X

MATHEMATICS

COMPLETE QUESTION BANK

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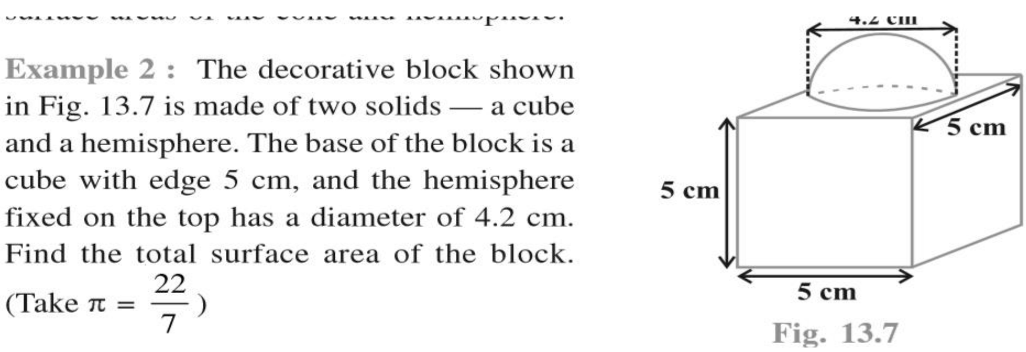
Youtube.com/Shobhit Nirwan

SURFACE AREAS AND VOLUMES

NCERT:



Example 2 : The decorative block shown in Fig. 13.7 is made of two solids — a cube and a hemisphere. The base of the block is a cube with edge 5 cm, and the hemisphere fixed on the top has a diameter of 4.2 cm. Find the total surface area of the block. (Take $\pi = \frac{22}{7}$)

Fig. 13.7

Example 4 : Mayank made a bird-bath for his garden in the shape of a cylinder with a hemispherical depression at one end (see Fig. 13.9). The height of the cylinder is 1.45 m and its radius is 30 cm. Find the total surface area of the bird-bath.

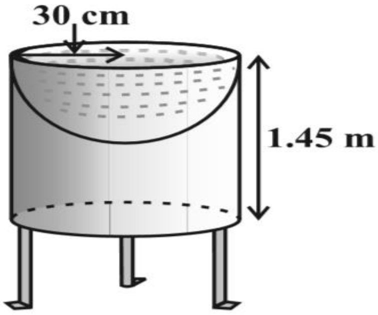
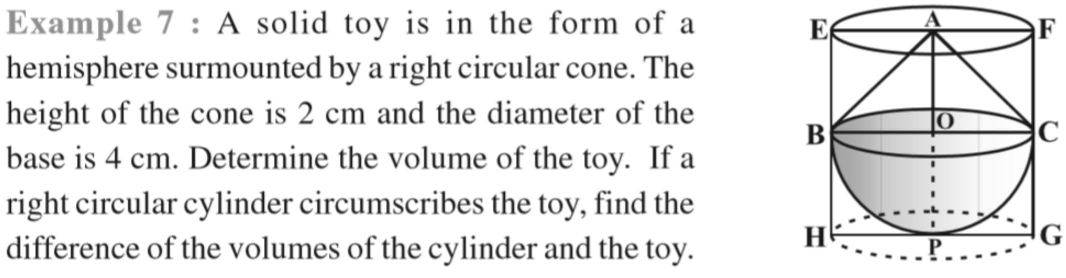


Fig. 13.9



Example 7 : A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. If a right circular cylinder circumscribes the toy, find the difference of the volumes of the cylinder and the toy.

Example 10 : A copper rod of diameter 1 cm and length 8 cm is drawn into a wire of length 18 m of uniform thickness. Find the thickness of the wire.

Example 11 : A hemispherical tank full of water is emptied by a pipe at the rate of $3\frac{4}{7}$ litres per second. How much time will it take to empty half the tank, if it is 3m in diameter? (Take $\pi = \frac{22}{7}$)

Example 14 : An open metal bucket is in the shape of a frustum of a cone, mounted on a hollow cylindrical base made of the same metallic sheet (see Fig. 13.23). The diameters of the two circular ends of the bucket are 45 cm and 25 cm, the total vertical height of the bucket is 40 cm and that of the cylindrical base is 6 cm. Find the area of the metallic sheet used to make the bucket, where we do not take into account the handle of the bucket. Also, find the volume of water the bucket can hold.

Fig. 13.23

EXERCISE 13.1:

1. 2 cubes each of volume 64 cm3 are joined end to end. Find the surface area of the resulting cuboid.

3. A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Find the total surface area of the toy.

4. 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.

8. 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 cm^2.

EXERCISE 13.2:

1.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. 1Find the volume of the solid in terms of pi

5. 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.

8.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

EXERCISE 13.3:

1. 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.

2. 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.

5. 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.

PREVIOUS YEARS

2018

In Fig. 1, ABCD is a rectangle. Find the values of x and y.

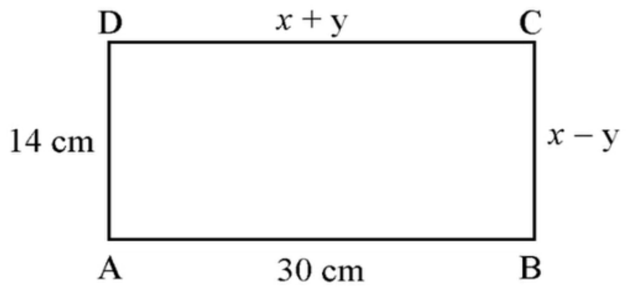


Fig. – 1

AB = DC and BC = AD

$$\left.\begin{array}{ll}\Rightarrow & x + y = 30 \\ \text{and} & x - y = 14\end{array}\right\}$$

Solving to get $x = 22$ and $y = 8$.

A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in Fig. 3. If the height of the cylinder is 10 cm and its base is of radius 3.5 cm. Find the total surface area of the article.

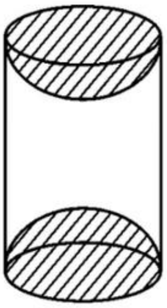


Fig. 3

OR

A heap of rice is in the form of a cone of base diameter 24 m and height 3.5 m. Find the volume of the rice. How much canvas cloth is required to just cover the heap ?

Total surface Area of article = CSA of cylinder + CSA of 2 hemispheres

CSA of cylinder $= 2\pi rh$

$$= 2 \times \frac{22}{7} \times 3.5 \times 10$$

$$= 220 \text{ cm}^2$$

Surface Area of two hemispherical scoops $= 4 \times \frac{22}{7} \times 3.5 \times 3.5$

$$= 154 \text{ cm}^2$$

Total surface Area of article $= 220 + 154$

$$= 374 \text{ cm}^2$$

OR

Radius of conical heap = 12 m

Volume of rice $= \frac{1}{3} \times \frac{22}{7} \times 12 \times 12 \times 3.5 \text{ m}^3$

$$= 528 \text{ m}^3$$

Area of canvas cloth required $= \pi r l$

$$l = \sqrt{12^2 + (3.5)^2} = 12.5 \text{ m}$$

$\therefore$ Area of canvas required $= \frac{22}{7} \times 12 \times 12.5$

$$= 471.4 \text{ m}^2$$

The diameters of the lower and upper ends of a bucket in the form of a frustum of a cone are 10 cm and 30 cm respectively. If its height is 24 cm, find :

(i) The area of the metal sheet used to make the bucket.

(ii) Why we should avoid the bucket made by ordinary plastic ? [Use $\pi = 3.14$]

Here $r_1 = 15$ cm, $r_2 = 5$ cm and $h = 24$ cm

(i) Area of metal sheet = CSA of the bucket + area of lower end

$$= \pi l(r_1 + r_2) + \pi r_2^2$$

where $l = \sqrt{24^2 + (15-5)^2} = 26$ cm

$\therefore$ Surface area of metal sheet $= 3.14(26 \times 20 + 25)\ \text{cm}^2$

$$= 1711.3\ \text{cm}^2$$

We should avoid use of plastic because it is non-degradable or similar value.

2017

Water in a canal, 5·4 m wide and 1·8 m deep, is flowing with a speed of 25 km/hour. How much area can it irrigate in 40 minutes, if 10 cm of standing water is required for irrigation ?

Volume of water flowing in 40 min $= 5.4 \times 1.8 \times 25000 \times \frac{40}{60}\ \text{m}^3$

$$= 162000\ \text{m}^3$$

Height of standing water = 10 cm = 0.10 m

$\therefore$ Area to be irrigated $= \frac{162000}{0.10}$

$$= 1620000\ \text{m}^2$$

The slant height of a frustum of a cone is 4 cm and the perimeters of its circular ends are 18 cm and 6 cm. Find the curved surface area of the frustum.

Here $l = 4$ cm, $2\pi r_1 = 18$ cm and $2\pi r_2 = 6$ cm

$\Rightarrow \quad \pi r_1 = 9,\ \pi r_2 = 3$

Curved surface area of frustum $= \pi(r_1 + r_2) \times l$ or $(\pi r_1 + \pi r_2) \times l$

$$= (9 + 3) \times 4$$

$$= 48\ \text{cm}^2$$

The dimensions of a solid iron cuboid are 4·4 m × 2·6 m × 1·0 m. It is melted and recast into a hollow cylindrical pipe of 30 cm inner radius and thickness 5 cm. Find the length of the pipe.

Volume of cuboid $= 4.4 \times 2.6 \times 1 \text{ m}^3$

Inner and outer radii of cylindrical pipe = 30 cm, 35 cm

$$\therefore \quad \text{Volume of material used} = \frac{\pi}{100^2}(35^2 - 30^2) \times h \text{ m}^3$$

$$= \frac{\pi}{100^2} \times 65 \times 5h$$

Now $\frac{\pi}{100^2} \times 65 \times 5h = 4.4 \times 2.6$

$$\Rightarrow \quad h = \frac{7 \times 4.4 \times 2.6 \times 100 \times 100}{22 \times 65 \times 5}$$

$$\Rightarrow \quad h = 112 \text{ m}$$

Two taps running together can fill a tank in $3\frac{1}{13}$ hours. If one tap takes 3 hours more than the other to fill the tank, then how much time will each tap take to fill the tank ?

Let one tap fill the tank in x hrs.

Therefore, other tap fills the tank in $(x + 3)$ hrs.

Work done by both the taps in one hour is

$$\frac{1}{x} + \frac{1}{x+3} = \frac{13}{40}$$

$$\Rightarrow \quad (2x + 3)\,40 = 13(x^2 + 3x)$$

$$\Rightarrow \quad 13x^2 - 41x - 120 = 0$$

$$\Rightarrow (13x + 24)(x - 5) = 0$$

$$\Rightarrow \quad x = 5$$

(rejecting the negative value)

Hence one tap takes 5 hrs and another 8 hrs separately to fill the tank.

In a rain-water harvesting system, the rain-water from a roof of 22 m × 20 m drains into a cylindrical tank having diameter of base 2 m and height 3·5 m. If the tank is full, find the rainfall in cm. Write your views on water conservation.

Volume of rain water on the roof = Volume of cylindrical tank

i.e., $22 \times 20 \times h = \frac{22}{7} \times 1 \times 1 \times 3.5$

$\Rightarrow \quad h = \frac{1}{40} m$

$= 2.5$ cm

Water conservation must be encouraged

or views relevant to it.

2016

In fig. 5, a tent is in the shape of a cylinder surmounted by a conical top of same diameter. If the height and diameter of cylindrical part are 2.1 m and 3 m respectively and the slant height of conical part is 2.8 m, find the cost of canvas needed to make the tent if the canvas is available at the rate of ₹ 500/sq.metre. (Use $\pi = \frac{22}{7}$)

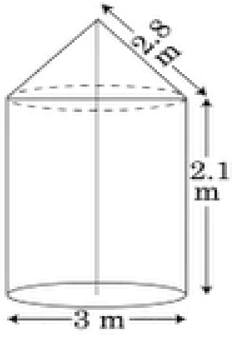


Figure 5

Area of canvas needed $= 2 \times \frac{22}{7} \times (1.5) \times 2.1 + \frac{22}{7} \times 1.5 \times 2.8$

$= \frac{22}{7}[6.3 + 4.2] = \frac{22}{7} \times 10.5 = 33 \text{ m}^2$

cost = 33 × 500 = ₹ 16500

A conical vessel, with base radius 5 cm and height 24 cm, is full of water. This water is emptied into a cylindrical vessel of base radius 10 cm. Find the height to which the water will rise in the cylindrical vessel. (Use $\pi = \frac{22}{7}$)

Volume of water in conical vessel = $\frac{1}{3}\times\frac{22}{7}\times 25\times 24\ \text{cm}^2$

$$\therefore\quad \frac{1}{3}\times\frac{22}{7}\times 25\times 24 = \frac{22}{7}\times 10\times 10\times h$$

$$\Rightarrow\quad h = 2\ \text{cm}$$

A sphere of diameter 12 cm, is dropped in a right circular cylindrical vessel, partly filled with water. If the sphere is completely submerged in water, the water level in the cylindrical vessel rises by $3\frac{5}{9}$ cm. Find the diameter of the cylindrical vessel.

Ans-use volume of sphere formula

Due to heavy floods in a state, thousands were rendered homeless. 50 schools collectively offered to the state government to provide place and the canvas for 1500 tents to be fixed by the government and decided to share the whole expenditure equally. The lower part of each tent is cylindrical of base radius 2.8 m and height 3.5 m, with conical upper part of same base radius but of height 2.1 m. If the canvas used to make the tents costs ₹ 120 per sq.m, find the amount shared by each school to set up the tents. What value is generated by the above problem ? (Use $\pi = \frac{22}{7}$)

Slant height of conical part = $\sqrt{(2.8)^2 + (2.1)^2} = 3.5$ m

Area of canvas/tent = $2\times\frac{22}{7}\times 2.8\times 3.5 + \frac{22}{7}\times 2.8\times 3.5\ \text{m}^2$

= $92.4\ \text{m}^2$

Cost of 1500 tents = 1500 × 92.4 × 120 = ₹ 16632000

Share of each school = $\frac{1}{50}\times 1663200$

= ₹ 332640 /-

"Helping the needy"

2015

Due to sudden floods, some welfare associations jointly requested the government to get 100 tents fixed immediately and offered to contribute 50% of the cost. If the lower part of each tent is of the form of a cylinder of diameter 4·2 m and height 4 m with the conical upper part of same diameter but of height 2·8 m, and the canvas to be used costs ₹ 100 per sq. m, find the amount, the associations will have to pay. What values are shown by these associations ? [Use $\pi = \frac{22}{7}$]

Slant height $(\ell) = \sqrt{(2.8)^2 + (2.1)^2} = 3.5$ cm.

$\therefore$ Area of canvas $= 2 \times \frac{22}{7} \times (2.1) \times 4 + \frac{22}{7} \times 2.1 \times 3.5$

for one tent

$= 6.6\ (8 + 3.5) = 6.6 \times 11.5\ \text{m}^2$

$\therefore$ Area for 100 tents $= 66 \times 115\ \text{m}^2$

Cost of 100 tents $=$ Rs. $66 \times 115 \times 100$

50% Cost $= 33 \times 11500 =$ Rs. 379500

Values : Helping the flood victims

A hemispherical bowl of internal diameter 36 cm contains liquid. This liquid is filled into 72 cylindrical bottles of diameter 6 cm. Find the height of the each bottle, if 10% liquid is wasted in this transfer.

Volume of liquid in the bowl $= \frac{2}{3} \cdot \pi \cdot (18)^3\ \text{cm}^3$

Volume, after wastage $= \frac{2\pi}{3} \cdot (18)^3 \cdot \frac{90}{100}\ \text{cm}^3$

Volume of liquid in 72 bottles $= \pi\,(3)^2 \cdot h \cdot 72\ \text{cm}^3$

$$\Rightarrow h = \frac{\frac{2}{3}\pi\,(18)^3 \cdot \frac{9}{10}}{\pi\,(3)^2 \cdot 72} = 5.4 \text{ cm.}$$

A cubical block of side 10 cm is surmounted by a hemisphere. What is the largest diameter that the hemisphere can have ? Find the cost of painting the total surface area of the solid so formed, at the rate of ₹ 5 per 100 sq. cm. [Use $\pi = 3{\cdot}14$]

Laergest possible diameter $=$ 10 cm.

of hemisphere

$\therefore$ radius $=$ 5 cm.

Total surface area $= 6\,(10)^2 + 3.14 \times (5)^2$

Cost of painting $= \frac{678.5 \times 5}{100} = \frac{\text{Rs. } 3392.50}{100} =$ ₹ 33.9250

$=$ ₹ 33.93

504 cones, each of diameter 3·5 cm and height 3 cm, are melted and recast into a metallic sphere. Find the diameter of the sphere and hence find its surface area. [Use $\pi = \frac{22}{7}$]

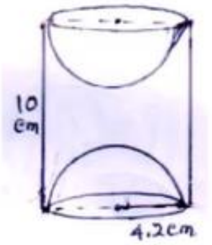
Volume of metal in 504 cones $= 504 \times \frac{1}{3} \times \frac{22}{7} \times \frac{35}{20} \times \frac{35}{20} \times 3$ cm.

$\therefore \; \frac{4}{3} \times \frac{22}{7} \times r^3 = 504 \times \frac{1}{3} \times \frac{22}{7} \times \frac{35}{20} \times \frac{35}{20} \times 3$

r = 10.5 cm. $\therefore$ diameter = 21 cm.

Surface area $= 4 \times \frac{22}{7} \times \frac{21}{7} \times \frac{21}{2} \times \frac{21}{2} = 1386 \text{ cm}^2$

From each end of a solid metal cylinder, metal was scooped out in hemispherical form of same diameter. The height of the cylinder is 10 cm and its base is of radius 4·2 cm. The rest of the cylinder is melted and converted into a cylindrical wire of 1·4 cm thickness. Find the length of the wire. [Use $\pi = \frac{22}{7}$]



Total Volume of cylinder $= \frac{22}{7} \times \frac{42}{10} \times \frac{42}{10} \times 10 \text{ cm}^3$

$= 554.40$ cm.

Volume of metal scooped out $= \frac{4}{3} \times \frac{42}{7} \times \left(\frac{42}{10}\right)^3$

$= 310.46 \text{ cm}^3$

$\therefore$ Volume of rest of cylinder $= 554.40 - 310.46$

$= 243.94 \text{ cm}^3$

If ℓ is the length of were, then

$\frac{22}{7} \times \frac{7}{10} \times \frac{7}{10} \times \ell = \frac{24394}{100}$

$\Rightarrow \ell = 158.4$ cm.

2014

The largest possible sphere is carved out of a wooden solid cube of side 7 cm. Find the volume of the wood left. $\left[\text{Use } \pi = \frac{22}{7}\right]$

Solution:

Diameter of sphere curved out = side of cube = 7cm ∴ r = 3.5 cm

Volume of cube = a^3

= 73

= 343 cm3

Volume of sphere curved out = 4/3 π r^3

= 4/3 × 22/7 × 7/2 × 7/2 × 7/2

= 179.66 cm^3

Volume of of wood left = 343 - 179.66 = 163.34 cm^3

Water in a canal, 6 m wide and 1.5 m deep, is flowing at a speed of 4 km/h. How much area will it irrigate in 10 minutes, if 8 cm of standing water is needed for irrigation?

Solution:

Speed = 4km/h = 200/3 m/min

Volume of water irrigate in 10 min = 10 × 6 × 1.5 × 200/3 = 6000m3

Volume of water irrigated = base area (of irrigated land) x height = base area x 8cm = base area x 0.08m

6000 = base area x 0.08

Base area = 6000/0.08 =75000 m^2 = 7.5 hectare

150 spherical marbles, each of diameter 1.4 cm, are dropped in a cylindrical vessel of diameter 7 cm containing some water, which are completely immersed in water. Find the rise in the level of water in the vessel.

Solution:

Volume of 150 spherical marbles, each of diameters 1.4 cm = volume of cylindrical vessel of diameter 7 cm

150 × 4/3 × π × 1.4/2 ×1.4/2 × 1.4/2 = π × 7/2 × 7/2 × h

h = 5.6 cm

A container open at the top, is in the form of a frustum of a cone of height 24 cm with radii of its lower and upper circular ends, as 8 cm and 20 cm respectively. Find the cost of milk which can completely fill the container at the rate of 21 per litre. $\left[\text{Use } \pi = \frac{22}{7}\right]$

Solution:

Volume of container = 1/3 π × h (R^2 + r^2 + Rr)

= 1/3 × 22/7 × 24[20 × 20 + 8 × 8 + 20 × 8]

= 15689.14 cm3

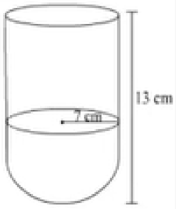
= 15.69 litre

The cost of milk which can completely fill the container at the rate of Rs.21 per liter = Rs. (21 × 15.69) = Rs. 329.49

2013

A vessel is in the form of hemispherical bowl surmounted by a hollow cylinder of same diameter. The diameter of the hemispherical bowl is 14 cm and the total height of the vessel is 13 cm. Find the total surface area of the vessel. $\left[\text{Use } \pi = \frac{22}{7}\right]$

Let the radius and height of cylinder be r cm and h cm respectively.



Diameter of the hemispherical bowl = 14 cm

∴ Radius of the hemispherical bowl = Radius of the cylinder

$= r = \frac{14}{2} \text{cm} = 7\text{cm}$

Total height of the vessel = 13 cm

∴ Height of the cylinder, h = 13 cm - 7 cm = 6 cm

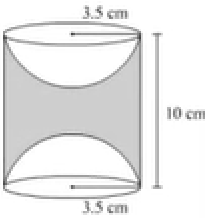
Total surface area of the vessel = 2(curved surface area of the cylinder + curved surface area of the hemisphere)

(Since, the vessel is hollow)

$= 2\ 2\pi rh + 2\pi r^2\ = 4\pi r\ h + r\ = 4 \times \frac{22}{7} \times 7 \times\ 6 + 7\ \text{cm}^2$

$= 1144\ \text{cm}^2$

A wooden toy was made by scooping out a hemisphere of same radius 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 volume of wood in the toy. $\left[\text{Use } \pi = \frac{22}{7}\right]$



Height of the cylinder, h = 10 cm

Radius of the cylinder = Radius of each hemisphere = r = 3.5 cm

Volume of wood in the toy = Volume of the cylinder - 2 × Volume of each hemisphere

$= \pi r^2 h - 2 \times \frac{2}{3} \pi r^3$

$= \pi r^2 \left(h - \frac{4}{3} r\right)$

$= \frac{22}{7} \times (3.5)^2 \left(10 - \frac{4}{3} \times 3.5\right)$

$= 38.5 \times\ 10 - 4.67$

$= 38.5 \times 5.33$

$= 205.205\ \text{cm}^3$

Radius = 21 cm

Water is flowing through a cylindrical pipe, of internal diameter 2 cm, into a cylindrical tank of base radius 40 cm, at the rate of 0.4 m/s. Determine the rise in level of water in the tank in half an hour.

Diameter of circular end of pipe = 2 cm

$\therefore$ Radius r_1 of circular end of pipe = $\frac{2}{200}\text{m} = 0.01\text{ m}$

Area of cross-section = $\pi \times r_1^2 = \pi \times 0.01^2 = 0.0001\pi\text{m}^2$

Speed of water = 0.4 m/s = 0.4 × 60 = 24 metre/min

Volume of water that flows in 1 minute from pipe = $24 \times 0.0001\pi\text{m}^3 = 0.0024\pi\text{m}^3$

Volume of water that flows in 30 minutes from pipe =

$30 \times 0.0024\pi\text{m}^3 = 0.072\pi\text{m}^3$

Radius (r_2) of base of cylindrical tank = 40 cm = 0.4 m

Let the cylindrical tank be filled up to h m in 30 minutes.

Volume of water filled in tank in 30 minutes is equal to the volume of water flowed out in 30 minutes from the pipe.

$\therefore \pi \times r_2^2 \times h = 0.072\pi$
$\Rightarrow 0.4^2 \times h = 0.072$
$\Rightarrow 0.16\text{ h} = 0.072$
$\Rightarrow h = \frac{0.072}{0.16}$
$\Rightarrow h = 0.45\text{ m} = 45\text{ cm}$

Therefore, the rise in level of water in the tank in half an hour is 45 cm.

A Group consists of 12 persons, of which 3 are extremely patient, other 6 are extremely honest and rest are extremely kind. A person from the group is selected at random. Assuming that each person is equally likely to be selected, find the probability of selecting a person who is (i) extremely patient (ii) extremely kind or honest. Which of the above values you prefer more?

The group consists of 12 persons.

$\therefore$ Total number of possible outcomes = 12

Let A denote event of selecting persons who are extremely patient

$\therefore$ Number of outcomes favourable to A is 3.

Let B denote event of selecting persons who are extremely kind or honest.

Number of persons who are extremely honest is 6.

Number of persons who are extremely kind is 12 - (6 + 3) = 3

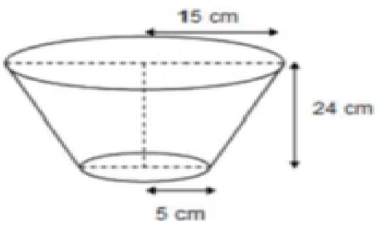
$\therefore$ Number of outcomes favourable to B = 6 + 3 = 9.

(i) $P\ A = \frac{\text{Number of outcomes favrouableto A}}{\text{Total number of possible outcomes}} = \frac{3}{12} = \frac{1}{4}$

(ii) $P\ B = \frac{\text{Number of outcomes favorableto B}}{\text{Total number of possible outcomes}} = \frac{9}{12} = \frac{3}{4}$

Each of the three values, patience, honesty and kindness is important in one's life.

A bucket open at the top, and made up of a metal sheet is in the form of a frustum of a cone. The depth of the bucket is 24 cm and the diameters of its upper and lower circular ends are 30 cm and 10 cm respectively. Find the cost of metal sheet used in it at the rate of Rs 10 per 100 cm². [Use $\pi = 3.14$]



Diameter of upper end of bucket = 30 cm

∴ Radius (r_1) of upper end of bucket = 15 cm

Diameter of lower end of bucket = 10 cm

∴ Radius (r_2) of lower end of bucket = 5 cm

Slant height (*l*) of frustum

$= \sqrt{r_1 - r_2{}^2 + h^2}$

$= \sqrt{15 - 5^2 + 24^2} = \sqrt{10^2 + 24^2} = \sqrt{100 + 576}$
$= \sqrt{676} = 26\text{cm}$

Area of metal sheet used to make the bucket

$= \pi\ r_1 + r_2\ l + \pi r_2^2$
$= \pi\ 15 + 5\ 26 + \pi\ 5^2$

$= 520\pi + 25\pi = 545\pi\text{cm}^2$

Cost of 100 cm^2 metal sheet = Rs 10

Cost of 545 π cm^2 metal sheet

$= \text{Rs.}\dfrac{545 \times 3.14 \times 10}{100} = \text{Rs.}171.13$

Therefore, cost of metal sheet used to make the bucket is Rs 171.13.

2012

The volume of a hemisphere is $2425\ \dfrac{1}{2}$ cm^3. Find its curved surface area.

[Use $\pi = \dfrac{22}{7}$]

Volume of a hemisphere $= \dfrac{2}{3}\ \pi r^3 = \dfrac{4851}{2}$

$$\Rightarrow\quad r^3 = \frac{441}{2} \times \frac{21}{4} = \left(\frac{21}{2}\right)^3 \Rightarrow r = \frac{21}{2}\text{ cm}$$

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

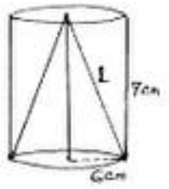
$$= \cancel{2} \times \frac{\overset{11}{\cancel{22}}}{7} \times \frac{21}{\cancel{2}} \times \frac{\overset{3}{\cancel{21}}}{\cancel{2}} = 693\text{ cm}^2$$

From a solid cylinder of height 7 cm and base diameter 12 cm, a conical cavity of same height and same base diameter is hollowed out. Find the total surface area of the remaining solid. [Use $\pi = \dfrac{22}{7}$]

OR

A cylindrical bucket, 32 cm high and with radius of base 18 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 cm, then find the radius and slant height of the heap.

23.



In case of cylinder : r = 6 cm, h = 7 cm

cone : $l = \sqrt{36+49} = \sqrt{85}$ cm ½m

∴ Total surface area of remaining solid

$= \pi r^2 + 2\pi rh + \pi rl$ ½+½m

$= \frac{22}{7} \times 6 \left[6 + 14 + \sqrt{85}\right] \text{cm}^2$

$= \frac{132}{7} \left[20 + \sqrt{85}\right] \text{cm}^2$ 1½m

or 550.63 cm^2

OR

Volume of sand in the bucket = $\left[\pi (18)^2 \cdot 32\right] \text{cm}^3$ ....(i) 1 m

let r be the radius of conical heap of sand

∴ Volume of sand in it = $\frac{1}{3}\pi (r)^2 \cdot 24 = 8\pi r^2 \text{ cm}^3$ ....(ii)

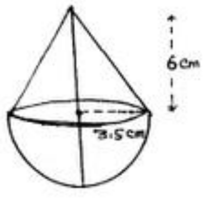
from (i) and (ii), $\pi(18)^2 \times 32 = 8\pi r^2 \Rightarrow r = 36$ cm 1 m

slant height of heap = $\sqrt{r^2 + h^2} = \sqrt{36^2 + 24^2} = \sqrt{1872}$ or $12\sqrt{13}$ cm 1 m

A solid is in the shape of a cone surmounted on a hemisphere, the radius of each of them being 3.5 cm and the total height of solid is 9.5 cm. Find the volume of the solid. [Use $\pi = \frac{22}{7}$].

Figure ½m

Volume of solid =



Volume of conical part + Volume of hemispherical part ½m

$= \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 6 + \frac{2}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2}$ 1½+½m

$= \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} [6+7] = \frac{77}{6} \times 13$ or $\frac{1001}{6} \text{ cm}^3$

1 m

or $166\frac{5}{6} \text{ cm}^3$

A bucket is in the form of a frustum of a cone and it can hold 28.49 litres of water. If the radii of its circular ends are 28 cm and 21 cm, find the height of the bucket. [Use $\pi = \frac{22}{7}$].

Volume of water in the bucket = 28.49 m or 28490 cm^3 ½ m

Let h be the height of bucket

$\therefore \quad 28490 = \frac{1}{3} \times \frac{22}{7} \times h \ (28^2 + 21^2 + 28 \times 21)$ 2 m

$\Rightarrow \quad h = \frac{28490 \times 21}{22} \left(\frac{1}{1813}\right)$ or 15 cm 1 m

$\therefore$ height of frustum = 15 cm ½ m