Surface Area and volume of cuboid and cube – 18.2

1.

Sol:

Given length $= 6cm$

Breath $= 56m$

Height $= 4\cdot 5m$

Volume of the tank $= l\times b\times h = 6\times 5(4\cdot 5) = 135m^3$ It is given that

$1m^3 = 1000$ liters

$\therefore 135m^3 = (135\times 1000)$ liters

$= 1,35,000$ liters

$\therefore$ The tank can hold $1,35,000$ liters of water

2.

Sol:

Given that

Length of vessel (l) = 10m

Width of vessel (b) = 8m

Let height of the cuboidal vessel be ‘h’

Volume of vessel $= 380m^3$

$\therefore l\times b\times h = 380$

$10\times 8\times h = 380$

$h = 4\cdot 75$

$\therefore$ height of the vessel should be $4\cdot 75m$.

3.

Sol:

Given length of the cuboidal P it $(l) = 8m$

Width $(b) = 6m$

Depth $(h) = 3m$

Volume of cuboid pit $= l\times b\times h = (8\times 6\times 3)m^3$

$= 144m^3$

Cost of digging $1m^3 = Rs\ 30$

Cost of digging $144m^3 = 144(Rs\ 30) = Rs\,4320$.

4.

Sol:
Given that
Length $= a$
Breadth $= b$
Height $= c$
Volume $(v) = l \times b \times h$
$= a \times b \times c = abc$
Surface area $= 2(lb + bh + hl)$
$= 2(ab + bc + ac)$
Now, $\frac{2}{5}\left[\frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right] = \frac{2}{2(ab+bc+ca)} \frac{[ab+bc+ca]}{abc}$
$= \frac{1}{abc} = \frac{1}{v}$

5.

Sol:
Let a, b, d be the length, breath and height of cuboid then,
$x = ab$
$y = bd,$
$z = da,\ and$
$v = abd \qquad [v = l \times b \times h]$
$\Rightarrow xyz = ab \times bc \times ca = (abc)^2$
And $v = abc$
$v^2 = (abc)^2$
$v^2 = xyz$

6.

Sol:
WKT, if x, y, z denote the areas of three adjacent faces of a cuboid
$\Rightarrow x = l \times b, y = b \times h, z = l \times h.$
Volume V is given by
$V = l \times b \times h.$
Now, $xyz = l \times b \times b \times h \times l \times h = V^2$
Here $x = 8$

$y = 18$

And $z = 25$

$\therefore v^2 = 8 \times 18 \times 25 = 3600$

$\Rightarrow v = 60cm^3.$

7.

Sol:

We have,

$b = 2h \ and \ b = \frac{1}{2}.$

$\Rightarrow \frac{l}{2} = 2h$

$\Rightarrow l = 4h$

$\Rightarrow l = 4h, b = 2h$

Now,

Volume $= 512 \ dm^3$

$\Rightarrow 4h \times 2h \times h = 512$

$\Rightarrow h^3 = 64$

$\Rightarrow h = 4$

So, $1 = 4 \times h = 16dm$

$b = 2 \times h = 8dm$

And $h = 4dm$

8.

Sol:

Radius of water flow $= 2km \ per \ hour = \left(\frac{2000}{60}\right) m / \min$

$= \left(\frac{100}{3}\right) m / \min$

Depth (h) of river = 3m

Width (b) of river = 40m

Volume of water followed in 1 min $= \frac{100}{3} \times 40 \times 3m^2 - 4000m^3$

Thus, 1 minute $4000 \ m^3 = 4000000$ liters of water will fall in sea.

9.

Sol:

Given that,

Water in the canal forms a cuboid of

width $(h) = 300d\ m = 3m$

height $= 12\ m = 1\cdot 2m$

length of cuboid is equal to the distance travelled in 30 min with the speed of 100 km per hour

$\therefore$ length of cuboid $= 100 \times \frac{30}{60} km = 50000$ meters

So, volume of water to be used for irrigation $= 50000 \times 3 \times 1\cdot 2m^3$

Water accumulated in the field forms a cuboid of base area equal to the area of the field and height equal to $\frac{8}{100}$ *meters*

$\therefore$ Area of field $\times \frac{8}{100} = 50,000 \times 3 \times 1\cdot 2$

$\Rightarrow$ Area of field $= \frac{50000 \times 3 \times 1\cdot 2 \times 100}{8}$

$= 2,250000$ meters

10.

Sol:

Let the length of each edge by of the new cube be a cm

Then,

$a^3 = \left(6^3 + 8^3 + 10^3\right) cm^3$

$\Rightarrow a^3 = 1728$

$\Rightarrow a = 12$

$\therefore$ Volume of new cube $= a^3 = 1728cm^3$

Surface area of the new cube $= 5a^2 = 6 \times 12^2 cm^2$

$= 864cm^2$.

Diagonals of the new cube $= \sqrt{3a} = 12\sqrt{3}cm.$

11.

Sol:

Given that

Volume of cube $= 512cm^3$

$\Rightarrow side^3 = 512$

$\Rightarrow side^3 = 8^3$

$\Rightarrow side = 8cm$

Dimensions of new cuboid formed

$l = 8 + 8 = 16cm, b = 8cm, h = 8cm$

Surface area $= 2(lb + bh + hl)$

$= 2[16(8) + 8(8) + 16(8)] = 2[256 + 64]$

$= 640cm^2$

$\therefore$ Surface area is $640cm^2$.

12.

Sol:

Given that

Volume of gold $= 0 \cdot 5m^3$

Area of gold sheet = 1 hectare = 10000 m^2

$\therefore$ Thickness of gold sheet $= \dfrac{Volume\ of\ \ gold}{Area\ of\ \ gold\ \ sheet}$

$= \dfrac{0 \cdot 5m^3}{1 Hectare}$

$= \dfrac{0 \cdot 5m^3}{1000000m^2}$

$= \dfrac{5}{10000} \times 10m$

$= \dfrac{100}{20000} m$

Thickness of gold sheet $= \dfrac{1}{200} cm.$

13.

Sol:

Volume of large cube = $V_1 + V_2 + V_3$

Let the edge of the third cube be x cm

$123^3 = 6^3 + 8^3 + x^3$ [Volume of cube $= side^3$]

$1728 = 216 + 512 + x^3$

$\Rightarrow x^3 = 1728 - 728 = 1000$

$\Rightarrow x = 10cm$

$\therefore$ Side of third side $= 10cm.$.

14.

Sol:

Given that

Volume of cinema hall $=100\times50\times18m^3$

Volume air required by each person $=150m^3$

Number of person who can sit in the hall

$$=\frac{volume\ of\ \ cinema\ \ hall}{volume\ of\ \ air\ \ req\ \ each\ \ person}$$

$$=\frac{100\times50\times18m^3}{150m^3}=600 \qquad [\because V=l\times b\times h]$$

$\therefore$ number of person who can sit in the hall

$=600$ members

15.

Sol:

Let the length of the block be 1cm

Then, volume $=l\times28\times5\ cm^3$

$\therefore$ weight $=140\times0\cdot25\ kg$

According to the question

$\Rightarrow 112=1401\times0\cdot25$

$$\Rightarrow l=\frac{112}{140\times0\cdot25}=3\cdot2cm$$

16.

Sol:

Given external dimensions of cuboid are

$l=25cm, b=18cm, h=15cm.$

$\therefore$ External volume $=l\times b\times h$

$=25\times15\times15cm^3$

$=6750cm^3.$

Internal volume $=l\times b\times h$

$=21\times14\times11cm^3$

$=3234cm^3$

$\therefore$ Volume of liquid that can be placed $=3234cm^3$

Now, volume of wood = external volume – Internal volume

$=6750-3324$

$=3516cm^3$

17.

Sol:

Given internal dimensions are

$l = 48 - 2 \times \text{thickness} = 48 - 3 = 45cm$

$b = 36 - 3 = 33cm$

$h = 30 - 3 = 27\,cm$

$\therefore$ Internal volume $= 45 \times 33 \times 27cm^3$

Volume of brick $= 5 \times 3 \times 0 \cdot 75cm^3$

Hence, number of bricks $= \dfrac{Internal\ volume}{volume\ of\ 1\ brick}$

$= \dfrac{45 \times 33 \times 27}{6 \times 3 \times 0 \cdot 37}$

$= \dfrac{38880}{13 \cdot 5}$

$= 2970$

$\therefore$ 2970 bricks can be kept inside the box

18.

Sol:

Outer dimensions

$l = 36\ cm$

$b = 25\ cm$

$h = 16 \cdot 5cm$

Inner dimensions

$l = 36 - (2 \times 1 \cdot 5) = 33cm$

$b = 25 - (3) = 22cm$

$h = 16 \cdot 5 - 1 \cdot 5 = 15cm$

Volume of iron = outer volume – inner volume

$= (36 \times 25 \times 16 \cdot 5 - 33 \times 12 \times 15)cm^3 = 3960cm^3$

Weight of iron $= 3960 \times 1 \cdot 59m = 59400gm = 59 \cdot 4kg$

19.

Sol:

Volume of cube $= S^3 = 9^3 = 729cm^3$

Area of base $l \times b = 15 \times 12 = 180cm^2$

Rise in water level $= \frac{Volume\ of\ \ cube}{Area\ of\ \ base\ of\ \ rec\tan gular\ vessel}$

$= \frac{729}{180} = 4 \cdot 05cm$

20.

Sol:

Let the length of each edge of the cube be x cm

Then,

Volume of cube = volume of water inside the tank + volume of water that over flowed

$x^3 = (5 \times 5 \times 1) + 2 = 25 + 2$

$x^3 = 27$

$x = 3cm$

Hence, volume of cube = $27cm^3$

And edge of cube $= 3cm.$

21.

Sol:

Volume of earth dug out $= 50 \times 40 \times 7\,m^3$

$= 14000m^3$

Let the height of the field rises by h meters

$\therefore$ volume of filed (cuboidal) = Volume of earth dugout

$\Rightarrow 200 \times 150 \times h = 1400$

$\Rightarrow h = \frac{1400}{200 \times 150} = 0 \cdot 47m.$

22.

Sol:

Let the level of the field be risen by h meters volume of the earth taken out from the pit

$= 7 \cdot 5 \times 6 \times 0 \cdot 8m^3$

Area of the field on which the earth taken out is to be spread $= 18 \times 15 - 7 \cdot 5 \times 6 = 225m^2$

Now, area of the field $Yh =$ volume of the earth taken out from the pit

$\Rightarrow 225 \times h = 7 \cdot 5 \times 6 \times 0 \cdot 8$

$\Rightarrow h = \frac{36}{225} = 0 \cdot 16m = 16cm.$

23.

Sol:

Let the level of water be risen by h cm.

Then,

Volume of water in the tank $= 8000 \times 2500 \times h cm^2$

Area of cross – section of the pipe $= 25 cm^2$.

Water coming out of the pipe forms a cuboid of base area $25 cm^2$ and length equal to the distance travelled in 45 minutes with the speed 16km/hour.

i.e., length $= 16000 \times 100 \times \frac{45}{60} cm$

$\therefore$ Volume of water coming out of pipe in 45 minutes

$= 25 \times 16000 \times 100 \left(\frac{45}{60}\right)$

Now, volume of water in the tank $=$ volume of water coming out of the pipe in 45 minutes

$\Rightarrow 8000 \times 2500 \times h = 16000 \times 100 \times \frac{45}{60} \times 25$

$\Rightarrow h = \frac{16000 \times 100 \times 45 \times 25}{8000 \times 2500 \times 60} cm = 1 \cdot 5 cm.$

24.

Sol:

Given that,

Flow of water $= 15 km/hr$

$= 15000 m/hr.$

Volume of water coming out of the pipe in one hour

$= \frac{20}{100} \times \frac{20}{100} \times \pm 5000 = 600 m^3$

Volume of the tank $= 80 \times 60 \times 6 \cdot 5$

$= 31200 m^3$

$\therefore$ Time taken to empty the tank

$= \frac{Volume\ of\ \tan k}{volume\ of\ water\ co\min g\ out\ of\ the\ pipe\ in\ one\ hour}$

$= \frac{31200}{600}$

$= 52\ hours.$

25.

Sol:

Given that

Length of the cuboidal tank $(l) = 20m$

Breath of the cuboidal tank $(b) = 15m.$

Height of the tank $= l \times b \times h = (20 \times 15 \times 6)\, m^3$

$= 1800 m^3$

$= 1800000$ liters.

Water consumed by people of village in one day

$= 4000 \times 150$ *litres.*

$= 600000$ *litres.*

Let water of this tank lasts for n days

Water consumed by all people of village in n days = capacity of tank

$n \times 600000 = 1800000$

$n = 3$

Thus, the water of tank will last for 3 days.

26.

Sol:

Volume of each cube = edge $\times$ edge $\times$ edge

$= 3 \times 3 \times 3 cm^3 = 27 cm^3.$

Number of cubes in the surface structure $= 15$

$\therefore$ Volume of the structure $= 27 \times 15 cm^3$

$= 405 cm^3.$

27.

Sol:

Given go down length $(l_1) = 40m.$

Breath $(b_1) = 25m.$

Height $(h_1) = 10m.$

Volume of go down $= l_1 \times b_1 \times h_1 = 40 \times 25 \times 10 m^3$

$= 10000 m^3$

Wood of wooden crate $= l_2 \times b_2 \times h_2$

$= 1 \cdot 5 \times 1 \cdot 25 \times 0 \cdot 25 m^3 = 0 \cdot 9375 m^3$

Let m wooden creates be stored in the go down volume of m wood crates = volume of go down

$0 \cdot 9375 \times n = 10000$

$n = \dfrac{10000}{0 \cdot 9375} = 10,666 \cdot 66,$

Thus, $10,666 \cdot 66$ wooden crates can be stored in go down.

28.

Sol:

Given that

The wall with all its bricks makes up the space occupied by it we need to find thee volume of the wall, which is nothing but cuboid.

Here, length $= 10m = 1000cm$

Thickness $= 24cm$

Height $= 4m = 400cm$

$\therefore$ The volume of the wall

$= length \times breadth \times height$

$= 1000 \times 24 \times 400 cm^3$

Now, each brick is a cuboid with length = 24cm,

Breadth $= 12cm\ and\ height = 8cm.$

So, volume of each brick = length $\times$breadth $\times$height

$= 24 \times 12 \times 8 cm^3$.

So, number of bricks required $= \dfrac{Volume\ of\ the\ wall}{Volume\ of\ each\ brick}$

$= \dfrac{1000 \times 24 \times 400}{24 \times 12 \times 8}$

$= 4166 \cdot 6.$

So, the wall requires 167 bricks.