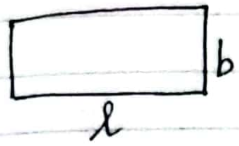
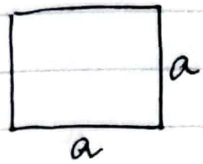
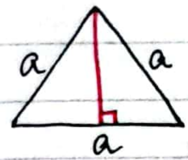
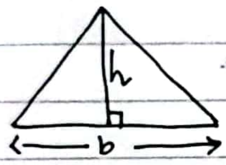
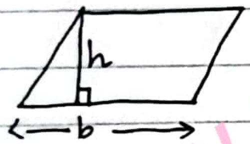
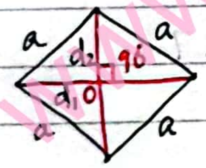
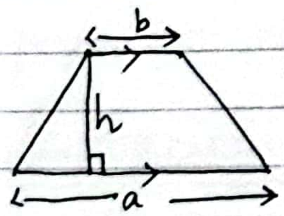
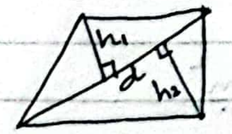
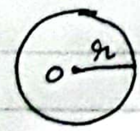
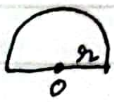
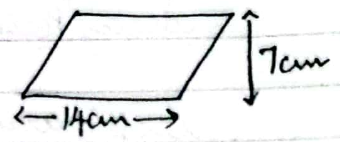
VIII

11. MENSURATION

Diagram	Shape	Area/Perimeter
	rectangle	$l \times b$ = area Perimeter = $2(l+b)$
	Square	a^2 = area Perimeter = $4a$
	Equilateral Δ	area = $\frac{\sqrt{3}a^2}{4}$ Perimeter = $3a$ Altitude = $\frac{\sqrt{3}a}{2}$
	triangle	area = $\frac{1}{2} \times bh$
	parallelogram	area = $b \times h$
	rhombus	area = $\frac{1}{2} \times d_1 \times d_2$ Perimeter = $4a$
	trapezium	area = $\frac{1}{2} h(a+b)$
	general quadrilateral	area = $\frac{1}{2} d(h_1+h_2)$
	circle	area = πr^2 Circumference = $2\pi r$
	Semi-circle	area = $\pi r^2/2$ Circumference = πr

Q:) find area of the following figures.

(a)

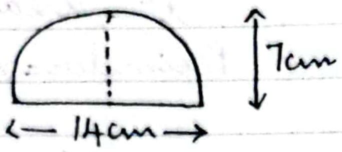


ans: area of a parallelogram $= b \times h$

$= 14 \times 7$

$= \underline{\underline{98 cm^2}}$

(b)



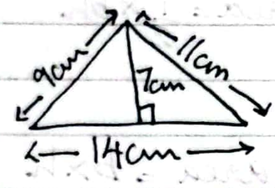
ans: $2r = 14$

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

area of a semi-circle $= \frac{\pi r^2}{2} = \frac{\cancel{22}^{11}}{\cancel{7}_{1}} \times \frac{1}{\cancel{2}_{1}} \times \cancel{7}^{1} \times 7$

$= 11 \times 7 = \underline{\underline{77 cm^2}}$

(c)



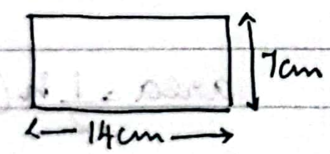
ans:- $b = 14cm$

$h = 7cm$

area of a triangle $= \frac{1}{2} \times b \times h = \frac{1}{\cancel{2}_{1}} \times \cancel{14}^{7} \times 7$

$= 7 \times 7 = \underline{\underline{49 cm^2}}$

(d)

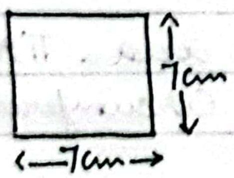


ans:- $l = 14cm$

$b = 7cm$

area of a rectangle $= l \times b = 14 \times 7 = \underline{\underline{98 cm^2}}$

(e)

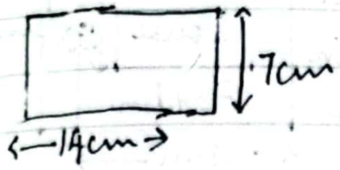


ans:- $a = 7cm$

area of a square $= a^2 = 7^2 = \underline{\underline{49 cm^2}}$

Q:) Find perimeter of the following figures.

(a)

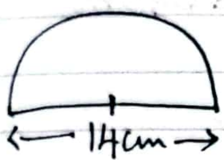


ans:- $l = 14cm$

$b = 7cm$

Perimeter of a rectangle $= 2(l+b) = 2(14+7) = 2 \times 21 = \underline{\underline{42cm}}$

(b)



ans:- $2r = 14cm$

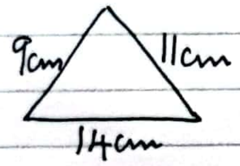
$r = 7cm$

$\therefore$ Perimeter of a semi-circle $= \pi r + 2r = \frac{22}{\cancel{7}_1} \times \cancel{7}^1 + 2 \times 7$

$= 22 + 14$

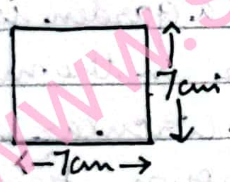
$= \underline{36cm}$

(c)



ans:- perimeter of a $\Delta = 9 + 11 + 14 = \underline{\underline{34cm}}$

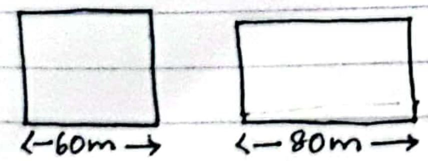
(d)



ans:- perimeter of a square $= 4a = 4 \times 7 = \underline{\underline{28cm}}$.

EXERCISE 11:1

1) A square and a rectangular field with measurements as given in the figure have the same perimeter. Which field has a larger area?



ans:- Perimeter of square field $= 4a = 4 \times 60 = 240m$

Perimeter of rectangular field $= 2(l+b) = 2(80+b)\,m$

Thus, $2(80+b) = 240$

$80 + b = 120$

$b = 120 - 80$

$= 40m$

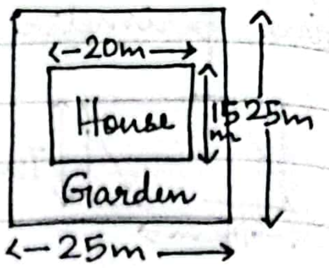
area of square field $= a^2 = 3600\,m^2$

area of rectangular field $= l \times b$

$= 80 \times 40 = 3200\,m^2$

Hence the square field has a larger area.

2) Mrs. Kaushik has a square plot with the measurement as shown. She wants to construct a house in the middle of the plot. A garden is developed around the house.



Find the total cost of developing a garden around the house at the rate of ₹ 55 per m^2.

ans: For square plot : $a = 25m$

area of square plot $= a^2 = 25^2 = 625 m^2$

For rectangular house : $l = 20m$

$b = 15m$

area of rectangular house $= l \times b = 20 \times 15$

$= 300 m^2$

$\therefore$ Area of garden $= 625 - 300 = 325 m^2$.

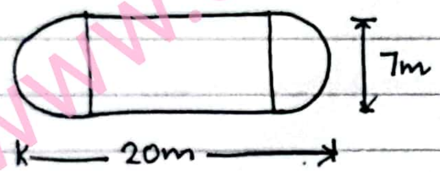
Thus, cost of developing the garden

$= \text{area} \times \text{rate}$

$= 325 \times 55$

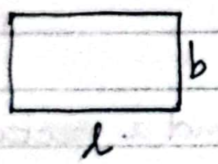
$= ₹ 17875$

3)



The shape of a garden is rectangular in the middle and semi-circular at the ends as shown. Find the area and the perimeter of this garden.

Ans:-



$r = 7/2 m$

$l = 20 - 2r = 20 - 2 \times \frac{7}{2} = 20 - 7 = 13m$

$b = 7m$

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

Area of garden = area of rectangle + area of a circle

$= l \times b + \pi r^2 = 13 \times 7 + \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$

$= 91 + 11 \times 3.5$

$= 91 + 38.5 = 129.5 m^2$.

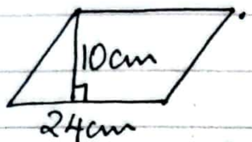
Perimeter of the garden $= \pi r + l + \pi r + l = 2l + 2\pi r$

$= 2 \times 13 + \cancel{2} \times \frac{22}{\cancel{7}_1} \times \frac{\cancel{7}^1}{\cancel{2}_1}$

$= 26 + 22 = \underline{48m}$

4) A flooring tile has the shape of a parallelogram whose base is 24cm and the corresponding height is 10cm. How many such tiles are required to cover a floor of area $1080m^2$.

ans:-



$b = 24cm$

$h = 10cm$

Area of 1 tile $= b \times h = 24 \times 10 = 240cm^2$

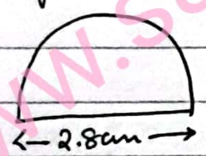
area of floor $= 1080m^2 = 10800000cm^2$

$\therefore$ No. of tiles required $= \frac{\text{area of floor}}{\text{area of 1 tile}} = \frac{1080000\cancel{0}}{24\cancel{0}}$

$= \underline{\underline{45,000 \text{ tiles}}}$

5) An ant is moving around a few food pieces of different shapes scattered on the floor. For which food-piece would the ant have to take a longer round?

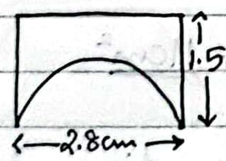
(a)



ans:- distance covered by the ant $= \pi r + 2r = \frac{\cancel{22}^{11}}{7_1} \times \frac{\cancel{2.8}^{0.4}}{\cancel{2}_1} + \cancel{2}^1 \times \frac{2.8}{\cancel{2}_1}$

$= 4.4 + 2.8 = \underline{\underline{7.2cm}}$

(b)

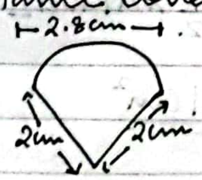


ans:- For circle: $r = \frac{2.8}{2} = 1.4cm$

distance covered by the ant $= \pi r + 1.5 + 1.5 + 2.8$

$= \frac{22}{7_1} \times \cancel{1.4}^{0.2} + 5.8 = \underline{10.2cm}$

(c)



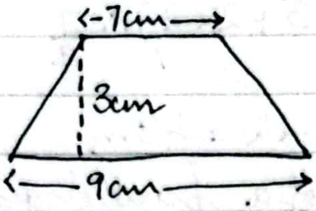
ans:- $r = \frac{2.8}{2} = 1.4 \ cm$

distance covered by the ant $= 2 + 2 + \pi r = 4 + \frac{22}{7_1} \times \cancel{1.4}^{0.2} = \underline{\underline{8.4cm}}$

Hence, figure (b) has longer distance.

Q) Find the area of the following trapeziums

(i)

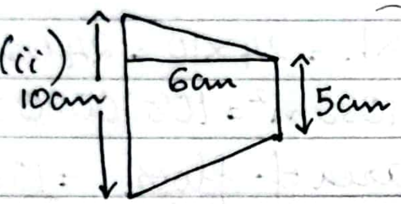


ans:- area of trapezium $= \frac{1}{2}$ (Sum of parallel sides) $\times$ height

$$= \frac{1}{2}(7+9)\times 3 = \frac{1}{\cancel{2}_1}\times \cancel{16}^{8}\times 3$$

$$= 8\times 3 = \underline{\underline{24\ cm^2}}$$

(ii)

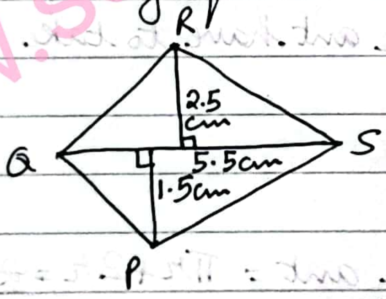


Ans:- area of trapezium $= \frac{1}{2}$ (sum of parallel sides) $\times$ height

$$= \frac{1}{2}(10+5)\times 6 = \frac{1}{\cancel{2}_1}\times 15\times \cancel{6}^{3}$$

$$= 15\times 3 = \underline{\underline{45 cm^2}}$$

Q:-) Find the area of quadrilateral PQRS

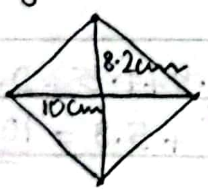


ans:- Area of quad. PQRS $= \frac{1}{2}(h_1+h_2)\times QS = \frac{1}{2}(2.5+1.5)\times 5.5$

$$= \frac{1}{\cancel{2}_1}\times \cancel{4}^{2}\times 5.5 = \underline{11 cm^2}$$

Q:-) Find the area of a rhombus whose diagonals are of lengths 10cm and 8.2cm.

ans:-

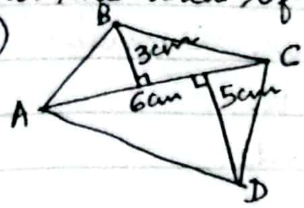


area of rhombus $= \frac{1}{2}\times d_1\times d_2$

$$= \frac{1}{\cancel{2}_1}\times 10\times \cancel{8.2}^{4.1} = \underline{\underline{41\ cm^2}}$$

Q:- Find the area of the following quadrilaterals :-

(i)

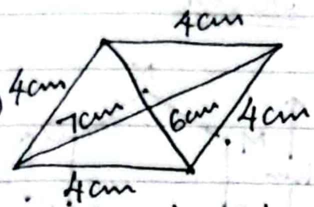


ans:- area of quadrilateral ABCD $= \frac{1}{2}(h_1+h_2)\times d$

$= \frac{1}{2}(3+5)\times 6 = \frac{1}{\cancel{2}_1}\times \cancel{8}^4\times 6$

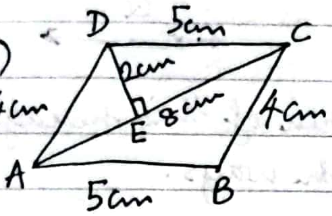
$= \underline{24 cm^2}$

(ii)



ans:- area of rhombus $= \frac{1}{2}\times d_1\times d_2 = \frac{1}{\cancel{2}_1}\times \cancel{6}^3\times 7 = \underline{21 cm^2}$

(iii)



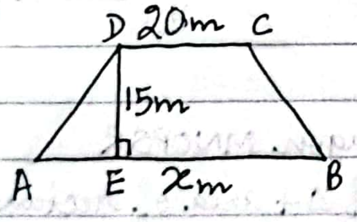
ans:- Since a diagonal divides the parallelogram into two congruent triangles, area of parallelogram ABCD = 2 × area of △ADC

$= 2\times\frac{1}{2}\times AC\times DE$

$= 8\times 2 = \underline{16 cm^2}$

Q:-) The area of a trapezium shaped field is $480 m^2$, the distance between two parallel sides is 15m and one of the parallel side is 20m. Find the other parallel side.

ans:-



area(trap. ABCD) $= \frac{1}{2}(AB+DC)\times DE$

$\Rightarrow 480 = \frac{1}{2}(20+x)\times 15$

$\Rightarrow \frac{\cancel{480}^{96}\times 2}{\cancel{15}_3} = 20+x$

$\Rightarrow 20+x = 64$

$\therefore x = 64-20 = 44$

Hence, the other parallel side = 44m

Q:-) The area of a rhombus is $240 cm^2$ and one of the diagonals is 16cm. find the other diagonal.

ans:- area of a rhombus $= \frac{1}{2} \times d_1 \times d_2$

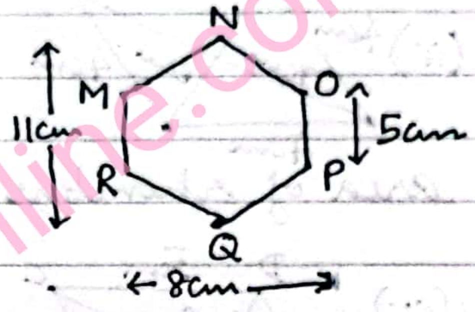
$$240 = \frac{1}{2} \times 16 \times d_2$$

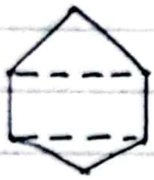
$$240 \times 2 = 16 d_2$$

$$\therefore d_2 = \frac{240 \times \cancel{2}^{1}}{\cancel{16}_{8}} = 30cm$$

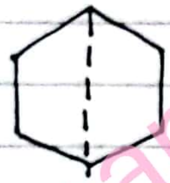
Hence, the other diagonal $= \underline{\underline{30cm}}$

Q:-) There is a hexagon MNOPQR of side 5cm. Aman and Ridhima divided it in two different ways.





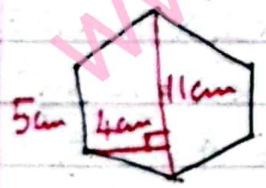
Ridhima's



Aman's

Find the area of this hexagon using both ways.

ans:- Aman's method



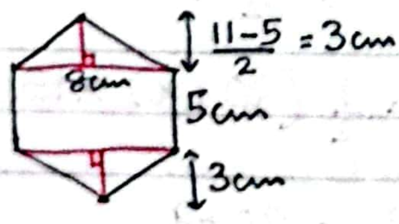
area of hexagon MNOPQR

$= 2 \times$ area of trapezium MNQR

$= 2 \times \frac{1}{2}$ (Sum of parallel sides) $\times$ height

$= \cancel{2}^{1} \times \frac{1}{\cancel{2}_{1}} (5+11) \times 4 = 16 \times 4 = \underline{\underline{64 cm^2}}$

Ridhima's method



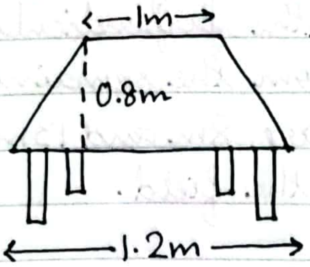
area of hexagon MNOPQR

$= 2 \times$ area of Δ + area of rectangle

$= 2 \times \frac{1}{2} \times 8 \times 3 + 5 \times 8$

$= 24 + 40 = \underline{64 cm^2}$

EXERCISE 11.2

1) 

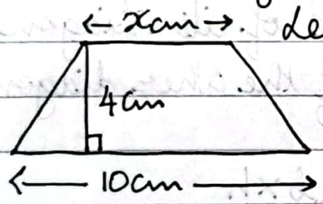
The shape of the top surface of a table is a trapezium. Find its area if its parallel sides are 1m and 1.2m and perpendicular distance between them is 0.8m

ans:- Area of top surface of the table $= \frac{1}{2}$(Sum of parallel sides)$\times h$

$$= \frac{1}{2}(1+1.2)\times 0.8 = \frac{1}{2}\times 2.2\times 0.8$$

$$= 1.1\times 0.8 = \underline{\underline{0.88m^2}}$$

2) The area of a trapezium is $34cm^2$ and the length of one of the parallel sides is 10cm and its height is 4cm. Find the length of the other parallel side.

ans:- 

Let the length of the other parallel side be x cm.

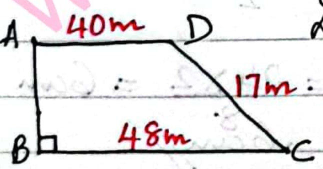
area of trapezium $= \frac{1}{2}$(Sum of parallel sides)$\times h$

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

$$\frac{34 \times \cancel{2}^{1}}{\cancel{4}_{2}} = x+10$$

$$\therefore x = 17-10 = 7cm$$

Hence, the length of the other parallel side $= 7cm$//

3) 

Length of the fence of a trapezium shaped field ABCD is 120m. If BC = 48m, CD = 17m and AD = 40m, find the area of this field. Side AB is perpendicular to the parallel sides AD and BC.

ans:- perimeter (trap. ABCD) = 120m

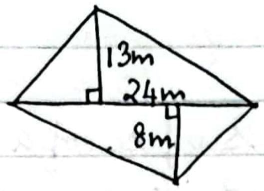
$$AB + BC + CD + AD = 120$$

$$AB = 120 - (40+17+48) = 120 - 105$$

$$= 15m//$$

area (trap. ABCD) $= \frac{1}{2}(AD+BC)\times AB = \frac{1}{2}(40+48)\times 15$

$$= \frac{1}{2}\times 88\times 15 = 44\times 15 = \underline{\underline{660m^2}}$$

4) 

The diagonal of a quadrilateral shaped field is 24m and the perpendiculars dropped on it from the remaining opposite vertices are 8m and 13m. Find the area of the field.

Ans:- Area of the field $= \frac{1}{2}(h_1+h_2)\times d$

$$= \frac{1}{2}(13+8)\times 24 = 21\times 12 = \underline{\underline{252 m^2}}$$

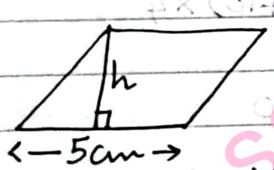
5) The diagonals of a rhombus are 7.5cm and 12cm. Find its area.

Ans:- area of a rhombus $= \frac{1}{2}\times d_1 \times d_2$

$$= \frac{1}{2}\times 7.5\times 12 = 7.5\times 6 = \underline{\underline{45 m^2}}$$

6) Find the area of a rhombus whose side is 5cm and whose altitude is 4.8cm. If one of its diagonals is 8cm long, find the length of the other diagonal.

Ans:-



area of rhombus $= b\times h$

$= 5\times 4.8 = 24 cm^2$

Also, area of rhombus $= \frac{1}{2}\times d_1 \times d_2$

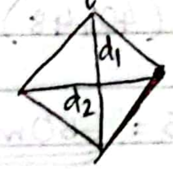
$\Rightarrow 24 = \frac{1}{2}\times 8\times d_2$

$\therefore d_2 = \frac{24\times 2}{8} = 6cm$

Hence, length of the other diagonal = 6cm//

7) The floor of a building consists of 3000 tiles which are rhombus shaped and each of its diagonals are 45cm and 30cm in length. Find the total cost of polishing the floor, if the cost per m^2 is ₹4.

ans:-



$d_1 = 45cm$

$d_2 = 30cm$

area of 1 tile $= \frac{1}{2}\times d_1 \times d_2 = \frac{1}{2}\times 45\times 30$

$= 45\times 15 = 675 cm^2$

Cost of 3000 tiles $= 675 \times 3000 = 2025000 \, cm^2$

$= \dfrac{2025\cancel{000}}{100 \times 10\cancel{0}} \, m^2$

$= \underline{\underline{202.5 \, m^2}}$

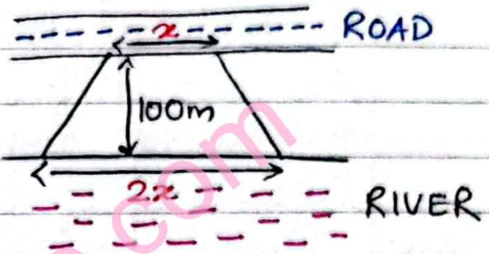
rate of polishing $= ₹4/m^2$

$\therefore$ Cost of polishing the floor $=$ area $\times$ rate

$= 202.5 \times 4$

$= \underline{\underline{\text{Rs } 810}}$

8) Mohan wants to buy a trapezium shaped field. Its side along the river is parallel to and twice the side along the road. If the area of this field is $10500 \, m^2$ and the perpendicular distance between the two parallel sides is 100m, find the length of the side along the river.



ans:- Area of a trapezium $= \frac{1}{2} \times$ (sum of parallel sides) $\times h$

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

$$\frac{105\cancel{00} \times 2}{1\cancel{00}} = x + 2x$$

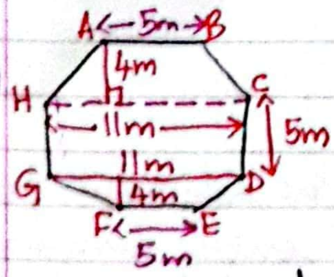
$$\therefore 3x = 210$$

$$x = \frac{210}{3} = 70$$

Hence, the length of the side along the river $= 2x$

$= 2 \times 70 = \underline{140m}$

9) Top surface of a raised platform is in the shape of a regular actagon. find the area of the octagonal surface.



ans:-

area of trapezium $= \frac{1}{2} \times$ (sum of parallel sides) $\times h$

$= \frac{1}{2} \times (5 + 11) \times 4 = 16 \times 2 = 32 m^2$

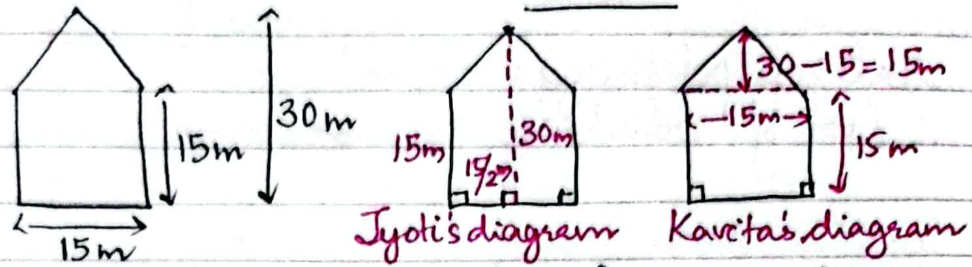
area of rectangle $= l \times b = 11 \times 5 = 55 m^2$

area of octagonal surface

$= 2 \times$ area of trapezium + area of rectangle

$= 2 \times 32 + 55 = 64 + 55 = \underline{\underline{119 m^2}}$

10)



There is a pentagonal shaped park as shown. For finding its area Jyoti and Kavita divided it in two different ways. Find the area of this park using both ways. Can you suggest some other way of finding its area?

ans:- Jyoti's method :- Area of pentagonal park

$= 2 \times$ area of trapezium $= \cancel{2} \times \frac{1}{\cancel{2}}$ (Sum of || sides) $\times h$

$= (15+30) \times \frac{15}{2}$

$= \frac{45 \times \cancel{15}^{7.5}}{\cancel{2}} = \underline{\underline{337.5 m^2}}$

Kavita's method :-

Area of triangle $= \frac{1}{2} \times b \times h = \frac{1}{2} \times 15 \times 15 = \frac{225}{2} m^2$

Area of square $=$ side $\times$ side $= 15 \times 15 = 225 m^2$

$\therefore$ Area of pentagonal park

$=$ area of $\Delta +$ area of square

$= \frac{225}{2} + 225$

$= 112.5 + 225 = \underline{337.5 m^2}$

11)

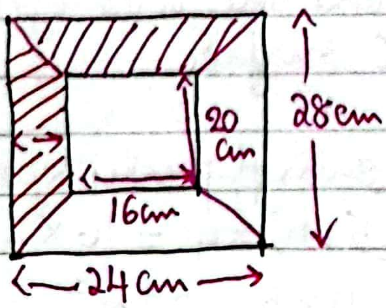
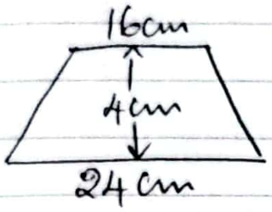


Diagram of the adjacent picture frame has outer dimensions $= 24 cm \times 28 cm$ and inner dimensions $16 cm \times 20 cm$.

Find the area of each section of the frame, if the width of each section is same.

ans:-

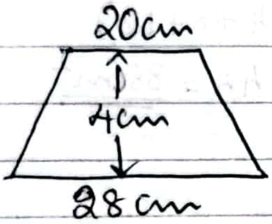
width of the frame $= \dfrac{24-16}{2} = 4\text{ cm}$



area of trapezium $= \frac{1}{2}$(sum of parallel sides) $\times h$

$= \frac{1}{2}(16+24)\times 4 = \frac{1}{2}\times 40\times 4$

$= \underline{\underline{80\text{ cm}^2}}$

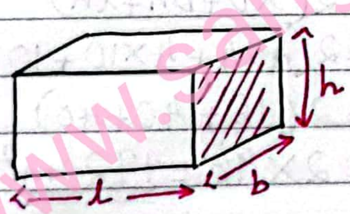


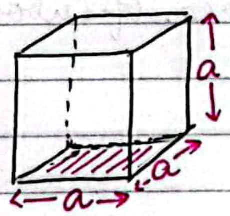
area of trapezium $= \frac{1}{2}$(sum of parallel sides) $\times h$

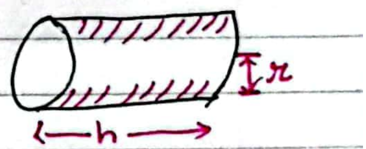
$= \frac{1}{2}(20+28)\times 4$

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

Hence area of each section $= 80\text{ cm}^2, 96\text{ cm}^2, 80\text{ cm}^2, 96\text{ cm}^2$







Base area $= l\times b$	Base area $= a^2$	C.S.A $= 2\pi rh$
L.S.A $= 2h(l+b)$	L.S.A $= 4a^2$	T.S.A $= 2\pi r(r+h)$
T.S.A $= 2(lb+bh+hl)$	T.S.A $= 6a^2$	volume $= \pi r^2 h$
Volume $= lbh$	volume $= a^3$	Base area $= \pi r^2$
diagonal $= \sqrt{l^2+b^2+h^2}$	diagonal $= \sqrt{3}a$	

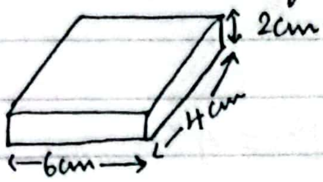
Diagonal of a rectangle $= \sqrt{l^2+b^2}$

Diagonal of a square $= \sqrt{2}\,a$

1 hectare $= 10{,}000\text{ m}^2$	$1\text{ cm}^3 = 1\text{ ml}$
1 litre $= 1000\text{ cm}^3$	$1\text{ m}^3 = 1\text{ kl}$
$1\text{ m}^3 = 1000$ litre	

Q:- Find the total Surface area of the following Cuboids:

(i)



ans:- $l = 6cm$

$b = 4cm$

$h = 2cm$

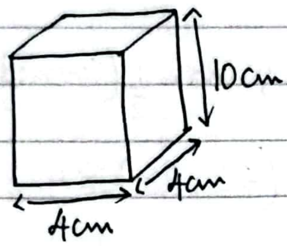
total surface area of Cuboid $= 2(lb+bh+hl)$

$= 2(6\times4+4\times2+2\times6)$

$= 2(24+8+12)$

$= 2\times44 = \underline{\underline{88cm^2}}$

(ii)



ans:- $l = 4cm$

$b = 4cm$

$h = 10cm$

total surface area of Cuboid $= 2(lb+bh+lh)$

$= 2(4\times4+4\times10+10\times4)$

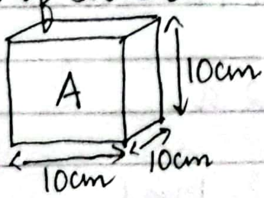
$= 2(16+40+40)$

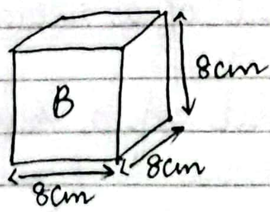
$= 2\times96 = \underline{\underline{192cm^2}}$

$\boxed{\text{T.S.A of a Cuboid} = \text{L.S.A} + 2\times\text{base area}}$

Note :- If we interchange the lengths of the base and the height of a cuboid, then its L.S.A will be changed.

Q:- Find the surface area of Cube A and lateral Surface area of Cube B.





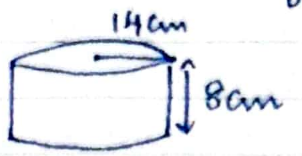
ans:- Surface area of Cube A $= 6a^2 = 6\times10\times10 = \underline{\underline{600cm^2}}$

Lateral Surface area of Cube B $= 4a^2 = 4\times8\times8 = \underline{\underline{256cm^2}}$

Scanned with CamScanner

Q:- Find the total surface area of the following cylinders

(i)



Ans:- $r = 14cm$

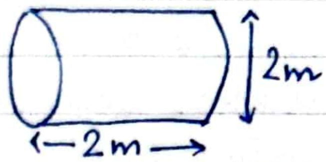
$h = 8cm$

total surface area of cylinder $= 2\pi r(r+h)$

$= 2 \times \frac{22}{7} \times 14 (14+8)$

$= 88 \times 22 = \underline{1936 cm^2}$

(ii)



Ans:- $r = \frac{2}{2} = 1m$

$h = 2m$

total surface area of cylinder $= 2\pi r(r+h)$

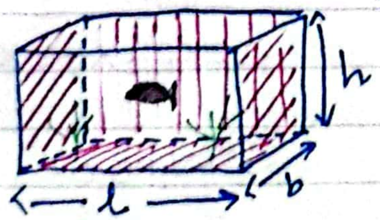
$= 2 \times \frac{22}{7} \times 1 (1+2)$

$= \frac{44}{7} \times 3 = \frac{132}{7} = \underline{18.85m^2}$

$\boxed{\text{C.S.A of a cylinder = circumference of base} \times \text{height}}$

Q:- An aquarium is in the form of a cuboid whose external measures are 80cm × 30cm × 40cm. The base, side faces and back face are to be covered with a coloured paper. Find the area of the paper needed?

Ans:- $l = 80cm$; $b = 30cm$; $h = 40cm$



base area $= l \times b$

Side face area $= b \times h$

back face area $= l \times h$

Area of paper needed $= l \times b + 2 \times b \times h + l \times h$

$= 80 \times 30 + 2 \times 30 \times 40 + 80 \times 40$

$= 2400 + 2400 + 3200$

$= \underline{8000 cm^2}$

Q:- The internal measures of a cuboidal room are $12m \times 8m \times 4m$. Find the total cost of white washing all four walls of a room, if the cost of white washing is Rs 5 per m^2. What will be the cost of white washing if the ceiling of the room is also whitewashed.

ans:- $l = 12m$
$b = 8m$
$h = 4m$

area of four walls of the room $= 2h(l+b)$
$= 2 \times 4 (12+8)$
$= 8 \times 20 = \underline{\underline{160 m^2}}$

$\therefore$ Cost of white washing all four walls of the room
$=$ area $\times$ rate
$= 160 \times 5 = \underline{\underline{Rs\ 800}}$

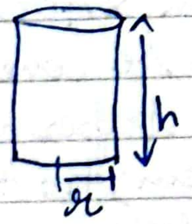
area of ceiling $= l \times b = 12 \times 8 = 96 m^2$

$\therefore$ total area including ceiling $= 160 + 96 = 256 m^2$

Hence, total cost of white washing four walls and ceiling $= 256 \times 5 = \underline{\underline{Rs\ 1280}}$

Q:-) In a building there are 24 cylindrical pillars. The radius of each pillar is 28cm and height is 4m. Find the total cost of painting the curved surface area of all pillars at the rate of Rs $8/m^2$.

ans:-



$r = 28cm$
$h = 4m = 400cm$

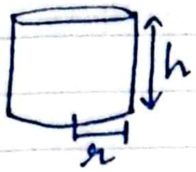
area of 1 pillar, C.S.A of a cylinder
$= 2\pi r h$
$= 2 \times \frac{22}{\cancel{7}_1} \times \cancel{28}^{4} \times 400$

$= 70400\ cm^2$
$= 7.04 m^2$

$\therefore$ Cost of painting 24 cylindrical pillars
$= 24 \times 7.04 \times 8$
$= \underline{\underline{Rs\ 1351.68}}$

Q:- Find the height of a cylinder whose radius is 7cm and the total surface area is $968\ cm^2$.

ans:-



$r = 7cm$

T.S.A of cylinder $= 2\pi r(r+h) = 968$

$\Rightarrow 2 \times \frac{22}{7} \times 7(7+h) = 968$

$\Rightarrow 7+h = \frac{968}{44}$

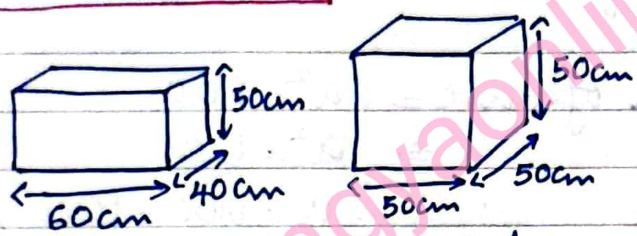
$\Rightarrow 7+h = 22$

$\therefore h = 22-7 = \underline{15cm}$

Hence, height of the cylinder = 15cm//

EXERCISE 11.3

1)



There are two cuboidal boxes as shown. Which box requires the lesser amount of material to make?

ans:- Box 1: $l = 60cm$

$b = 40cm$

$h = 50cm$

T.S.A of box1 $= 2(lb+bh+hl) = 2(60\times40+40\times50+50\times60)$

$= 2(2400+2000+3000) = 2\times7400$

$= 14{,}800cm^2$//

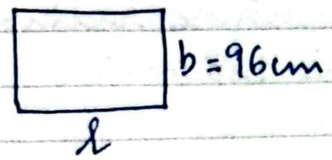
Box 2: $a = 50cm$

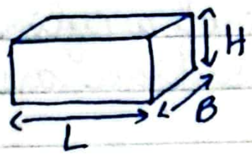
T.S.A of box 2 $= 6a^2 = 6\times50\times50 = 15{,}000cm^2$//

Thus, cuboidal box requires less amount of material to make.

2) A suitcase with measures $80cm \times 48cm \times 24cm$ is to be covered with a tarpaulin cloth. How many metres of tarpaulin of width 96cm is required to cover 100 such suitcases?

ans:-





$L = 80cm$
$B = 48cm$
$H = 24cm$

$$\text{ATQ}, \; l \times b = 100 \times 2(LB + BH + HL)$$
$$l \times 96 = 200(80 \times 48 + 48 \times 24 + 80 \times 24)$$
$$= 200(3840 + 1152 + 1920)$$
$$= 200 \times 6912$$
$$\therefore l = \frac{200 \times 6912}{96} = 200 \times 72 = 14400 \text{ cm}$$
$$= 144 \text{ m}$$

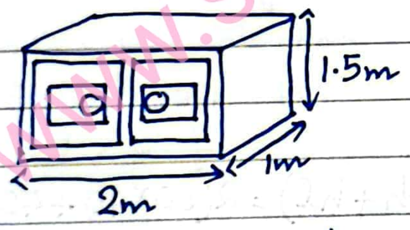
Hence, 144m tarpaulin of width 96cm is required to cover 100 suitcases.

3) Find the side of a cube whose surface area is $600 cm^2$

ans:- Surface area of cube $= 6a^2 = 600$
$$\Rightarrow a^2 = 100$$
$$\therefore a = \sqrt{100} = 10cm$$

Hence, the side of the cube = 10cm.

4)

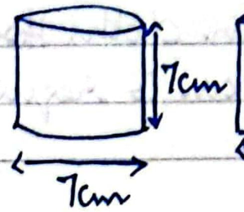


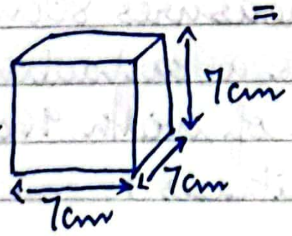
Rukhsar painted the outside of the cabinet of measure $1m \times 2m \times 1.5m$. How much surface area did she cover if she painted all except the bottom of the cabinet.

ans:- $l = 1m$
$b = 2m$
$h = 1.5m$

Area to be painted $= 2h(l+b) + l \times b$
$$= 2 \times 1.5(1+2) + 1 \times 2$$
$$= 3 \times 3 + 2 = 9 + 2 = 11 m^2$$

5)





Daniel is painting the walls and ceiling of a cuboidal hall with length, breadth and height of 15m, 10m and 7m respectively. From each can of paint $100m^2$ of area is painted. How many cans of paint will she need to paint the room?

ans:- For cuboidal : $l = 15m$
$b = 10m$
$h = 7m$

For cylinder : $r = \frac{7}{2}cm$

$H = 7cm$

area covered by 1 can of paint $= 100m^2$

area to be painted $= 2h(l+b) + l \times b$
$= 2\times7(15+10) + 15\times10$
$= 14\times25 + 150 = 350+150 = 500m^2$

$\therefore$ No. of cans of paint needed $= \frac{500}{100} = 5$ cans

6) Describe how the two figures in Q.No 5) are alike and how they are different. Which box has larger lateral surface area?

ans:- Given figures are alike since their heights are equal. But they differ by their shapes. ie, the first figure is a cylinder and other is cube.

C.S.A of cylinder $= 2\pi rh = 2\times\frac{22}{7}\times\frac{7}{2}\times7$

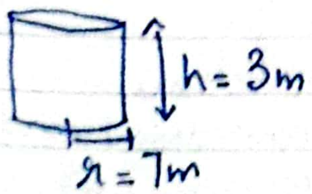
$= 22\times7 = 154cm^2$

L.S.A of Cube $= 4a^2 = 4\times7\times7 = 196cm^2$

Hence, Cube has the larger lateral surface area.

7) A closed cylindrical tank of radius 7m and height 3m is made from a sheet of metal. How much sheet of metal is required?

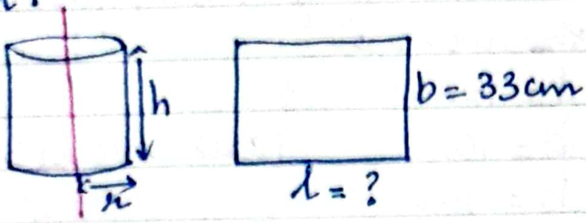
ans:-



Area of metal sheet required
$= 2\pi r(r+h)$
$= 2\times\frac{22}{7}\times7(7+3) = 44\times10$
$= 440m^2$

8) The lateral Surface area of a hollow cylinder is $4224 cm^2$. It is cut along its height and formed a rectangular sheet of width 33cm. Find the perimeter of rectangular sheet?

ans:-



$h = b = 33cm$

$l = 2\pi r$

C.S.A of cylinder, $2\pi rh = 4224$

$$r = \frac{4224}{2\pi h} = \frac{\overset{32}{\cancel{\overset{96}{\cancel{4224}}}} \times 7}{\underset{1}{\cancel{2}} \times \underset{1}{\cancel{22}} \times \underset{11}{\cancel{33}}}$$

$$= \frac{224}{11} cm$$

$\therefore$ length of rectangular sheet,

$$l = 2\pi r = 2 \times \frac{\overset{2}{\cancel{22}}}{\underset{1}{\cancel{7}}} \times \frac{\overset{32}{\cancel{224}}}{\underset{1}{\cancel{11}}}$$

$$= 4 \times 32$$

$$= 128cm$$

Thus, perimeter of rectangular sheet

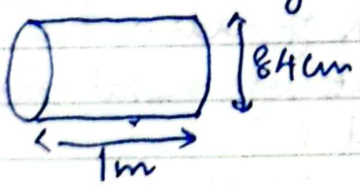
$$= 2(l+b)$$

$$= 2(128+33) = 2 \times 161$$

$$= \underline{\underline{322cm}}$$

9) A road roller takes 750 complete revolutions to move once over to level a road. Find the area of the road if the diameter of a road roller is 84cm and length is 1m.

ans:-



$r = \frac{84}{2} = 42cm$

$h = 1m = 100cm$

Total area covered in 750 revolutions

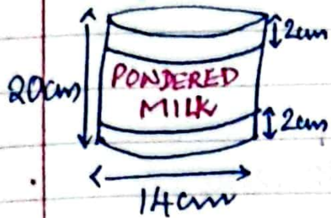
$$= 750 \times \text{C.S.A of cylindrical road roller}$$

$$= 750 \times 2\pi rh = 750 \times 2 \times \frac{22}{\underset{1}{\cancel{7}}} \times \overset{6}{\cancel{42}} \times 100$$

$$= 1980000 cm^2$$

$$= 1980 m^2$$

10) A company packages its milk powder in cylindrical container whose base has a diameter of 14cm and height 20cm. Company places a label around the surface of the container. If the label is placed 2cm from top and bottom, what is the area of the label.



ans:- $r = \frac{14}{2} = 7cm$

$h = 20cm$

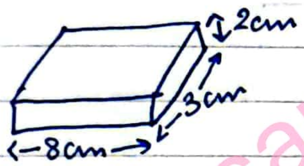
Height of label, $H = 20-2-2 = 20-4 = 16\,cm$

area of label $= 2\pi r H$

$= 2 \times \frac{22}{\cancel{7}_1} \times \cancel{7}^1 \times 16 = \underline{\underline{704\,cm^2}}$

Q:-) Find the volume of the following cuboids

(i)



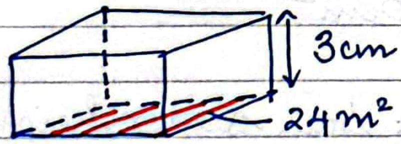
ans:- $l = 8cm$

$b = 3cm$

$h = 2cm$

volume of the Cuboid $= l \times b \times h = 8 \times 3 \times 2 = 48\,cm^3$

(ii)



ans:- volume of the Cuboid = base area × height

$= 24 \times \frac{3}{100} = \frac{72}{100} = \underline{\underline{0.72\,m^3}}$

Q:-) Find the volume of the following cubes:

(a) with a side 4cm

ans:- volume of the Cube $= a^3 = 4 \times 4 \times 4 = \underline{\underline{64\,cm^3}}$

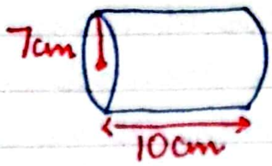
(b) with a side 1.5m

ans:- $a = 1.5m$

volume of the Cube $= a^3 = 1.5 \times 1.5 \times 1.5 = \underline{\underline{3.375\,m^3}}$

Q:-) Find the volume of the following cylinders

(i)



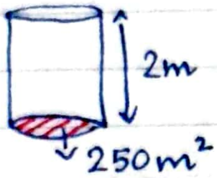
ans:- $r = 7cm$

$h = 10cm$

Volume of the Cylinder $= \pi r^2 h = \frac{22}{\cancel{7}_1} \times \cancel{7}^1 \times 7 \times 10$

$= \underline{\underline{1540 cm^3}}$

(ii)



ans:- base area $= 250 m^2$

height $= 2m$

Volume of the Cylinder = base area × height

$= 250 \times 2$

$= \underline{\underline{500 m^3}}$

$1\ell = 1000 cm^3$
$1m^3 = 1000 \ell$
$1 m\ell = 1 cm^3$
$1m^3 = 1 k\ell$

Q:-) Find the height of a cuboid whose volume is $275 cm^3$ and the base area is $25 cm^2$.

ans:- base area $= 25 cm^2$

Volume of a cuboid = base area × height

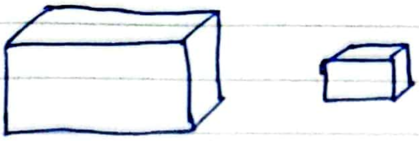
$275 = 25 \times$ height

$\therefore$ Height $= \frac{275}{25} = \underline{\underline{11 cm}}$

Hence, height of the cuboid = 11cm

Q:-) A godown is in the form of a cuboid of measures $60m \times 40m \times 30m$. How many cuboidal boxes can be stored in it if the volume of one box is $0.8m^3$?

ans:-



For godown : $L = 60m$

$B = 40m$

$H = 30m$

For cuboidal box : volume $= 0.8m^3$

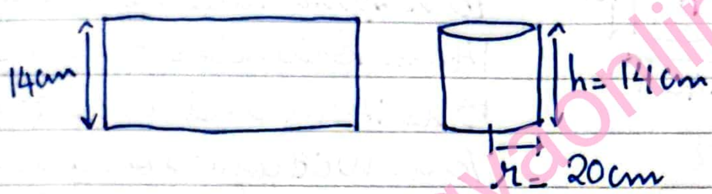
$\therefore$ No. of cuboidal boxes that can be stored $= \frac{L \times B \times H}{0.8}$

$= \frac{\overset{30}{\cancel{60}} \times \overset{10}{\cancel{40}} \times 30 \times 10}{\cancel{8}\,\cancel{2}\,1}$

$= \underline{90000}$

Q:-) A rectangular paper of width 14cm is rolled along its width and a cylinder of radius 20cm is formed. Find the volume of the cylinder ($\pi = 22/7$)

Ans:



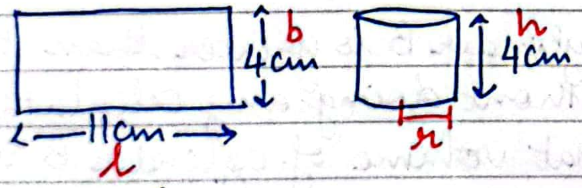
For the cylinder : $h = 14cm$

$r = 20cm$

Volume of the cylinder $= \pi r^2 h = \frac{22}{\cancel{7}\,1} \times 20 \times 20 \times \overset{2}{\cancel{14}} = \underline{\underline{17600cm^3}}$

Q:-) A rectangular piece of paper 11cm x 4cm is folded without overlapping to make a cylinder of height 4cm. Find the volume of the cylinder.

Ans:-



$2\pi r = l$

$2 \times \frac{22}{7} \times r = 11 \Rightarrow r = \frac{\overset{1}{\cancel{11}} \times 7}{2 \times \cancel{22}\,2} = \frac{7cm}{4}$ //

$\therefore$ volume of the cylinder $= \pi r^2 h$

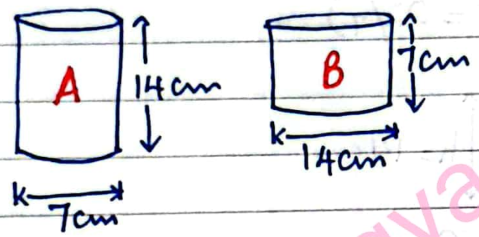
$= \frac{22}{\cancel{7}\,1} \times \frac{\overset{1}{\cancel{7}}}{\cancel{4}\,1} \times \frac{7}{4} \times \overset{1}{\cancel{4}} = \frac{\overset{11}{\cancel{22}} \times 7}{\cancel{4}\,2}$

$= \frac{11 \times 7}{2} = \frac{77}{2} = \underline{\underline{38.5cm^3}}$

EXERCISE 11.4

1) Given a cylindrical tank, in which situation will you find surface area and in which situation 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.

ans:- (a) volume of the tank
(b) surface area of the tank
(c) volume of the tank.

2) 

Diameter of cylinder A is 7cm and the height is 14cm. Diameter of cylinder B is 14cm and height is 7cm. Without doing any calculations can you suggest whose volume is greater? Verify it by finding the volume of both the cylinders. Check whether the cylinder with greater volume also has greater surface area?

ans:- For cylinder A : $r_1 = \frac{7}{2}$ cm ; $h_1 = 14$ cm

For cylinder B : $r_2 = \frac{14}{2} = 7$cm ; $h_2 = 7$cm

Since radius of cylinder B is greater than that of cylinder A, without doing any calculations, we can suggest that volume of cylinder B is greater.

volume of cylinder A $= \pi r_1^2 h_1 = \frac{\overset{11}{\cancel{22}}}{\cancel{7}_1} \times \frac{\overset{1}{\cancel{7}}}{\cancel{2}_1} \times \frac{7}{\cancel{2}_1} \times \overset{7}{\cancel{14}}$

$= 539 \text{cm}^3$

volume of cylinder B $= \pi r_2^2 h_2 = \frac{22}{7} \times 7 \times 7 \times 7$
$= 1078 \text{cm}^3$

Hence, volume of cylinder B is greater than volume of cylinder A.

Surface area of cylinder A $= 2\pi r_1(r_1+h_1)$

$= \cancel{2}^1 \times \frac{22}{\cancel{7}_1} \times \frac{\cancel{7}^1}{\cancel{2}_1}\left(\frac{7}{2}+14\right)$

$= 22 \times \frac{35}{2} = 11 \times 35 = \underline{385 cm^2}$

Surface area of cylinder B $= 2\pi r_2(r_2+h_2)$

$= 2 \times \frac{22}{\cancel{7}_1} \times \cancel{7}^1 (7+7) = 44 \times 14$

$= \underline{616 cm^2}$

Thus, Surface area of cylinder B is greater than cylinder A.

3) Find the height of a cuboid whose base area is $180 cm^2$ and volume is $900 cm^3$?

ans:- Base area of a cuboid $= l \times b = 180 cm^2$

volume of a cuboid $= l \times b \times h = 900 cm^3$

$\therefore h = \frac{900}{l \times b} = \frac{90\cancel{0}}{18\cancel{0}} = 5 cm$

Hence, height of a cuboid $= 5 cm$

4) A cuboid is of dimensions $60 cm \times 54 cm \times 30 cm$. How many small cubes with side 6cm can be placed in the given cuboid?

ans:- For cuboid : $l = 60 cm$

$b = 54 cm$

$h = 30 cm$

For cube : $a = 6 cm$

No. of small cubes can be placed $= \frac{\text{volume of cuboid}}{\text{volume of 1 cube}}$

$= \frac{l \times b \times h}{a^3} = \frac{\cancel{60}^{10} \times \cancel{54}^{9} \times \cancel{30}^{5}}{\cancel{6}_1 \times \cancel{6}_1 \times \cancel{6}_1} = \underline{450} \text{ cubes}$

5) Find the height of the cylinder whose volume is $1.54 m^3$ and diameter of the base is 140cm?

ans:- $2r = 140cm$

$r = 70cm = 0.7m$

Volume of the cylinder $= \pi r^2 h = 1.54$

$$\Rightarrow \frac{22}{\cancel{7}_1} \times \frac{\cancel{7}^1}{10} \times \frac{7}{10} \times h = \frac{154}{100}$$

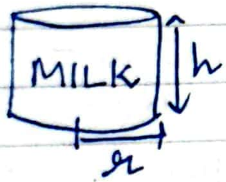
$$\Rightarrow h = \frac{\cancel{154}^{22} \times 1\cancel{0} \times 1\cancel{0}}{1\cancel{0}\cancel{0} \times 22 \times 7_1}$$

$= 1m$

Hence, the height of the cylinder $= 1m = 100cm$

6) A milk tank is in the form of cylinder whose radius is 1.5m and length is 7m. Find the quantity of milk in litres than can be stored in the tank?

ans:-



$r = 1.5m$

$h = 7m$

Quantity of milk stored in the tank

$= \pi r^2 h = \frac{22}{7} \times 1.5 \times 1.5 \times 7$

$= 49.5 m^3$

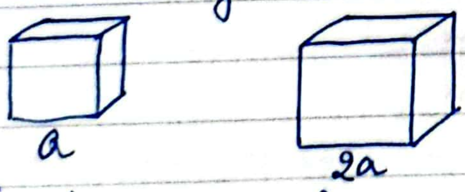
$= 49.5 \times 1000 = \underline{49500 l}$

7) If each edge of a cube is doubled,

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

(ii) how many times will its volume increase?

ans:-



(i) Surface area of original cube $= 6a^2$

Surface area of new cube $= 6(2a)^2 = 6 \times 4a^2$

$= 4(6a^2)$

Thus, surface area increases by 4 times

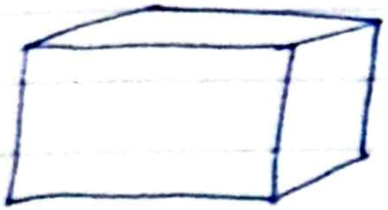
(ii) volume of original cube $= a^3$

volume of new cube $= (2a)^3 = 8a^3 = 8(a)^3$

Thus, volume increases by 8 times.

8) Water is pouring into a cuboidal reservoir at the rate of 60 litres per minute. If the volume of reservoir is 108 m^3, find the number of hours it will take to fill the reservoir.

ans:-



Amount of water pouring into the reservoir in 1 minute

$= 60\,l = \frac{60}{1000} m^3$

Volume of reservoir $= 108 m^3$

$\therefore$ Time taken to fill the reservoir $= \frac{\text{Volume of reservoir}}{\text{amount of water poured in 1 min}}$

$= \frac{108 \times 100\cancel{0}}{6\cancel{0}}$

$= 1800$ minutes

$= \frac{1800}{60} = \underline{\underline{30 \text{ hours}}}$