⇒ r = diameter/2 = 21/2 cm = 10.5 cm

We know, Curved surface area(CSA) = $2\pi rh$

So, $2\pi rh$ = 1320

⇒ 2x 22/7 x 10.5 x h = 1320

or h = 20 cm

Now,

Volume of cylinder = $\pi r^2 h$

= 22/7 x 10.5 x 10.5 x 20

= 6930

Thus, Volume of cylinder is 6930 cm^3.

Question 13: The ratio between the radius of the base and the height of a cylinder is 2:3. Find the total surface area of the cylinder, if its volume is 1617cm^3.

Solution:

Let, r be the radius of the cylinder and h be the height of the cylinder.

As per statement: r:h = 2:3

Then, radius = 2x cm and height = 3x cm

Volume of cylinder = $\pi r^2 h$

And Volume of cylinder= 1617 cm^3 (given)

So, $1617 = 22/7\ (2x)^2\ 3x$

$1617 = 22/7\ (12\ x^3\ )$

$x^3 = 343/8$

or x = 7/2

or x = 3.5 cm

Now, radius, r = 2 x 3.5 = 7 cm and

Height = 3x = 3 x 3.5 = 10.5 cm

Now,

Total surface area of cylinder = $2\pi r(h+r)$

= 2 x 22/7 x 7(10.5+7)

= 770

Thus, Total surface area of cylinder is 770 cm^2.

Question 14: A rectangular sheet of paper, 44 cm x 20 cm, is rolled along its length of form cylinder. Find the volume of the cylinder so formed.

Solution:

Length of a rectangular sheet = 44 cm

Height of a rectangular sheet = 20 cm

Now, $2\pi r = 44$

$r = 44/2\pi$

$r = 44 \times 1/2 \times 7/22$

or $r = 7$ cm

Now,

Volume of cylinder = $\pi r^2 h$

$= 22/7 \times 7 \times 7 \times 20$

$= 3080$

So, Volume of cylinder is 3080 cm^3.

Question 15: The curved surface area of cylindrical pillar is 264 m^2 and its volume is 924 m^3. Find the diameter and the height of the pillar.

Solution:

Let, r be the radius of the cylindrical pillar and h be the height of the cylindrical pillar

Curved surface area of cylindrical pillar = CSA = 264 m^2 (Given)

So, $2\pi rh = 264$

or $\pi rh = 132$ …(1)

Again,

Volume of the cylinder = 924 m^3 (given)

$\pi r^2 h = 924$

or $\pi rh(r) = 924$

Using equation (1)

$132\ r = 924$

or $r = 924/132$

or r = 7m

Substitute value of r value in equation (1)

22/7 x 7 x h = 132

Or h = 6m

Therefore, diameter = 2r = 2(7) = 14 m and height = 6 m

Exercise VSAQs Page No: 19.27

Question 1: Write the number of surfaces of a right circular cylinder.

Solution:

There are 3 surfaces in a cylinder.

Question 2: Write the ratio of total surface area to the curved surface area of a cylinder of radius r and height h.

Solution:

Ratio of total surface area to the curved surface area of a cylinder of radius r and height h can be written as:

$$\frac{\text{Total surface area of a cylinder}}{\text{Curved surface area of a cylinder}} = \frac{[2\pi r(h+r)]}{2\pi r^2} = \frac{h+r}{r}$$

Chapterwise RD Sharma Solutions for Class 9 Maths :

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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.