4. Rectangular Parallelopiped or Cuboid

Let us Work Out 4

1. Question

Let us write the names of 4 cuboid and 4 cube shaped solid things of our environment.

Answer

4 cuboidal shapes found in the environment are books, pencil boxes, mobile phones, and windows.

4 cubical shapes found in the environment are sweets, ice cubes, sugar cubes, and dice.

2. Question

Let us write the names of surfaces, edges, and vertices of the adjoining cuboidal figure.
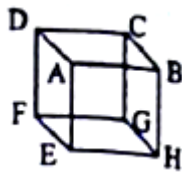
Answer

The above cuboidal figure has 6 surfaces, 12 edges, and 8 vertices.

6 surfaces are ABCD, EFGH, CBGH, ADFE, ABHE, and DCGF.

12 edges are AB, BH, EH, AE, DC, CG, GF, FD, DA, CB, FE, and GH.

8 vertices are A, B, C, D, E, F, G, and H.

3. Question

The length, breadth, and height of a cuboidal room are 5m, 4m and 3m respectively, Let us write the length of the longest rod which can be kept in that room.

Answer

Given, length of the room = 5 m

breadth of the room = 4 m

and height of the room = 3 m

Therefore, length of the longest rod = length of the body diagonal

$$= \sqrt{5^2 + 4^2 + 3^2}$$

$$= \sqrt{25 + 16 + 9}$$

$$= \sqrt{50} = 5\sqrt{2} \text{ m}$$

4. Question

The area of one surface of a cube is 64 sq.m., let us calculate the volume of the cube.

Answer

Let the surface of the cube be 'a' m.

We know that all surfaces of a cube are equal.

Therefore, the surface area of the cube = a^2

Given surface area of the cube = 64 sq. m

∴ a^2 = 64

⇒ a = $\sqrt{64}$

⇒ a = 8 m

We know that the volume of a cube = a^3

∴ Volume = 8^3 = 8×8×8 = 512 m^3

5. Question

In our Bokultala village, a canal is cut whose breadth is of 2m. and depth is of 8 dcm. If the total quantity of soil extracted is 240 cubic metre, then let us calculate the length of the canal.

Answer

Given , the breadth of the canal = 2m

And the depth of the canal = 8 dcm = $\dfrac{8}{1000}$ m

As we know that 1m = 1000 dcm

Volume of the canal = 240 cubic m

We know that volume = area × length

⇒ 240 = 2 × $\dfrac{8}{1000}$ × length

⇒ length = $240 \times \dfrac{10000}{2 \times 8}$

⇒ length = 150000 dcm = 15 m

6. Question

If the length of the diagonal of a cube is 43 cm.,then let us calculate the total surface area of the cube.

Answer

Let the edge of a cube be a cm.

We know that the body diagonal of a cube = 3a cm

∴ According to question,

3 a = 43

a = $\dfrac{4\sqrt{3}}{\sqrt{3}}$ = 4 cm

As, total surface area of a cube = $6a^2$ sq.cm

= $6 \times (4)^2$

= 6×16

= 96 sq. cm

7. Question

The sum of length of the edges of a cube is 60 cm, let us find out the volume of the cube.

Answer

Let the edge of a cube be a cm.

We know that total length of edges of a cube = 12a cm

According to question ,

12a = 60

⇒ a = $\dfrac{60}{12}$ = 5 cm.

As, Volume of a cube is a^3

Therefore, volume = 5^3 = 125 cubic cm

8. Question

If the sum of the areas of 6 surfaces of the cube be 216 sq. cm , then let us calculate the volume of the cube.

Answer

Let the edge of a cube be a cm.

We know that total surface area of cube is $6a^2$

According to question,

$6a^2 = 216$

$a^2 = \dfrac{216}{6} = 36$

$a = \sqrt{36} = 6$ cm

As, volume of cube is a^3

Therefore, volume = $6^3 = 216$ cubic cm.

9. Question

The volume of rectangular parallelepiped is 432 sq cm.If it is converted into 2 cubes of equal volumes, then let us calculate the length of each edge of each cube.

Answer

Let the edge of a cube be a cm.

And the volume be V cubic cm.

Given, rectangular parallelepiped is converted into 2 cubes of equal area.

So, volume of each cube = $\dfrac{432}{2} = 216$ sq. cm

As, $a^3 = $ volume

$a = $ voulme$^{1/3}$

So, $a = 216^{1/3} = 6$ cm.

10. Question

Each side of a cube is decreased by 50%. Let us calculate the ratio of the volumes original cube and changed cube.

Answer

Original cube:

Let the edge of the original cube be a cm

∴ Volume of the original cube = a^3

Cube after 50% decrease in each side:

As edge is decreased by 50%

∴ $a = a - \left(\dfrac{50 \times a}{100}\right) = a - \dfrac{a}{2} = \dfrac{a}{2}$

So, volume of the changed cube $= \left(\dfrac{a}{2}\right)^3 = \dfrac{a^3}{8}$

Hence, $\dfrac{\text{volume of original cube}}{\text{volume of changed cube}} = \dfrac{a^3}{\frac{a^3}{8}} = 8$

11. Question

If the ratio of length breadth and height of a cuboidal box is 3:2:1 and its volume is 384cc. then let us calculate the total surface area of the box.

Answer

Let the ratio be in x.

∴ length = 3x

breadth = 2x

and height = x

Given, volume = 384 cc

⇒ 3x × 2x × x = 384

⇒ $6x^3 = 384$

⇒ $x^3 = \dfrac{384}{6} = 64$

⇒ $x = 64^{\frac{1}{3}}$ cm.

⇒ x = 4 cm

So, length = 3×4 = 12 cm

breadth = 2×4 = 8 cm

height = 4 cm

Therefore, Surface area of cuboidal box = 2(length× breadth + breadth×height + height×length)

surface area = 2(12×8 + 8×4 + 4×12)

= 2(96 + 32 + 48)

= 2×176

= 352 sq. cm.

12. Question

The inner length, breadth, and height of a box of tea are 7.5 dcm.and 5.4dcm. respectively, if the weight of the box filled with tea is 52 kg 350 gm., but in the empty state, its weight is 3.5 kg , then let us write by calculating, the weight of 1 cubic cm. tea.

Answer

Given,

The weight of box filled with tea = 52kg 350gm

Weight of empty box = 3kg 750gm

Weight of tea = Weight of box filled with tea- Weight of empty box

⇒ Weight of tea = 52.350-3.750

⇒ Weight of tea =48.600kg

Volume of box=length × breadth × height

⇒ Volume of box=7.5×5.4×1dcm^3

⇒ Volume of box=40.50 dcm^3

$$\text{the weight of 1 cubic dcm.tea.} = \frac{\text{weight of tea}}{\text{volume of tea}}$$

$$\Rightarrow \text{the weight of 1 cubic dcm.tea.} = \frac{48.600}{40.50}$$

The weight of 1 cubic dcm. tea. = 1.2kg/dcm^3

13. Question

The length, breadth, and weight of a brass plate with the squared base are x cm, 1 mm and 4725 gm respectively, if the weight of 1 cubic dcm brass is 8.4 gm, then let us write by calculating the value of x.

Answer

Given, Weight of brass plate=4725gm

Weight of 1 square dcm brass is 8.4 gm

Area of brass plate=x × 1mm

$$\text{Weight of 1 square dcm brass} = \frac{\text{Weight of brass plate}}{\text{Area of brass plate}}$$

Therefore,

$8.4 = \frac{4725 \times 100}{x}$ [1dcm=100mm]

$x = \frac{472500}{8.4}$

X =56250 dcm

14. Question

The height of Chandmari road is to be raised. So, 30 cuboidal holes with equal depth and of equal measure are dug out on both sides of the road and with this soil, the road is elevated. If the length and breadth of each hole are 14 m and 8 m. respectively and if the total quantity of soil required to make the road be 2520 cu m.let us calculate the depth of each hole.

Answer

Let the depth of each hole be h.

Given , length of each hole = 14m

breadth of each hole = 8m

total no. of holes = 30

Total quantity of soil = 2520 m^3

As, total volume of soil in 30 holes = total quantity of soil

therefore, 30×14×8×h = 2520

$h = \frac{2520}{30 \times 14 \times 8}$

h = 0.762 m.

15. Question

If 64 water filled buckets of equal measure are taken out from a cubical water-filled the tank, then 1/3rd of water remains in the tank. If the length of one edge of the tank is 1.2 m, then let us calculate and write the quantity of water that can be held in each budget?

Answer

Let the tank can hold V Lts. of water.

Let each bucket can hold B Lts. of water.

Given, edge of cubical tank = 1.2m

total number of buckets = 64

part of water taken out with bucket $= (1-\frac{1}{3})$ of total volume of tank

As, volume of cubical tank = 1.2^3 m^3

therefore, $64 \times B = (\frac{2}{3})V$

$64B = \left(\frac{2}{3}\right) \times 1.23$

$64\,B = 2 \times \dfrac{1.23}{3}$

$B = 2 \times \dfrac{1.728}{3 \times 64}$

$B = 18$ m^3

As, $1m^3$ = 1000 L

So, B = $\dfrac{18}{1000}$ L = 0.018 L

16. Question

If the length, breadth, and height of one packet of one gross match box are 2.8dcm. and 0.9dcm respectively, then let us calculate the volume of one match box. [one gross=12dozen]. But if the length and breadth of one matchbox be 5 cm and 3.5 cm , then let us calculate the height of it.

Answer

Given,

Length of one gross match box=2.8dcm

The breadth of one gross match box=0.9dcm

The height of one gross match box=1.5dcm

The volume of one gross match box=2.8×0.9×1.5

⇒ Volume of one gross match box =3.78dcm^3

one gross=12dozen

1 dozen =12 units

Therefore, one gross=12×12units

one gross=144units

Therefore,

the volume of one match box $= \dfrac{\text{Volume of one gross match box}}{144}$

$\Rightarrow$ volume of one match box $= \dfrac{3.78 \times 1000}{144}$ [1dcm=100mm]

The volume of one match box=26.25cubic cm

Length of one match box=5cm

The breadth of one match box=3.5 cm

The height of one match box=? cm

The volume of one match box=26.25cubic cm

$\Rightarrow$ 5×3.5×height=26.25

$\Rightarrow$ Height $= \dfrac{26.25}{17.5}$

Height of one cube=1.5cm

17. Question

Half of the cuboidal water tank with length of 2.1 m and breadth of 1.5 m is filled with water. If 630 lt of water is poured more into the tank, then let us calculate and write the depth that will be increased by.

Answer

Let the rise in level be H m.

Given, length of tank = 2.1m

breadth of tank = 1.5m

volume that can be added = 630 L

As, $1m^3$ = 1000 L

So, volume that can be added $= \dfrac{630}{1000} = 0.63 \ m^3$.

According to question,

Capacity of tank to be filled = Volume of water that can be added.

$2.1 \times 1.5 \times H = 0.63$

$H = \dfrac{0.63}{2.1 \times 1.5}$

H = 0.35 m

18. Question

The length and breadth of a rectangular field of the village are 20m and 15 m respectively.For the construction of pillars in the 4 corners of that field 4 cubic holes having the depth of 4 m are dug out and the soils removed are dispersed on the remaining land. Let us calculate and write the height of the surface of the field that is increased by.

Answer

Let the height to be increased = H m

Given, length of rectangular field = 20m.

breadth of rectangular field = 15m.

edge of each cubic hole = 4m

total no. of cubic holes = 4

According to the question,

Total volume of soil dug out of 4 cubical holes = volume of soil deposited on rectangular field.

$4 \times 4^3 = 20 \times 15 \times H$

$\Rightarrow 256 = 300H$

$H = 0.853$ m

19. Question

For elevating 6.5dcm of a low land with length of 48m and breadth of 31.5m , it is decided that the soil will be collected by scooping a hole in a nearby land with a length of 27m and breadth od 18.2m, let us calculate the depth of the hole in the metre.

Answer

Let the depth of hole scooped be H m

Given, Length of field to be scooped = 27m

breadth of field to be scooped = 18.2 m

Length of low land = 48m

breadth of low land = 31.5m

height of low land = 6.5 dcm = 0.65 m

A/Q, Volume of field to be scooped = volume of low land

$27 \times 18.2 \times H = 48 \times 31.5 \times 0.65$

$H = \dfrac{982.8}{491.4}$

$H = 2m$

20. Question

There were 800L, 725L and 575 L kerosene oil in 3 kerosine oil drums of the house. The oil of these 3 drums is poured into a cubical pot and for this, the depth of the drum becomes 7dcm.If the ratio of the length and breadth of the cuboidal pot is 4:3 then let us write by calculating the length and breadth of the pot.

If the depth of the cuboidal pot would be 5 dcm, let us calculate whether 1620 L oil can be kept or not in that pot.

Answer

Let the ratio be in x m

So, length of cuboidal pot = 4x m

breadth of cuboidal pot = 3x m

Given: Height of cuboidal pot = 7 dcm = 0.7 m

As, $1m^3$ = 1000 L

Volume of 1st drum = 800 L = 0.8 m^3

Volume of 2nd drum = 725L = 0.725 m^3

Volume of 3rd drum = 575 L = 0.575 m^3

A/Q, Volume from all the 3 drums = volume of cuboidal pot

therefore, 0.8 + 0.725 + 0.575 = 4x × 3x × 0.7

$2.1 = 8.4x^2$

$x^2 = 0.25$

x = 0.25

x = 0.5 m

Thus, length of pot = 4x = 4X0.5 = 2 m

breadth of pot = 3x = 3X0.5 = 1.3 m

2nd part: Given if depth of cuboidal pot = 5dcm = 0.5 m

then volume = length×breadth×height

volume = 2×1.5×0.5

volume = 1.5 m3 = 1.5×1000L

volume = 1500 L

Thus the mentioned volume of 1620 L cannot be kept in that pot .

21. Question

The daily requirement of water of 3 families in our 3 storeyed flat are 1200L,1050L and 950L respectively. After fulfilling these requirement in order to put up a tank again and to deposit to store 25% of the required water, only a land having a length of 2.5m and breadth of 1.6m has been poured. Let us calculate the depth of tank in metre that should be made.

If the breadth of the land would be more by 4 dcm, then let us calculate the depth of the tank to be made.

Answer

Given, Length of tank = 2.5m

breadth of tank = 1.6m

Let height of tank be H m

Requirement of 1st family = 1200L = $\frac{1200}{1000}$ = 1.2 m^3

Requirement of 2nd family = 1050L = $\frac{1050}{1000}$ = 1.05 m^3

Requirement of 3rd family = 950L = $\frac{950}{1000}$ = 0.95m^3

As, 1m^3 = 1000 L

According to question,

25% of the requirement is to be stored in a tank.

25% of Requirement of 1st family = $1.2 \times \frac{25}{100}$ = 0.3 m^3

25% of Requirement of 2nd family = $1.05 \times \frac{25}{100}$ = 0.2625m^3

25% of Requirement of 3rdfamily = $0.95 \times \frac{25}{100}$ = 0.2375m^3

As, 25% of the total requirement of the water = volume of the land to be irrigated

0.3 + 0.2625 + 0.2375 = 2.5×1.6×H

0.8 = 4H

H = 0.2m

2nd part: breadth is increased by 4 dcm = 0.4 m

As, length = 2.5 m

Let the new depth be d m

again, As, 25% of the total requirement of the water = volume of the land to be irrigated

0.8 = 0.4×2.5×d

$d = \dfrac{0.8}{0.4 \times 2.5}$

d = 0.8 m

22. Question

The weight of the wooden box made of wooden plate with thickness of 5cm along with its covering is115.5kg, but the weight of box filled with rice is 880.5kg.The length and breadth of inner side of the box are 12dcm and 8.5dcm respectively and weight of 1 cubic dcm rice is 1.5kg .Let us calculate the inner height of the box after calculation. Let us calculate the total expenditure to colour the outside of the box, if rate is Rs 1.5 per sq. dcm.

Answer

Given, thickness = 5cm = 0.5dm

weight of empty box = 115.5 kg

weight of filled box = 880.5 kg

Length of inner side of box = 12dcm

breadth of inner side of box = 8.5 dcm

According to question, volume of rice inside the box = Inner capacity of box

weight of filled box-weight of empty box = length × breadth height

(880.5-115.5)kg = 12×8.5×h

$(\dfrac{765}{1.5})dcm^3$ = 102 h {1 cubic dcm rice is 1.5kg}

$h = \dfrac{510}{102}$

h = 5 dcm

As, thickness of the box = 0.5dcm

So, outer length of box (L) = inner length + 2xthickness = 12 + 2×0.5 = 13 dcm

outer breadth of box(B) = inner breadth + 2Xthickness = 8.5 + 2×0.5 = 9.5 dcm

outer height of box(H) = inner height + 2X thickness = 5 + 2×0.5 = 6 dcm

As,Outer surface area = 2(LB + BH + LH)

= 2(13×9.5 + 9.5×6 + 6×13)

= 2(123.5 + 57 + 78)

= 2×285.5

= 517 dcm^2

According to question, cost of 1 dcm^2 = Rs.1.5

So, cost of 517 dcm^2 = Rs.(1.5×517)

= Rs 775.5

23. Question

The depth of a cuboidal pond with length of 20m and breadth of 18.5m is 3.2m, let us write by calculating the time required to irrigate whole water of the pond with a pump with capacity to irrigate 160 kilo L water per hour. If that quantity of water is poured on a paddy field with a ridge having the length of 59.2m and breadth of 40m then what is the depth of water in that field –let us write calculating it,[I cubic m = I kilo L]

Answer

Given, length of cuboidal pond = 20m

breadth of cuboidal pond = 18.5 m

height of cuboidal pond = 3.2m

Thus volume of cuboidal pond = length × breadth × height

= 20×18.5×3.2

= 1184 m^3

According to question, time required to irrigate upto 160 L = 1 hr

As, 1m3 = 1000L

160L = $\frac{160}{1000}$ = 0.16 m^3

So, time required to irrigate 1184 m^3 = $\left(\frac{1}{0.16}\right)$ 1184 hr.

= $\frac{1184}{0.16}$ hr

= 7400 hr

2nd part: Length of field = 59.2m

breadth of field = 40 m

Let height of field = H m

According to question,

Volume of field to be poured with water = volume of water

length ×breadth × height = 1184 m^3

59.2 × 40 × H = 1184

H = $\frac{1184}{2368}$

H = 0.5 m

24 A1. Question

The inner volume of a cuboidal box is 440cc. and the area of the base is 88sq. cm, its height is-

A. 4cm

B. 5cm

C. 3cm

D. 6cm

Answer

volume = area × height

⇒ 440 = 88 × height

⇒ height = $\frac{440}{88}$ = 5 cm

24 A2. Question

The length breadth and height of a cuboidal hole are 40m, 12m and 16m respectively. The number of planks having the height of 5m and breadth of 4m and thickness of 2m , can be kept in that hole is

A. 190

B. 192

C. 184

D. 180

Answer

Volume of cuboidal hole = Total Volume of planks

$\Rightarrow 40 \times 12 \times 16 = n \times 5 \times 4 \times 2$

$\Rightarrow 7680 = n \times 40$

$\Rightarrow n = \dfrac{7680}{40} = 192$

24 A3. Question

The surface area of cube is 256 sq. m, the volume of the cube is

A. 64 m^3

B. 216 m^3

C. 256 m^3

D. 512 m^3

Answer

Surface area of cube = 6 edge^2

$\text{edge}^2 = \dfrac{256}{6} = 64$ sq.cm

edge = $\sqrt{64}$ = 8 m

Volume = edge^3 = 8^3 = 512 m^3

24 A4. Question

The ratio of volume of 2 cubes is 1:27, the ratio of total surface areas of 2 cubes are

A. 1:4

B. 1:8

C. 1:9

D. 1:18

Answer

Let the edges of two cubes be a cm and b cm.

ratio of volumes of cube = $\dfrac{a^3}{b^3} = \dfrac{1}{27}$

$\dfrac{a}{b} = \dfrac{1}{3}$

ratio of surface area of cube $= \dfrac{6a^2}{6b^2} = \dfrac{1^2}{3} = \dfrac{1}{9}$

24 A5. Question

If the total surface area of a cube is s sq. unit and the length of the diagonal is d unit, then the relation between s and d is

A. $s = 6d^2$

B. $3s = 7d$

C. $s^3 = d^2$

D. $d^2 = s/2$

Answer

Let the edge be of a cm

then total surface area of cube $= s = 6a^2$

$a = \sqrt{\dfrac{s}{6}}$

and body diagonal $= d = 3a$

$a = \dfrac{d}{\sqrt{3}}$

Thus, $\sqrt{\dfrac{s}{6}} = \dfrac{d}{\sqrt{3}}$

Squaring both sides,

$\dfrac{s}{6} = \dfrac{d^2}{3}$

$\dfrac{s}{2} = d^2$

24 B. Question

Let us write true/false of the following statements:

(i) If the length of each of a cube is twice of that 1st cube then the

volume of this cube is 4 times more than that of the 1st cube.

(ii) In rainy season, the height of rainfall in 2 hectare land is 5 cm, the volume of rain water is 1000 cubic metre.

[hint: 1 are = 100 sq. m,1 hectre = 100are]

Answer

(i) FALSE

Let the side of 1st cube be a cm.

volume of 1st cube = a^3

Now, as length of 2nd cube = 2a

Then , volume becomes = $(2a)^3 = 8a^3 = a^3 + 7a^3$

i.e. its 7 times more than that of 1st cube.

(ii) FALSE

Area = 2 hectares = 2 × 100 acres = 200 × 100 sq m = 20000 sq m

height = 5 cm = 0.005 m

Thus,

volume of rain water it can hold = area×height

= 20000 × 0.005 = 100 m^3

24 C. Question

Let us fill in the blanks:

(i) The number of diagonals of a cuboid is _____.

(ii) The length of diagonal on the surface of a cube = _____ × the length of one edge.

(iii) If the length, breadth and height of a rectangular parallelepiped are equal, then the special name of this solid is _____.

Answer

(i) total number of diagonals of a cuboid =

surface diagonals + body diagonals

= 6 + 4 = 10

(ii) Length of surface diagonal = $(a^2 + a^2) = (2a^2) = 2$ a

(iii) When the length of rectangular parallelepiped are equal then it becomes a CUBE.

25 A. Question

If the number of surfaces of cuboid is x, the number of edges is y, the number of vertices is z and the number of diagonal is p, let us write the value of x-y +

z + p.

Answer

In cuboid –number of surfaces = 6 = x

number of edges = 12 = y

number of vertices = 8 = z

number of diagonal = surface diagonal + body diagonal = 6 + 4 = 10 = p

Thus, x-y + z + p = 6-12 + 8 + 10 = 12.

26 B. Question

The length of the dimensions of 2 cuboids are 4,6,4 units and 8, (2h-1) , 2 units respectively. If the volume of 2 cuboids are equal, then let us write the value of h.

Answer

volume of 1st cuboid = length breadth × height

= 4 × 6 × 4 = 96 cubic unit

Volume of 2nd cuboid = length breadth × height =

8 × (2h-1) × 2 = 32h-16

Given, volumes are equal.

So, 32h-16 = 96

$\Rightarrow$ 32h = 96 + 16 = 112

$\Rightarrow h = \dfrac{112}{32}$

h = 3.5 units.

25 C. Question

If each edge of a cube is increases by 50%, then how much total surface area of the cube will be increased in %?

Answer

Let the edge of cube be a

Surface area = $6a^2$

According to question, edge increased by 50%

$= a + a \times \dfrac{50}{100} = a + \dfrac{a}{2} = \dfrac{3a}{2}$

new surface area = $6\left(\dfrac{3a}{2}\right)^2$

Therefore, ratio of surface areas $= \dfrac{6a^2}{6\left(\dfrac{3a}{2}\right)^2}$

$= a^2 : \dfrac{9a^2}{4} = \dfrac{4}{9}$

25 D. Question

The length of each side of three solid cubes are 3 cm, 4 cm, 5 cm respectively, a new solid is made by melting these three solid cubes. Let us write the edge of the new cube.

Answer

volume of 1st cube = 3^3 = 27 cm^3

volume of 2nd cube = 4^3 = 64 cm^3

volume of 3rd cube = 5^3 = 125 cm^3

As, a new solid is made by melting these three solid cubes, So, volume of new cube is the sum of volume of all the 3 cubes.

Thus, volume of new cube = 27 + 64 + 125 = 216 cm^3

new edge^3 = 6^3

So, new edge = 6 cm

25 E. Question

The lengths of 2 adjacent walls of room are 12m, 8 m respectively. If the height of the room is 4 m , then let us write by calculating, the area of the floor of the room.

Answer

As, the length of 2 adjacent walls of room are 12m and 8m = length and breadth of the floor

So, area of the floor = 12×8 = 96 sq m.