UNIQUE STUDY POINT

IMPORTANT QUESTIONS PPT

CLASS X

SURFACE AREA AND VOLUME

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TGT MATHEMATICS

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If the radius of the sphere is increased by 100%, the volume of the corresponding sphere is increased by

(a) 200%
(b) 500%
(c) 700%
(d) 800%

Let r be the original radius of sphere. If we increased radius by 100 %. it will be $2r$.

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

Now $$V_{2r} = \frac{4}{3}\pi \times (2r)^3 = \frac{4}{3}\pi \times 8r^2$$

Thus new volume is 8 times of original volume.
Hence when the radius is increased by 100%, the corresponding volume becomes 800% and thus increase is 700%.
Thus (c) is correct option.

Ratio of volumes of two cylinders with equal height is

(a) $H : h$

(b) $R : r$

(c) $R^2 : r^2$

(d) None of these

Sol :

$$\pi R^2 h : \pi r^2 h = R^2 : r^2$$

Thus (c) is correct option.

The base radii of a cone and a cylinder are equal. If their curved surface areas are also equal, then the ratio of the slant height of the cone to the height of the cylinder is

(a) 2 : 1

(b) 1 : 2

(c) 1 : 3

(d) 3 : 1

From a solid circular cylinder with height 10 cm and radius of the base 6 cm, a right circular cone of the same height and same base is removed, then the volume of remaining solid is

(a) $280\,\pi \text{cm}^3$

(b) $330\,\pi \text{cm}^3$

(c) $240\,\pi \text{cm}^3$

(d) $440\,\pi\ \text{cm}^3$

Volume of the remaining solid

$$= \text{Volume of the cylinder} - \text{Volume of the cone}$$

$$= \pi \times 6^2 \times 10 - \frac{1}{3} \times \pi \times 6^2 \times 10$$

$$= (360\pi - 120\pi) = 240\pi \text{ cm}^3$$

Thus (c) is correct option.

Assertion : If the height of a cone is 24 cm and diameter of the base is 14 cm, then the slant height of the cone is 15 cm.

Reason : If r be the radius and h be the slant height of the cone, then slant height $= \sqrt{h^2 + r^2}$.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

Sol :

Slant height $l = \sqrt{\left(\frac{14}{2}\right)^2 + (24)^2}$

$= \sqrt{49 + 576}$

$= \sqrt{625} = 25$

Assertion (A) is false but reason (R) is true.

Thus (d) is correct option.

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.

Here diameter of hemisphere is equal to the side of cubical block which is 7 cm.

Diameter of hemisphere = Side of cubical block

$$2r = 7 \Rightarrow r = \frac{7}{2}$$

Surface area of solid

= Surface area of the cube

− Area of base of hemisphere

+ curved surface area of hemisphere

$= 6\ell^2 - \pi r^2 + 2\pi r^2$

$= 6\ell^2 + \pi r^2$

$= 6 \times 7^2 + \frac{22}{7} \times \left(\frac{7}{2}\right)^2$

$= 6 \times 49 + \frac{77}{2} = 332.5 \text{ cm}^2$

A 5 m wide cloth is used to make a conical tent of base diameter 14 m and height 24 m. Find the cost of cloth used at the rate of Rs.25 per meter.

Slant height of tent,

$$l = \sqrt{r^2 + h^2} = \sqrt{7^2 + 24^2}$$

$$= \sqrt{625} = 25 \text{ m}.$$

Curved surface area of cone,

$$\pi rl = \frac{22}{7} \times 7 \times 25 = 550 \text{ m}^2$$

Curves surface area of tent will be required area of cloth.
Let x meter of cloth is required

$$5x = 550 \text{ or, } x = \frac{550}{5} = 110 \text{ m}.$$

Thus 110 m of cloth is required.

$$\text{Cost of cloth} = 25 \times 110 = Rs.2750.$$

From a solid cylinder whose height is 15 cm and the diameter is 16 cm, a conical cavity of the same height and same diameter is hollowed out, Find the total surface area of remaining solid. (Given your answer in terms of π).

Height of cylinder, $h = 15$ cm

Radius of cylinder, $r = \frac{16}{2} = 8$ cm

Radius of base of cone, $r = 8$ cm

Let slant height of cone be l, then we have

$$l = \sqrt{r^2 + h^2} = \sqrt{8^2 + 15^2}$$

$$= \sqrt{64 + 225} = \sqrt{289}$$

Thus $l = 17$ cm

TSA of reaming solid

= Top area of cylinder+

+ CSA of cylinder + CSA of conical cavity

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

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

$$= \pi \times 8(3 + 2 \times 15 + 17)$$

$$= \pi \times 8 \times 55 = 440\pi$$

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 ?

Water flow in 1 hour,

$$= \text{Area of cross-section} \times \text{Speed of water}$$

$$= 5.4 \times 1.8 \times 25000 \text{ m}^3$$

$$= 54 \times 18 \times 250 \text{ m}^3$$

Water flow in 40 minutes,

$$= 54 \times 18 \times 250 \times \frac{40}{60} \text{ m}^3$$

$$= 54 \times 6 \times 500 \text{ m}^3$$

Let A be the irrigated area then volume of water in irrigated area is equal to the water flow.

Thus $A \times 0.1 = 54 \times 6 \times 500$

$$A = 54 \times 6 \times 500 \times 10$$

$$= 1620000 \text{ m}^3$$

DK Jain runs a company that makes ball bearings. The bearings are shipped in boxes that are then loaded onto trucks. Each bearing has a diameter of 18 mm.

(i) Each box can hold 3888π cm^3 of ball bearings. How many ball bearings can a box hold?

(ii) Each ball bearing has a mass of 4 gm. Determine the mass of each box.

(iii) The maximum mass a truck can carry is 11000 kg. What is the maximum number of boxes that can be loaded into a truck?

(i) Volume of a ball bearing

$$V = \frac{4}{3}\pi r^3$$
$$= \frac{4}{3}\pi\left(\frac{18}{2}\right)^3$$
$$= \frac{4 \times \pi \times 9 \times 9 \times 9}{3} = 972\pi \text{ mm}^3$$

Since box can hold $3888\pi \text{ cm}^3$ or $3888000\pi \text{ mm}^2$, ball bearing in box

$$= \frac{3888000\pi}{972\pi}$$
$$= 4000 \text{ ball bearing}$$

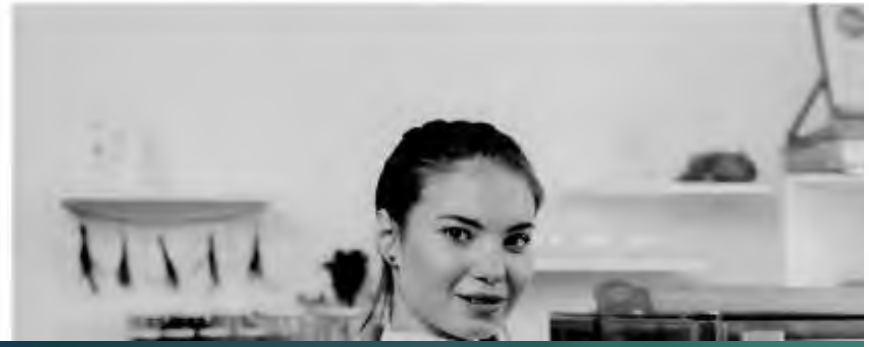
(ii) Mass of box

$$= 4000 \times 4$$
$$= 16000 \text{ gm} = 16 \text{ kg}$$

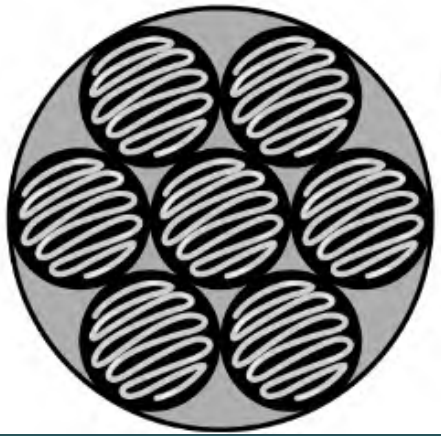
(iii) Maximum number of box loaded in truck,

$$= \frac{12000}{16} = 750 \text{ box}$$

A bakery is an establishment that produces and sells flour-based food baked in an oven such as bread, cookies, cakes, pastries, and pies. Some retail bakeries are also categorized as cafés, serving coffee and tea to customers who wish to consume the baked goods on the premises.



Tania runs a bakery shop and her bakery is very famous for tasty biscuits. The amount of mixture required to make one biscuit is 18 cu cm. Before it is cooked, the mixture is rolled into a sphere. After the biscuit is cooked, the biscuit becomes a cylinder of radius 3 cm and height 0.7 cm. The increase in volume is due to air being trapped in the biscuit. Biscuits are packed in a cylindrical card box of height 14 cm. The arrangement of biscuits is shown below.



(i) What is the volume of the biscuits after it is cooked ?

(ii) What is the volume of air trapped, while cooking the biscuit ?

(iii) How many biscuits will be there in a box ?

(iv) How much space is vacant in box after biscuits are packed ?

(v) If weight of 7 biscuits is 50 grams, what will be the weight of box of biscuits?

(i) Volume of the biscuit,

$$= \pi r^2 h = \frac{22}{7} \times 3^2 \times 0.7 = 19.8 \text{ cu cm}$$

(ii) Volume of air trap

= Volume of biscuit − Volume of sphere

$= 19.8 - 18 = 1.8$ cu cm

(iii) In a layer, 7 biscuits are arranged whose height is 0.7 cm.

Thus total layer in box,

$$= \frac{14}{0.7} = 20 \text{ layer}$$

Total biscuits in box $= 20 \times 7 = 140$ biscuits

(iv) From figure it is clear that radius of box is 3 times of biscuit radius i.e. $3 \times 3 = 9$.

$$\text{Volume of box} = \pi R^2 H$$

$$= \frac{22}{7} \times 9 \times 9 \times 14$$

$$= 22 \times 9 \times 9 \times 2$$

$$= 3564 \text{ cm}^3$$

$$\text{Volume of biscuits} = \pi r^2 h \times 140$$

$$= 19.8 \times 140 = 2772 \text{ cm}^3$$

$$\text{Vacant volume} = 3564 - 2772 = 792 \text{ cm}^3$$

(v) Weight of 7 biscuits = 50 grams

$$\text{Weight of 140 biscuits} = \frac{50}{7} \times 140$$

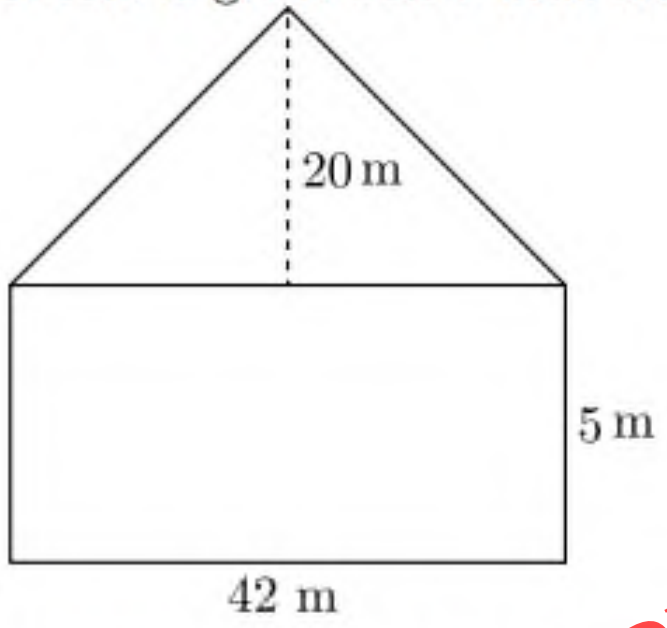
$$= 1000 \text{ grams} = 1 \text{ kg}$$

Government of UP is planing to procure tent for the pilgrims during Kumbh Mela. The specification of tent is given below.

(1) Lower cylindrical part must have a white colored thick fabric whose cost is ₹ 60 per square meter.

(2) Top conical part must have PVC coated blue fabric whose cost is ₹ 70 per square meter.

The front view of tent is given below with dimension.



(i) How much blue PVC coated fabric is required?

(ii) How much white fabric is required ?

(iii) If labour charge for the construction of tent is ₹ 15 per sq. meter what is the total cost of tent ?

(iv) If space requirement of a pilgrims is 6 sq. meter, how many pilgrims can be accommodate in a tent?

(v) If total 50000 pilgrims are expected to visit fair, how many tents are required ?

(i) Common radius of conical and cylindrical part is $\frac{42}{2} = 21$ m. Height of conical part is equal to its radius 21 m.

Surface area of conical part of tent

$$\pi rl = \pi r\sqrt{h^2 + r^2}$$

$$= \frac{22}{7} \times 21 \times \sqrt{(21)^2 + (20)^2}$$

$$= 22 \times 3 \times 29$$

$$= 1914 \text{ sq. meter}$$

Thus, 1914 sq. meter of blue PVC coated fabric is required.

(ii) Surface area of cylindrical part of tent,

$$= 2\pi rh$$

$$= 2 \times \frac{22}{7} \times 21 \times 5$$

$$= 660 \text{ sq. meter}$$

(iii) Total cost is sum of material cost and construction cost of both type of fabric.

$$\begin{aligned}\text{Total cost} &= \text{White fabric cost} + \text{Blue fabric cost}\\ &= (60+15)\times 1914 + (70+15)\times 660\\ &= 75\times 1914 + 85\times 660\\ &= 75(1914 + 17\times 44)\\ &= ₹199650\end{aligned}$$

(iv) Total floor area of tent,

$$\begin{aligned}\pi r^2 &= \frac{22}{7}\times 21\times 21\\ &= 22\times 3\times 21\\ &= 1386 \text{ sq. meter}\end{aligned}$$

$$\text{Pilgrims in a tent} = \frac{1386}{6} = 231 \text{ pilgrims}$$

(v) Total requirement of tent

$$= \frac{50000}{231} = 216.45$$

Thus, 217 tent are required.