Chapter – 11
Mensuration

- **Perimeter**: Length of boundary of a simple closed figure.

  Perimeter of:

  Rectangle = 2(l + b)

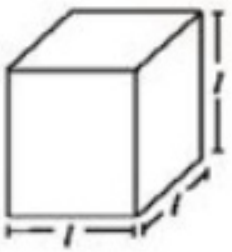
  Square = 4a

  Parallelogram = 2(sum of two adjacent sides)
- **Area**: The measure of region enclosed in a simple closed figure.
- Area of a trapezium = half of the sum of the lengths of parallel sides × perpendicular distance between them.
- Area of a rhombus = half the product of its diagonals.
- Triangle = $\frac{1}{2}$ x base x height
- **Diagonal of:**

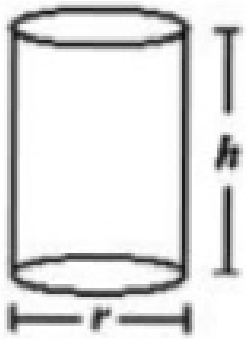
  Rectangle = $\sqrt{l^2 + b^2}$

  Square = $\sqrt{2a}$
- **Surface area** of a solid is the sum of the areas of its faces.
- **Surface area of**:

a cuboid = 2(lb + bh + hl)



a cube = $6l^2$



a cylinder = $2\pi r(r + h)$

- Amount of region occupied by a solid is called its **volume.**
- Volume of

  a cuboid = l x b x h

  a cube = l^3

  a cylinder = $\pi r^2 h$
- (i) 1 cm^3 = 1 ml
- (ii) 1L = 1000 cm^3
- (iii) 1 m^3 = 1000000 cm^3 = 1000L

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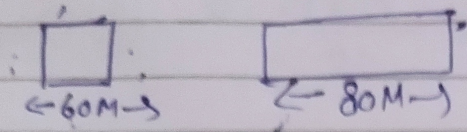
Day 24 Nov 2020

Chapter - 11

Ex 11.1

Q1. A square _____ area? ...

Sol.



(a) (b)

Side of a square = 60 m (given)

And the length of ~~rectangular~~ rectangular field, l = 80 m (given)

Acc. to question

Perimeter of rectangular field = Perimeter of square field

$2(l+B) = 4 \times \text{Side}$

$2(80+B) = 4 \times 60$

$160 + 2B = 240$

$2B = 240 - 160$

$B = \frac{80}{2} \Rightarrow 40$

Breadth of the rectangle is 40 m.

Now, Area of square field. = Side x side

$60 \times 60 = 3600 m^2$.

Area of Rectangular field = $l \times B$

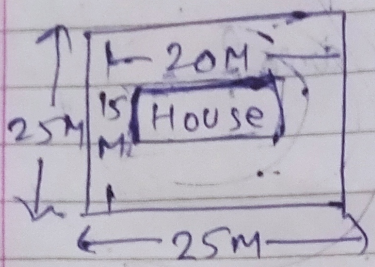
$\Rightarrow 80 \times 40$

$\Rightarrow 3200 m^2$

So, area of square field is larger.

Q2. Mrs. Kaushik _____ 55 per m^2.

Sol



Side of a square plot = 25m
Area of square plot ⇒ side × side
$25 \times 25 = 625\ m^2$
Length of the house ⇒ 20m
Breadth of the house ⇒ 15m
Area of the house ⇒ $l \times B$
⇒ 20×15 ⇒ $300\ m^2$
Area of garden = Area of square plot − Area of house
⇒ $625 - 300 = 325\ m^2$
Cost of developing the garden per Sq. m is Rs 55.
Cost of developing the garden 325 Sq. m =
⇒ 55×325
⇒ 17,875 Rs.
total cost of developing a garden is Rs 17875

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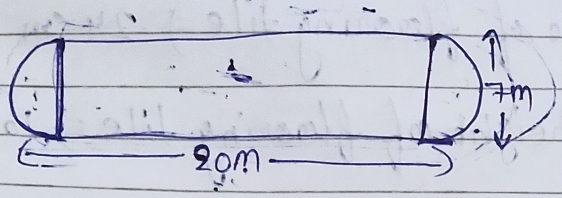
Day 27 Nov 2020

Ex - 11.1

Q3. The shape of a _____ this garden.

Sol.



Given ⇒ Total Length = 20 m

Diameter of semi circle ⇒ 7 m

Radius of semi circle ⇒ $\frac{7}{2}$ ⇒ 3.5 m.

Length of rectangular field.

⇒ 20 - (3.5 + 3.5) ⇒ 13 m

Height / Breadth of the rectangular field = 7 m.

Area of rectangular field = L × B

⇒ 13 × 7 ⇒ 91 m^2.

Area of 2 semi circles ⇒ $2 \times \left(\frac{1}{2} \times \pi r^2\right)$

⇒ $2 \times \frac{1}{2} \times \frac{22}{7} \times 3.5 \times 3.5$

⇒ 38.5 m^2

Area of garden ⇒ 91 + 38.5 ⇒ 129.5 m^2

Now Perimeter of garden ⇒ 22 + 13 + 13 = 48 m.

Perimeter of 2 semi circles ⇒ $2\pi r$

⇒ $2 \times \frac{22}{7} \times 3.5$ ⇒ 22 m

Q4- A flooring tile _____ corners.

Sol:- Adrieen =) Base of flooring tile =) 24 cm =) $\frac{24}{100}$ =) .24

Corresponding height of flooring tile =) 10cm =) .10m

Now area of flooring tile =) Base x Altitude

=) .24 x .10

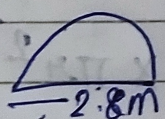
=) 0.024 m 2

Number of tiles required to cover the floor =)

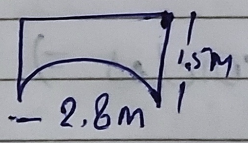
$\frac{\text{Area of floor}}{\text{Area of one tile}}$ =) $\frac{1080}{0.024}$ =) 45000 tiles.

Q5. An ant _____ circles.

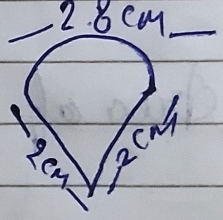
Sol. (a)



(b)



(c)



Sol. (a) Radius =) $\frac{\text{Diameter}}{2}$ =) $\frac{2.8}{2}$ =) 1.4cm

Circumference of Semicircle =) πr .2

=) $\frac{22}{7} \times 1.4$ =) 4.4cm

Total distance covered by the ant =)

Circumference of Semi circle + Diameter

=) 4.4 + 2.8 =) 7.2cm.

b) Diameter = 2.8 cm

R ⇒ $\frac{2.8}{2}$ ⇒ 1.4 cm.

Circumference of Semi circle ⇒ πr

$\frac{22}{7} \times 1.4 = 4.4$ cm

Total distance covered by the ant = 1.5 + 2.8 + 1.5 + 4.4

⇒ 10.2 cm

c) Diameter of Semi circle ⇒ 2.8 cm

R ⇒ $\frac{2.8}{2}$ = 1.4 cm

Circumference of Semi Circle ⇒ πr

⇒ $\frac{22}{7} \times 1.4 = 4.4$ cm

Total distance covered by the ant ⇒ 2 + 2 + 4.4

⇒ 8.4 cm

After analyzing results of three fig. we concluded that for figure (b) Food piece, the ant would take a longer round.

Day 28 Nov 2020

Ex 11.2

Q1. The shape of the _____ is 0.8m.

Sol: Here one parallel side of the trapezium (a) = 1m
and second side (b) = 1.2m
height (h) = 0.8m

Area of top surface of the table = $\frac{1}{2}(a+b) \times h$

$\Rightarrow \frac{1}{2}(1 + 1.2) \times 0.8$

$\Rightarrow \frac{1}{2} \times 2.2 \times 0.8 \Rightarrow 0.88 m^2$.

Q2. The area of _____ 4cm.

Sol: Length of one parallel side (a) = 10 cm.
height (h) = 4 cm.
Let the length of other parallel side be (b)
Area of trapezium = $\frac{1}{2}(a+b) \times h$

$34 = \frac{1}{2}(10 + b) \times 4$

$34 = \frac{1}{2} \times 40 + 20 + 2b$

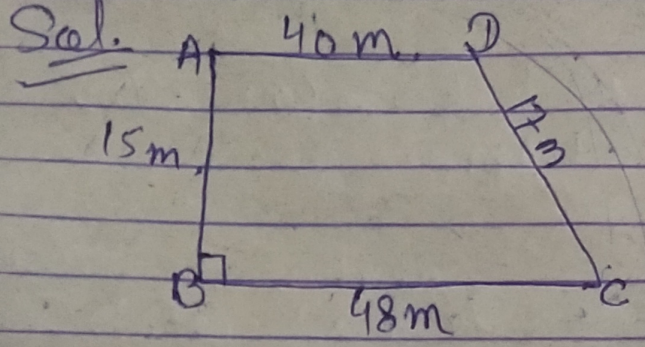
$-2b = 20 - 34$

$+2b = +14$

$b = \frac{14}{2} = 7$

Q3. Length of the _____ BC.

Sol.



Sol. Given = BC = 48m, CD = 17m.
AD = 40m and perimeter = 120m.
Perimeter of trapezium ABCD
$AB + BC + CD + DA = 120$
$AB + 48 + 17 + 40 = 120$
$AB + 105 = 120$
$AB = 120 - 105$
$AB = 15m$
Now Area of the field $= \frac{1}{2} \times (BC + AD) \times AB$

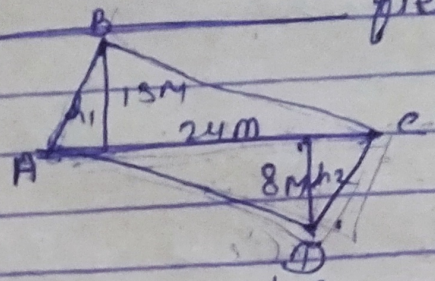
$\frac{1}{2} \times (48 + 40) \times 15$

$\frac{1}{2} \times 88 \times 15$

$= 660 m^2$.

Q4 The diagonal of _____ field.

Sol.



Here, $h_1 = 13m$, $h_2 = 8m$ and $AC = 24m$.

Area of quadrilateral ABCD

$\Rightarrow$ Area of ABC + Area of ADC

$\Rightarrow \frac{1}{2} \times b \times h + \frac{1}{2} \times b \times h$

$\Rightarrow \frac{1}{2} \times b (h_1 + h_2)$

$\frac{1}{2} \times 24 \times (13 + 8)$

$\frac{1}{2} \times 24^{12} \times 21 = 252 m^2$.

Q5. The diagonals _____ area.

Sol. Given $\Rightarrow d_1 = 7.5$ cm and $d_2 = 12$ cm

Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

$\Rightarrow \frac{1}{2} \times 7.5 \times 12^6$

$\Rightarrow 45 cm^2$.

6. Find the area _____ diagonal.

Sol: Rhombus is also a kind of Parallelogram.

Area of rhombus = Base x Altitude

$\Rightarrow 6 \times 4 \Rightarrow 24\ cm^2$

Area of rhombus $\Rightarrow \frac{1}{2} \times d_1 \times d_2$

$24 = \frac{1}{2} \times 8 \times d_2$

$24 = 4d_2$

$4d_2 = 24$

$d_2 \Rightarrow \frac{24}{4} = 6\ cm.$

7. The floor _____ 54.

Sol: Here, $d_1 = 45\ cm$ and $d_2 = 30\ cm$.

Area of one tile $\Rightarrow \frac{1}{2} \times d_1 \times d_2$

$\Rightarrow \frac{1}{2} \times 45 \times 30 \Rightarrow 675\ cm^2$

Area of 3000 tiles $\Rightarrow 675 \times 3000 \Rightarrow 2025000\ cm^2$

$\Rightarrow \frac{2025000}{10000} \Rightarrow 202.5\ m^2$

$[\because 1\ m^2 = 10,000\ cm^2]$

Cost of ~~polishing~~ polishing the floor per sq. meter = 4.

Cost of polishing the floor here $202.5 m^2$ =>

4 X 202.5 => 810.

Total cost = 810.

Q8. Mohan ——————— River.

Sol Given => Perpendicular distance (h) = 100m.

Area of the trapezium => $10500 m^2$

Let side along the road be x m and side along the river = 2x m.

Area of the trapezium field = $\frac{1}{2}(a+b) \times h$

$$10500 = \frac{1}{2}(x + 2x) \times 100$$

$$10500 = 50x + 100x$$

$$10500 = 150x$$

$$150x = 10500$$

$$x = \frac{10500}{150} = 70 \text{ m}.$$

Here the side along the river = 2x

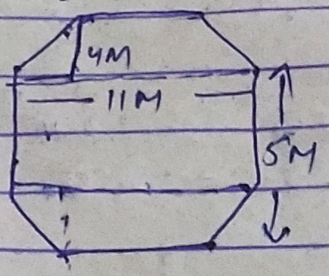
=> 2 X 70

=> 140m

$x = 70$, $2x = 140$ m.

Q9. Torch ——— surface.

Sol.



Given:- octagon having 8 equal sides, each 5 m.

Construction:- divided the octagon in 3 fig.
2 trapezium whose parallel and perpendicular sides are 11 and 4 m and third fig. is rectangle having length and Breadth 11m and 5m respectively.

Area of 2 trapeziums $= 2 \times \frac{1}{2}(a+b) \times h$

$= 2 \times \frac{1}{2}(11+5) \times 4$

$= 2 \times 16 \times 2$

$= 64\ m^2$

Area of rectangle $= L \times B$

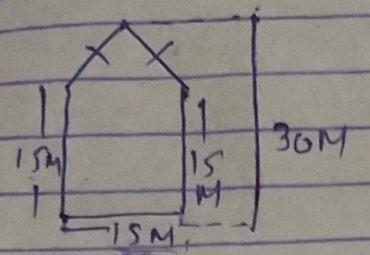
$= 11 \times 5 = 55\ m^2$

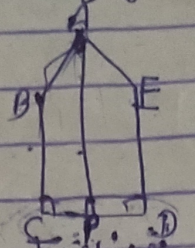
Total area of octagon $= 64 + 55$

$= 119\ m^2$.

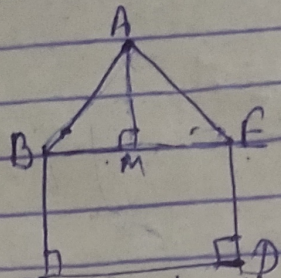
10. There ——— figure.

Sol.





Jyoti's diagram



Kavita's diagram

Sol. First :- By Jyoti's diagram :

Area of pentagon = Area of trapezium ABCP + Area of trapezium AEDP

$\frac{1}{2}(AP+BC)\times CP + \frac{1}{2}(ED+AP)\times DP$

$\frac{1}{2}(30+15)\times CP + \frac{1}{2}(15+30)\times DP$

$\frac{1}{2}\times 45 \times a(CP+DP)$

$\frac{1}{2}\times 45 \times CD$, $\frac{1}{2}\times 45 \times \overset{7.5}{15} = 337.5 m^2$

By Kavita's diagram.

a perpendicular AM drawn to BE.

AM = 30 − 15 = 15 m.

Area of pentagon = Area of ΔBEA + Area of square BCDE

$\frac{1}{2} \times 15 \times (15 + 15) \times 15$ m.

$\Rightarrow 112.5$

$\frac{1}{2} \times 15 \times 15 + (15 + 15)$

$112.5 + 225 \Rightarrow 337.5 m^2$

Q11. Diagram of _____ same.

Sol. Here 2 of given fig (1) and (2) are ~~same~~ similar in dimensions and also (3) and (4) are similare in dimensions.

Area of fig (1) = Area of trapezium

$\frac{1}{2} \times (a+b) \times h = \frac{1}{2} \times (28 + 20) \times 4$

$\Rightarrow \frac{1}{2} \times 48 \times 4 = 96 cm^2$

Area of fig (2) = $96 cm^2$

Now Area of fig (3) = Area of trapezium

$\Rightarrow \frac{1}{2} \times (a+b) \times h$

$\Rightarrow \frac{1}{2} \times (24 + 16) \times 4$

$\Rightarrow \frac{1}{2} \times 40 \times 4 = 80 cm^2$

Area of fig (4) = 80 cm^2

Ex 11.3

Q1. There are two _____ make?

Sol. given (a) Length = 60 cm
Breadth ⇒ 40 cm
Height ⇒ 50 cm
Total Surface area of cuboidal box = 2 x (lb + bh + hl)

⇒ 2 x (60 x 40 + 40 x 50 + 50 x 60)
⇒ 2 x (2400 + 2000 + 3000)
⇒ 2 x 7400 ⇒ 14800 cm^2

(b) Length (l) = 50 cm
Breadth (b) 50 cm
Height (h) = 50 cm
Total Surface area of cubical box = 6 x (side)^2
⇒ 6 x (50)^2
⇒ 6 x 2500
⇒ 15000 cm^2

From the result of (a) & (b), Cuboidal box requires the lesser amount of material to make.

Sol 2.

Length of Suitcase (l) = 80 cm
Breadth of Suitcase (b) = 48 cm
Height of Suitcase (h) = 24 cm.

Total Surface area of Suitcase = $2 \times (lb + bh + hl)$
$= 2 \times (80 \times 48 + 48 \times 24 + 24 \times 80)$
$= 2 \times (3840 + 1152 + 1920)$
$= 2 \times 6912 \Rightarrow 13824 \text{ cm}^2$

Area of Tarpaulin cloth = Surface area of Suitcase
$l \times b = 13824$
$l \times 96 = 13824$
$l \Rightarrow \frac{13824}{96} \Rightarrow 144$

Required tarpaulin for 100 Suitcases
$\Rightarrow 144 \times 100 \Rightarrow 14400 \text{ cm} = 144 \text{ m}$

Q3.

Sol

Surface area of Cube = 600 cm^2
Surface area of a Cube = $6 \times (\text{side})^2$
$600 \Rightarrow 6 \times (\text{side})^2$
$6 \times (\text{Side})^2 \Rightarrow 600$
$(\text{Side})^2 = \frac{600}{6} = 100$
$\text{Side} = \sqrt{100}$
$\text{Side} \Rightarrow 10.$

Day 2 Dec 2020

Q21 11.3

Q4. Rukshar ..... Cabinet?

Sol $l = 2m$, $b = 1m$, $h = 1.5m$

Surface area of Cabinet $\Rightarrow lb + 2(bh + hl)$

$2 \times 1 + 2(1 \times 1.5 + 1.5 \times 2)$

$2 + 2(1.5 + 3)$

$2 + 2 \times 4.5$

$2 + 9.0 = 11m^2$

Surface area $= 11m^2$.

Q5

Sol Given $= l = 15m$, $b = 10m$, $h = 7m$.

Total Surface area of hall

$lb + 2(bh + hl)$

$\Rightarrow 15 \times 10 + 2(10 \times 7 + 7 \times 15)$

$\Rightarrow 150 + 2(70 + 105)$

$\Rightarrow 150 + 2 \times 175$

$\Rightarrow 150 + 350 = 500m^2$

Required number of Cans $\Rightarrow$

$\frac{\text{Area of hall}}{\text{Area of one Can}} = \frac{500}{100} = 5 \text{ Can}$

Q6. Describe _____ area?

Sol. (a) Given Diameter of cylinder = 7 cm

Radius of cylinder = $\frac{7}{2}$ = 3.5 cm.

Height = 7 cm.

Lateral Surface area of cylinder = $2\pi rh$

$\Rightarrow 2 \times \frac{22}{7} \times \frac{7}{2} \times 7$

$\Rightarrow 154\ cm^2$

(b) Side = 7 cm.

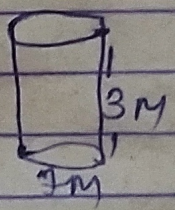
Lateral Surface area of cube = $4l^2$

$\Rightarrow 4 \times (7)^2$

$\Rightarrow 4 \times 49 = 196\ cm^2$

So the cube has larger lateral Surface area.

Q7. A closed _____ required?



Sol. Given - Radius of tank (r) = 7m

Height = 3m

Total Surface area of cylindrical tank

$\Rightarrow 2\pi r(h+r)$

$\Rightarrow 2 \times \frac{22}{7} \times 7(3+7)$

$\Rightarrow 44 \times 10 = 440\ m^2$

440 m^2 metal sheet is required.

Day 3 Dec 2020

Ex 11.3

Q8. The lateral ____ Sheet?

Sol: Given → Lateral Surface area of hollow cylinder
⇒ 4224 cm²

Height of hollow cylinder = 33 cm
Curved Surface area of hollow cylinder
⇒ $2\pi rh$

$4224 \Rightarrow 2 \times \frac{22}{7} \times r \times 33$

$r \Rightarrow \frac{4224 \times 7}{2 \times 22 \times 33} \Rightarrow \frac{64 \times 7}{22} = \frac{224}{11}$

$r \Rightarrow 20.363.$

$r \Rightarrow \frac{64 \times 7}{22}$

Length of rectangular Sheet $= 2\pi r$

$l = 2 \times \frac{22}{7} \times \frac{64 \times 7}{22} = 128 \text{ cm}$

Perimeter of rectangular Sheet $= 2(l + B)$
$= 2(128 + 33)$
$= 2 \times 161$
$\Rightarrow 322 \text{ cm}.$

Perimeter of rectangular Sheet = 322 cm.

Q. A road roller ——— 1m.

Sol. Given = Diameter of road roller = 84 cm

$$R = \frac{84}{2} \Rightarrow 42 \text{ cm}$$

Length of road roller (h) = 1m = 100 cm

Curved Surface area of road roller = $2\pi rh$

$$\Rightarrow 2 \times \frac{22}{\cancel{7}} \times \cancel{42}^{6} \times 100$$

$$\Rightarrow 26400 \text{ cm}^2$$

Area covered by road roller in 750 revolutions

$$\Rightarrow 26400 \times 750$$

$$\Rightarrow 1,98,00,000 \text{ cm}^2$$

$1 m^2 = 10,000 cm^2$

$$\frac{1,98\cancel{,00,000}}{\cancel{10,000}}$$

$$\Rightarrow 1980 \text{ m}^2$$

Area of the road is $1980 m^2$.

10. A company ____ label?

Sol Given ⇒ Diameter of cylindrical container = 14 cm

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

height = 20 cm

Height of the label = 20 - 2 - 2

⇒ 16 cm

Covered surface area of label = $2\pi rh$

$\frac{2 \times 22}{7} \times 7 \times 16 = 704 \text{ cm}^2$

Area of the label = 704 cm^2

Ex 11.4

Q1. Given a _____ Volume.

(a) To find how much it can hold.
(b) Number of cement bags required to plaster it.
(c) To find the number of smaller tanks that can be filled with water from it.

Sol. We find area when a region covered by a boundary such as outer & inner surface area of a cylinder, a cone, a sphere and surface of wall or floor.

(ii) When the amount of space occupied by an object such as water, milk, coffee, tea etc, then we have to find out volume of the object.

(a) Volume (b) Surface area (c) Volume

Q2. Diameter of _____ area.

Sol. Yes, we can say that volume of cylinder B is greater, since radius of cylinder B is greater than that of cylinder A.

Sol (a) Diameter of cylinder A = 7cm

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

height = 14 cm.

Volume of cylinder A $\rightarrow \pi r^2 h$

$\Rightarrow \frac{\overset{11}{\cancel{22}}}{\cancel{7}} \times \frac{\overset{1}{\cancel{7}}}{\cancel{2}} \times \frac{7}{\cancel{2}} \times \overset{7}{\cancel{14}}$

$\Rightarrow 539\ cm^3$

(b) Diameter of cylinder B = 14 cm

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

height = 7 cm

Volume of cylinder B = $\pi r^2 h$

$\Rightarrow \frac{22}{\cancel{7}} \times \cancel{7} \times 7 \times 7$

$\Rightarrow 22 \times 49 = 1078\ cm^3$

Total Surface area of cylinder A $\Rightarrow \pi r(2h + r)$ (It is open from top)

$\Rightarrow \frac{\overset{11}{\cancel{22}}}{\cancel{7}} \times \frac{\cancel{7}}{\cancel{2}_{14}} \left(2 \times 14 + \frac{7}{2}\right)$

$\Rightarrow \cancel{11 \times 28 + 7}$

$\Rightarrow 11 \times \left(28 + \frac{7}{2}\right)$

$\Rightarrow 11 \times \left(\frac{56 + 7}{2}\right)$

$\Rightarrow 11 \times \frac{63}{2} \Rightarrow 346.5\ cm^2$

Total Surface area of cylinder B $\Rightarrow \pi r(2h + r)$ (It is open from top)

$\frac{22}{\cancel{7}} \times \cancel{7}(2 \times 7 + 7) \Rightarrow 22 \times 21 = 462\ cm^2$

$22 \times (14 + 7)$

Yes, Cylinder with greater Volume also has greater Surface area.

Q3. Find the height ——— 140 cm.

Sol. Given: Base area of cuboid $= 180 cm^2$ and Volume of cuboid $= 900 cm^3$

Volume of cuboid $= l \times b \times h$

$\because$ Base area $= l \times b = 180$ given

$900 = 180 \times h$

$180 \times h = 900$

$h = \frac{900}{180} = 5 cm$

Height of cuboid $= 5 cm$.

Q4. A cuboid ——— Cuboid?

Sol. $l = 60 cm$, $b = 54 cm$, $h = 30 cm$.

Volume of cuboid $= l \times b \times h$

$\Rightarrow 60 \times 54 \times 30$

Volume of cube $= (side)^3$

$\Rightarrow 6 \times 6 \times 6$

Number of small cubes $=$ Volume of cuboid / Volume of cube

$\Rightarrow \frac{60 \times 54 \times 30}{6 \times 6 \times 6} = 450$

So required cubes are 450.

Day 5 Dec 2020 Ex 11.4

Q5. Find the 140cm.

Sol Given :) Volume = $1.54 m^3$

Diameter = 140 cm

$r = \frac{140}{2} = 70 cm$ $\frac{70}{100} = 0.7m$.

Volume of Cylinder = $\pi r^2 h$

$1.54 = \frac{22}{7} \times 0.7 \times 0.7 \times h$.

$h = \frac{1.54 \times 7 \times 10 \times 10}{22 \times 0.7 \times 0.7 \times 100}$

$h = 1 m$

height of the Cylinder is 1m.

Q6. A milk tank.

Sol Radius of Cylindrical tank (r) = 1.5m

height (h) = 7m

Volume of Cylindrical tank $\Rightarrow \pi r^2 h$

$\frac{22}{7} \times 1.5 \times 1.5 \times 7 = 49.5 m^3$

49.5×1000 liters

[$1 m^3 = 1000$ liters]

49500 liters

quantity of milk = 49500 liters

Q7 If each edge of a cube is doubled:

(i) how many times will its Surface area increase?

Sol Let the edge of cube be l.

Surface area of the cube $(A) = 6(l)^2 = 6l^2$

When edge of cube is doubled, then (A')

Surface area of the cube $= 6(2l)^2$

$\Rightarrow 6 \times 4l^2$

$\Rightarrow 4 \times 6l^2$

$\Rightarrow A' = 4 \times A$

Surface area will increase 4 times.

(ii) Volume of cube $(V) = l^3$

When edge of cube is doubled then

Volume of cube $(V') = (2l)^3$

$8l^3$

$V' = 8 \times V$

Volume will be increase 8 times.

1000

Q8 Water is _____ reservoir.

Given Vol Volume of reservoir = $108 m^3$

$(108 \times 1000L) \Rightarrow 108000L$.

It is given that water is being poured at the rate of 60 liters per minute.

$\Rightarrow 60 \times 60 L \rightarrow 3600L$

Number of hours $\Rightarrow \frac{108000}{3600} = 30$ hours

It will take 30 hours to fill it.