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#42777

**Topic:** Cuboid and Cube

The volume of a cube is 512 cubic metres. Find the length of the side of the cube.

**Answer:** 8

**Solution**

Given, volume of cube = 512 cu.m

We know that, the volume of a cube \( (\text{side})^3 \)

\[ \frac{1}{3} \sqrt[3]{512} \]

\[ = \frac{1}{3} \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \]

\[ = 2 \times 2 = 8 \text{ m} \]

#463651

**Topic:** Cuboid and Cube

There are two cuboidal boxes as shown in the adjoining figure. Which box requires the lesser amount of material to make?

**Solution**

Total surface area of cuboid = \([2 \times (60 \times 40) + (40 \times 50) + (50 \times 60)]\)

= 14800 sq cm

Total surface area of cube = \(6 \times 50 = 15000 \text{ sq cm}\)

So, the cuboidal box will require lesser amount of material.

#463656

**Topic:** Cuboid and Cube

A suitcase with measure 80 cm \( \times 48 \text{ cm} \times 24 \text{ cm} \) is to be covered with a tarpaulin cloth. How many metres of tarpaulin of width 96 cm is required to cover 100 such suitcases?

**Solution**

T.S.A = \(2(80 \times 48) + (48 \times 24) + (24 \times 80)) = 13824 \text{ sq cm}\)

T.S.A of 100 suitcases = \(13824 \times 100 = 1382400 \text{ sq cm}\)

Length of tarpaulin = \(\frac{1382400}{96} = 14400 \text{ cm} \approx 144 \text{ m}\)
Rukhsar painted the outside of the cabinet of measure $1m \times 2m \times 1.5m$. How much surface area did she cover if she painted all except the bottom of the cabinet?

Solution

A cabinet has 6 surfaces including bottom surface. However, we have to paint only 5 surfaces. So, we have one front and one back surface ($2 \times 1.5$), one left and one right surface ($1 \times 1.5$) and one upper surface ($2 \times 1$).

So, area to be painted is 

$$\text{Area} = (2 \times (2 \times 1.5)) + (2 \times (1 \times 1.5)) + (2 \times 1)$$

$$= 11 \text{ sq. m}$$

Daniel is painting the walls and ceiling of a cuboidal hall with length, breadth and height of $15m$, $10m$ and $7m$ respectively. From each can of paint $100$ sq metre of area is painted. How many cans of paint will she need to paint the room?

Solution

Area to be painted = area of the walls + area of ceiling

$$\text{Area} = [2 \times 7 \times (15 + 10)] + (15 \times 10) = 500 \text{ sq m}$$

No. of cans required = $\frac{500}{100} = 5$

Given a cylindrical tank, in which situation will you find surface area and in which situation volume.

(a) To find how much it can hold.

(b) Number of cement bags required to plaster it.

(c) To find the number of smaller tanks that can be filled with water from it.

Solution
(a) In this case, we will find the volume

(b) In this case, we will find the surface area

(c) In this case, we will find the volume.

---

**#463715**

**Topic:** Cylinder

Diameter of cylinder A is 7 cm, and the height is 14 cm. Diameter of cylinder B is 14 cm and height is 7 cm. Without doing any calculations can you suggest whose volume is greater? Verify it by finding the volume of both the cylinders. Check whether the cylinder with greater volume also has greater surface area?

**Solution**

Volume of cylinder A = \( \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 14 \) = 539 cubic cm

Volume of cylinder B = \( \frac{22}{7} \times 7 \times 7 \times 7 \) = 1078 cubic cm

Volume of cylinder B is greater

Surface area of cylinder A = \( 2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} + 14 \) = 385 sq cm

Surface area of cylinder B = \( 2 \times \frac{22}{7} \times 7 \times (7 + 7) \) = 616 sq cm

Surface area of cylinder B is also greater than the surface area of cylinder A.

---

**#463716**

**Topic:** Cuboid and Cube

Find the height of a cuboid whose base area is 180 sq. cm and volume is 900 cu. cm?

**Solution**

\( \text{Area} = l \times b = 180 \)

\( \text{Volume of cuboid} = l \times b \times h = 900 \)

\( \Rightarrow 180 \times h = 900 \)

\( \Rightarrow h = \frac{900}{180} = 5 \text{ cm} \)

---

**#463717**

**Topic:** Cuboid and Cube

A cuboid is of dimensions 60 cm \( \times \) 54 cm \( \times \) 30 cm. How many small cubes with side 6 cm can be placed in the given cuboid?

**Solution**
Volume of cuboid = \(60 \times 54 \times 30 = 97200\) cu. cm

Volume of a cube = \(6 \times 6 \times 6 = 216\) cu. cm

Required no. of cubes = \(\frac{97200}{216} = 450\)

---

### #463718
**Topic:** Cylinder

Find the height of the cylinder whose volume is 1.54 m and diameter of the base is 140 cm?

**Solution**

Radius of base of cylinder = \(\frac{140}{2} = 70\) cm = 0.70 m

Volume of cylinder = \(\frac{22}{7} \times 0.70 \times 0.70 \times h = 1.54\)

\[ h = \frac{1.54 \times 100}{\left(\frac{22}{7}\right) \times 0.70} = 1\ m \]

So, height of cylinder is 1 m

---

### #463719
**Topic:** Cylinder

A milk tank is in the form of cylinder whose radius is 1.5 m and length is 7 m. Find the quantity of milk in litres that can be stored in the tank?

**Solution**

Volume of cylinder = \(\left(\frac{22}{7} \times 1.5 \times 1.5 \times 7\right) = 49.5\) cu. m

Required quantity = \(49.5 \times 1000 = 49500\) l

---

### #463720
**Topic:** Cuboid and Cube

If each edge of a cube is doubled,

(i) how many times will its surface area increase?

(ii) how many times will its volume increase?

**Solution**

(i) Initial surface area = \(6 \times l \times l\)

New surface area = \(6 \times (2l) \times (2l) = 4 \times \) initial surface area.

So, the new surface area will be increased by 4 times.

(ii) Initial volume = \(l \times l \times l\)

Final volume = \((2l) \times (2l) \times (2l) = 8 \times\) initial volume.

So, volume of the cube will be increased by 8 times.
### #464114
**Topic:** Cuboid and Cube

A plastic box 1.5 m long, 1.25 m wide and 65 cm deep is to be made. It is opened at the top. Ignoring the thickness of the plastic sheet,

(i) determine the area of the sheet

(ii) the cost of sheet for it, if a sheet measuring 1 m² costs Rs. 20.

**Solution**

Length of box = 1.5 m, Breadth = 1.25 m, Height = 0.65 m

(i) Area of sheet required = 2lh + 2bh + lb [Box is open]

= [2 × 1.5 × 0.65 + 2 × 1.25 × 0.65 + 1.5 × 1.25] m²

= (1.95 + 1.625 + 1.875) m² = 5.45 m²

(ii) Cost of sheet per m² area = Rs. 20

Cost of sheet of 5.45 m² area = Rs. 5.45 × 20

= Rs. 109

---

### #464116
**Topic:** Cuboid and Cube

The length, breadth and height of a room are 5m, 4m and 3 m respectively. Find the cost of white washing the walls of the room and the ceiling at the rate of 7.50 per m².

**Solution**

L = 5 m, B = 4 m, H = 3m

Area to be white washed = Area of walls + Area of ceiling of room.

= 2lh + 2bh + lb

= [2 × 5 × 3 + 2 × 4 × 3 + 5 × 4] m²

= 74 m²

Cost of white washing per m² area = Rs. 7.50

Cost of white washing 74 m² area = 74 × 7.50

= Rs. 555

---

### #464117
**Topic:** Cuboid and Cube

The floor of a rectangular hall has a perimeter 250 m. If the cost of painting the four walls at the rate of 10 per m² is 15000, find the height of the hall (in meters).

**Solution**

Area of 4 walls = 2lh + 2bh

= 2(b + h)

Perimeter of floor of wall = 2l + 2b

2l + 2b = 250 m

∴ Area of 4 walls = 2(l + bh)

= 250h m²

Cost of painting per m² area = Rs. 10

Cost of painting 250h m² area = Rs (250h × 10)

= Rs 2500h

Painting cost of walls = Rs. 15000

2500h = 15000

h = 6 m
#464118
**Topic:** Cuboid and Cube

The paint in a certain is sufficient to paint an area equal to 9.375 m$^2$. How many bricks of dimensions $22.5$ cm $\times$ $10$ cm $\times$ $7.5$ cm can be painted out of this container?

**Solution**

Total surface of cuboid (brick) = $2(lb + bh + lh)$

$2(22.5 \times 10 + 10 \times 7.5 + 22.5 \times 7.5)$ cm$^2$

$= 2 \times 468.75 = 937.5$ cm$^2$

Area that can be painted by part of container = 9.375 m$^2$

Let $x$ number of bricks will be used.

Area = $937.5 \times x$ cm$^2$

$\frac{937.5}{x} = 10$

$x = 100$

#464120
**Topic:** Cuboid and Cube

A cubical box has each edge 10 cm and another cuboidal box is 12.5 cm long, 10 cm wide and 8 cm high.

(i) Which box has the greater lateral surface area and by how much?

(ii) Which box has the smaller total surface area and by how much?

**Solution**

(i) Lateral surface area of cube = $4$ (edge)$^2$

$= 4(10)^2 = 400$ cm$^2$

Lateral surface area of cuboidal box = $2(lh + bh)$

$2(12.5 \times 8 + 10 \times 8)$

$= 2 \times 180 = 360$ cm$^2$

Lateral surface area of cubical box $>$ Lateral surface area of cuboidal box

$\Rightarrow$ Difference: $400 - 360$ cm$^2$

$= 40$ cm$^2$

(ii) Total surface area of cubical box = $6$ (edge)$^2$

$= (6)^2 = 300$ cm$^2$

Total surface area of cuboidal box = $2(lb + bh + lh)$

$2(12.5 \times 100 + 10 \times 8 + 12.5 \times 8)$

$= 630$ cm$^2$

Total S.A of cuboidal box $<$ cuboidal total S.A

Difference = $610 - 600$ cm$^2 = 10$ cm$^2$

#464123
**Topic:** Cuboid and Cube

A small indoor greenhouse (herbarium) is made entirely of glass panes (including base) held together with tape. It is 30 cm long, 25 cm wide and 25 cm high.

(i) What is the area of the glass?

(ii) How much of tape is needed for all the 12 edges?

**Solution**
(i) Total S.A of green house = 2(lb + bh + lh) 
\[2(30 \times 25 + 30 \times 25 + 25 \times 25)\] 
= 4250 cm²

(ii) For 12 edges: Total length = 4(i + 4b + 4h) 
\[4(30 + 25 + 25)\] 
= 320 cm

#464125

**Topic:** Cuboid and Cube

Shanti sweets stall was placing an order for making cardboard boxes for packing their sweets. Two sizes of boxes were required. The bigger of dimensions 25 cm × 20 cm × 5 cm and the smaller of dimensions 15 cm × 12 cm × 5 cm. For all the overlaps, 5% of the total surface area is required extra. If the cost of the cardboard is 4 for 1000 cm², find the cost of cardboard required for supplying 250 boxes of each kind.

**Solution**

Total S.A of bigger box = 2(lb + bh + lh) 
\[2(25 \times 20 + 25 \times 5 + 20 \times 5)\] cm² 
\[2(500 + 125 + 100)\] 
1450 cm² 

For overlapping extra area required 
\[\frac{450 \times 5}{100} = 72.5\] cm²

∴ Total S.A (including overlaps) 
\[1450 + 72.5 = 1522.5\] cm²

Area of cardboard sheet for 250 such boxes 
\[(1522.5 \times 250)\] cm²

Total S.A of smaller box = 2(l5 × 12 + 15 × 5 + 12 × 5) cm² 
= 630 cm² 

For overlapping area required 
\[\frac{630 \times 5}{100} = 31.5\] cm² 

Total S.A (including overlaps) = 630 + 31.5 = 661.5 cm²

Area of cardboard sheet required for 250 such boxes 
\[250 \times 661.5 cm² = 165375 cm²\]

Total cardboard sheet required = 380625 + 165375
= 546000 cm² 
Cost of 1000 cm² cardboard sheet = Rs. 4

Cost of 546000 cm² cardboard sheet = Rs. \[\frac{546000 \times 4}{1000}\] = Rs. 2184

#464127

**Topic:** Cuboid and Cube

Parveen wanted to make a temporary shelter for her car, by making a box-like structure with tarpaulin that covers all the four sides and the top of the car (with the front face as a flap which can be rolled up). Assuming that the stitching margins are very small, and therefore negligible, how much tarpaulin would be required to make the shelter of height 2.5 m, with base dimensions 4 m × 3 m²?

**Solution**
Area of trapaulin required \[= 2(bh + lb)\] because it will be required for top and four sides shelter
\[= [2(4 \times 2.5 + 3 \times 2.5) + 4 \times 3] \text{m}^2 \]
\[= [2(10 + 7.5) + 12] \text{m}^2 \]
\[= 47 \text{m}^2 \]

#464146

**Topic:** Cone

Diameter of the base of a cone is 10.5 cm and its slant height is 10 cm. Find its curved surface area.

**Solution**

\[R = \frac{d}{2} = \frac{10.5}{2} \text{ cm} \]

Slant height \[= 10 \text{ cm} \]

CSA of cone \[= \pi rl \]
\[= \frac{22}{7} \times 5.25 \times 10 \text{ cm}^2 \]
\[= 22 \times 0.75 \times 10 \text{ cm}^2 \]
\[= 165 \text{ cm}^2 \]

#464147

**Topic:** Cone

Find the total surface area of a cone, if its slant height is 21 m and diameter of its base is 24 m.

**Solution**

\[R = \frac{d}{2} = \frac{24}{2} = 12 \text{ m} \]

Slant height \[= 21 \text{ m} \]

Total Surface area of cone \[= \pi r(r + l) \]
\[= \frac{22}{7} \times 12(12 + 21) \text{ m}^2 \]
\[= \frac{22}{7} \times 12 \times 33 \text{ m}^2 \]
\[= 1244.57 \text{ m}^2 \]

#464148

**Topic:** Cone

Curved surface area of a cone is 308 m² and its slant height is 14 cm. Find (i) radius of the base and (ii) total surface area of the cone.

**Solution**
Given, \( l = 14 \text{ cm}. \)

Let \( x \) be radius of cone

CSA of cone = \( \pi rl \)

\[
\begin{align*}
3.0 &= \pi l \\
\frac{308}{x} &= \frac{22}{7} \times \frac{7}{14} = 7 \text{ cm}
\end{align*}
\]

Total Surface Area = CSA + Area of base

\[
= 308 + \pi r^2
\]

\[
= 308 + \frac{22}{7} \times 7 \times 7
\]

\[
= 308 + 154
\]

\[
= 462 \text{ cm}^2
\]

---

**#464150**

**Topic:** Cone

A conical tent is 10m high and the radius of its base is 24m. Find

(i) slant height of the tent and

(ii) cost of the canvas required to make the tent, if the cost of \( 1 \text{ m}^2 \) canvas is 70.

**Solution**

\[
h = 10 \text{ m} \\
r = 24 \text{ m}
\]

(i) \( l = \sqrt{h^2 + r^2} \) \text{...[Pythagoras theorem]}\]

\[
= (10)^2 + (24)^2 = 100 + 576
\]

\[
l = \sqrt{676} = 26 \text{ m}
\]

(ii) Curved surface area \( = \pi rl = \frac{22}{7} \times 24 \times 26 = \frac{13728}{7} \text{ m}^2 \)

Cost of \( 1 \text{ m}^2 \) canvas = Rs. 1470

Cost of \( \frac{13728}{7} \text{ m}^2 \) canvas = \[
\frac{13728}{7} \times 70
\]

= Rs. 1, 37, 280

---

**#464151**

**Topic:** Cone

What length of tarpaulin 3m wide will be required to make conical tent of height 8m and base radius 6m? Assume that the extra length of material that will be required for stitching margins and wastage in cutting is approximately 20cm.

**Solution**
\[ h = 8 \text{ m}, \quad r = 6 \text{ m}, \quad l = \sqrt{r^2 + h^2} \]
\[ = \sqrt{6^2 + 8^2} \]
\[ \sqrt{100} = 10 \text{ m} \]

CSA = \( ml = (3.14 \times 6 \times 10) \text{ m}^2 = 188.4 \text{ m}^2 \)

Let the length of sheet required = \( x \)

Breadth = 3 m

Area = \( l \times b = 3 \times x = 3x \)

20 cm of length will be wasted:

Effective length = \( x - \frac{20}{100} \)

\[ \frac{80}{100} \times \text{m} = \frac{80}{100} \times \text{m} \]

CSA of tent = Area of sheet

\[ \frac{80 \times x}{100} = \frac{188.4}{3} \]

\[ \frac{80}{100} \times x = \frac{62.8}{8} \]

\[ l = 63 \text{ m} \]

---

### #464152

**Topic:** Cone

The slant height and base diameter of a conical tomb are 25 m and 14 m respectively. Find the cost of white-washing its curved surface at the rate of 210 per 100 m².

**Solution**

\[ l = 25 \text{ m}, \quad R = \frac{14}{2} = 7 \text{ m} \]

Curved surface area = \( ml \)

\[ = (\frac{22}{7} \times 7 \times 25) \text{ m}^2 \]

550 m²

Cost of white washing 100 m² area = Rs. 210

Cost of white washing 550 m² area = \( \frac{210 \times 55}{100} \text{ Rs.} \)

= Rs. 115.5

---

### #464153

**Topic:** Cone

A joker's cap is in the form of a right circular cone of base radius 7 cm and height 24 cm. Find the area of the sheet required to make 10 such caps.

**Solution**
Given: 
\( r = \frac{40}{2} = 20 \text{ cm} = 0.2 \text{ m} \)

\( h = 1 \text{ m} \)

\( l = \sqrt{r^2 + h^2} \)

\[ = \sqrt{0.2^2 + 1^2} = \sqrt{1.04} = 1.02 \text{ m} \]

CSA = \( \pi \times l \times r \)

\[ = (3.14 \times 0.2 \times 1.02) \text{ m}^2 = 0.64 \text{ m}^2 \]

CSA of 50 cones = \( 50 \times 0.64056 \text{ m}^2 = 32.028 \text{ m}^2 \)

Cost of painting 1 m\(^2\) area = Rs. 12

Cost of painting 32.026 m\(^2\) area = Rs. 32.028 \times 12

= Rs. 384.336

= Rs. 384.34

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

Total Surface Area = CSA of hemisphere + Area of circular end of hemisphere

\[ = 2\pi r^2 + \pi r^2 \]
\[ = 3\pi r^2 \]
\[ = [3 \times 3.14 \times 10^2] \text{ cm}^2 \]
\[ = 942 \text{ cm}^2 \]

The radius of a spherical balloon increases from 7 cm to 14 cm as air is being pumped into it. Find ratio of surface areas of the balloon in the two cases.

Solution

The ratio of surface areas of the balloon in the two cases is:

\[ \frac{7^2}{14^2} = \frac{49}{196} = \frac{1}{4} \]

\[ \text{Ratio} = 1:4 \]
\[
\begin{align*}
& r_1 = 7 \text{ cm} \\
& r_2 = 14 \text{ cm}, \\
& \text{Required ratio} = \frac{4\pi r_1^2}{4\pi r_2^2} = \left(\frac{r_1}{r_2}\right)^2 = \left(\frac{7}{14}\right)^2 = \frac{1}{4}
\end{align*}
\]
Let diameter of earth = \(d_e\)

\[ \therefore \text{ The diameter of moon } = \frac{d_e}{4} \]

Radius of earth = \(\frac{d_e}{2}\)

Radius of moon = \(\frac{d_e}{8}\)

\[ S_{A_m} = 4\pi \left(\frac{d_e}{8}\right)^2 \]

\[ S_{A_p} = 4\pi \left(\frac{d_e}{2}\right)^2 \]

\[ \text{Ratio} = \frac{S_{A_m}}{S_{A_p}} = \frac{4\pi \left(\frac{d_e}{8}\right)^2}{4\pi \left(\frac{d_e}{2}\right)^2} \]

\[ \text{Ratio} = \frac{1}{16} = 1:16 \]

---

**#464172**

**Topic:** Sphere

A hemispherical bowl is made of steel, 0.25 cm thick. The inner radius of the bowl is 5 cm. Find the outer curved surface area of the bowl.

**Solution**

Thickness = 0.25 cm

Inner radius = 5 cm

\[ \therefore \text{ Outer radius} = 5 + 0.25 = 5.25 \text{ cm} \]

Outer Curved Surface Area = \(2\pi r^2\)

\[ = 2 \times \frac{22}{7} \times 5.25 \times 5.25 \]

\[ = 173.25 \text{ m}^2 \]

---

**#464186**

**Topic:** Cuboid and Cube

A river 3 m deep and 40 m wide is flowing at the rate of 2 km per hour. How much water will fall into the sea in a minute?

**Solution**

Ratio of flow of water = 2 km/hour

\[ = \frac{2000}{60} \text{ m/min} \]

\[ h = 3 \text{ m} \]

\[ b = 40 \text{ m} \]

Volume of water flowed in 1 min = \[\frac{2000}{60} \times 40 \times 3 \]

\[ = 4000 \text{ m}^3 \]

---

**#464187**

**Topic:** Cylinder

The circumference of the base of a cylindrical vessel is 132 cm and its height is 25 cm. How many litres of water can it hold?
Solution

Let radius  = \( r \)

Given, \( h = 25 \text{ cm} \), Circumference  = 132 cm

\[ 2\pi r = 132 \]
\[ r = \frac{132}{2\pi} \times \frac{7}{2} \]  
\[ r = 21 \text{ cm} \]

Volume  = \( \pi r^2 h = \frac{22}{7} \times (21)^2 \times 25 \]
\[ = 34650 \text{ cm}^3 \]
\[ = 34.65 \text{ litres} \]

#464190

Topic: Cylinder

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

(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

Length  = 5cm [Tin can]

Breadth  = 4cm

Height  = 15cm

Capacity volume  = \( l \times b \times h = 5 \times 4 \times 15 \]
\[ = 300 \text{ cm}^3 \]

Radius of cylinder  = \( \frac{7}{2} = 3.5 \text{ cm} \), \( h = 10 \text{ cm} \)

Capacity  = \( \pi r^2 H = \frac{22}{7} \times (3.5)^2 \times 10 \text{ cm}^3 \)

Cylinder has more capacity by  = \( 385 - 300 \text{ cm}^3 \)
\[ = 85 \text{ cm}^3 \]

#464191

Topic: Cylinder

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 g.

Solution
Inner radius \( \frac{24}{2} = 12 \text{ cm} \)

Outer radius \( \frac{28}{2} = 14 \text{ cm} \)

Height = Length of pipe = 35 cm

Volume of pipe = \( \pi (r_2^2 - r_1^2) h \)

\[ \frac{22}{7} \times (14^2 - 12^2) \times 35 \text{ cm}^3 \]

= 110 \times 52 \text{ cm}^3

= 5720 \text{ cm}^3

Mass of 1 cm\(^3\) wood = 0.6 kg

Mass of 5720 cm\(^3\) wood = \((5720 \times 0.6) g\)

= 3432 g

= 3.432 kg

---

#464192

**Topic:** Cylinder

If the lateral surface a cylinder is 94.2 cm\(^2\) and its height is 5 cm, then find

(i) radius of its base and

(ii) its volume

**Solution**

Given, \( h = 5 \text{ cm} \)

Let radius = \( r \)

(i) Curved Surface Area = 94.2 cm\(^2\) = 2\( \pi \)rh

94.2 cm\(^2\) = \( 2 \times 3.14 \times r \times 5 \text{ cm} \)

\( r = 3 \text{ cm} \)

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

= 3.14 \times 3 \times 3 \times 5

= 141.2 \text{ cm}^3

---

#464193

**Topic:** Cylinder

If costs 2200 to paint the inner curved surface of a cylindrical vessel 10 m deep. If the cost of painting is at the rate of 20 per m\(^2\), find

(i) inner curved surface area of the vessel,

(ii) radius of the base and

(iii) capacity of the vessel.

**Solution**
(i) Cost of painting 1 m² area = Rs. 20

Rs. 20 is cost painting 1 m² area

Rs. 2200 is cost of painting = \( \frac{2200}{20} \) m²

= 110 m² area

(ii) Let radius = \( r_1 \), h = 10m, SA = 2πrh = 110

\[
\frac{110 \times 7}{2 \times 10} = \frac{7}{4} = 1.75 \text{ m}
\]

(iii) Volume of vessel = \( \pi r^2 h = \frac{22}{7} \times 1.75 \times 1.75 \times 10 \)

= 96.25 m³

= 96250 litres

---

**#464196**

**Topic:** Cylinder

A lead pencil consists of a cylinder of wood with a solid cylinder of graphite filled in the interior. The diameter of at the pencil is 7 mm and the diameter of the graphite is 1 mm. If the length of the pencil is 14 cm, find the volume of the wood and that of the graphite.

**Solution**

Radius of pencil \( r_p = \frac{7}{2} \text{ mm} = 3.5 \text{ mm} \)

0.35 cm = \( r_p \)

\( h = 14 \text{ cm}, \text{ radius of graphite } = \frac{1}{2} \text{ mm} \)

= 0.05 cm

Volume of wood in pencil = \( \pi r_p^2 - \pi r_g^2 h \)

\[
\frac{22}{7} \left(0.35^2 - 0.05^2 \times 14\right)
\]

\[
= \frac{22}{7} \times 0.1225 - 0.0025 \times 14
\]

\[
= 44 \times 0.12 = 5.28 \text{ cm}^3
\]

Volume of a graphite = \( \pi r_g^2 h \)

\[
\frac{22}{7} \times (0.05)^2 \times 14 \text{ cm}^3
\]

\[
= 44 \times 0.0025 \text{ cm}^3
\]

= 0.11 cm³

---

**#464197**

**Topic:** Cylinder

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 the prepare daily to serve 250 patients.

**Solution**
Radius \(7\) cm, height of bowl \(= 4\) cm (soup land)

Volume of soup \(= \pi r^2 h\)
\[
= \frac{22}{7} \times 3.5 \times 3.5 \times 4
= 154 \text{ cm}^3
\]

Volume of soup given to 250 patients \(= 250 \times 154 = 38500 \text{ cm}^3\)
\[
= \frac{38500}{1000} \text{ l}
= 38.5 \text{ l}
\]

#464200

**Topic:** Cylinder

Find the volume of the right circular cone with

(i) radius \(6\) cm, height \(7\) cm.

(ii) radius \(3.5\) cm, height \(12\) cm

**Solution**

(i) radius \(= 6\) cm, \(h = 7\) cm

Volume
\[
= \frac{1}{3} \pi r^2 h
= \frac{1}{3} \times \frac{22}{7} \times 6 \times 6 \times 7
= 44 \times 6 = 264 \text{ cm}^3
\]

(ii) \(r = 3.5\) cm, \(h = 12\) cm

Volume
\[
= \frac{1}{3} \pi r^2 h
= \frac{1}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 12
= 154 \text{ cm}^3
\]

#464203

**Topic:** Cylinder

Find the capacity in litres of a conical vessel with

(i) radius \(7\) cm, slant height \(25\) cm.

(ii) height \(12\) cm, slant height \(13\) cm.

**Solution**

(i) \(r = 7\) cm, \(l = 25\) cm, \(h = \sqrt{l^2 - r^2}\)
\[
= \sqrt{25^2 - 7^2} = \sqrt{576} = 24
\]

Volume
\[
= \frac{1}{3} \pi r^2 h
= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 24
= 154 \times 8 = 1232 \text{ cm}^3
\]
\[
= 1.232 \text{ litres}
\]

(ii) \(h = 12\) cm, \(l = 13\) cm, \(r = \sqrt{l^2 - h^2}\)
\[
= \sqrt{13^2 - 12^2} = \sqrt{25} = 5
\]

Volume
\[
= \frac{1}{3} \pi r^2 h
= \frac{1}{3} \times \frac{22}{7} \times 5 \times 5 \times 12
= \frac{22000}{3} \text{ cm}^3
= \frac{22000}{7 \times 1000} \text{ litres}
= \frac{11}{35} \text{ litres}
\]
#464206
**Topic:** Cone

The height of a cone is 15 cm. If its volume is 1570 cm$^3$, find the radius of the base.

**Solution**

$h = 15$ cm, volume $= 1570$ cm$^2$

Let radius $r_1$

\[
1570 = \frac{1}{3} \times 3.14 \times r_1^2 \times 15
\]

\[
r_1 = \sqrt{\frac{1570}{3 \times 3.14 \times 100}}
\]

\[
r_1 = \sqrt{10} \text{ cm}
\]

---

#464210
**Topic:** Cone

If the volume of a right circular cone of height $g$ cm is $48\pi$ cm$^3$, find the diameter of its base.

**Solution**

Given, $h = 9$ cm

Let radius $= r$

\[
\text{Vol} = 48\pi = \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi r^2 \times g^3 = 48\pi
\]

$r^2 = \frac{48\pi}{\pi} = 4$

Diameter $= 2 \times 4$

$= 8$ cm

---

#464217
**Topic:** Cone

A right triangle $ABC$ with sides 5 cm, 12 cm and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained.

**Solution**

Given, $r = 5$ cm, $l = 13$ cm, $h = 12$ cm

Volume of solid $= \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \times 5 \times 5 \times 12 = 100\pi$ cm$^3$

$= 100 \times 3.14$

$= 314$ cm$^3$

---

#464222
**Topic:** Cone

A right triangle $ABC$ with sides 5 cm, 12 cm and 13 cm is revolved about the side 5 cm. Find the volume of the solid so obtained. Find also the ratio of volume of two solids obtained.

**Solution**
\[ r = 5 \text{ cm}, \quad l = 13 \text{ cm}, \quad h = 12 \text{ cm} \]

Vol \[ = \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \times 5 \times 5 \times 12 = 100\pi \text{ cm}^3 \]

\[ r = 12, \quad h = 5 \text{ cm}, \quad l = 13 \text{ cm} \]

Volume \[ = \frac{1}{3} \pi \times 12 \times 12 \times 5 = 240\pi \text{ cm}^3 \]

Ratio \[ = \frac{100\pi}{240\pi} = \frac{10}{24} = \frac{5}{12} \]

5:12

#464225

**Topic**: Cone

A heap of wheat is in the form of a cone whose diameter is 10.5 m and height is 3 m. Find its volume. The heap is to be covered by canvas to protect it from rain. Find the area of the canvas required.

**Solution**

Diameter = 10.5 m

radius \[ = r = \frac{10.5}{2} \text{ m} = 5.25 \text{ m} \]

height = 3 m

volume \[ = \frac{1}{3} \pi r^2 h \]

\[ = \frac{1}{3} \times \frac{22}{7} \times 5.25 \times 5.25 \times 3 \text{ m}^3 = 86.625 \text{ m}^3 \]

For slant height:

\[ l^2 = h^2 + r^2 = 3^2 + (5.25)^2 \]

= 9 + 27.5625 = 36.5625

⇒ 6.0467 m(approx)

Canvas needed to protect wheat from rain =

Therefore, curved surface area = \[ \pi rl = (227 \times 5.25 \times 6.0467) \text{ m}^2 \]

= 99.77 m²(approx)

#464236

**Topic**: Sphere

How many litres of milk can a hemispherical bowl of diameter 10.5 cm hold?

**Solution**

\[ r = \frac{10.5}{2} = 5.25 \text{ cm}, \quad V = \frac{2}{3} \pi r^3 \]

\[ V = \frac{2}{3} \pi \times (5.25)^3 = 303.1875 \text{ cm}^3 \]

\[ \frac{303.1875}{1000} = 0.303 \text{ L} \]

#464238

**Topic**: Sphere

A hemispherical tank is made up of an iron sheet 1 cm thick. If the inner radius is 1 m, then find the volume of the iron used to make the tank.

**Solution**
Inner radius \( r_1 = 1 \text{ m} = r_1 \)

Thickness = 1cm = 0.01m

Outer radius = 1 + 0.01 = 1.01m = \( r_0 \)

Volume of iron used

\[
\frac{2}{3} \times \left( r^3_0 - r^3_1 \right)
\]

\[
= \frac{2}{3} \times \frac{22}{7} \times (1.03)^3 - (1)^3
\]

= 0.0634cm\(^3\)

---

**#464243**

**Topic:** Sphere

A dome of a building is in the form of a hemisphere. From inside, it was white-washed at the cost of 498.96. If the cost of white-washing is 2.00 per square metre, find

(i) the inside surface area of the dome and

(ii) volume of the air inside the dome.

**Solution**

Cost of white washing dome = 498.96

Cost of white washing 1m\(^2\) area = Rs.2

(i) CSA = \( \frac{498.96}{2} \) = 249.48 m\(^2\)

(ii) Let ratio = \( r \), CSA = 249.48cm\(^2\)

\[
249.48 = 2 \times \frac{22}{7} \times r^2
\]

\[
r^2 = \frac{249.48 \times 7}{44} = 39.7 \text{ m}^2
\]

\[ r = 6.3 \text{ m} \]

Volume of air inside dome = Vol of hemispherical dome

\[
\frac{2}{3} 4r^3
\]

\[
= \frac{2}{3} \times 6.3 \times 6.3
\]

= 523.9m\(^3\)

---

**#464249**

**Topic:** Cuboid and Cube

A wooden bookshelf has external dimensions as follows:

Height = 110 cm, Depth = 25 cm, Breadth = 85 cm (see figure). The thickness of the plank is 5 cm everywhere. The external faces are to be polished and the inner faces are to be painted. If the rate of polishing is 20 paise per cm\(^2\) and the rate of painting is 10 paise per cm\(^2\), find the total expenses required for polishing and painting the surface of the bookshelf.

**Solution**
External length = 85 cm
External breadth = 25 cm
External height = 110 cm

External SA = lh + 2(18b + 2bh)
= 85 × 110 + 2(85 × 25 + 25 × 110)
= (9350 + 9750) cm²
= 19100 cm²

Area to be polished = 19100 × 2600 = 21700 cm²

Cost of polishing 1 cm² area = 0.20 Rs
Cost of polishing 21700 cm² area = 21700 × 0.20 = Rs. 4340

Now, area to be painted in 3 rows = 3 × area to be painted in 1 row
= 3 × [2(l + bh + lh)]
= 3[2(75 + 30) × 20 + 30 × 75]
= 3(4200 + 2250) = 19350 cm²

Cost of painting 1 cm² area = 0.10 Rs
Cost of painting 19350 area = Rs. 1935

Total cost = 1935 + 4340 = Rs. 6275

#464252

**Topic:** Sphere

The diameter of a sphere is decreased by 25%. By what percent does its curved surface area decrease?

**Solution**

Let Diameter = d, radius of sphere = r₁ = \( \frac{d}{2} \)

New radius = \( \frac{8}{2} \left( 1 - \frac{25}{100} \right) \)

\( \frac{3}{8} d = r₂ \)

Curved Surface Area = \( 4\pi r₁² \)

\( = \frac{d²}{2} = \pi d² \)

Curved Surface Area (when radius decreased) = \( 4\pi r₂² \)

\( = \frac{9}{16} \pi d² \)

Decrease = \( \pi d² - \frac{9}{16} \pi d² = \frac{7}{16} \pi d² \)

%decrease = \( \frac{\frac{7}{16} \pi d²}{\pi d²} \times 100 = 43.75 \%

#464467

**Topic:** Cone

A conical pit of top diameter 3.4 m is 12 m deep. What is its capacity in kilolitres?

**Solution**
\[
\begin{align*}
\text{r} = \frac{3.5}{2} = 1.75 \text{ m, } h = 12 \text{ m} \\
\text{Volume} = \frac{1}{3} \pi r^2 h \\
= \frac{1}{3} \times \frac{22}{7} \times 1.75 \times 1.75 \times 12 \\
= 38.5 \text{ m}^3 = 38.5 \text{ kl}
\end{align*}
\]

### #464468
**Topic:** Cone

The volume of a right circular cone is 9856 cm\(^3\). If the diameter of the base is 28 cm, find

(i) Height of the cone.
(ii) Slant height of the cone.
(iii) curved surface area of the cone.

**Solution**

\[
\begin{align*}
\text{r} = \frac{28}{2} = 14 \text{ cm} \\
\text{Let height} = h \\
\text{Volume} = \frac{1}{3} \pi r^2 h \\
= \frac{1}{3} \times \frac{22}{7} \times 14 \times 14 \times h \\
= 9856 \\
h = 48 \text{ cm} \\
\text{Slant height} = \sqrt{r^2 + h^2} = \sqrt{14^2 + 48^2} = \sqrt{196 + 2304} = 50 \text{ cm} \\
\text{Curved Surface Area} = \frac{22}{7} \times 14 \times 50 \text{ cm}^2 \\
= 2200 \text{ cm}^2
\end{align*}
\]

### #464914
**Topic:** Cuboid and Cube

Parikshit makes a cuboid of plasticine of sides 5 cm, 2 cm and 5 cm. How much such cuboids will he need to form a cube?

**Solution**

Volume of cube = \(2 \times 5 \times 5\)

\(2 \times 5 \times 5\) is not a perfect cube, to make it perfect we will have to multiply it with \((2 \times 2 \times 5)\)

\(2 \times 2 \times 5 = 20\)

So, 20 cuboids are required to form a cube.

### #465173
**Topic:** Combination of Solids

A solid is in the shape of a cone standing on a hemisphere with both their radii being equal to 1 cm and the height of the cone is equal to its radius. Find the volume of the solid in terms of \(\pi\).

**Solution**
Given:

Height \((h)\) of conical part = radius \((r)\) of conical part = 1 cm

Radius \((r)\) of hemispherical part = radius of conical part = 1 cm

Volume of solid = Volume of conical part + Volume of hemispherical part

\[
= \frac{1}{3} \pi r^2 h + \frac{2}{3} \pi r^3
\]

\[
= \frac{1}{3} \pi \times 1^2 \times 1 + \frac{2}{3} \pi \times 1^3
\]

\[
= \frac{1}{3} \pi \times 1 + \frac{2}{3} \pi \times 1
\]

\[
= \frac{\pi}{3} + \frac{2\pi}{3} = \pi \text{ cm}^3
\]

#465174
Topic: Combination of Solids

Rachel, an engineering student, was asked to make a model shaped like a cylinder with two cones attached at its two ends by using a thin aluminium sheet. The diameter of the model is 3 cm and its length is 12 cm. If each cone has a height of 2 cm, find the volume of air contained in the model that Rachel made. (Assume the outer and inner dimensions of the model to be nearly the same.)

Answer: 66

Solution

For the given statement first draw a diagram,

In this diagram, we can observe that

Height \((h_1)\) of each conical part = 2 cm

Height \((h_2)\) of cylindrical part = 12 - 2 - 2 = 8 cm

Radius \((r)\) of cylindrical part = Radius of conical part = \(\frac{3}{2}\) cm

Volume of air present in the model = Volume of cylinder + 2 x Volume of a cone

\[
= \pi r^2 h_2 + 2 \times \pi r^2 h_1
\]

\[
= \pi \left(\frac{3}{2}\right)^2 \times 8 + 2 \times \pi \left(\frac{3}{2}\right)^2 \times 2
\]

\[
= \pi \times \frac{9}{4} \times 8 + \frac{9}{4} \times 2
\]

\[
= 18\pi + 3\pi = 21\pi
\]

\[
21 \times \frac{22}{7} = 66 \text{ cm}^2
\]
A gulab jamun, contains sugar syrup up to about 30% of its volume. Find approximately how much syrup would be found in 45 gulab jamuns, each shaped like a cylinder with two hemispherical ends with length 5 cm and diameter 2.8 cm.

Solution

Given:
- Radius \( r \) of cylindrical part = Radius \( r \) of hemispherical part = \( \frac{2.8}{2} = 1.4 \) cm
- Length of each hemispherical part = Radius of hemispherical part = 1.4 cm
- Length \( h \) of cylindrical part = 5 - 2 × length of hemispherical part

\[
\begin{align*}
\text{Volume of one gulab jamun} & = \text{Volume of cylindrical part} + 2 \times \text{Volume of hemispherical part} \\
 & = \pi r^2 h + 2 \times \frac{2}{3} \pi r^3 = \pi r^2 h + \frac{4}{3} \pi r^3 \\
 & = \pi \times (1.4)^2 \times 2.2 + \frac{4}{3} \pi (1.4)^3 \\
 & = \frac{22}{7} \times 1.4 \times 1.4 \times 2.2 + \frac{4}{3} \times \frac{22}{7} \times 1.4 \times 1.4 \times 1.4 \\
 & = 13.552 + 11.498 = 25.05 \text{ cm}^3 \\
\end{align*}
\]

So, Volume of 45 gulab jamuns = 45 × 25.05 = 1,127.25 cm³

Volume of sugar syrup = 30% of volume

\[
\begin{align*}
& = \frac{30}{100} \times 1,127.25 \\
& = 338.17 \text{ cm}^3 = 338 \text{ cm}^3
\end{align*}
\]
A pen stand made of wood is in the shape of a cuboid with four conical depressions to hold pens. The dimensions of the cuboid are 15 cm by 10 cm by 3.5 cm. The radius of each of the depressions is 0.5 cm and the depth is 1.4 cm. Find the volume of wood in the entire stand.

**Solution**

Depth (h) of each conical depression = 1.4 cm
Radius (r) of each conical depression = 0.5 cm

Volume of wood = Volume of cuboid - 4 x Volume of cones

\[
= l \times b \times h - 4 \times \frac{1}{3} \pi r^2 h
\]

\[
= 15 \times 10 \times 3.5 - 4 \times \frac{1}{3} \times \frac{22}{7} \times (0.5)^2 \times 1.4
\]

\[
= 525 - 1.47
\]

\[
= 523.53 \text{ cm}^3
\]

---

**#465177**

**Topic:** Combination of Solids

A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-fourth of the water flows out. Find the number of lead shots dropped in the vessel.

**Solution**
Given:

Height \((h)\) of conical vessel = 8 cm
Radius \((r)\) of conical vessel = 5 cm
Radius \((r_2)\) of lead shots = 0.5 cm

Let \(x\) number of lead shots were dropped in the vessel.

Volume of the cone = \(\frac{1}{3} \pi r^2 h\)

Volume of water spilled = Volume of dropped lead shots

According to the question

\[
\frac{1}{4} \times \frac{1}{3} \pi r^2 h = x \times \frac{4}{3} \pi r_2^3
\]

\[
\Rightarrow r_1^2 h = x \times 16 r_2^3
\]

\[
\Rightarrow 5^2 \times 8 = x \times 16 \times (0.5)^3
\]

\[
\Rightarrow 200 = x \times 2
\]

\[
x = \frac{200}{2}
\]

\[
x = 100.
\]

Therefore, the number of lead shots dropped in the vessel is 100.

---

#465178

**Topic:** Combination of Solids

A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm, which is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pole, given that 1 cm\(^3\) of iron has approximately 8 g mass. (Use \(\pi = 3.14\))

**Solution**
Height \(h_1\) of larger cylinder = 220 cm
Radius \(r_1\) of larger cylinder = \(\frac{24}{2}\) = 12 cm
Height \(h_2\) of smaller cylinder = 60 cm
Radius \(r_2\) of smaller cylinder = 8 cm

Total volume of pole = Volume of larger cylinder + Volume of smaller cylinder
\[
= \pi r_1^2 h_1 + \pi r_2^2 h_2
= \pi (12)^2 \times 220 + \pi (8)^2 \times 60
\]
\[
= 3.14 \times (144 \times 220 + 64 \times 60)
\]
\[
= 3.14 \times (31,680 + 3,840)
\]
\[
= 3.14 \times 35520 = 111,532.8 \text{ cm}^3
\]

Mass of 1 cm\(^3\) iron = 8 g

Mass of 111532.8 cm\(^3\) iron = 11532.8 \times 8 = 92262.4 g

---

**#465179**  
**Topic:** Combination of Solids

A solid consisting of a right circular cone of height 120 cm and radius 60 cm standing on a hemisphere of radius 60 cm is placed upright in a right circular cylinder full of water such that it touches the bottom. Find the volume of water left in the cylinder, if the radius of the cylinder is 60 cm and its height is 180 cm.

**Solution**
Given:
Radius \( r \) of hemispherical part = Radius \( r \) of conical part = 60 cm
Height \( h_1 \) of conical part of solid = 120 cm
Height \( h_2 \) of cylinder = 180 cm
Radius \( r \) of cylinder = 60 cm

Volume of water left = Volume of cylinder - Volume of solid
= Volume of cylinder - (Volume of cone + Volume of hemisphere)
= \( \pi r^2 h_1 - \left[ \frac{1}{3} \pi r^2 h_2 + \frac{2}{3} \pi r^3 \right] \)
= \( \pi \times 60^2 \times 120 - \left[ \frac{1}{3} \pi \times 60^2 \times 120 + \frac{2}{3} \pi \times 60^3 \right] \)
= \( \pi \times 3600 \times 100 \)
= \( 3,600,000 \times \frac{22}{7} \) = 113,142.857 cm\(^3\)

Solution

#465180
Topic: Combination of Solids

A spherical glass vessel has a cylindrical neck 8 cm long, 2 cm in diameter; the diameter of the spherical part is 8.5 cm. By measuring the amount of water it holds, a child finds its volume to be 345 cm\(^3\). Check whether she is correct, taking the above as the inside measurements, and \( \pi = 3.14 \).
Given:

Height (h) of cylindrical part = 8 cm

Radius \((r_2)\) of cylindrical part = \(\frac{2}{2} = 1\) cm

Radius \((r_1)\) of spherical part = \(\frac{8.5}{2} = 4.25\) cm

Volume of vessel = Volume of sphere + Volume of cylinder

\[
= \frac{4}{3} \pi r_1^3 + \pi r_2^2 h \\
= \frac{4}{3} \left(\frac{8.5}{2}\right)^3 + \pi (1)^2 (8) \\
= \frac{4}{3} \times 76.76625 + 8 \times 3.14 \\
= 321.392 + 25.12 \\
= 346.51 \text{ cm}^3
\]

So, the child measurement is wrong.
Radius \( (r_1) \) of circular end of pipe = \( \frac{20}{200} = 0.1 \) m

Area of cross-section = \( \pi \times (0.1)^2 = 0.01\pi \) sq. m

Speed of water = 3 kilometer per hour = \( \frac{3000}{60} = 50 \) meter per minute.

Volume of water that flows in 1 minute from pipe = \( 50 \times 0.01\pi = 0.5\pi \) cu. m

From figure 2, Volume of water that flows in \( t \) minutes from pipe = \( t \times 0.5\pi \) cu. m

Radius \( (r_2) \) of circular end of cylindrical tank = \( \frac{10}{2} = 5 \) m

Depth \( (h_2) \) of cylindrical tank = 2 m

Let the tank be filled completely in \( t \) minutes.

Volume of water filled in tank in \( t \) minutes is equal to the volume of water flowed in \( t \) minutes from the pipe.

Volume of water that flows in \( t \) minutes from pipe = Volume of water in tank

Therefore, \( t \times 0.5\pi = \pi \times 5^2 \times 2 \)

\[ t = \frac{25 \times 2}{0.5} \]

\[ t = 100 \]

Therefore, the cylindrical tank will be filled in 100 minutes.

---

**#465193**

**Topic:** Cone

A drinking glass is in the shape of a frustum of a cone of height 14 cm. The diameters of its two circular ends are 4 cm and 2 cm. Find the capacity of the glass.

**Solution**

Given:

Upper base diameter, \( D = 4 \) cm

Lower base diameter, \( d = 2 \) cm

Height, \( h = 14 \) cm

So, \( R \) (upper base) = 2 cm,

\( r \) (lower) = 1 cm

Capacity of glass = Volume of frustum of cone

\[ \frac{\pi h}{3} [ r_1^2 + r_1 r_2 + r_2^2 ] \]

\[ = \frac{\pi \times 14}{3} [2^2 + 2 \times 1 + 1^2] \]

\[ = \frac{22 \times 14}{3} [4 + 1 + 1] \]

\[ = \frac{308}{3} \text{ cm}^3 \]

So, the capacity of the glass is \( \frac{102}{3} \) cm\(^3\).
A right triangle whose sides are 3 cm and 4 cm (other than hypotenuse) is made to revolve about its hypotenuse. Find the volume and surface area of the double cone so formed. (Choose value of $\pi$ as found appropriate.)

**Solution**

The double cone so formed by revolving this right-angled triangle ABC about its hypotenuse is shown in the figure.

Hypotenuse, $AC = \sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25} = 5$ cm

Area of $\triangle ABC = \frac{1}{2} \times AB \times AC$

$\frac{1}{2} \times AC \times DB = \frac{1}{2} \times 4 \times 3$

$\frac{1}{2} \times 5 \times DB = 6$

So, $DB = \frac{12}{5} = 2.4$ cm

Volume of double cone = Volume of cone 1 + Volume of cone 2

$\frac{1}{3} \pi r^2 h_1 + \frac{1}{3} \pi r^2 h_2$

$\frac{1}{3} \pi \left[ h_1 + h_2 \right] = \frac{1}{3} \pi \left[ DA + DC \right]$

$\frac{1}{3} \times 3.14 \times 2.4^2 \times 5$

$= 30.14$ cm$^3$

Surface area of double cone = Surface area of cone 1 + Surface area of cone 2

$= \pi l_1 + \pi l_2$

$= \pi \left[ 4 + 3 \right] = 3.14 \times 2.4 \times 7$

$= 52.75$ cm$^2$

A cistern, internally measuring 150 cm x 120 cm x 110 cm, has 129600 cm$^3$ of water in it. Porous bricks are placed in the water until the cistern is full to the brim. Each brick absorbs one-seventeenth of its own volume of water. How many bricks can be put in without overflowing the water, each brick being 22.5 cm x 7.5 cm x 6.5 cm?

**Solution**

A cistern, internally measuring 150 cm x 120 cm x 110 cm, has 129600 cm$^3$ of water in it. Porous bricks are placed in the water until the cistern is full to the brim. Each brick absorbs one-seventeenth of its own volume of water. How many bricks can be put in without overflowing the water, each brick being 22.5 cm x 7.5 cm x 6.5 cm?
Volume of cistern = \(150 \times 120 \times 110\) 
\(= 1980000\) cm\(^3\)

Volume to be filled in cistern = \(\frac{1980000}{129600}\) 
\(= 154.2075\) cm\(^3\)

Let \(x\) numbers of porous bricks were placed in the cistern.

Volume of \(x\) bricks = \(x \times 22.5 \times 7.5 \times 6.5\) 
\(= 1096.875x\)

As each brick absorbs one-seventeenth of its volume, therefore, volume absorbed by these bricks 
\(= \frac{x}{17}(1096.875)\) 
\[\Rightarrow 1850400 + \frac{x}{17}(1096.875) = 1096.875x\]
\[\Rightarrow 1850400 = 16\frac{x}{17}(1096.875)\]
\[\Rightarrow x = 1792.41\]

Therefore, 1792 bricks were placed in the cistern.

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#465378

**Topic:** Cone

Derive the formula for the volume of the frustum of a cone.

**Solution**

Let \(ABC\) be a cone. A frustum \(DECB\) is cut by a plane parallel to its base. Let \(r_1\) and \(r_2\) be the radii of the ends of the frustum of the cone and \(h\) be the height of the frustum of the cone.

\[\angle AGB \sim \angle ADF, DF \parallel BG\]

\[\frac{DF}{BG} = \frac{AF}{AD} = \frac{AD}{AB}\]

\[\Rightarrow \frac{r_2}{r_1} = \frac{h_1 - h}{h_1} = \frac{l_1 - l}{l_1}\]

\[\Rightarrow \frac{r_2}{r_1} = 1 - \frac{h}{h_1} = 1 - \frac{l}{l_1}\]

\[\Rightarrow 1 - \frac{h}{h_1} = \frac{r_2}{r_1}\]

\[\Rightarrow \frac{h}{h_1} = 1 - \frac{r_2}{r_1} = \frac{r_1 - r_2}{r_1}\]

\[\Rightarrow \frac{h}{h_1} = \frac{r_1}{r_1 - r_2}\]
\[ h_1 = \frac{r_1h}{r_1 - r_2} \]

Volume of frustum of cone = Volume of cone ABC - Volume of cone ADE

\[ = \frac{1}{3} \pi r_1^2 h_1 - \frac{1}{3} \pi r_2^2 (h_1 - h) \]

\[ = \frac{\pi}{3} (r_1^2 h_1 - r_2^2 (h_1 - h)) \]

\[ = \frac{\pi}{3} \left( \frac{r_1 h}{r_1 - r_2} \right) - \frac{\pi}{3} \left( \frac{r_2 h}{r_1 - r_2} \right) \]

\[ = \frac{\pi}{3} \left( \frac{r_1^3 h}{r_1 - r_2} \right) - \frac{\pi}{3} \left( \frac{r_2^3 h}{r_1 - r_2} \right) \]

\[ = \frac{\pi}{3} \left( \frac{r_1^3 h}{r_1 - r_2} - \frac{r_2^3 h}{r_1 - r_2} \right) \]

\[ = \frac{\pi}{3} \left( \frac{r_1^3}{r_1 - r_2} \right) \]

\[ = \frac{\pi}{3} \left( \frac{(n - c) r_1^3 + r_2^3 + n r_2}{r_1 - r_2} \right) \]

\[ = \frac{1}{3} \pi (r_1^3 + r_2^3 + n r_2) \]
If one side of a cube is 13 metres, find its volume.

**Answer:** 2197

**Solution**

Given, side of a cube 13 metres

The volume of a cube = \((\text{side})^3\)

\[ = (13)^3 \]

\[ = 2197 \text{ m}^3 \]

Is a square prism same as a cube? Explain.

**Solution**

A square prism is a cube. A prism is "a solid geometrical figure whose two end faces are similar, equal, and parallel rectilinear figures and whose sides are parallelograms".

In the case of a cube, all sides are similar therefore it fits the definition of a square prism.

Find the side of a cube whose surface area is 600 sq. cm

**Solution**

Surface area = 600 sq.cm

\[ \Rightarrow 6l^2 = 600 \]

\[ \Rightarrow l = 10 \text{ cm} \]

Side of cube = 10 cm

Describe how the two figures at the right are alike and how they are different. Which box has larger lateral surface area?

**Solution**

Both the figures have same heights.

Lateral surface area of cube = \(4 \times 7 \times 7 = 196 \text{ sq cm}\)

Lateral surface area of cylinder = \(2 \times \frac{22}{7} \times \frac{7}{2} \times 7 = 154 \text{ sq cm}\)

So, cube has larger surface area.
A closed cylindrical tank of radius 7 m and height 3 m is made from a sheet of metal. How much sheet of metal is required?

Solution

Given, radius \( r = 7 \text{ m} \), height \( h = 3 \text{ m} \)

We need to find total surface area of cylinder \( = 2\pi rh \)

\[
= 2 \times \frac{22}{7} \times 7 \times (7 + 3) = 440 \text{ sq meter}
\]

So, 440 sq m sheet of metal is required.

The lateral surface area of a hollow cylinder is 4224 cm\(^2\). It is cut along its height and formed a rectangular sheet of width 33 cm. Find the perimeter of rectangular sheet?

Solution

Area of cylinder = area of rectangular sheet

\[
\Rightarrow 4224 = 33 \times l
\]

\[
\Rightarrow l = 128 \text{ cm}
\]

Perimeter of rectangular sheet = \( 2(128 + 33) = 322 \text{ cm} \)

A road roller takes 750 complete revolutions to move once over to level a road. Find the area of the road if the diameter of a road roller is 84 cm and length is 1 m.

Solution

Area of road covered in 1 revolution = \( 2\pi r' = 2 \times \frac{22}{7} \times 42 \times 1 = \frac{264}{100} \text{ sq m} \)

Area of road covered in 750 revolution = \( 750 \times \frac{264}{100} = 1980 \text{ sq m} \)
A company packages its milk powder in cylindrical container whose base has a diameter of 14 cm and height 20 cm. Company places a label around the surface of the container (as shown in the figure). If the label is placed 2 cm from top and bottom, what is the area of the label.

**Solution**

Height of the label = 20 - 2 - 2 = 16 cm

Radius = \( \frac{d}{2} = \frac{14}{2} = 7 \) cm

Area of the label = \( 2 \pi rh = 2 \times \frac{22}{7} \times 7 \times 16 = 704 \text{ sq cm} \)

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Water is pouring into a cuboidal reservoir at the rate of 60 litres per minute. If the volume of reservoir is 108 m, find the number of hours it will take to fill the reservoir.

**Solution**

Volume of cuboidal reservoir = 108 \times 1000 = 108000 l

Required number of hours = \( \frac{108000}{3600} = 30 \) hours

So, it will take 30 hrs to fill the reservoir

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The curved surface area of a right circular cylinder of height 14 cm is 88 cm². Find the diameter of the base of the cylinder.

**Solution**
Height = 14 cm
To calculate: diameter.
Let \( x \) be the diameter
Curved surface Area = 88 cm²

\[ 2\pi rh = 88 \]
\[ 2r \times x \times h = 88 \]

\[ \frac{88}{7} \]
\[ x = 22 \times 14 \]
\[ x = 2 \text{ cm} \]
Diameter = 2 cm

#464129
Topic: Cylinder

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

Solution

Height = 1 m, radius = \( \frac{140}{2} = 70 \) cm = 0.7 m

Area of sheet required = Total surface area of tank

\[ = 2\pi r^2 + 2\pi rh \]
\[ = 2 \times \frac{22}{7} \times 0.7 \times 1.7 \text{ m}^2 \]
\[ = 7.48 \text{ m}^2 \]

#464131
Topic: Cylinder

A metal pipe is 77 cm long. The inner diameter of a cross section is 4 cm, the outer diameter being 4.4 cm [see figure]. Find its

(i) inner curved surface area.
(ii) outer curved surface area
(iii) total surface area

Solution
Inner radius \( r_1 \) = \( \frac{4}{2} \) cm = \( 2 \) cm

Outer radius \( r_2 \) = \( \frac{4.4}{2} \) cm = \( 2.2 \) cm

Height = 77 cm

(i) Curved S.A = \( 2 \pi r_1 h \) (inner)

\[
\frac{22}{7} \times 2 \times 77 = 968 \text{ cm}^2
\]

(ii) Curved S.A (outer) = \( 2 \pi r_2 h \)

\[
\frac{22}{7} \times 2.2 \times 77 = (22 \times 2 \times 2.2) \text{ cm}^2
\]

= 1064.8 cm\(^2\)

(iii) Total S.A of pipe = CSA of inner surface + CSA of outer surface + Area of circular base and top

= 968 + 1064.8 + 2\pi(2.2)^2 - 2\pi(2)^2

= 2038.08 cm\(^2\)

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#464134

**Topic:** Cylinder

The diameter of a roller is 84 cm and its length is 120 cm. It takes 500 complete revolutions to move once over to level a playground. Find the area of the playground in \( \text{m}^2 \)

**Solution**

Height = 120 cm, \( \frac{84}{2} = 42 \) cm

CSA = \( 2 \pi r h \) = \( 2 \times \frac{22}{7} \times 42 \times 120 \text{ cm}^2 = 31680 \text{ cm}^2 \)

Area = 500 \times CSA

500 \times 31680 \text{ cm}^2

= \frac{15840000}{10000} \text{ m}^2 = 1548 \text{ m}^2

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#464135

**Topic:** Cylinder

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 \( \text{m}^2 \).

**Solution**

\( H = 3.5 \text{ m}, \quad \frac{50}{2} = 25 \text{ cm} \)

\( \frac{25}{100} = 0.25 \text{ m} \)

CSA = \( 2 \pi r h \) = \( 2 \times \frac{22}{7} \times 0.25 \times 3.5 \text{ m}^2 \)

= \frac{125}{100} \text{ m}^2 = 5.5 \text{ m}^2

Cost of painting 1 \text{ m}^2 \text{ area} = Rs. 12.50

Cost of painting 5.5 \text{ m}^2 \text{ area} = Rs. 5.5 \times 12.50

= Rs. 68.75
Curved surface area of a right circular cylinder is 4.4 m². If the radius of the base of the cylinder is 0.7 m, find its height.

Solution

Let's assume height be \( x \)

\[ R = 0.7 \text{ m} \]

CSA = 4.4 m², \( 2 \pi R h = 4.4 \)

\[ 4.4 \times 7 \times 10 \]

\[ x = 2 \times 22 \times 7 \times 10 = 1 \]

Height = 1 m

#464138
Topic: Cylinder

The inner diameter of a circular well is 3.5 m. It is 10 m deep. Find

(i) its inner curved surface area
(ii) the cost of plastering the curved surface at the rate of 40 per m²

Solution

(i) \( r = \) radius, \( h = \) depth of the well.

Curved surface area = \( 2 \pi rh \)

\[ (2 \times 22 \times 3.5 \times 10) \text{m}^2 = 110 \text{m}^2 \]

(ii) Cost of plastering = Rs 40 per m²

The cost of plastering the curved surface = Rs (110 \times 40) = Rs 4400.

#464140
Topic: Cylinder

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

Solution

\[ H = 28 \text{ cm}, \quad R = 2.5 \text{ cm} = 0.025 \text{ m} \]

CSA of pipe (cylindrical) = \( 2 \pi rh \)

\[ = \frac{22}{7} \times 0.025 \times 2.8 \text{ m}^2 \]

\[ = 4.4 \text{ m}^2 \]

#464141
Topic: Cylinder

Find

(i) The lateral or curved surface area of a closed cylindrical petrol storage tank that is 4.2 m in diameter and 4.5 m high.

(ii) How much steel was actually used, if \( \frac{1}{2} \) of the steel actually used was wasted in making the tank.

Solution
In the figure, you see the frame of a lampshade. It is to be covered with a decorative cloth. The frame has a base diameter of 20 cm and height of 30 cm. A margin of 2.5 cm is to be given for folding it over the top and bottom of the frame. Find how much cloth is required for covering the lampshade.

**Solution**

\[ H = 2.5 + 30 + 2.5 = 35 \text{ cm} \] (ft includes margin)

\[
\frac{20}{\text{cm}} = \frac{10}{\text{cm}} = R
\]

Cloth required = 2 \( \pi \) \( r \) \( h \) (CSA)

\[
= \frac{8712}{1 - \frac{11}{12}}
\]

\[
= 11 \times 12
\]

\[
= 95.04 \text{ m}^2
\]

---

The students of a Vidyalaya were asked to participate in a competition for making and decorating penholders in the shape of a cylinder with a base, using cardboard. Each penholder was to be of radius 3 cm and height 10.5 cm. The Vidyalaya was to supply the competitors with cardboard. If there were 35 competitors, how much cardboard was required to be bought for the competition?

**Solution**

\[ H = 2.5 + 30 + 2.5 = 35 \text{ cm} \] (ft includes margin)

\[
\frac{20}{\text{cm}} = \frac{10}{\text{cm}} = R
\]

Cloth required = 2 \( \pi \) \( r \) \( h \) (CSA)

\[
= \frac{22}{7} \times 3 \times 10 \times 35 \text{ cm}^2
\]

\[
= 2200 \text{ cm}^2
\]
R = 3 cm, H = 10.5 cm

\[
\text{Surface area} = \text{Curved Surface Area} + \text{Base Area}
\]
\[
= 2\pi RH + \pi r^2
\]
\[
= 2 \times \frac{22}{7} \times 3 \times 10.5 + \frac{22}{7} \times 3 \times 3 \text{ cm}^2
\]
\[
= 198 + \frac{22}{7} \text{ cm}^2
\]
\[
= \frac{1584}{7} \text{ cm}^2
\]

Area of cardboard sheet used by competitor = \frac{1584}{7} \text{ cm}^2

Area of cardboard sheet used by 35 competitors = \frac{1584}{7} \times 35

= 7920 \text{ cm}^2

### #464156

**Topic:** Sphere

Find the surface area of a sphere of radius

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

**Solution**

(i) \( r = 10.5 \text{ cm} \)

\[ SA = 4\pi r^2 = 4 \times \frac{22}{7} \times 10.5 \times 10.5 \]
\[ = \frac{88 \times 15 \times 105}{100} \]
\[ = 1386 \text{ cm}^2 \]

(ii) \( r = 5.6 \text{ cm} \)

\[ SA = 4\pi r^2 \]
\[ = \left[ 4 \times \frac{22}{7} \times (5.6)^2 \right] \text{ cm}^2 \]
\[ = \left[ \frac{88}{7} \times 5.6 \times 5.6 \right] \text{ cm}^2 \]
\[ = 394.24 \text{ cm}^2 \]

(iii) \( r = 14 \text{ cm} \)

\[ SA = 4\pi r^2 \]
\[ = \frac{22}{7} \times 14 \times 14 \]
\[ = 2464 \text{ cm}^2 \]

### #464160

**Topic:** Sphere

Find the surface area of a sphere of diameter

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

**Solution**

(i) \( d = 14 \text{ cm} \)

\[ r = \frac{d}{2} = 7 \text{ cm} \]

\[ SA = 2\pi rh \]
\[ = \pi \times 7 \times 14 \]
\[ = 2464 \text{ cm}^2 \]

(ii) \( d = 21 \text{ cm} \)

\[ r = \frac{d}{2} = 10.5 \text{ cm} \]

\[ SA = 2\pi rh \]
\[ = \pi \times 10.5 \times 14 \]
\[ = 7920 \text{ cm}^2 \]

(iii) \( d = 3.5 \text{ cm} \)

\[ r = \frac{d}{2} = 1.75 \text{ cm} \]

\[ SA = 2\pi rh \]
\[ = \pi \times 1.75 \times 14 \]
\[ = 158.8 \text{ cm}^2 \]
A right circular cylinder just encloses a sphere of radius $r$ (see figure). Find the
(i) surface area of the sphere, 
(ii) curved surface area of the cylinder and (iii) ratio of the surfaces obtained in (i) and (ii).

Solution

(i) $SA$ of sphere $= 4\pi r^2$

(ii) Height $= r + r = 2r$

radius $= r$

Curved Surface Area $= 2\pi rh = 2\pi (2r) = 4\pi r^2$

(iii) Ratio $= \frac{4\pi r^2}{\pi r^2} = \frac{1}{1}$ or $1:1$

#464175
Topic: Cuboid and Cube

A match box measures $4$ cm $\times 2.5$ cm $\times 1.5$ cm. What will be the volume of a packet containing 12 such boxes?

Solution
\[ l = 6 \times 5 \times 2.5, \quad h = 4.5 \]

Volume of tank \( V = l \times b \times h \)

\[ V = 6 \times 5 \times 4.5 = 135 \text{m}^3 \]

Amount of water hold by \( 1 \text{m}^3 \) volume = 1000 l

Amount of water hold by \( 135 \text{m}^3 \) volume = \( 135 \times 1000 \)

\[ = 135000 \text{l} \]

#464178

**Topic:** Cuboid and Cube

A cuboidal vessel is 10 m long and 8 m wide. How high must it be made to hold 380 cubic metres of a liquid?

**Solution**

\[ l = 10 \text{m}, \quad b = 8 \text{m} \]

Let height of a cuboidal vessel be \( h \)

Volume \( V = l \times b \times h = 10 \times 8 \times h \)

\[ = 380 \text{m}^3 \]

\[ h = \frac{380}{80} \text{m} = 4.75 \text{m} \]

#464180

**Topic:** Cuboid and Cube

Find the cost of digging a cuboidal pit 8 m long, 6 m broad and 3 m deep at the rate of 30 per \( \text{m}^3 \).

**Solution**

\[ l = 8 \text{m}, b = 6 \text{m}, h = 3 \text{m} \]

Volume \( V = l \times b \times h = (8 \times 6 \times 2) \text{m}^3 = 144 \text{m}^3 \)

Cost of digging per \( \text{m}^3 \) volume = Rs. 30

Cost of digging per 144 m\(^3 \) volume = Rs. 144 \times 30

\[ = \text{Rs. 4320} \]

#464182

**Topic:** Cuboid and Cube

The capacity of a cuboidal tank is 50000 litres of water. Find the breadth of the tank, if its length and depth are respectively 2.5 m and 10 m.

**Solution**

\[ l = 2.5 \text{m}, b = ? \text{m}, h = 10 \text{m} \]

Volume \( V = l \times b \times h = 2.5 \times b \times 10 \text{m}^3 \)

\[ = 500 \text{m}^3 \]

Capacity of tank = \( 500 \times 1000 \text{ l} \)

\[ = 500000 \text{ l} \]

\[ b = \frac{500000}{500} \text{ m} = 1000 \text{ m} \]

\[ b = 1000 \text{ m} \]
Let breadth \( b = x \) m

\( l = 2.5 \text{ m}, h = 10 \text{ m} \)

\[ V = l \times b \times h = (2.5 \times x \times 10) \text{ m}^3 \]

\[ = 25x \text{ m}^3 \]

Capacity of a tank = \( 25x \text{ m}^3 = 50000 \text{ litres} \)

\[ \Rightarrow 25x \text{ m}^3 = 50\text{ m}^3 \]

\[ \Rightarrow x = 2 \]

Hence, \( b = 2 \text{ m} \)

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**#464183**

**Topic:** Cuboid and Cube

A village, having a population of 4000, requires 150 litres of water per head per day. It has a tank measuring \( 20 \text{ m} \times 15 \text{ m} \times 6 \text{ m} \). For how many days will the water of this tank last?

**Solution**

Capacity of tank = \( l \times b \times h = (20 \times 15 \times 6) \text{ m}^3 \)

\[ = 1800 \text{ m}^3 \]

\[ = 1800000 \text{ litre} \]

Consumption of water in 1 day = \( 4000 \times 150 \text{ litres} \)

\[ = 600000 \text{ litres} \]

Water of this tank will last for \[ \frac{1800000}{600000} = 3 \text{ days} \]

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**#464184**

**Topic:** Cuboid and Cube

A godown measures \( 40 \text{ m} \times 25 \text{ m} \times 15 \text{ m} \). Find the maximum of wooden crates each measuring \( 1.5 \text{ m} \times 1.25 \text{ m} \times 0.5 \text{ m} \) that can be stored in the godown.

**Solution**

Volume of godown = \( l \times b \times h = 40 \times 25 \times 15 \text{ m}^3 \)

\[ = 15000 \text{ m}^3 \]

Volume of 1 wooden crate = \( 1.5 \times 1.25 \times 0.5 \text{ m}^3 \)

\[ = 0.9375 \text{ m}^3 \]

No. of wooden crate stored in godown

\[ \frac{10000}{0.9375} = 10000 \]

\[ = 16000 \]

\( \triangle 16000 \) crates can be proved

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**#464185**

**Topic:** Cuboid and Cube

A solid cube of side 12 cm is cut into eight cubes of equal volume. What will be the side of the new cube? Also, find the ratio between their surface areas.

**Solution**
Side 12 cm

Volume of cube = 12 × 12 × 12 = 1728 cm³

Volume of smaller cube = \( \frac{1}{8} \) of 1728 cm³

\( \frac{1}{8} \times 1728 = 216 \)

Let side be S.

\( S^3 = 216 \)

\( S = 6 \) cm

Ratio of SA of cubes = \( \frac{\text{SA of bigger cube}}{\text{SA of smaller cube}} \)

\( \frac{12^2}{6^2} = \frac{4}{1} = \frac{4}{1} \)

∴ Ratio between their surface areas 4:1

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#464195

**Topic:** Cylinder

The capacity of a closed cylindrical vessel of height 1 m is 15.4 litres. How many square metres of metal sheet would be needed to make it?

**Solution**

Given, \( h = 1 \) m, \( V = 15.4 \) l = 0.0154 m³

Let radius \( = r \)

\( 0.0154 = \pi r^2 h = \frac{22}{7} \times r^2 \times 1 \) \( r = 0.07 \) m

Total Surface Area = \( 2 \pi r^2 + 2 \pi rh \)

\( = 2 \times 227 \times 0.07 \times 0.07 \)

\( = 0.44 \times 1.074 \) m²

\( = 0.4708 \) m²

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#464226

**Topic:** Sphere

Find the volume of a sphere whose radius is

(i) 7 cm

(ii) 0.63 m

**Solution**

(i) \( r = 7 \) cm, \( V = \frac{4}{3} \pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 7^3 \)

\( 4312 \) cm³

\( = \frac{4312}{3} \) cm³

\( = 1437.3 \) cm³

(ii) \( r = 0.63 \) m, \( V = \frac{4}{3} \pi r^3 = \frac{4}{3} \times \frac{22}{7} \times (0.63)^3 \)

\( = 1.04 \) m³

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#464230

**Topic:** Sphere

Find the volume of a sphere whose radius is

(i) 7 cm

(ii) 0.63 m

**Solution**

(i) \( r = 7 \) cm, \( V = \frac{4}{3} \pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 7^3 \)

\( 4312 \) cm³

\( = \frac{4312}{3} \) cm³

\( = 1437.3 \) cm³

(ii) \( r = 0.63 \) m, \( V = \frac{4}{3} \pi r^3 = \frac{4}{3} \times \frac{22}{7} \times (0.63)^3 \)

\( = 1.04 \) m³
Find the amount of water displaced by a solid spherical ball of diameter

(i) 28 cm
(ii) 0.21 m

Solution

(i) \( r = \frac{28}{2} = 14 \text{ cm} \), Vol \( = \frac{4}{3} \pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 14 \times 14 \times 14 \)
\( = 11498.66 \text{ cm}^3 \)

(ii) \( r = \frac{0.21}{2} = 0.105 \text{ m} \), Vol \( = \frac{4}{3} \pi r^3 = \frac{4}{3} \times \frac{22}{7} \times (0.105)^3 \)
\( = 0.004851 \text{ m}^3 \)

#464232

Topic: Sphere

The diameter of a metallic ball is 4.2 cm. What is the mass of the ball, if the density of the metal is 8.9 g per cm³?

Solution

\( r = \frac{4.2}{2} = 2.1 \text{ cm} \), Volume \( = \frac{4}{3} \pi r^3 \)
\( = \frac{4}{3} \times \frac{22}{7} \times (2.1)^3 \)
\( = 38.808 \text{ cm}^3 \)
\( m = \rho \times V \)
\( = 8.9 \times 38.808 \)
\( = 345.3912 \text{ g} \)

#464235

Topic: Sphere

The diameter of the moon is approximately one-fourth of the diameter of the earth. What fraction of the volume of the earth is the volume of the moon?

Solution

Let diameter \( = \frac{d_e}{2} \) and radius \( = \frac{d_e}{2} \)

Diameter of moon \( = \frac{d_e}{4} \) and radius \( = \frac{d_e}{8} \)

Vol of moon \( = \frac{4}{3} \pi r^3 = \frac{4}{3} \left( \frac{d_e}{8} \right)^3 \)

Vol of earth \( = \frac{4}{3} \pi \left( \frac{d_e}{2} \right)^3 \)

Ratio \( \frac{\text{Vol of the Moon}}{\text{Vol of the Earth}} = \frac{\frac{4}{3} \left( \frac{d_e}{8} \right)^3}{\frac{4}{3} \left( \frac{d_e}{2} \right)^3} \)
\( = \frac{1}{64} \)

Volume of moon \( = \frac{1}{64} \text{ Volume of earth} \)
#464240

**Topic:** Sphere

Find the volume of a sphere whose surface area is 154 cm$^2$.

**Solution**

Let radius $r$, Surface Area $= 154$ cm$^2$

$\frac{4}{3} \pi r^2 = 154$

$r^2 = \frac{154 \times 7}{4}$

$r = \frac{7}{2} = 3.5$ cm

Thus, $r = \frac{7}{2}$ cm

Volume of sphere $= \frac{4}{3} \pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 3.5$

$= 179.66$ cm$^3$

#464245

**Topic:** Sphere

Twenty seven solid iron spheres, each of radius $r$ and surface area $S$ are melted to form a sphere with surface area $S'$. Find the

(i) radius $r'$ of the new sphere and

(ii) ratio of $S$ and $S'$

**Solution**

(i) Radius of 1 solid iron sphere = $r$

Vol $= \frac{4}{3} \pi r^3$

Vol of 27 solid iron spheres $= \frac{4}{3} \pi r^3$

$\frac{4}{3} \pi r^3 = 27 \times \frac{4}{3} \pi r^3$

$r^3 = 27 r^3$

$r' = 3r$

(ii) Surface area $= 4 \pi r^2$

$SA' = 4 \pi r'^2$

$= 4 \pi (3r)^2 = 36 \pi r^2$

$S = \frac{4 \pi r^2}{1}$

$S' = \frac{36 \pi r^2}{9} = S : 9$

#464247

**Topic:** Sphere

A capsule of medicine is in the shape of a sphere of a diameter 3.5 mm. How much medicine (in mm$^3$) is needed to fill this capsule?

**Solution**

Radius $= \frac{3.5}{2} = 1.75$ mm

Volume $= \frac{4}{3} \pi \times \frac{22}{7} \times (1.75)^3$

$= 22.46$ mm$^3$
The front compound wall of a house is decorated by wooden spheres of a 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 1.5 cm and height 7 cm and is to be painted black. Find the cost of paint required if silver paint costs 25 paise per cm².

Solution

\[ r = \frac{21}{2} = 10.5 \text{ cm}, \quad \text{SA} = 4\pi r^2 \]

\[ 4 \times \frac{22}{7} \times (10.5)^2 \]

= 1386 cm²

Cylindrical support,
\[ r_1 \text{ of circular end} = 1.5 \text{ cm}, \quad h = 7 \text{ cm} \]

Curved Surface Area
\[ = 2\pi rh = 2 \times \frac{22}{7} \times 1.5 \times 7 = 66 \text{ cm}^2 \]

Area of circular end
\[ = \pi r_1^2 = \frac{22}{7} \times (1.5)^2 = 7.07 \text{ cm}^2 \]

Area to be painted silver
\[ = 8 \times (1386 - 7.07) \text{ cm}^2 \]

= 8 \times 1378.9 \equiv 11031.4 \text{ cm}^2

Cost of silver color
\[ = Rs.0.25 \times 11031.4 \]

= Rs.2757.8

Area to be painted black
\[ = 8 \times 66 = 578 \text{ cm}^2 \]

Cost of painting black color
\[ = 1528 \times 0.05 \]

= Rs.26.40

Total cost
\[ = Rs.2757.8 + 26.4 \]

= Rs.2784.2

#465129

Topic: Combination of Solids

2 cubes each of volume 64 cm³ are joined end to end. Find the surface area of the resulting cuboid.

Solution
Volume of cubes = 64 cm³

(Edge)³ = 64

Edge = 4 cm

If cubes are joined end to end, the dimensions of the resulting cuboid will be 4 cm, 4 cm, 8 cm.

Surface area of cuboids = 2(lb + bh + lh)

= 2(4 × 4 × 8 + 4 × 8)
= 2(16 + 32)
= 2(48)
= 2(80) = 160 cm²
The radius(r) of the cylindrical part and the hemispherical part is the same (i.e., 7 cm)

Height of hemispherical part = Radius = 7 cm
Height of cylindrical part (h) = 13 - 7 = 6 cm

Inner surface area of the vessel = CSA of cylindrical part + CSA of hemispherical part

\[ = 2\pi rh + 2\pi r^2 \]

Inner surface area of vessel

\[ = 2 \times \frac{22}{7} \times 7 \times 6 + 2 \times \frac{22}{7} \times 7 \times 7 \]

\[ = 44(6 + 7) \]

\[ = 44 \times 13 \]

\[ = 572 \text{ cm}^2 \]
As per the question we can draw the diagram,

Given:

The radius of the conical part and the hemispherical part is same (i.e., 3.5 cm)

Height of the hemispherical part, \( r = 3.5 = \frac{7}{2} \)

Height of conical part, \( h = 15.5 - 3.5 = 12 \) cm

Slant height (l) of conical part = \( \sqrt{r^2 + h^2} \)

\[
= \sqrt{\left(\frac{7}{2}\right)^2 + 12^2} = \sqrt{\frac{49}{4} + 144} = \sqrt{\frac{49 + 576}{4}}
\]

\[
= \sqrt{\frac{625}{4}} = \frac{25}{2}
\]

Total surface area of toy = CSA of conical part + CSA of hemispherical part

\[
= \pi l + 2\pi r^2
\]

\[
= \frac{22}{7} \times \frac{25}{2} + 2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}
\]

\[
= 214.7
\]

---

**#465132**

**Topic:** Combination of Solids

A cubical block of side 7 cm is surmounted by a hemisphere. What is the greatest diameter the hemisphere can have? Find the surface area of the solid.

**Solution**
As per the question we can draw the diagram,
The diagram shows that the greatest diameter possible for such hemisphere is equal to the cubes edge, i.e., 7cm.

Radius (r) of hemispherical part = \( \frac{7}{2} \) = 3.5cm

Total surface area of solid = Surface area of cubical part + CSA of hemispherical part Area of base of hemispherical part

\[ = 6(\text{Edge}^2) + 2\pi r^2 - \pi r^2 = 6(\text{Edge}^2) + \pi r^2 \]

\[ = 6\left(\frac{22}{7}\right)^2 \times \frac{7}{2} \times \frac{7}{2} \]

\[ = 294 + 38.5 \]

\[ = 332.5 \text{ cm}^2 \]

#465133

**Topic**: Combination of Solids

A hemispherical depression is cut out from one face of a cubical wooden block such that the diameter of the hemisphere is equal to the edge of the cube. Determine the surface area of the remaining solid.

**Solution**
Given:
Diameter of hemisphere = Edge of the cube = \( l \)
Radius of hemisphere = \( \frac{l}{2} \)
Total surface area of solid = Surface area of cubical part + CSA of hemisphere part - Area of base of hemispherical part

\[
= 6(Edge)^2 + 2\pi r^2 - \pi r^2 = 6(Edge)^2 + \pi r^2
\]

Total surface area of solid = \( 6l^2 + \pi \times \left( \frac{l}{2} \right)^2 \)

\[
= 6l^2 + \frac{\pi l^2}{4}
\]

\[
= \frac{1}{4}(24 + \pi l^2) \text{ unit}^2
\]

---

**#465134**

**Topic:** Combination of Solids

A medicine capsule is in the shape of a cylinder with two hemispheres stuck to each of its ends. The length of the entire capsule is 14 mm and the diameter of the capsule is 5 mm. Find its surface area. (Use \( \pi = \frac{22}{7} \)).

**Answer:** 220

**Solution**
Given:

Length of Capsule (l) = 14 mm

Diameter of Capsule = Diameter of Cylinder = 5 mm

Radius = \( \frac{\text{Diameter}}{2} \)

Therefore, Radius of each Hemisphere = Radius of Cylinder = \( r = \frac{5}{2} = 2.5 \) mm

Length of Cylinder = \( AB = \text{Total length of Capsule} - \text{Radius of left Hemisphere} - \text{Radius of Right Hemisphere} \)

\[ = 14 - 2.5 - 2.5 = 9 \text{ mm} \]

Surface Area of Capsule = Curved Surface Area of Cylinder + Surface Area of Left Hemisphere + Surface Area of Right Hemisphere

\[ = 2\pi rl + 2\pi r^2 + 2\pi r^2 \]

\[ = 2\times \frac{22}{7} \times 2.5 \times 9 + 2\times \frac{22}{7} \times 2.5^2 \]

\[ = \frac{22}{7}(45 + 25) = \frac{22}{7} \times 70 = 220 \text{ mm}^2 \]

---

**#465135**

**Topic:** Combination of Solids

A tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1 m and 4 m respectively, and the slant height of the top is 2.8 m, find the area of the canvas used for making the tent. Also, find the cost of the canvas of the tent at the rate of Rs 500 per \( m^2 \). (Note that the base of the tent will not be covered with canvas.) (Use \( \pi = \frac{22}{7} \)).

**Solution**
Given:

Height (h) of the cylindrical part = 2.1 m
Diameter of the cylindrical part = 4 m
Radius of the cylindrical part = 2 m
Slant height (l) of conical part = 2.8 m

Area of canvas used = CSA of conical part + CSA of cylindrical part

\[
= \pi rl + 2\pi rh
\]

\[
= \pi \times 2 \times 2.8 + 2\pi \times 2 \times 2.1
\]

\[
= 2\pi(2.8 + 4.2)
\]

\[
= 2 \times \frac{22}{7} \times 7
\]

\[
= 44 m^2
\]

Cost of 1 m² canvas = 500 rupees
Cost of 44 m² canvas = 44 × 500 = 22000 rupees.

Therefore, it will cost 22000 rupees for making such a tent.

#465136

**Topic:** Combination of Solids

From a solid cylinder whose height is 2.4 cm and diameter 1.4 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid to the nearest cm² (Use \( \pi = \frac{22}{7} \)).

**Solution**
Given:
Height (h) of the conical part = Height (h) of the cylindrical part = 2.4 cm
Diameter of the cylindrical part = 1.4 cm

Radius = \( \frac{\text{Diameter}}{2} \)
Radius (r) of the cylindrical part = 0.7 cm

Slant height (l) of conical part = \( \sqrt{r^2 + h^2} \)
= \( \sqrt{0.7^2 + 2.4^2} \) = \( \sqrt{0.49 + 5.76} \) = \( \sqrt{6.25} \) = 2.5 cm

Total surface area of the remaining solid = CSA of cylindrical part + CSA of conical part + Area of cylindrical base
= \( 2\pi rh \) + \( \pi rl \) + \( \pi r^2 \)
= \( 2 \times \frac{22}{7} \times 0.7 \times 2.4 + \frac{22}{7} \times 0.7 \times 2.5 + \frac{22}{7} \times 0.7 \times 0.7 \)
= 4.4 \times 2.4 + 2.2 \times 2.5 + 2.2 \times 0.7
= 10.56 + 5.50 + 1.54 = 17.60 cm\(^2\)

The total surface area of the remaining solid to the nearest cm\(^2\) is 18 cm\(^2\)

---

A wooden article was made by scooping out a hemisphere from each end of a solid cylinder. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the total surface of the article.

**Answer:** 374

**Solution**
Given:
Height of Cylinder = $h = 10$ cm
Radius of Cylinder = Radius of Hemispheres = $r = 3.5$ cm

Surface area of article = CSA of cylindrical part + 2 x CSA of hemispherical part

$= 2\pi rh + 2 \times 2\pi r^2$
$= 2\pi \times 3.5 \times 10 + 2 \times 2\pi \times 3.5^2$
$= 70\pi + 49\pi$
$= 119\pi = \frac{119 \times 22}{7}$
$= 17 \times 22$
$= 374 \text{ cm}^2$

#465181
Topic: Combination of Solids
A metallic sphere of radius 4.2 cm is melted and recast into the shape of a cylinder of radius 6 cm. Find the height of the cylinder.

Solution

Given:
Radius ($r_1$) of hemisphere = 4.2 cm
Radius ($r_2$) of cylinder = 6 cm
Height (h) = ?

The object formed by recasting the hemisphere will be same in volume.

So, Volume of sphere = Volume of cylinder

$\frac{4}{3}m_1^3 = m_2^2h$

$\Rightarrow \frac{4}{3}\pi \times (4.2)^3 = \pi (6)^2h$

$\Rightarrow \frac{4}{3} \times \frac{4.2 \times 4.2 \times 4.2}{36} = h$

$h = (1.4)^3 = 2.74 \text{ cm}$

Therefore, the height of cylinder so formed will be 2.74 cm.

#465182
Topic: Combination of Solids
Metallic spheres of radii 6 cm, 8 cm and 10 cm, respectively, are melted to form a single solid sphere. Find the radius of the resulting sphere.

Solution
Given:
Radius \(r_1\) of first sphere = 6 cm
Radius \(r_2\) of second sphere = 8 cm
Radius \(r_3\) of third sphere = 10 cm
Radius of the resulting sphere = \(r\)

The object formed by recasting these spheres will be same in volume as the sum of the volumes of these spheres.

So, Volume of 3 spheres = Volume of resulting shape

\[
\frac{4}{3} \pi (r_1^3 + r_2^3 + r_3^3) = \frac{4}{3} \pi r^3
\]

\[
\Rightarrow \frac{4}{3} (6^3 + 8^3 + 10^3) = \frac{4}{3} r^3
\]

\[
\Rightarrow 216 + 512 + 1000 = r^3
\]

\[
\Rightarrow 1728 = r^3
\]

\[
\Rightarrow r = 12 \text{ cm}
\]

Therefore, the radius of sphere so formed will be 12 cm.

---

**#465183**

**Topic:** Combination of Solids

A 20 m deep well with diameter 7 m is dug and the earth from digging is evenly spread out to form a platform 22 m by 14 m. Find the height of the platform.

**Solution**

The shape of the well will be cylindrical as shown in the figure below:

Given:
Depth \(h\) of well = 20 m
Radius \(r\) of circular end of well = \(\frac{7}{2}\) m
Area of platform = Length \times Breadth = 22 \times 14 m²

Assume height of the platform = \(H\)

Volume of soil dug from the well will be equal to the volume of soil scattered on the platform.

Volume of soil from well = Volume of soil used to make such platform

\[
\Rightarrow \pi r^2 h = \text{Area of platform} \times \text{Height of platform}
\]

\[
\Rightarrow \pi \left(\frac{7}{2}\right)^2 \times 20 = 22 \times 14 \times H
\]

\[
H = \frac{22}{7} \times \frac{49}{4} \times \frac{20}{22 \times 14}
\]

\[
H = \frac{5}{2} = 2.5 \text{ m}
\]

Hence, the height of such platform will be 2.5 m.

---

**#465184**

**Topic:** Combination of Solids

A well of diameter 3 m is dug 14 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 4 m to form an embankment. Find the height of the embankment.

**Solution**
The shape of the well will be cylindrical as shown in the figure below:

Given:
Depth \((h_1)\) of well = 14 m
Radius \(r_1\) of the circular end of well = \(\frac{3}{2}\) m
Width of embankment = 4 m

From the figure, it can be observed that our embankment will be in a cylindrical shape having outer radius, \(r_2 = 4 + \frac{3}{2} = \frac{11}{2}\) m.

Let height of embankment be \(h_2\).

Volume of soil dug from well = Volume of earth used to form embankment

\[
\pi \times r_1^2 \times h_1 = \pi \times \left[ r_2^2 - r_1^2 \right] \times h_2
\]

\[
\Rightarrow \pi \times \left( \frac{3}{2} \right)^2 \times 14 = \pi \times \left[ \left( \frac{11}{2} \right)^2 - \left( \frac{3}{2} \right)^2 \right] \times h_2
\]

\[
\Rightarrow \frac{9}{4} \times 14 = \frac{112}{4} \times h_2
\]

\[
h_2 = \frac{9}{8} = 1.125 \text{ m}
\]

So, the height of the embankment will be 1.125 m.

---

### #465185

**Topic:** Combination of Solids

A container shaped like a right circular cylinder having diameter 12 cm and height 15 cm is full of ice cream. The ice cream is to be filled into cones of height 12 cm and diameter 6 cm, having a hemispherical shape on the top. Find the number of such cones which can be filled with ice cream.

**Solution**
Given:

Height \((h_1)\) of cylindrical container = 15 cm

Radius = \(\frac{\text{Diameter}}{2}\)

Radius \((r_1)\) of circular end of container = \(\frac{12}{2} = 6\) cm

Radius \((r_2)\) of circular end of ice-cream cone = \(\frac{6}{2} = 3\) cm

Height \((h_2)\) of conical part of ice-cream cone = 12 cm

Let \(n\) ice-cream cones be filled with ice-cream of the container.

Volume of ice-cream in cylinder = \(n\) (Volume of 1 ice-cream cone + Volume of hemispherical shape on the top)

\[\pi r_1^2 h_1 = n \left( \frac{1}{3} \pi r_2^2 h_2 + \frac{2}{3} \pi r_2^3 \right)\]

\[\Rightarrow \pi \times 6^2 \times 15 = n \left( \frac{1}{3} \pi \times 3^2 \times 12 + \frac{2}{3} \pi \times 3^3 \right)\]

\[\Rightarrow n = \frac{30 \times 15}{\frac{1}{3} \times 9 \times 12 + \frac{2}{3} \times 27}\]

\[\Rightarrow n = \frac{36 \times 15 \times 3}{108 + 54}\]

\[n = 10\]

So, 10 ice-cream cones can be filled with the ice-cream in the container.

---

**#465186**

**Topic:** Combination of Solids

How many silver coins, 1.75 cm in diameter and of thickness 2 mm, must be melted to form a cuboid of dimensions 5.5 cm \(\times\) 10 cm \(\times\) 3.5 cm?

**Solution**
Coins are cylindrical in shape as shown in the figure.

Given:
- Height \((h_1)\) of cylindrical coins = \(2 \text{ mm} = 0.2 \text{ cm}\)
- Radius \((r)\) of circular end of coins = \(1.75 \text{ cm} = 0.875 \text{ cm}\)

Let \(x\) coins be melted to form the required cuboids.

Volume of \(x\) coins = Volume of cuboids

\[x \times \pi r^2 h_1 = l \times b \times h\]

\[\Rightarrow x \times \pi \times 0.875^2 \times 0.2 = 5.5 \times 10 \times 3.5\]

\[\Rightarrow x = \frac{5.5 \times 10 \times 3.5}{0.875^2 \times 0.2} = 400\]

So, the number of coins melted to form such a cuboid is \(400\).

---

### #465187

**Topic:** Combination of Solids

A cylindrical bucket, \(32 \text{ cm}\) high and with radius of base \(18 \text{ cm}\), is filled with sand. This bucket is emptied on the ground and a conical heap of sand is formed. If the height of the conical heap is \(24 \text{ cm}\). Find the radius and slant height of the heap.

**Solution**

Given:
- Height \((h_1)\) of cylindrical bucket = \(32 \text{ cm}\)
- Radius \((r_1)\) of circular end of bucket = \(18 \text{ cm}\)
- Height \((h_2)\) of conical heap = \(24 \text{ cm}\)

Let the radius of the circular end of conical heap be \(r_2\).

The volume of sand in the cylindrical bucket will be equal to the volume of sand in the conical heap.

Volume of sand in the cylindrical bucket = Volume of sand in conical heap

\[\pi r_1^2 h_1 = \frac{1}{3} \pi r_2^2 h_2\]

\[\Rightarrow \pi \times 18^2 \times 32 = \frac{1}{3} \pi \times r_2^2 \times 24\]

\[\Rightarrow r_2^2 = \frac{3 \times 18^2 \times 32}{24} = 18^2 \times 4\]

\[\Rightarrow r_2 = 18 \times 2 = 36 \text{ cm}\]

Slant height = \(\sqrt{r_2^2 + h_2^2} = \sqrt{12^2 \times (3^2 + 2^2)} = 12\sqrt{13} \text{ cm}\)

Therefore, the radius and slant height of the conical heap are \(36 \text{ cm}\) and \(12\sqrt{13} \text{ cm}\) respectively.
The slant height of a frustum of a cone is 4 cm and the perimeters (circumference) of its circular ends are 18 cm and 6 cm. Find the curved surface area of the frustum.

**Solution**

\( l = 4 \text{ cm} \)

Circumference of a circular end = 18 cm

\[ \Rightarrow 2\pi r_1 = 18 \]

\[ \Rightarrow \pi \times r_1 = \frac{18}{2} = 9 \] \( \cdots (1) \)

Circumference of other circular end = 6 cm

\[ \Rightarrow 2\pi r_2 = 6 \]

\[ \Rightarrow \pi \times r_2 = \frac{6}{2} = 3 \] \( \cdots (2) \)

Adding (1) and (2)

Curved surface area

\[ = \pi (r_1 + r_2)l \]

\[ = (9 + 3) \times 4 \]

\[ = 48 \text{ cm}^2 \]

---

A fez, the cap used by the Turks, is shaped like the frustum of a cone. If its radius on the open side is 10 cm, radius at the upper base is 4 cm and its slant height is 15 cm, find the area of material used for making it.

**Solution**
Given:

Radius (r) of upper circular end = 4 cm
Radius (R) of lower circular end = 10 cm
Slant height (l) of frustum = 15 cm

Area of material used for making the fez = CSA of frustum + Area of upper circular end

\[ \pi (R + r) \times l + \pi r^2 \]

\[ = \pi (10 + 4) \times 15 + \pi \times 4^2 \]

\[ = 210\pi + \frac{226 \times 22}{7} \]

\[ = \frac{7102}{7} \text{ cm}^2 \]

Therefore, the area of material used for making it is \( \frac{7102}{7} \text{ cm}^2 \).

---

#465196

**Topic:** Cone

A container, opened from the top and made up of a metal sheet, is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends as 8 cm and 20 cm respectively. Find the cost of the milk which can completely fill the container, at the rate of Rs. 20 per litre. Also find the cost of metal sheet used to make the container, if it costs Rs 8 per 100 cm². (Take \( \pi = 3.14 \)).

**Solution**
Given:
Radius (R) of upper end of container = 20 cm
Radius (r) of lower end of container = 8 cm
Height (h) of container = 16 cm
Slant height (l) of frustum = $\sqrt{(R - r)^2 + h^2}$

Capcity of container = Volume of frustum

\[
\frac{\pi \times h}{3} \left[ R^2 + r^2 + R \times r \right]
\]

\[
= \frac{3.14 \times 16}{3} \left[ 20^2 + 8^2 + 20 \times 8 \right]
\]

\[
= \frac{3.14 \times 16}{3} \left[ 400 + 64 + 160 \right] = \frac{502.4}{3} \times 624
\]

\[
= 10449.92 \text{ cm}^3
\]

\[
= 10.45 \text{ litres.}
\]

Cost of 1 litre milk = Rs. 20
Cost of 10.45 litre milk = 10.45 \times 20 = Rs. 209

Area of metal sheet used to make the container = $\pi (R + r) \times l + \pi r^2$

\[
= \pi (20 + 8) \times 16 + \pi \times 8^2
\]

\[
= 560\pi + 64\pi = 624\pi \text{ cm}^2
\]

Cost of 100 cm$^2$ metal sheet = Rs. 8
Cost of $624\pi \text{ cm}^2$ metal sheet =

\[
\frac{624 \times 3.14 \times 8}{100}
\]

\[
= 156.75
\]

Therefore, the cost of the milk which can completely fill the container is Rs. 209.

The cost of metal sheet used to make the container is Rs. 156.75.

---

**#465210**

**Topic:** Combination of Solids

A metallic right circular cone 20 cm high and whose vertical angle is 60° is cut into two parts at the middle of its height by a plane parallel to its base. If the frustum so obtained be drawn into a wire of diameter $\frac{1}{16}$ cm, find the length of the wire.

**Solution**

**FRUSTUM:**

Let $r_1$ and $r_2$ be the radii of the top and bottom surface, respectively of the frustum.

In $\triangle AOF$,

\[
\tan 30° = \frac{FO}{OA}
\]

\[
\frac{1}{\sqrt{3}} = \frac{FO}{10}
\]

\[
\Rightarrow FO = 10 \times \frac{\sqrt{3}}{3} = \frac{10\sqrt{3}}{3} \text{ cm}
\]
So, \( r_1 = \frac{10\sqrt{3}}{3} \) cm

\[ \text{In } \triangle ABD, \quad \frac{BD}{AD} = \tan 30^\circ \]

\[ \Rightarrow BD = \frac{20\sqrt{3}}{3} \text{ cm.} \]

So, \( r_2 = \frac{20\sqrt{3}}{3} \) cm

And height of frustum \((h) = 10 \text{ cm.} \)

So, Volume of frustum

\[ = \frac{1}{3} \pi h \left( r_1^2 + r_2^2 + r_2 r_1 \right) \]

\[ = \frac{1}{3} \pi \times 10 \left[ \left( \frac{10\sqrt{3}}{3} \right)^2 + \left( \frac{20\sqrt{3}}{3} \right)^2 + \left( \frac{10\sqrt{3}}{3} \right) \left( \frac{20\sqrt{3}}{3} \right) \right] \]

\[ = \frac{100}{3} + \frac{400}{3} + \frac{200}{3} \]

\[ = \frac{1}{3} \pi \times \frac{22}{7} \times \frac{700}{3} = \frac{22000}{9} \text{ cm}^3 \]

**WIRE:**

Let the radius of the wire \( r \) and \( l \) be the length of the wire.

So, \( r = \frac{1}{32} \) cm

Volume of wire = Volume of cylinder

\[ \text{Volume of wire} = \pi r^2 l \]

\[ \frac{22000}{9} = \frac{22}{7} \times \left( \frac{1}{32} \right)^2 \times l \]

\[ l = \frac{22000 \times 32 \times 32 \times 7}{22 \times 9} \]

\[ l = 7964.44 \text{ cm} \]

\[ l = 7964.44 \text{ m.} \]

So, length of the wire is 7964.44 cm.
#465221

**Topic:** Combination of Solids

A copper wire, 3 mm in diameter, is wound about a cylinder whose length is 12 cm, and diameter 10 cm, so as to cover the curved surface of the cylinder. Find the length and mass of the wire, assuming the density of copper to be 8.88 g per cm$^3$.

**Solution**

From the figure we can observe that 1 round of wire will cover 3 mm height of cylinder.

Number of rounds = \( \frac{\text{Height of cylinder}}{\text{Diameter of wire}} \)

\[ \frac{12}{0.3} = 40 \text{ rounds}. \]

Length of wire required in 1 round = Circumference of base of cylinder

\[ = 2\pi r = 2\pi \times 5 \]

Length of wire in 40 rounds

\[ = 40 \times 10\pi \]

\[ = \frac{400 \times 22}{7} \]

\[ = \frac{8800}{7} \]

\[ = 1257.14 \text{ cm} \]

Radius of wire = \( \frac{0.3}{2} = 0.15 \text{ cm} \).

Volume of wire = Area of cross-section of wire x Length of wire

\[ = \pi (0.15)^2 \times 125714 \]

\[ = 88.898 \text{ cm}^3 \]

Mass = Volume x Density

\[ = 88.898 \times 8.88 \]

\[ = 789.41 \text{ gm} \]

#465234

**Topic:** Combination of Solids

In one fortnight of a given month, there was a rainfall of 10 cm in a river valley. If the area of the valley is 7280 km$^2$, show that the total rainfall was approximately equivalent to the addition to the normal water of three rivers each 1072 km long, 75 m wide and 3 m deep.

**Solution**

**Given:**

Area of the valley = 7280 km$^2$

Volume of rainfall in the area = \( 7280 \times 10 \times 0.00001 = 0.728 \text{ km}^3 \)

Volume of water in 3 rivers = \( 3 \times 1 \times 75 \times 0.001 \times 3 \times 0.001 = 0.723 \text{ km}^3 \) (Converted m = km)

So, the 2 valleys are nearly similar.
An oil funnel made of tin sheet consists of a 10 cm long cylindrical portion attached to a frustum of a cone. If the total height is 22 cm, diameter of the cylindrical portion is 8 cm and the diameter of the top of the funnel is 18 cm, find the area of the tin sheet required to make the funnel.

**Solution**

Given:

Radius ($R$) of upper circular end of frustum part = $\frac{18}{2} = 9$ cm

Radius ($r$) of lower circular end of frustum part = Radius of circular end of cylindrical part = $\frac{8}{2} = 4$ cm

Height ($h_1$) of frustum part = 22 - 10 = 12 cm

Height ($h_2$) of cylindrical part = 10 cm

Slant height ($l$) of frustum part = $\sqrt{(R - r)^2 + h_1^2} = \sqrt{(9 - 4)^2 + 12^2} = \sqrt{25 + 144} = \sqrt{169} = 13$ cm

Area of tin sheet required = CSA of frustum part + CSA of cylindrical part

$= \pi (R + r) l + 2\pi rh_2$

$= \frac{22}{7} \times (9 + 4) \times 13 + 2 \times \frac{22}{7} \times 4 \times 10$

$= \frac{22}{7} \times (169 + 80) = \frac{22 \times 249}{7}$

$= 782 \frac{4}{7}$ cm$^2$

Derive the formula for the curved surface area and total surface area of the frustum of a cone.

**Solution**

Let $ABC$ be a cone. A frustum $DECB$ is cut by a plane parallel to its base.
Let \( r_1 \) and \( r_2 \) be the radii of the ends of the frustum of the cone and \( h \) be the height of the frustum of the cone.

\[ \text{In } \angle ABG \text{ and } \angle ADF, \text{ DF } \parallel \text{ BG} \]

Therefore, \( \angle ABG \sim \angle ADF \)

\[ \frac{DF}{BG} = \frac{AF}{AG} = \frac{AD}{AB} \]

\[ \frac{r_2}{r_1} = \frac{h_1 - h}{h_1} = \frac{h_1 - l}{l_1} \]

\[ \frac{r_2}{r_1} = 1 - \frac{h}{h_1} = 1 - \frac{l}{l_1} \]

\[ 1 - \frac{l}{l_1} = \frac{r_2}{r_1} \]

\[ 1 - \frac{l}{l_1} = 1 - \frac{r_2}{r_1} = \frac{r_1 - r_2}{r_1} \]

\[ \frac{h_1}{l_1} = \frac{r_2}{r_1 - r_2} \]

\[ \frac{h}{l} = \frac{r_2}{r_1 - r_2} \]

CSA of frustum \( DECB = \text{CSA of cone } ABC - \text{CSA cone } ADE \)

\[ = \pi r_1 l_1 - \pi r_2 (l_1 - h) \]

\[ = \pi \left( r_1 - r_2 \right) l_1 - \pi \left( \frac{r_1}{r_1 - r_2} \right) \frac{h_1}{l_1} \]

\[ = \pi \left( r_1 - r_2 \right) l_1 - \pi \left( \frac{r_1 - r_1 + r_2 h}{r_1 - r_2} \right) \]

\[ = \pi \left( r_1 - r_2 \right) l_1 - \pi \left( \frac{r_1 h + r_2 h}{r_1 - r_2} \right) \]

\[ = \pi \left( r_1 - r_2 \right) l_1 - \pi \left( \frac{r_1 h}{r_1 - r_2} \right) \]

CSA of frustum = \( \pi (r_1 + r_2)l \)

Total surface area of frustum = CSA of frustum + Area of upper circular end + Area of lower circular end.

\[ = \pi (r_1 + r_2)l + \pi r_1^2 + \pi r_2^2 \]

\[ = \pi (r_1 + r_2)l + \pi (r_1^2 + r_2^2) \]