CBSE Grade 9th

Surface area and Volume

Q1) An open thermocol box 70cm long, 55cm wide and 30cm high. Is made of 1.5cm thick thermocol sheet. Find capacity and volume of box. Find volume of thermocol used. Find weight of box if 1000cm^3 of thermocol weight 10gm.

Q2) If a gift seller placed an order for making cardboard boxes of size 18cm x 15cm x 3cm. If 5% of the total surface area is required extra for all overlaps and the cost of cardboard is ₹5 for 1000cm^2. Find the cost of cardboard required to make 200 such boxes. If all the boxes are bordered with beautiful ribbons, find the length of ribbon required.

Q3) A well of inner diameter 14m is dug to a depth of 18m. Earth taken out from it is used for its embarkment 7m. Find the height of embarkment so formed.

Q4) A cloth having area of 189m^2 is shaped into the form of a conical circus tent of radius 6m.

i) How many spectators can sit inside it, if on an average, each spectators occupies $\frac{8}{7}$m^2 on ground?

ii) Find Slant height and height of Tent

iii) If on average each spectators needs 15 m^3 of air. Is this tent is big enough to accommodate 20 spectators.

(round to one decimal places when required)

Q5) A hollow sphere of external and internal diameter 8cm and 4cm respectively is melted into cone of base diameter 8cm. Find the height of cone.

Q6) The volume of two spheres are in ratio 64:27. Find the ratio of their surface areas.

Solutions

CBSE 9th Surface area and Volume

Sol.1) External Length of box = 70 cm

External breadth of box = 55 cm

External height of box = 30 cm

Volume of box = 70 x 55 x 30 = 1,15,500 cm^3

Internal Length of box = 67 cm

Internal breadth of box = 52 cm

Internal height of box = 28.5 cm

Capacity (Internal Volume) of box = 67 x 52 x 28.5 = 99,294 cm^3

Volume of thermocol used = External Volume – Internal Volume =1,15,500 - 99,294 = 16,206 cm^3

Weight of box = $\frac{16206}{1000} \times 10$ = 162.06gm

Sol.2) Length of box = 18 cm

Breadth of box = 15 cm

Height of box = 3 cm

Total surface area = $2(lb + bh + hl)$

$$= 2(18 \times 15 + 15 \times 3 + 3 \times 18) = 2(270 + 45 + 54) = 738cm^2$$

=TSA of extra cardboard required for overlapping = $\frac{5}{100} \times 738 = 36.90\ cm^2$

TSA of total cardboard required for one box = 738 + 36.90 = 774.9 cm^2

TSA of total cardboard required for 200 such box = 774.9 x 200 = 1,54,980 cm^2

Cost of cardboard for 200 boxes = $\frac{1,54,980}{1000} \times 5$ = ₹774.90

Ribbon required for bordering = perimeter of top + perimeter of bottom + 4 vertical edges

= {2(l + b) +2(l + b) +4h} = 4(l + b) +4h = 4(l +b + h) = 4(36) = 144 cm or 1m 44cm

Sol.3)

Volume of earth dug = Volume of well

= $(\pi r^2 h)$

= $\frac{22}{7} \times 7 \times 7 \times 18 = 2772m^3$

External radius of embarkment = 14m

internal radius of embarkment = 7m

let height of embarkment = h

Volume of embarkment = Volume of embarkment with external radius – Volume of embarkment with internal radius

= $\left(\frac{22}{7} \times 14 \times 14 \times h - \frac{22}{7} \times 7 \times 7 \times h\right)$

= $\left(\frac{22}{7} \times 14 \times 14 - \frac{22}{7} \times 7 \times 7\right) h$

= 22 x 7 x (4 - 1) = 22 x 7 x 3 = 462 h m^2

Volume of embarkment = volume of earth dug

462 h = 2772

$h = 6m$

Sol.4)

i) Base area of tent = πr^2

= $\frac{22}{7} \times 6 \times 6 = \frac{792}{7} = 113.14$ m^2

Space occupied by each spectator = $\frac{8}{7}$ m^2

Number of spectators = $\frac{792}{7} \times \frac{7}{8} = 99$

ii)

Curved surface area of cone = area of cloth

Curved surface area of cone = $\pi r l$

$\frac{22}{7} \times 6 \times l$ = 189m^2

$l = 10.02 = 10m$

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

$\sqrt{(10^2 - 6^2)}$ = $\sqrt{64}$ = 8

Volume of Cone = $\frac{1}{3}\pi r^2 h$

= $\frac{1}{3} \times \frac{22}{7} \times 6 \times 6 \times 8$ = 301.71 m^3

No. of spectators it can accommodate = $\frac{301.71}{15}$ = 20.11

Yes, it can accommodate 20 spectators.

Sol.5) External Radius = 4cm

Internal radius = 2cm

Volume of material of sphere = $\frac{4}{3}\pi(4^3 - 2^3)cm^3$

=$\left(\frac{224\pi}{3}\right) cm^3$

Volume of cone = = $\frac{1}{3}\pi r^2 h = \left(\frac{224\pi}{3}\right) cm^3$

Radius of cone = 4cm

$$\frac{1}{3}\pi 4^2 h = \left(\frac{224\pi}{3}\right)$$

$$\frac{1}{3}\pi 16h = \left(\frac{224\pi}{3}\right)$$

$$h = 14cm$$

Sol.6) Let the radius of two sphere be r_1 and r_2 respectively.

Let volume of two sphere be V_1 and V_2 respectively.

$$\frac{V_1}{V_2} = \frac{64}{27}$$

$$\frac{64}{27} = \frac{\frac{4}{3}\pi {r_1}^3}{\frac{4}{3}\pi {r_2}^3}$$

$$= \frac{{r_1}^3}{{r_2}^3} = \frac{64}{27} = \frac{4}{3}$$

Let surface area of two sphere be S_1 and S_2 respectively.

$$\frac{S_1}{S_2} = \frac{4\pi {r_1}^2}{4\pi {r_2}^2} = \left(\frac{r_1}{r_2}\right)^2 = \frac{16}{9}$$

Hence, $S_1 : S_2 = 16 : 9$