Mensuration

Exercise 18.1

1. Given

Ratio of length and breadth of rectangular field = 9:5

Area of field = $14580\ m^2$

Cost of fence = ₹ 3.25/m

Let length, breadth = $9x, 5x$

Area = 14580

$l \times b = 14580$

$9x \times 5x = 14580$

$45x^2 = 14580$

$x^2 = \frac{14580}{45}$

$x^2 = 324$

$x = \sqrt{324}$

$x = 18m.$

$\therefore$ length $= 9x = 9 \times 18 =$ ~~162m~~ 162m

breadth $= 5x = 5 \times 18 =$ 90m

Length of fence = ~~Leno~~ Perimeter of rectangle section

$= 2(l+b)$

$= 2(162+90)$

$= 2(252)$

Length of fence $= 504m$

Cost of fence = 504×3.25

= ₹ 1638.

2. Given

Dimensions of ~~pe~~ rectangle = $16m \times 9m$

Let side of Square = x m.

perimeter of rectangle = $2(16+9) = 50m$

Area of rectangle = Area of square

$$l \times b = x^2$$

$$16 \times 9 = x^2$$

$$x = \sqrt{16 \times 9}$$

$$x = 4 \times 3 = 12m$$

$$x = 12m$$

∴ Side of Square = 12m

∴ Perimeter of Square = $4x$

$= 4 \times 12$

$= 48m$

∴ Perimeter of rectangle exceeds perimeter of square by $50 - 48 = 2m$.

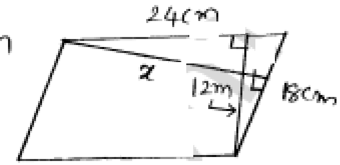
3. Given

lengths of adjacent sides = 24cm and 18cm

the Distance b/w longer sides = 12cm.

Let the Distance b/w shorter sides = x cm

Area of Parallelogram =



side × the distance b/w the opposite sides

$\therefore \quad 24 \times 12 = 18 \times x$

$$x = \frac{24 \times 12}{18}$$

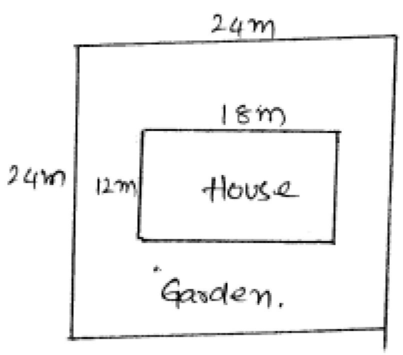
$x = 16$ cm

$\therefore$ the distance b/w shorter sides = 16cm.

4. Given

plot dimension = 24m × 24m

House dimensions = 18m × 12m.



$\therefore$ Garden Area =

Plot Area − House Area.

$= 24 \times 24 - 18 \times 12$

Garden Area = 360 m^2

Given cost of developing garden = ₹50/m^2

$\therefore$ Total cost of developing garden around House

$= 360 \times 50$

$=$ ₹ 18000

5. Dimension of tiles (Parallelogram) = 18cm × 6cm
↳ Height

Floor Area = $540 m^2$

Area of one tile = 18cm × 6cm (b×h)

= $108 cm^2$

Area of one tile = $108 \times 10^{-4} m^2$ ($\because 1cm = 10^{-2} m$)

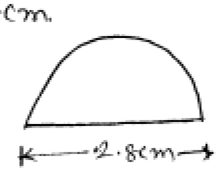
No. of tiles required = $\frac{\text{Total Area}}{\text{Area of one tile}}$

= $\frac{540}{108 \times 10^{-4}}$

No. of tiles required = 50000

6.

(a) diameter of semi circle = 2.8cm.



Perimeter of semi circle

$= \frac{\pi d}{2}$

$= \frac{\pi \times 2.8}{2}$

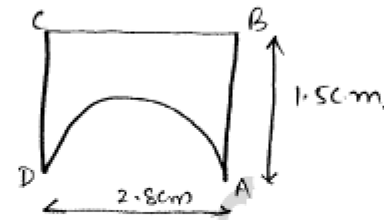
$= \frac{3.14 \times 2.8}{2}$

$= 3.14 \times 1.4$

Perimeter of semi circle = 4.398 c.m

(b)

Perimeter of given shape



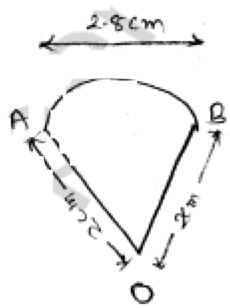
$= \overline{AB} + \widehat{BC} + \overline{CD} +$ Semi circle perimeter

$= 1.5 + 2.8 + 1.5 + 4.398$

$= 10.198$ cm.

(c)

Perimeter of given shape



$= \overline{OA} +$ Semi circle AB $+ \overline{OB}$

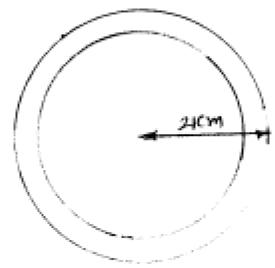
$= 2 + 4.398 + 2$

$= 8.398$ cm

∴ Comparing three ~~p~~ figures perimeter values, we can say in case of figure 'b' Ant has covered more distance.

7. Given

Area b/w enclosed concentric circle $= 770\ cm^2$



Outer circle radius $= 21$ cm.

Let inner circle radius $= r$ cm

Outer circle Area − Inner circle Area = $770\,cm^2$

$\pi(21)^2 - \pi r^2 = 770$

$\pi(21^2 - r^2) = 770$

$21^2 - r^2 = 245.098$

$441 - r^2 = 245.098$

$r^2 = 441 - 245.098$

$r^2 = 195.90$

$r = \sqrt{195.9}$

$r = 13.996 \approx 14\,cm.$

Radius of Inner circle = 14cm.

8. Given

Area of square = $121\,cm^2$

$s^2 = 121$

$s = \sqrt{121}$

$s = 11\,cm.$

∴ Side of Square = 11cm

∴ length of wire ~~circle~~ = Perimeter of Square = 4×11cm

= 44cm.

Now wire is bent into a form of circle

∴ length of wire = perimeter of circle

$44 = 2\pi r$ r = radius of circle

$\pi r = \frac{44}{2}$

$$\pi r = 22$$

$$r = \frac{22}{\pi}$$

$$r = \frac{22}{3.14}$$

$$r = 7\,cm$$

radios of circle = 7cm.

Area of circle = πr^2

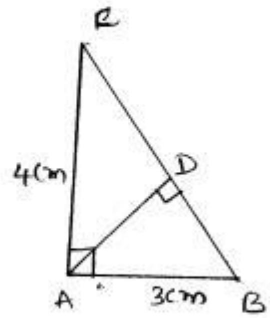
$= 3.14 \times 7^2$

Area of circle $= 153.938\ cm^2$

9.

(i)

Area of $\triangle$le ABC



$= \frac{1}{2} \times b \times h$

$= \frac{1}{2} \times 3 \times 4$ ($\because$ right angle triangle)

$= \frac{1}{2} \times 3 \times 4$

$= \frac{1}{2} \times 12$

$= 6\,cm^2$

(ii)

$BC^2 = AB^2 + AC^2$ ($\because$ Pythogorus theorem)

$BC^2 = 3^2 + 4^2$

$BC^2 = 9 + 16$

$BC^2 = 25$

$BC = \sqrt{25}$

$BC = 5\,cm$

(ii) Area of triangle ABC = 6 cm²

By taking $\overline{BC}$ as base

Area of triangle = $\frac{1}{2} \times b \times h$

$= \frac{1}{2} \times BC \times AD$

$6 = \frac{1}{2} \times 6 \times AD$

$AD = \frac{6 \times 2}{6}$

AD = 2 cm

10. Dimension of rectangular garden = 80m × 40m

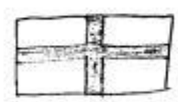
Width of path (w) = 2.5 m

i) Area of cross path = $l \times w + b \times w - (w \times w)$

$= 80 \times 2.5 + 40 \times 2.5 - (2.5 \times 2.5)$

= 293.75 m²

ii) Area of unshaded portion =



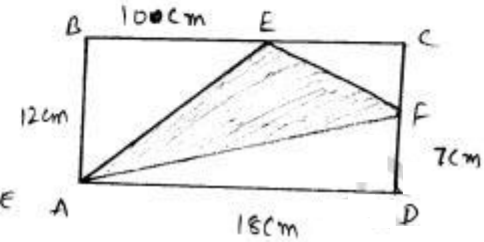
= Area of garden − Area of cross path

$= 80 \times 40 - (293.75)$

= 2906.25 m²

11.

Area of Shaded portion:



Area of $\square$ ABCD $-$ [Area of $\triangle^{le}$ ABE + Area of $\triangle^{le}$ AFD + $\triangle^{le}$ EFC]

$18 \times 12 - \left[\frac{1}{2} \times 7 \times 18 + \frac{1}{2} \times 12 \times 10 + \frac{1}{2} \times 5 \times 8\right]$

$216 - [7 \times 9 + 6 \times 10 + 5 \times 4]$

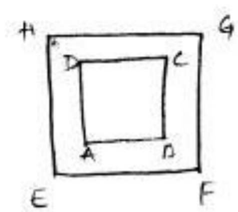
$216 - [63 + 60 + 20]$

$216 - 143$

$73\ cm^2$

$\therefore$ Area of Shaded portion $73 cm^2$.

12. Given



Area of Square ~~ABCD~~ EFGH $= 729 m^2$

$\therefore$ Side of ~~ABCD~~ lawn $= \sqrt{729}$

$= 27 m$

Area of Square ~~EFGH~~ ABCD $= 295 m^2$

Side of $\square$ ABCD $= \sqrt{295}$

Side of ABCD $= 17.175 m$.

i) $\therefore$ length of Square field enclosing lawn & path

$= 27m$

(ii) width of the path = Side of EFGH − Side of ABCD

= 27 − 17.175

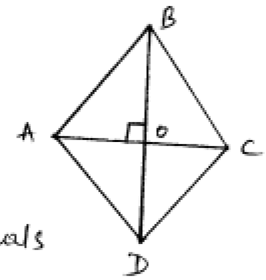
width of the path = 9.825 m.

Exercise 18.2

1. Let ABCD is a Rhombus

$AB = BC = CD = AD = 13cm.$

$AC = 10cm.$



'O' intersection point of diagnals

$\overline{OA} = \overline{OC} = 5cm.$

In $\triangle^{le}$ AOB

(i) $\overline{AB}^2 = \overline{OA}^2 + \overline{OB}^2$ ($\because$ Pythogorus theorem)

$13^2 = 5^2 + \overline{OB}^2$

$169 = 25 + \overline{OB}^2$

$\overline{OB}^2 = 169 - 25$

$\overline{OB}^2 = 144$

$\overline{OB} = \sqrt{144}$

$\overline{OB} = 12cm$

$\overline{BD} = 2 \times \overline{OB}$

$= 2 \times 12$

$\overline{BD} = 24cm$

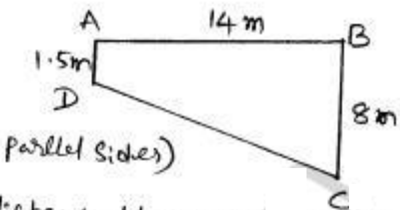
(ii) length of diagnel = 24cm

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

$= \frac{1}{2} \times 10 \times 24$

Area of rhombus $= 120 cm^2$

2. Given ABCD is a trapezium



Area of trapezium = $\frac{1}{2} \times$ (Sum of parllel sides) $\times$ (distance b/w parllel sides)

$= \frac{1}{2} \times (1.5+8) \times 14$

Area of trapezium = $66.5\ m^2$

3. Given

Area of a trapezium = $360 m^2$

distance b/w two parallel side = 20m

length of one parallel side = 25m

Let unknown parallel sides = x

Area of a trepezium = $\frac{1}{2}$ (Sum of parallel sides) $\times$ (distance b/w parallel sides)

$360 = \frac{1}{2}(25+x) \times 20$

$(25+x) = \frac{360 \times 2}{20}$

$25+x = 36$

$x = 36-25$

$x = 11m$

Unknown length of

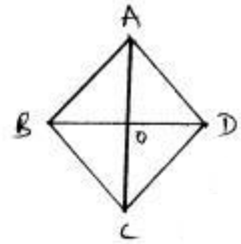
$\therefore$ another parrle side length = 11m.

4. Given ABCD is a rhombus

$\overline{BD} = 13cm$

$\overline{AB} = \overline{BC} = \overline{CD} = \overline{AD} = 6.5cm$

Altitude $\overline{AC} = 5cm$.



(i) Area of rhombus $= \frac{1}{2} \times$ (product of diagnals)

$= \frac{1}{2} \times (13 \times 5)$

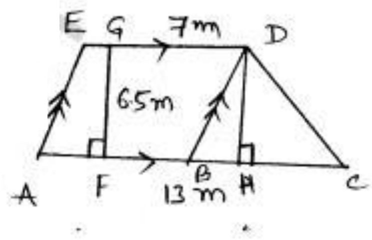
$= 6.5 \times 5$

Area of rhombus $= 32.5\ cm^2$

(ii) Another diagnal $\overline{AC} = 5cm$.

5.

(i) Area of trapezium ACDE



$= \frac{1}{2}(ED + AC) \times FG$

$= \frac{1}{2}(7+13) \times 6.5$

$= \frac{1}{2} \times 20 \times 6.5$

$= 65 m^2$

(ii) Area of parallelogram ABDE = base × ter distance b/w parallel sides

$= 7 \times 6.5$

$= 45.5\ m^2$

(iii) The area of triangle BCD = $\frac{1}{2} \times BC \times DH$

$$AC = AB + BC$$

$$13 = 7 + BC$$

$$BC = 13 - 7$$

$$BC = 6m$$

$$DH = GF = 6.5m$$

$\therefore$ The area of triangle BCD = $\frac{1}{2} \times 6 \times 6.5$

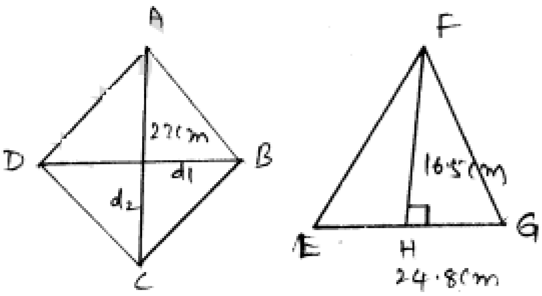
$$= 3 \times 6.5$$

$$= 19.5 \ m^2$$

6.

ABCD is a rhombus and

EFG is a triangle



Given

Area of rhombus = Area of a triangle

$$\frac{1}{2} \times d_1 \times d_2 = \frac{1}{2} \times b \times h$$

$$\frac{1}{2} \times 22 \times d_1 = \frac{1}{2} \times 24.8 \times 16.5$$

$$22 \times d_1 = 24.8 \times 16.5$$

$$d_1 = \frac{24.8 \times 16.5}{22}$$

$$d_1 = 18.6 cm.$$

length of diagonal = 18.6cm.

7. Given

Perimeter of trapezium $= 52 cm$

length of non- parallel side $= 10 cm$.

Altude $= 8 cm$.

length of parllel sides $=$ perimeter $- 2$(parallel side)

$= 52 - 2 \times 10$

$= 52 - 20$

Sum of parallel sides $= 32 cm$

Area of ~~p~~ trapezium $= \frac{1}{2} \times$ (sum of parallel side) $\times$ Altitude

$= \frac{1}{2} \times 32 \times 8$

$= 32 \times 4$

Area of trapezium $= 128 cm^2$

8. Given

Area of trapezium $= 540 cm^2$

Altitude $= 18 cm$.

Ratio of lengths of parallel sides $= 7:5$

Let lengths of parallel sides $= 7x, 5x$

$\therefore$ Area of trapezium $= \frac{1}{2} \times$ (Sum of parallel sides) $\times$ Altitude.

$540 = \frac{1}{2} \times (7x + 5x) \times 18$

$540 = \frac{1}{2}(12x)\times 18$

$540 = \cancel{1}\ 6\times 18\times x$

$x = \frac{540}{6\times 18}$

$x = 5\ cm$

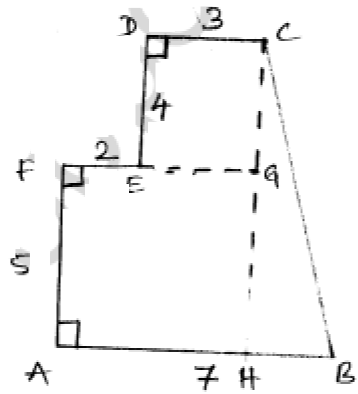
length of parallel sides = $7x = 7\times 5 = 35cm$

$5x = 5\times 5 = 25cm.$

9.

(i)

Area enclosed by shape



= Area of □AHGF + Area of △BCH

+ Area of □DCGE

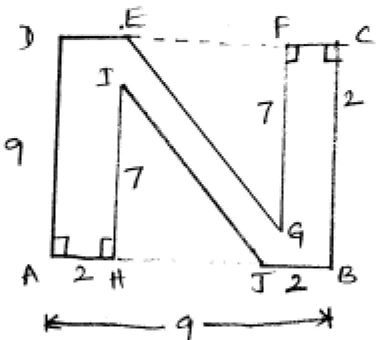
$= 5\times 5 + \frac{1}{2}\times 2\times 9 + 4\times 3$

$= 25 + 9 + 12$

$= 46\ cm^2$

~~10~~(ii)

Area enclosed by shape



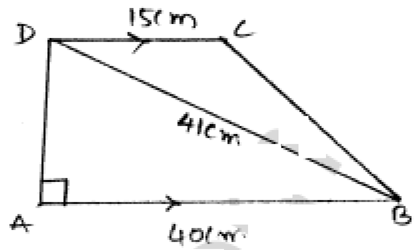
= Area of □ABCD − [Area of $\triangle^{le}$ EFG + Area of $\triangle^{le}$ HIJ]

$= 9\times 9 - \left[\frac{1}{2}\times 5\times 7 + \frac{1}{2}\times 5\times 7\right]$

$= 81 - [5\times 7) \Rightarrow 81 - 35 = 46cm^2.$

10.

(i) In Δ^{le} ABD



$AB^2 + AD^2 = DB^2$ ($\because$ Pythogorus theorem)

$40^2 + AD^2 = 41^2$

$AD^2 = 41^2 - 40^2$

$= 1681 - 1600$

$AD^2 = 81$

$AD = \sqrt{81}$

$AD = 9cm.$

(ii) Area of trapezium $= \frac{1}{2}$ (Sum of parallel sides) $\times$ Altitude

$= \frac{1}{2}(15+40) \times 9$ ($\because$ AD = 9cm)

$= \frac{1}{2} \times 55 \times 9$

Area of trapezium $= 247.5 cm^2$

iii) Area of Δ^{le} BCD = Area of $\square$ ABCD $-$ [Area of Δ^{le} ADB]

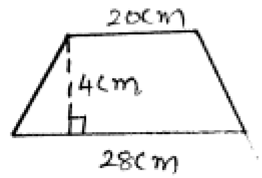
$= 247.5 - \left[\frac{1}{2} \times AB \times AD\right]$

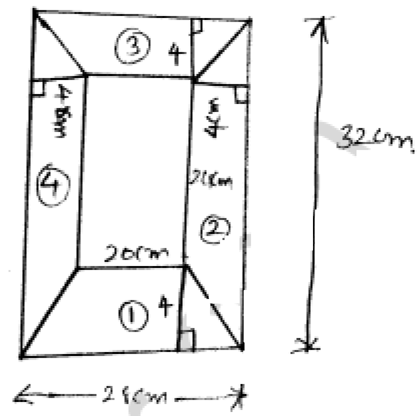
$= 247.5 - \left[\frac{1}{2} \times 40 \times 9\right]$

$= 247.5 - [180]$

Area of Δ^{le} BCD $= 67.5 cm^2$

11. Area of section (1)





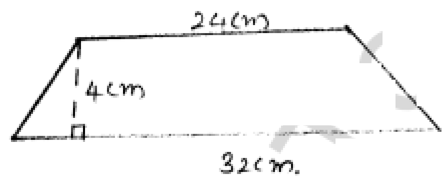
Area of trapezium =

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

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

$= 96 \text{ cm}^2$ $\therefore$ Area of section (1) $= 96 \text{ cm}^2$

Area of section (2)



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

$= \frac{1}{2} \times (24+32) \times 4$

Area of section (2) $= 112 \text{ cm}^2$

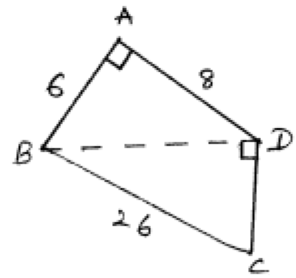
Section (3) dimension are same as section (1)

$\therefore$ Area of section (3) $= 96 \text{ cm}^2$

Section (4) dimensions are same as section (2)

$\therefore$ Area of section (4) $= 112 \text{ cm}^2$

12.



From $\triangle^{le}$ ABD

$BD^2 = AB^2 + AD^2$

$BD^2 = 6^2 + 8^2$

$BD^2 = 36 + 64$

$BD^2 = 100$

$BD = 10$ cm.

from $\triangle^{le}$ BDC

$BC^2 = BD^2 + DC^2$

$26^2 = 10^2 + DC^2$

$676 = 100 + DC^2$

$DC^2 = 676 - 100$

$DC^2 = 576$

$DC = \sqrt{576}$

$DC = 24$ cm.

Area of quadrilateral ABCD = Area of $\triangle^{le}$ BAD + Area of $\triangle^{le}$ BDC

$= \frac{1}{2}(AB \times AD) + \frac{1}{2}(BD \times DC)$

$= \frac{1}{2}(6 \times 8) + \frac{1}{2}(10 \times 24)$

$= \frac{1}{2}(48) + \frac{1}{2}(240)$

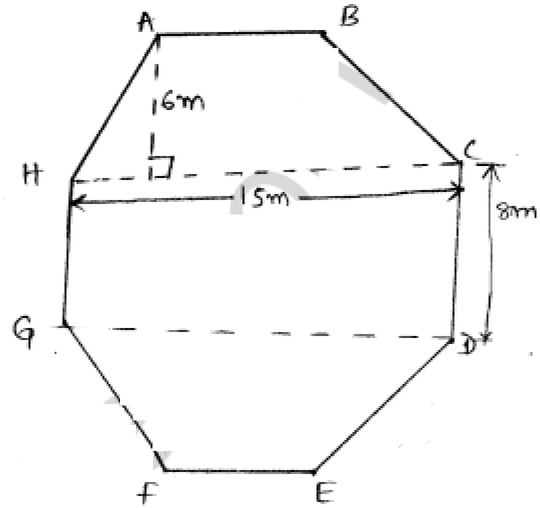
$= 24 + 120$

Area of Quadrilateral ABCD $= 144$ cm^2

13.

Given ABCDEFGH a Regular octagon

Area of octagon ABCDEFGH



= Area of ⏢ ABCH +

Area of ▭ HCDG +

Area of ⏢ GDEF

= 2 × Area of ⏢ ABCH +

Area of ▭ HCDG

$= 2 \times \left(\frac{1}{2} \times (8+15) \times 6\right) + (8 \times 15)$

$= \left(2 \times \frac{1}{2} \times 23 \times 6\right) + (8 \times 15)$

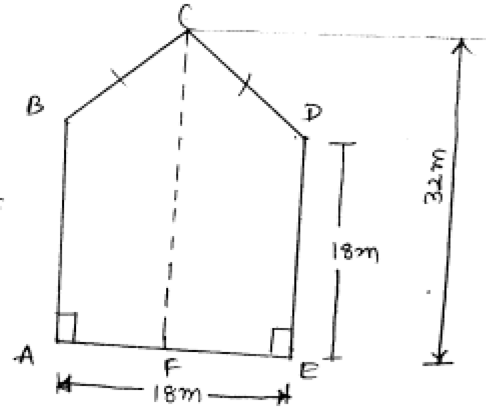
$= 23 \times 6 + 8 \times 15$

$= 138 + 120$

$= 258 \text{ m}^2$

14. Jaspreet's diagram

Area of ABCDE =



Jaspreet's diagram

Area of ⏢ ABCF + Area of ⏢ FCDE

= 2 × (Area of ⏢ ABCF)

(∵ both are Symmetric)

$= 2 \times \left(\frac{1}{2} \times (AB + CF) \times AF\right)$

$2 \times \frac{1}{2} \times (18 + 32) \times \frac{18}{2}$

$= 50 \times 9$

Area of ABCDE $= 450\ cm^2$

Rahul's diagram.

Area of pentagon ABCDE =

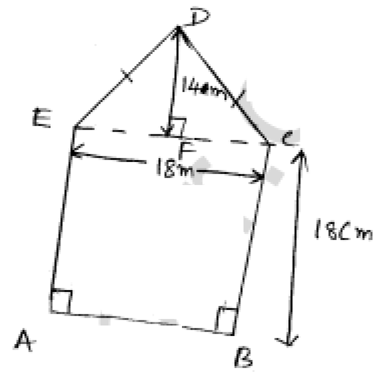
Area of $\triangle$le DEC + Area of $\square$ ECBA

$= \frac{1}{2}(EC \times DF) + BC \times AB$

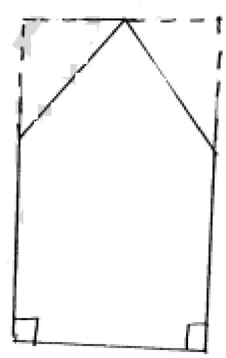
$= \frac{1}{2} \times 18 \times 14 + 18 \times 18$

$= 126 + 324$

$= 450\ cm^2$

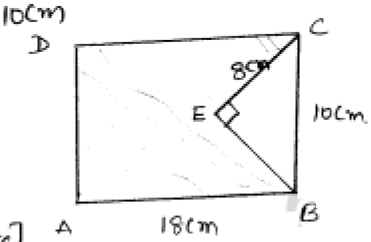


We can find area of pentagon ofte it in This way



Mahesh's diagram.

15. Given ABCD is a rectangle of 18cm x 10cm



Area of shaded pentagon ABECD

= Area of $\square$ ABCD − [Area of Δ^{le} BEC]

= $18 \times 10 - \left[\frac{1}{2} \times 8 \times EB\right] \rightarrow (1)$

From Δ^{le} BEC

$BC^2 = EC^2 + EB^2$

$10^2 = 8^2 + EB^2$

$EB^2 = 100 - 64$

$EB^2 = 36$

$EB = \sqrt{36}$

EB = 6 cm.

Sub EB value in eq (1)

∴ Area of shaded pentagon ABECD = $180 - \left[\frac{1}{2} \times 8 \times 6\right]$

$= 180 - [4 \times 6]$

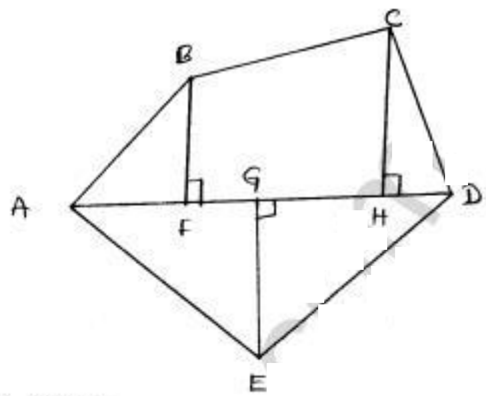
$= 180 - 24$

∴ Area of shaded pentagon ABECD = 156 cm^2

16.

Given

ABCDE is a polygon.



$AD = 8cm$

$AH = 6cm$

$AG = 4cm$

$AF = 3cm.$

$BF = 2cm$, $CH = 3cm$, $EG = 2.5cm.$

Area of polygon ABCDE = Area of $\triangle^{le}$ ABF + Area of $\square$ BCHF + Area of $\triangle^{le}$ CHD

+ ~~$\triangle^{le}$~~ Area of $\triangle^{le}$ ADE + ~~Area of $\triangle^{le}$~~ DGE

$$= \frac{1}{2}(AF \times BF) + \frac{1}{2}(BF + CH) \times FH + \frac{1}{2}(DH \times CH) +$$

$$\frac{1}{2}(AD \times EG)$$

$AD = AH + HD$

$8 = 6 + HD$

$HD = 8 - 6$

$\boxed{HD = 2cm.}$

$AH = AF + FH$

$6 = 3 + FH$

$FH = 6 - 3$

$\boxed{FH = 3cm}$

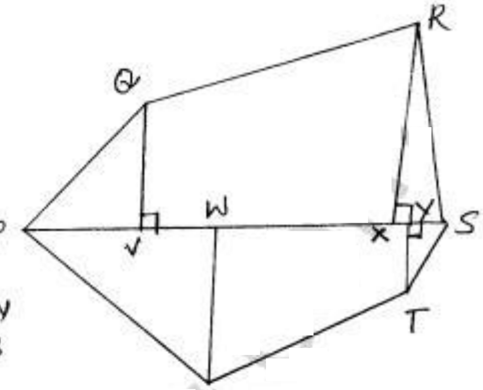
$\therefore$ Area of Polygon ABCDE $= \frac{1}{2}(3 \times 2) + \frac{1}{2}(5) \times 3 + \frac{1}{2} \times 2 \times 3 + \frac{1}{2}(8 \times 2.5)$

$= 3 + 7.5 + 3 + 10$

Area of Polygon ABCDE $= 23.5\ cm^2$

17.

Given PQRSTU is a polygon



PS = 11cm

PY = 9cm

PX = 8cm

PW = 5cm

PV = 3cm

QV = 5cm

UW = 4cm

RX = 6cm

TY = 2cm

VX = PX − PV
= 8 − 3
VX = 5cm

WY = PY − PW ⇒ 9 − 5 = 4cm.

XS = PS − PX
= 11 − 8
XS = 3cm

YS = PS − PY
= 11 − 9
YS = 2cm

Area of polygon PQRSTU = Area of Δ^{le} PQV + Area of ⏢ QRXV + Area of Δ^{le} XRS + Area of Δ^{le} PUW + Area of ⏢ UWYT + Area of Δ^{le} YST

$= \left(\frac{1}{2} \times PV \times QV\right) + \frac{1}{2}(QV + RX) \times (VX) + \frac{1}{2}(RX)(XS) + \frac{1}{2} \times PW \times UW + \frac{1}{2}(UW + YT) \times (YW) + \frac{1}{2}(YS) \times (YT)$

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

$= \frac{1}{2}(15 + 55 + 18 + 20 + 24 + 4)$

$= \frac{1}{2}(136)$

$= 68 \text{ cm}^2$

Exercise 18.3:

1. Given volume of cube = $343\,cm^3$

Let 's' be edge of cube

$\therefore$ volume of cube = s^3

$s^3 = 343$

$s = \sqrt[3]{343}$

$s = 7\,cm.$

$\therefore$ length of an edge of cube = 7 cm.

2.

	Volume of Cuboid	Length	Breadth	Height
i.	$90\,cm^3$	6 cm	5 cm	3 cm
ii.	$840\,cm^3$	15 cm	8 cm	7 cm.
iii.	$62.5\,m^3$	10 m	5 m	1.25 m

3. Given

Volume of Cuboid = $312\,cm^3$.

Base Area = $26\,cm^2$

Volume = $312\,cm^3$

Area × height = 312

$26 \times h = 312$

$h = \frac{312}{26}$

$\boxed{h = 12\,cm}$

4. Given

godown dimensions $(l\times b\times h) = 55m\times 45m\times 30m$

Cuboidal box volume $= 1.25m^3$

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

$= 55\times 45\times 30$

$= 74250 m^3$

No. of cuboidal boxes $= \dfrac{\text{godown Volume}}{\text{box volume}}$

$= \dfrac{74250}{1.25}$

No. of cuboidal boxes $= 59400$

5.

Given Dimensions of rectangular pit $= 1.4m\times 90cm\times 70cm$

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

$= 140\times 90\times 70\ cm^3$

Volume of pit $= 882000 cm^3$

Given

Brick dimension $(l\times b) = 21cm\times 10.5cm$

Let 'h' height of brick

~~Area~~ $1000\times$ Brick volume $=$ Pit volume

$1000\times 21\times 10.5\times h = 882000$

$h = \dfrac{882000}{21\times 10.5\times 1000}$

$h = 4cm$

$\therefore$ Height of brick $= 4cm$

6. ~~Et~~ Let 'a' be edge of cube.

Volume of or cube = a^3

If each edge of cube is tripled = $a' = 3a$

Volume of new cube = a'^3

$= (3a)^3$

$= 27a^3$

The Volume becomes 27 times the original volume of cube.

7.

Given

milk tank is in the form of cylinder

diameter of ~~diameter~~ tank = 1.4m x2

Height of tank = 8m.

Volume of tank = $\frac{\pi}{4} d^2 \times h$

$= \frac{\pi}{4} \times (1.4)^2 \times 8$

Volume of tank = ~~12.315 m³~~ 49.260 m^3

8.

∴ Volume of tank = 49260 lit

8.

Given

External dimensions of box = 84 cm x 75cm x 64 cm

Thickness of box = 2 cm.

∴ Internal dimensions of box = $(84-2\times2)$ cm, $(75-2\times2)$ cm, $(64-2\times2)$ cm

$=$ 80cm x 71cm x 60cm

Volume of wood = External Volume − Internal Volume

$= (84 \times 75 \times 64) - (80 \times 71 \times 60)$

$= 403200 - 340800$

Volume of wood $= 62400\ cm^3$.

9. Given

Two cylinder Jar has Same Volume

Let d_1, d_2 are diameter of jar

h_1, h_2 are heights of jar

given $d_1 : d_2 = 3:4$

Volume of cylinder equal

$$\therefore \frac{\pi}{4} d_1^2 \times h_1 = \frac{\pi}{4} d_2^2 \times h_2$$

$$d_1^2 \times h_1 = d_2^2 \times h_2$$

$$\left(\frac{d_1}{d_2}\right)^2 = \frac{h_2}{h_1}$$

$$\left(\frac{3}{4}\right)^2 = \frac{h_2}{h_1}$$

$$\frac{9}{16} = \frac{h_2}{h_1}$$

$$\frac{h_1}{h_2} = \frac{16}{9}$$

$$h_1 : h_2 = 16:9$$

$\therefore$ heights of cylinders are in the ratio $= 16:9$

10. Let 'r' be the radius of cylinder

h be the height of cylinder

Volume $V = \pi r^2 \times h$

Now radius is halved $= r' = \frac{r}{2}$

Height is doubled $= h' = 2h$

new volume $V' = \pi r'^2 \times h'$

$$= \pi \left(\frac{r}{2}\right)^2 \times (2h)$$

$$= \frac{\pi r^2}{4} \times 2h$$

$$V' = \frac{\pi r^2 \times h}{2}$$

$$V' = \frac{V}{2}$$

∴ New volume is half of original volume.

11.

Dimensions of tin sheet = 30cm × 18cm

<u>When rolled along it's length (30cm)</u>

$2\pi r = 30$, $h = 18cm$

$$r = \frac{30}{2\pi}$$

$$r = 4.77cm$$

Volume $= \pi r^2 \times h$

$= \pi \times 4.77^2 \times 18$

Volume $= 1289.155\ cm^3$

When rolled along breadth (18cm)

$2\pi r = 18$, $h = 30cm$

$r = \frac{18}{2\pi}$

$r = 2.86cm$

Volume $= \pi r^2 \times h$

$= \pi \times 2.86^2 \times 30$

$= 773.493 \ cm^3$

(5) 12.

(i) Given dia of pipe = 7cm. = 0.07m

Velocity = 5m/sec

Discharge = Area × Velocity

$= \frac{\pi d^2}{4} \times V$

$= \frac{\pi \times (0.07)^2}{4} \times 5$

Discharge $= 0.0192 \ m^3/sec$

∴ Discharge = 19.2 lits/sec

$= 19.2 \times 60$ lits/min

Discharge = 1154.53 lits/min.

∴ Discharge ≈ 1155 lit/min

(ii) Dimension of tank = $4m \times 3m \times 2.31m$

Discharge = $0.0192\ m^3/sec$

= $1.154\ m^3/min$

Time taken to fill the tank = $\frac{\text{Volume of tank}}{\text{Discharge}}$

= $\frac{4 \times 3 \times 2.31}{1.154}$

Time taken to fill the tank = 24 min

13. Given

	vessel 1	vessel 2
radius	15cm	20cm
height	40cm	45cm
Volume	$\frac{\pi}{4} \times r^2 \times h$	$\pi \times r^2 \times h$
	$\pi \times (15)^2 \times 40$	$\pi \times (20)^2 \times 45$
Volume	$28274.33\ cm^3$	$56548.667 cm^3$

given another vessel with capacity equal to sum of vessel 1 and vessel 2.

Let radius of vessel '3' = R

Height of vessel 3 = 30cm.

$(\pi R^2) \times 30 = 28274.33 + 56548.667$

$30 \times (\pi R^2) = 84823$

$R^2 = \frac{84823}{\pi \times 30}$

$$R^2 = 900$$

$$R = \sqrt{900}$$

$$\boxed{R = 30\,cm}$$

$\therefore$ Radios of Vessel = 30cm.

14. Given

pole height = ~~700cm.~~ 7m

pole diameter = 20cm = 0.2 m

density = 225 Kg/m³

$$\text{Volume of wood} = \frac{\pi d^2}{4} \times h$$

$$= \frac{\pi}{4} \frac{(20)^2}{10^4} \times 7$$

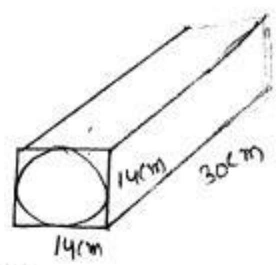
$$\text{Volume of wood} = 0.219\ m^3$$

$$\text{Weight of wood} = \text{Volume} \times \text{density}$$

$$= 0.219 \times 225$$

$$\text{Weight of wood} = 49.48\ Kg.$$

15.



A cylinder with diameter of 14cm and height of 30cm is the maximum volume that can be cut from ~~ab~~ given cuboid.

Volume of cylinder = $\frac{\pi}{4} d^2 \times h$

$= \frac{\pi}{4} (14)^2 \times 30$

Volume of cylinder = 4618.14 cm^3

Volume of wood wasted = Volume of cuboid − Volume of cylinder

$= 14 \times 14 \times 30 - (4618.14)$

Volume of wood wasted. = 1261.85 cm^3

Exercise 18.4

1. Given surface area = 384 cm^2

(i) Let length of side of cube = a

Surface area of cube = $6a^2$

$$6a^2 = 384$$

$$a^2 = \frac{384}{6}$$

$$a^2 = 64$$

$$a = \sqrt{64}$$

$$\boxed{a = 8cm}$$

∴ length of an edge = 8cm

(ii) Volume of the cube.

Volume of the cube = a^3

$= 8^3$

$= \cancel{216}$

Volume of the cube $= 512\ cm^3$

2. Given

radius of cylinder = 5cm

height of cylinder = 10cm

Surface area of cylinder = $2\pi rh$

$= 2\pi \times 5 \times 10$

Surface area of cylinder $= 100\pi$

3. Given

Aquarium dimensions = $70cm \times 28cm \times 35cm$

To cover base, side and back faces total area of

Paper needed = $2(lb + bh + lh)$

$= 2(70 \times 28 + 28 \times 35 \times 70 \times 35)$

$= 2(5390)$

$= 10780\ cm^2$

4.

Given

Internal dimensions of hall = $15m \times 12m \times 4m$

Area of four walls = ~~2(lb+~~

$= lh + bh + lh + bh$

$= 2(lh + bh)$

$= 2(15 \times 4 + 12 \times 4)$

$= 2(60 + 48)$

Area of four walls $= 2 \times 108$

$= 216\ m^2$

Given

4 windows of dimension = $2m \times 1.5m$

2 doors of dimension = $1.5 \times 2.5 m^2$

∴ Remaining walls area = Area of four walls − [4 × Area of window + 2 × area of door]

$= 216 - [4 \times 2 \times 1.5 + 2 \times 1.5 \times 2.5]$

$= 216 - [12 + 7.5]$

$= 216 - 19.5$

∴ Remaining walls area $= 196.5\ m^2$

Given

Cost for white washing walls = ₹5/m^2

Total Cost of white washing walls = 5×196.5

$= ₹982.5$

Area of Ceiling = $lb = 15 \times 12$

$= 180 m^2$

Total Area = Area of walls + Area of Ceiling

$= 196.5 + 180$

Total Area $= 376.5 m^2$

Total cost of white washing walls including Ceiling

$= 5 \times 376.5$

$= ₹ 1882.5$

5. Swimming pool length = 50m

breadth = 30m

height = 2.5m

Area of walls and base = $lb + lh + bh + lh + bh$

$= 2(lh + bh) + lb$

$= 2(50 \times 2.5 + 30 \times 2.5) + 50 \times 30$

$= 400 + 1500$

Area of walls and base $= 1900 m^2$

Given Cementing rate = ₹27/m²

∴ Total cost for cementing = 27×1900

= ₹51300

6. Given rectangular hall perimeter = 236 m

hall height = 4.5m

Surface area of walls = $2h(l+b)$

= 4.5×236

Surface area of walls = 1062 m²

Painting of walls cost = ₹8.4/m²

Total cost of painting = 8.4×1062

Total cost of painting = ₹8920.8

7. Dimension of fish tank = 30cm×20cm×20cm

Given only $\frac{3}{4}$th of tank contains water

∴ Volume of water = 30cm×20cm×20×$\frac{3}{4}$cm

Volume of water = 30cm×20cm×15cm.

Area of tank in contact with water =

walls area upto water level + base area

= $2h(l+b)+lb$

= $2(30+20)\times15+30\times20$

= 1500+600

Area of tank in contact with water. = 2100 cm²

8. Given

(i)

Volume of cuboid $= 448\ cm^3$

Let side of square $= a\ cm$

height $= 7\ cm$.

$$a^2 \times 7 = 448$$

$$a^2 = \frac{448}{7}$$

$$a^2 = 64$$

$$a = \sqrt{64}$$

$$\boxed{a = 8cm}$$

Side of square base $= 8cm$

(ii)

Surface area cuboid $= 2(a^2 + 2ah)$

$$= 2(8^2 + 2 \times 8 \times 7)$$

$$= 2(176)$$

Surface area of cuboid. $= 352\ cm^2$

9. Given

total surface area of rectangular solid $= 1216\ cm^3$

Ratio of length, breadth and height $= 5:4:2$

Let length, breadth and height $= 5x, 4x, 2x$

total surface area $= 1216$

$$2(lb + bh + hl) = 1216$$

$$2(5x \times 4x + 4x \times 2x + 2x \times 5x) = 1216$$

$$2(20x^2 + 8x^2 + 10x^2) = 1216$$

$$2 \times 38x^2 = 1216$$

$76x^2 = 1216$

$x^2 = \frac{1216}{76}$

$x^2 = 16$

$x = \sqrt{16}$

$x = 4cm$

$\therefore$ length $5x = 5\times4 = 20cm$

breadth $4x = 4\times4 = 16cm$

height $2x = 2\times4 = 8cm$.

Volume of rectangular solid $= l\times b\times h$

$= 20\times16\times8$

$= \cancel{288}$

Volume of rectangular solid $= 2560\ cm^3$

10. Dimension of room $= 6\times5\times3.5\ m^3$

Dimensions of window $=$ ~~1.4m×2m~~ $1.5m\times1.4m$

Dimension of door $= 1.1m\times2m$

Area of walls $= 2h(l+b) - [3\times1.5\times1.4 + 2\times1.1\times2]$

$= 2\times3.5(6+5) - [6.3 + 4.4]$

$= 77 - 10.7$

Area of walls $= 66.3\ m^2$

Area of ceiling $= lb = 6\times5 = 30m^2$

Total area = $66.3 + 30 = 96.3\,m^2$

Cost of white washing = ₹ $5.3/m^2$

Total cost = area × cost/m^2

= 96.3×5.3

Total cost = ₹ 510.39

11. Given

dimensions of Cuboidal block = $36cm \times 32cm \times 25cm$.

(i) Volume of cuboidal block = $36 \times 32 \times 25$

= $28800\ cm^3$

Cube of edge = 4cm.

Volume of cube = 4^3

= $64\ cm^3$

$$\text{no. of cubes} = \frac{\text{Volume of Cuboidal block}}{\text{Volume of cube}}$$

$$= \frac{28800}{64}$$

no. of cubes = 450

∴ From given Cuboid 450 cubes of edge 4cm can be Costed.

(ii) Cost of silver coating = ₹ 0.75 / cm^2

Surface area of cube = $6a^2$

$= 6 \times 4^2$

$= 6 \times 16$

Surface area of cube $= 96\ cm^2$

Total surface area of cubes $= 450 \times 96$

$= 43200\ cm^2$

Total surface area of cubes $= 4.32\ m^2$

Cost of silver coating of all cubes $= 4.32 \times 0.75 \times 10^4$

= ₹ 32400

∴ Total cost for silver coating of cubes is ₹ 32400

12. Given three cubes of edge lengths = 3cm, 4cm, 5cm.

New cube edge length = a cm

$\therefore\ a^3 = 3^3 + 4^3 + 5^3$

$a^3 = 216$

$a = (216)^{1/3}$

$\boxed{a = 6cm}$

Surface area of cube $= 6a^2$

$= 6 \times 6^2$

Surface area of cube $= 216\ cm^2$

Cost of gold coating = ₹ 3.5 / cm^2

Total cost ~~for~~ of gold coating of Cube

$= \text{Area} \times \text{cost}/cm^2$

$= 216 \times 3.5$

$= ₹756$

$\therefore$ Total cost of gold coating of cube $= ₹756$

13. Given

Surface area of Cylinder $= 4375\ cm^2$

rectangular sheet width $= 35\,cm$.

perimeter of circle (base) $= 35\,cm$

$2\pi r = 35$

$r = \frac{35}{2\pi}$

radius of base $(r) = 5.57\ cm$

Surface area $= 2\pi r h = 4375$

$= 2\pi \times r \times h = 4375$

$35 \times h = 4375$

$h = \frac{4375}{35}$

$h = 125\,cm$

Height of Cylinder $= 125\,cm$

$\therefore$ ~~Height of Sheet~~ =

length of ~~Cylinder~~ Sheet $= 125\,cm$

Perimeter of Sheet $= 2(l+w)$

$= 2(125+35) \Rightarrow 2(160)$

$= \underline{320\,cm}$

14. Road roller diameter = 0.7m

Road roller width = 1.2m

Play ground size = 120m × 44m

Area of ground = 5280 m^2

Surface area of roller = $\cancel{2}\pi d w$

$= \pi \times 0.7 \times 1.2$

Surface area of roller $= 2.638 m^2$

No. of revolutions to cover ground = $\frac{\text{Area of ground}}{\text{Surface area of roller}}$

$= \frac{5280}{2.638}$

$= 2000.8 \approx \cancel{2001}$ 2000

∴ ~~No.~~ Minimum no. of revolutions to cover ground is 2000.

15. Given Diameter of Cylindrical Container = 14cm

Height of Cylindrical Container = 20cm

Label height = 20 − (2+2)

= 16cm.

∴ Area of label = Surface area of cylinder of height 16cm

$= \frac{\pi}{4} d^2 \times h$

$= \frac{\pi}{4} \times 14^2 \times 16$

$= 2463$

$= \pi dh$

$= \pi \times 14 \times 16$

$= \frac{22}{7} \times 14 \times 16$

$\therefore$ Area of label $= 704\ cm^2$

16. given

Sum of radius and height of cylinder $= 37\ cm$

$r + h = 37 \rightarrow (1)$

total Surface area $= 1628\ cm^2$

$2\pi rh = 1628$

$rh = \frac{1628}{2 \times \pi}$

$rh = \frac{1628 \times 7}{2 \times 22}$

$rh = 259$

$(37 - h) h = 259$

$37h - h^2 = 259$

$h^2 - 37h + 259 = 0$

$h_1 = 27.63$	$h_2 = 9.37$
$r_1 = 37 - 27.63$	$r_2 = 37 - 9.37$
$r_1 = 9.37\ cm$	$r_2 = 27.63\ cm$
Volume of Cylinder	Volume of Cylinder
$= \pi r_1^2 h_1$	$= \pi r_2^2 h_2$
$= \pi \times 9.37^2 \times 27.63$	$= \pi \times 27.63^2 \times 9.37$
$V_1 = 7620.96\ cm^3$	$V_2 = 22472.5\ cm^3$

17. Given

Ratio b/w Curved surface area and total surface area $= 1:2$

total surface area $= 616\,cm^2$

$2\pi rh : 2\pi r(h+r) = 1:2$

$\frac{h}{h+r} = \frac{1}{2}$

$2h = h+r$

$\boxed{h=r}$

$\therefore$ Height = radius

total surface area $= 616\,cm^2$

$2\pi r(h+r) = 616\,cm^2$

$2\pi r(r+r) = 616\,cm^2$

$2(2\pi r^2) = 616\,cm^2$

$2\pi r^2 = 308\,cm^2$

$r^2 = \frac{308}{2\pi}$

$r^2 = 49$

$r = \sqrt{49}$

$r = 7cm$

$r = h = 7\,c.m$

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

$= \pi(7)^2 \times 7$

Volume of cylinder $= 1077.56\,cm^3$

18. length of cylinder = 77cm = h

Inner diameter(d_1) = 4 cm

Outer diameter(d_2) = 4.4cm

(i) Inner Curved surface area

$= \pi d_1 h$

$= \pi \times 4 \times 77$

$= 967.61 \text{ cm}^2$

(ii) Outer Curved surface area

$= \pi d_2 h$

$= \pi \times 4.4 \times 77$

$= 1064.37 \text{ cm}^2$

(iii) total surface area

$\pi d_1 h + \pi d_2 h + 2 \times \pi (r_2^2 - r_1^2)$

$967.63 + 1064.37 + 2\pi (2.2^2 - 2^2)$

$= 967 + 1064.37 + 5.27$

$= 2038.08 \text{ cm}^2$