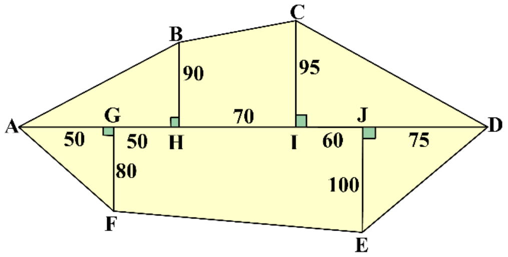
15. Area

1. The adjoining figure is the map of land. Find its area [All measures are given in metre.]



Solution :

l(AG) = 50 m , l(GH) = 50 m , l(GF) = 80 m,

l(BH) = 90 m , l(HI) = 70 m , l(CI) = 95 m ,

l(IJ) = 60 m , l(JD) = 75 m , l(JE) = 100 m

Seg BH, seg CI , seg FG and seg EJ are perpendicular to the base AD.

(i) $l(\mathrm{AH}) = l(\mathrm{AG}) + l(\mathrm{GH}) = 50 + 50 = 100\mathrm{m}$

Area of Δ BAH $= \frac{1}{2} \times$ base $\times$ height

$= \frac{1}{2} \times l(\mathrm{AH}) \times l\,(\mathrm{BH})$

$= \frac{1}{2} \times 100 \times 90$

$= 50 \times 90 = 4500$ sqm

(ii) ◻ BHIC is a trapezium.

Area of trapezium BHIC $= \frac{1}{2} \times$ (sum of the lengths of parallel sides) $\times$ height

$= \frac{1}{2} \times \left[[l(\mathrm{BH}) + l(\mathrm{CI})] \times l(\mathrm{HI})\right]$

$= \frac{1}{2} \times [(90 + 95) \times 70]$

$$= \frac{1}{2} \times [185 \times 70]$$

$$= 185 \times 35 = 6475 \text{ sqm}$$

(iii) $l(\text{ID}) = l(\text{IJ}) + l(\text{JD})$

$$= 60 + 75 = 135\text{m}$$

Area of Δ CID $= \frac{1}{2} \times \text{base} \times \text{height}$

$$= \frac{1}{2} \times l(\text{ID}) \times l(\text{CI})$$

$$= \frac{1}{2} \times 135 \times 95$$

$$= 6412.5 \text{ sqm}$$

(iv) Area of Δ AGF $= \frac{1}{2} \times \text{base} \times \text{height}$

$$= \frac{1}{2} \times l(\text{AG}) \times l(\text{FG})$$

$$= \frac{1}{2} \times 50 \times 80$$

$$= 50 \times 40 = 2000 \text{ sqm}$$

(v) $l(\text{GJ}) = l(\text{GH}) + l(\text{HI}) + l(\text{IJ})$

$$= 50 + 70 + 60 = 180\text{m}$$

Area of trapezium GFEJ $= \frac{1}{2} \times$ (sum of the lengths of parallel sides) $\times$ height

$$= \frac{1}{2} \left[[l(\text{FG}) + l(\text{EJ})] \times l(\text{GJ})\right]$$

$$= \frac{1}{2} [(80 + 100) \times 180]$$

$$= \frac{1}{2}\,[180 \times 180]$$

$$= 90 \times 180 = 16200 \text{ sqm}$$

(vi) Area of Δ EJD $= \frac{1}{2} \times$ base $\times$ height

$$= \frac{1}{2} \times \; l(\text{JD}) \times \; l(\text{EJ})$$

$$= \frac{1}{2} \times 75 \; \times 100$$

$$= 75 \; \times 50 = 3750 \text{ sqm}$$

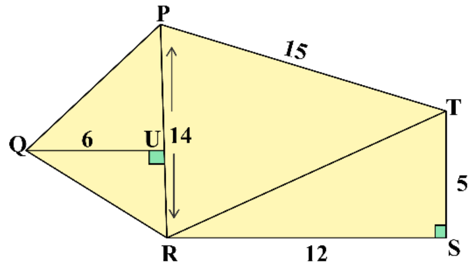
$\therefore$ Area of the plot = Area of Δ BAH + Area of $\square$ BHIC + Area of Δ CID + Area of Δ AGF + Area of Δ GFEJ + Area of Δ EJD

$= 4500 + 6475 + 6412.5 + 2000 + 16200 + 3750$

$= 39337.5$ sqm

$\therefore$ Area of the given plot is 39337.5 sqm

2. Adjacent figure is a polygon PQRST.
All given measures are in metre.
Find the area of the given figure.



Solution : $l(\text{QU}) = 6$ cm , $l(\text{PR}) = 14$ cm ,

$l(\text{PT}) = 15$ cm , $l(\text{TS}) = 5$m , $l(\text{RS}) = 12$m

Here , base PR and height QU of Δ PQR is given.

Δ TSR is a right angled triangle.

Side PR , side RT and side PT are the sides of Δ PRT.

Now let us find the area of each figure.

In a right angled Δ TSR,

By Pythagoras theorem,

$$(\mathrm{RT})^2 = (\mathrm{RS})^2 + (\mathrm{TS})^2$$

$$= (12)^2 + (5)^2$$

$$= 144 + 25 = 169$$

$$\therefore \mathrm{RT} = 13\mathrm{m}$$

(i) Area of Δ PQR $= \frac{1}{2} \times \text{base} \times \text{height}$

$$= \frac{1}{2} \times 14 \times 6$$

$$= 7 \times 6 = 42 \text{ sqm}$$

(ii) Semiperimeter of Δ PRT $= \mathrm{s} = \frac{a + \mathrm{b} + \mathrm{c}}{2}$

$$= \frac{14 + 13 + 15}{2} = \frac{42}{2} = 21$$

Area of Δ PRT $= \sqrt{s(s-a)(s-b)(s-c)}$

$$= \sqrt{21(21-14)\,(21-13)\,(21-15)}$$

$$= \sqrt{21 \times 7 \times 8 \times 6}$$

$$= \sqrt{7 \times 3 \times 7 \times 4 \times 2 \times 3 \times 2}$$

$$= \sqrt{\underline{7 \times 3} \times \underline{3 \times 3} \times \underline{2 \times 2} \times \underline{2 \times 2}}$$

$= 7 \times 3 \times 2 \times 2$ .... (taking square root)

$= 84$ sqm

(iii) Area of Δ TSR $= \frac{1}{2} \times$ base $\times$ height

$= \frac{1}{2} \times l\,(RS) \times l\,(TS)$

$= \frac{1}{2} \times 12 \times 5$

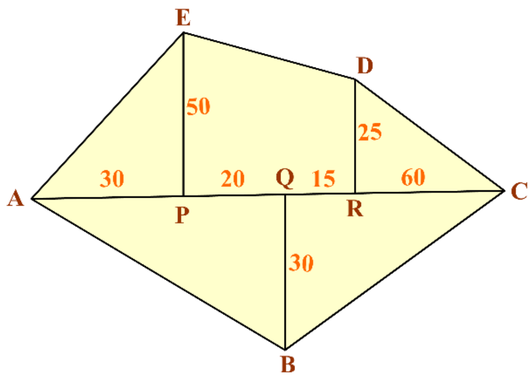
$= 30$ sqm

$\therefore$ Area of PQRST = Area of Δ PQR + Area of Δ PRT + Area of Δ TSR

$= 42 + 84 + 30 = 156$ sqm

$\therefore$ Area of PQRST is 156 sqm.

3. Alongside figure is a polygon ABCDE. All given measures are in metre. Find the area of the given figure.



Solution : Δ EAP , Δ DRC and Δ ABC are triangles.

□EPRD is a trapezium. Now let us find the area of each figure.

(i) Area of Δ EAP $= \frac{1}{2} \times$ base $\times$ height

$= \frac{1}{2} \times l(AP) \times l(EP)$

$= \frac{1}{2} \times 30 \times 50$

$= 15 \times 50 = 750$ sqm

(ii) $l(PR) = l(PQ) + l(QR) = 20 + 15 = 35m$

□EPRD is a trapezium.

Area of trapezium EPRD $= \frac{1}{2} \times$ (sum of the lengths of parallel sides) $\times$ height

$$= \frac{1}{2} \times [l(EP) + l(DR)] \times l(PR)$$

$$= \frac{1}{2} \times [50 + 25] \times 35$$

$$= \frac{1}{2} \times [75] \times 35$$

$$= \frac{2625}{2}$$

$$= 1312.5 \text{ sqm}$$

(iii) Area of Δ DRC $= \frac{1}{2} \times$ base $\times$ height

$$= \frac{1}{2} \times l(RC) \times l(DR)$$

$$= \frac{1}{2} \times 60 \times 25$$

$$= 30 \times 25 = 750 \text{ sqm}$$

(iv) $l(AC) = l(AP) + l(PQ) + l(QR) + l(RC)$

$$= 30 + 20 + 15 + 60 = 125 \text{ m}$$

Area of Δ ABC $= \frac{1}{2} \times$ base $\times$ height

$$= \frac{1}{2} \times l(AC) \times l(QB)$$

$$= \frac{1}{2} \times 125 \times 30$$

$$= 125 \times 15 = 1875 \text{ sqm}$$

$\therefore$ **Area of polygon ABCDE = Area of Δ EAP + Area of $\square$EPRD + Area of Δ DRC + Area of Δ ABC**

$$= 750 + 1312.5 + 750 + 1875 = 4687.5 \text{ sqm}$$

$\therefore$ **Area of polygon ABCDE is 4687.5 sqm**

4. There is a temple on a circular ground with radius 3m and the ground is surrounded by lawn of breadth 1m. The lawn is surrounded by a path of breadth 1m which of the both, the area of the ground used for a temple and the area used for a path is greater?

Solution : Radius of a circular temple = 3m

The area of the ground used for temple

$$= \pi r^2$$

$$= \frac{22}{7} \times 3 \times 3$$

$$= \frac{22}{7} \times 9 \text{ .... (I)}$$

External radius of the path = l(OC)

$$= l(OA) + l(AB) + l(BC) = 3 + 1 + 1 = 5\text{m}$$

Internal radius of the path = l(OB) = l(OA) + l(AB)

$$= 3 + 1 = 4\text{m}$$

$\therefore$ **Total area of the path = External radius of the path**

−Internal radius of the path

$= \pi \times (5)^2 - \pi(4)^2$

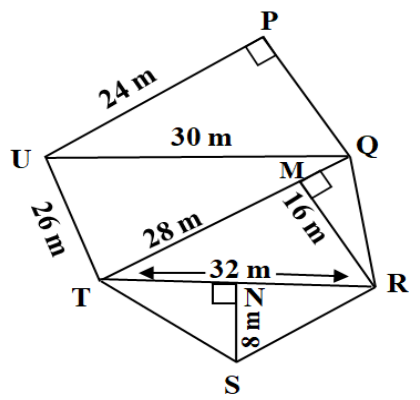
$= \pi \times [(5)^2 - (4)^2]$

$= \pi \times (25 - 16)$

$= \frac{22}{7} \times 9$ **........ (II)**

$\therefore$ **From eq^n. (I) and (II) the area of ground used for a temple and the area used for a path, both are same.**

5. Adjacent figure is a polygon. The measures of all sides are given. Find the area of the given figure.



Solution :

l(UP) = 24m, l(UQ) = 30 m ,

l(UT) = 26 m , l(TQ) = 28 m ,

l(TR) = 32 m , l(RM) = 16 m ,

l(SN) = 8 m

Now let us find the area of Δ PUQ ,Δ QUT, Δ QTR and Δ RTS

(i) First find the length of side PQ

Δ PUQ is a right angled triangle.

By Pythagoras theorem,

$l\,(UQ)^2 = l\,(UP)^2 + l\,(QP)^2$

$$\therefore (30)^2 = (24)^2 + \, l\,(\mathrm{QP})^2$$

$$\therefore l(\mathrm{QP})^2 = (30)^2 - (24)^2$$

$$= 900 - 576$$

$$= 324$$

$$\therefore l\,(\mathrm{QP}) = 18 \text{ m}$$

(ii) Area of Δ PUQ $= \frac{1}{2} \times$ **base** $\times$ **height**

$$= \frac{1}{2} \times l\,(\mathrm{UP}) \times l(\mathrm{QP})$$

$$= \frac{1}{2} \times 24 \times 18$$

$$= 12 \times 18 = 216 \text{ sqm}$$

(iii) Semi perimeter of Δ QUT $= s = \frac{a+b+c}{2}$

$$= \frac{30+26+28}{2}$$

$$= \frac{84}{2} = 42 \text{ sqm}$$

Area of Δ QUT $= \sqrt{s\,(s-a)(s-b)(s-c)}$

$$= \sqrt{42\,(42-30)(42-26)(42-28)}$$

$$= \sqrt{42 \times 12 \times 16 \times 14}$$

$$= \sqrt{14 \times 3 \times 3 \times 4 \times 16 \times 14}$$

$$= \sqrt{\underline{14 \times 14} \times \underline{3 \times 3} \times \underline{2 \times 2} \times \underline{4 \times 4}}$$

$$= 14 \times 3 \times 2 \times 4$$

... (By taking square root)

$$= 336 \text{ sqm}$$

(iv) Area of Δ QTR $= \frac{1}{2} \times \text{base} \times \text{height}$

$$= \frac{1}{2} \times l\,(TQ) \times l(RM)$$

$$= \frac{1}{2} \times 28 \times 16 = 224 \text{ sqm}$$

(v) Area of Δ RTS $= \frac{1}{2} \times \text{base} \times \text{height}$

$$= \frac{1}{2} \times l\,(TR) \times l(SN)$$

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

$$= 16 \times 8 = 128 \text{ sqm}$$

$\therefore$ **Area of polygon PQRSTU = Area of Δ PUQ +**

Area of Δ QUT + Area of Δ QTR + Area of Δ RTS

$$= 216 + 336 + 224 + 128 = 904 \text{ sqm}$$

$\therefore$ **Area of polygon PQRSTU is 904 sqm.**

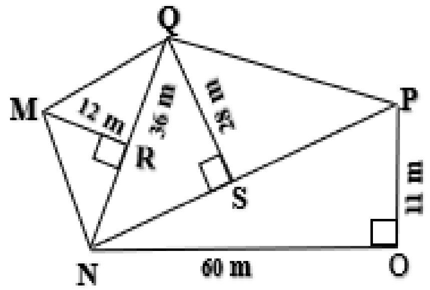
6. In the given figure, MNOPQ is a polygon. In MNOPQ, l (NQ) = 36 m ,

l (MR) = 12 m ,

l (QS) = 28 m ,

l (NO) = 60 m ,

l (PO) = 11 m. Find the area of MNOPQ.



Solution : l (NQ) = 36 m ,

l (MR) = 12 m , l (QS) = 28 m ,

l (NO) = 60 m , l (PO) = 11 m

Now let us find the area of Δ QMN , Δ QNP , Δ PNO

(i) Area of Δ QMN = $\frac{1}{2} \times$ base × height

$$= \frac{1}{2} \times l\text{ (NQ)} \times l\text{ (MR)}$$

$$= \frac{1}{2} \times 36 \times 12$$

$$= 18 \times 12 = 216 \text{ sqm}$$

(ii) Area of Δ PNO = $\frac{1}{2} \times$ base × height

$$= \frac{1}{2} \times l\text{ (NO)} \times l\text{ (PO)}$$

$$= \frac{1}{2} \times 60 \times 11$$

$$= 30 \times 11$$

$= 330$ sqm

(iii) In Δ PNO , $\angle$PON $= 90^0$

By Pythagoras theorem,

$$l\,(PN)^2 = l\,(NO)^2 + l\,(PO)^2$$

$$= (60)^2 + (11)^2$$

$$= 3600 + 121$$

$$= 3721$$

$$\therefore l\,(PN) = 61m$$

(iv) Area of Δ QNP $= \frac{1}{2} \times$ base $\times$ height

$$= \frac{1}{2} \times l(NP) \times l(QS)$$

$$= \frac{1}{2} \times 61 \times 28$$

$$= 61 \times 14$$

$= 854$ sqm

$\therefore$ Area of polygon MNOPQ = Area of Δ QMN +

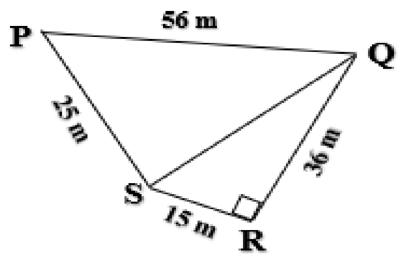
Area of Δ PNO + Area of Δ QNP

$= 216 + 330 + 854$

$= 1400$ sqm

$\therefore$ Area of polygon MNOPQ is 1400 sqm.

7. In adjacent figure all measures are given in metre. Find the area of □PQRS.



Solution :

(i) 0 Δ QRS is a right angled triangle.

In Δ QRS ,

$m\angle QRS = 90^0$, $l(QR) = 36$ m , and $l(SR) = 15$ m

Area of right angled Δ QRS $= \frac{1}{2} \times$ (Product of sides making right angle)

$= \frac{1}{2} \times l(QR) \times l(SR)$

$= \frac{1}{2} \times 36 \times 15$

$= 18 \times 15$

$= 270$ sqm

(ii) Seg QS is hypotenuse of right angled Δ QRS.

$\therefore$ By Pythagoras theorem,

$l(QS)^2 = l(QR)^2 + l(SR)^2$

$$= (36)^2 + (15)^2$$

$$= 1296 + 225$$

$$= 1521$$

$$l(QS)^2 = (39)^2$$

$$\therefore l(QS) = 39 \text{ m}$$

(iii) 56 m , 39m , and 25 m are the three sides of Δ PSQ

$$\therefore \text{Semi perimeter of } \Delta \text{ PSQ} = s = \frac{a+b+c}{2}$$

$$= \frac{56+39+25}{2}$$

$$= \frac{120}{2}$$

$$= 60 \text{ m}$$

$$\therefore \text{Area of } \Delta \text{ PSQ} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{60(60-56)\,(60-39)\,(60-25)}$$

$$= \sqrt{60 \times 4 \times 21 \times 35}$$

$$= \sqrt{3 \times 5 \times 4 \times 4 \times 3 \times 7 \times 5 \times 7}$$

$$= \sqrt{3 \times 3 \times 5 \times 5 \times 4 \times 4 \times 7 \times 7}$$

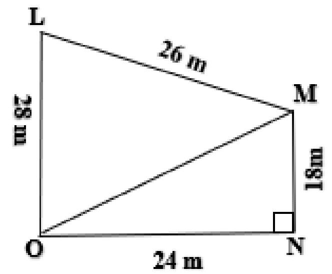
$= 3 \times 5 \times 4 \times 7$…… **(By taking square root)**

$= 420$ **sqm**

$\therefore$ **Area of $\square$ PQRS = Area of Δ QRS + Area of Δ PSQ**

$= 270 + 420 = 690$ **sqm**

8. In □ LMNO , $l(\text{LO}) = 28$ m , $l(\text{ON}) = 24$ m , $l(\text{MN}) = 18$ m , $l(\text{LM}) = 26$ m. Find area of □ LMNO.



Solution :

In Δ MNO,

$m\angle MNO = 90^0$, l (ON) $= 24$m, l (MN) $= 18$m

(i) Area of Δ MNO $= \frac{1}{2} \times$ (Product of sides making right angle)

$= \frac{1}{2} \times l(\text{MN}) \times (\text{ON})$

$= \frac{1}{2} \times 18 \times 24$

$= 9 \times 24$

$= 216$ sqm

(ii) Seg MO is hypotenuse of Δ MNO.

$\therefore$ By Pythagoras theorem,

$l(\text{MO})^2 = l(\text{MN})^2 + l(\text{ON})^2$

$= (18)^2 + (24)^2$

$= 324 + 576$

$= 900$

$\therefore l(\text{MO})^2 = (30)^2$

$\therefore l\ (\text{MO}) = 30$ m

(iii) Semi perimeter of Δ LOM $= s = \frac{a+b+c}{2}$

$$= \frac{28+26+30}{2}$$

$$= \frac{84}{2}$$

$$= 42 \text{ m}$$

$\therefore$ Area of Δ LOM $= \sqrt{s(s-a)(s-b)(s-c)}$

$$= \sqrt{42\,(42-28)\,(42-26)\,(42-30)}$$

$$= \sqrt{42 \times 14 \times 16 \times 12}$$

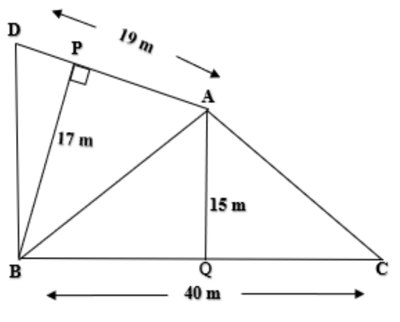
$$= \sqrt{3 \times 14 \times 14 \times 16 \times 4 \times 3}$$

$$= \sqrt{\underline{3 \times 3} \times \underline{14 \times 14} \times 4 \times 16}$$

$= 3 \times 14 \times 2 \times 4$ ……. (By taking square root)

$\therefore$ Area of $\square$ LMNO is 552 sqm.

9. In the adjoining figure, all measures are given in metre. Find area of $\square$ DBCA .



Solution :

(i) Area of Δ ABC $= \frac{1}{2} \times$ base $\times$ height

$$= \frac{1}{2} \times l(\text{BC}) \times l(\text{AQ})$$

$$= \frac{1}{2} \times 40 \times 15$$

$$= 20 \times 15 = 300 \text{ sqm}$$

(ii) Area of Δ ADB $= \frac{1}{2} \times \text{base} \times \text{height}$

$$= \frac{1}{2} \times l(DA) \times l(BP)$$

$$= \frac{1}{2} \times 19 \times 17$$

$$= \frac{323}{2}$$

$$= 161.5 \text{ sqm}$$

Area of $\square$ DBCA = Area of Δ ABC + Area of Δ ADB

$$= 300 + 161.5$$

$$= 461.5 \text{ sqm}$$

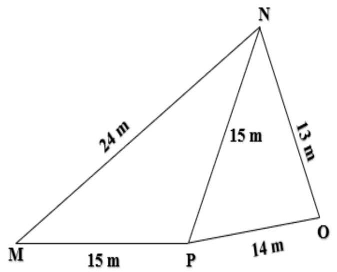
$\therefore$ **Area of $\square$ DBCA is 461.5 sqm**

10. In adjacent figure, l (MN) = 24 m ,

l (MP) = 15m , l (NP) = 15 m ,

l (PO) = 14 m , l (NO) = 13 m ,

Find the area of $\square$ MNOP



Solution :

(i) In Δ MNP , l (MN) = 24 m , l (MP) = 15m ,

l (NP) = 15 m ,

Semi perimeter of Δ MNP $= s = \frac{a+b+c}{2}$

$$= \frac{24 + 15 + 15}{2}$$

$$= \frac{54}{2}$$

$$= 27 \text{ m}$$

$$\therefore \text{Area of } \Delta \text{ MNP} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{27\,(27-24)\,(27-15)\,(27-15)}$$

$$= \sqrt{27 \times 3 \times 12 \times 12}$$

$$= \sqrt{9 \times \underline{3 \times 3} \times \underline{12 \times 12}}$$

$= 3 \times 3 \times 12$ …… (By taking square root)

$$= 108 \text{ sqm}$$

(ii) In Δ NPO , l (NP) = 15 m , l (NO) = 13 m and l (PO) = 14 m

Semi perimeter of Δ NPO = s = $\frac{a+b+c}{2}$

$$= \frac{14+15+13}{2}$$

$$= \frac{42}{2}$$

$$= 21 \text{ m}$$

$$\text{Area of } \Delta \text{ NPO} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{21\,(21-14)\,(21-15)\,(21-13)}$$

$$= \sqrt{21 \times 7 \times 6 \times 8}$$

$$= \sqrt{7 \times 3 \times 7 \times 2 \times 3 \times 2 \times 4}$$

$$= \sqrt{\underline{7 \times 7} \times \underline{3 \times 3} \times \underline{2 \times 2} \times 4}$$

$= 7 \times 3 \times 2 \times 2$ ......(By taking square root)

$= 84$ sqm

$\therefore$ Area of $\square$MNOP = Area of Δ MNP + Area of Δ NPO

$= 108 + 84$

$= 192$ sqm

$\therefore$ Area of $\square$MNOP is 192 sqm

11. Find the expenses of harvesting a groundnut crop in a field at the rate of 130 rupees with dimension 40 m , 68 m , 84 m.

Solution : Here $a = 40$, b = 68 , c = 84

$$\text{Semi perimeter } = s = \frac{a+b+c}{2}$$

$$= \frac{40+68+84}{2}$$

$$= \frac{192}{2} = 96 \text{ m}$$

$$\text{Area of triangular field} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{96(96-40)(96-68)(96-84)}$$

$$= \sqrt{96 \times 56 \times 28 \times 12}$$

$$= \sqrt{16 \times 6 \times 2 \times 28 \times 28 \times 2 \times 6}$$

$$= \sqrt{16 \times 6 \times 6 \times 2 \times 2 \times 28 \times 28}$$

$= 4 \times 6 \times 2 \times 28$ ...(By taking square root)

The expenses of plucking pods in a field at the rate of 130 rupees.

$\therefore$ The total area of field = 1344 sqm

$\therefore$ **The total expenses of plucking pods** $= 1344 \times 120$

$= 161280$ **rupees**

$\therefore$ **The expenses of plucking pods will be 161280 rupees.**

12. The ratio of the lengths of side of a triangle is 17 : 12 : 25 and Semi perimeter is 270 cm then find the area of a triangle.

Solution : Suppose $a = 17x$, b $= 12x$, and c $= 25x$

Semi perimeter of a triangle $= s = \dfrac{a+b+c}{2}$

$$\therefore 270 = \frac{17x + 12x + 25x}{2}$$

$$\therefore 270 \times 2 = 17x + 12x + 25x$$

$$\therefore 540 = 54x$$

$$\therefore x = \frac{540}{54}$$

$$\therefore x = 10$$

$$\therefore a = 17x = 17 \times 10 = 170$$

$$\therefore b = 12x = 12 \times 10 = 120$$

$$\therefore c = 25x = 25 \times 10 = 250$$

$\therefore$ **Area of a triangle** $= \sqrt{s(s-a)(s-b)(s-c)}$

$$= \sqrt{270\,(270-170)\,(270-120)\,(270-250)}$$

$$= \sqrt{270 \times 100 \times 150 \times 20}$$

$$= \sqrt{81000000}$$

= 9000 sqm ….(By taking square root)

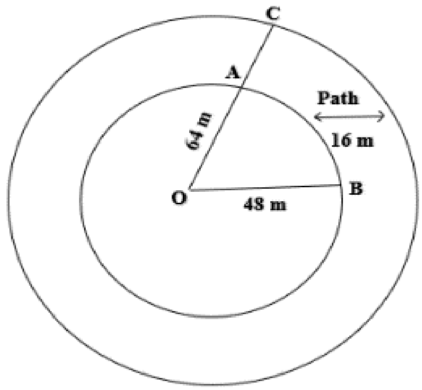
∴ Area of a given triangle is 9000 sqm.

13. A circular ground of diameter 96 m has a path of uniform width of 16 m around it ,then find (i) the area of the path (ii) What is the cost of construction of the path at the rate of 20 rupees per square metre ?

Solution :

In the figure,

Internal part of the circle is ground and shaded part is a path.



Diameter of the internal circle = 96m

∴ Radius of the internal circle = r = $\frac{96}{2}$ = 48m

Radius of the external circle (R) = Radius of the internal circle + width of the path

= 48 + 16 = 64m

Aera of the path = Area of external circle − Area of internal circle

$$= \pi r^2 - \pi r^2$$

$$= \frac{22}{7}(64)^2 - \frac{22}{7}(48)^2$$

$$= \frac{22}{7}\left[(64)^2 - (48)^2\right]$$

$$= \frac{22}{7}\left[4096 - 2304\right]$$

$$= \frac{22}{7}[1792]$$

$$= 22 \times 256$$

$$= 5632$$

$\therefore$ **Area of the path is 5632 sqm.**

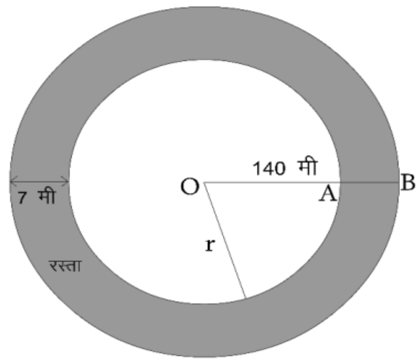
(ii) The path constructed at the rate of RS. 20 per square metre.

The total cost of construction of the path 5632 sqm

$$= 5632 \times 20 = 112640$$

$\therefore$ **The total cost of construction of the path is RS.1, 12 ,640**

14. The diameter of a circular garden is 280 m. A pathway of 7 m width is constructed all around the garden , inside it. What is the cost of constructing path at the rate of 25 rupees per square metre ?



Solution : In the figure, the external part of a circle is a garden and the shaded part is a path.

Diametre of a garden = OB = 280 m

$\therefore$ **Radius of a garden** $= R = \frac{280}{2} = 140$ **m**

Internal radius of a circle = OA = r =

Radius of a garden − Width of a path = 140 − 7 = 133 m

∴ Area of a path = Area of the external circle –

Area of the internal circle

$$= \pi R^2 - \pi r^2$$

$$= \frac{22}{7}(140)^2 - \frac{22}{7}(133)^2$$

$$= \frac{22}{7}[(140)^2 - (133)^2]$$

$$= \frac{22}{7}[(140 + 133)(140 - 133)]$$

$$\ldots\ldots [a^2 - b^2 = (a + b)(a - b)]$$

$$= \frac{22}{7}(273 \times 7)$$

$$= 22 \times 273 = 6006 \text{ sqm}$$

The rate of the cost of constructing path is 25 rupees per square metre.

∴ The cost of constructing path = 6006×25

= 150150

∴ The cost of constructing path is 150150 rupees.

15. The cost of 4 rounds of fencing of circular ground with wire is RS . 30800 at the rate of 5 rupees per metre. Find the area of a circular ground.

Solution : Length of wire required for 1 m at the rate of 5 rupees in Rs. 30800.

$$= \frac{30800}{5} = 6160 \text{ m}$$

$\therefore$ Cost of 4 – rounds of fencing $= 6160$ m

$\therefore$ Cost of one round of fence $= \frac{6160}{4}$

$= 1540$ m

Circumference of a circular ground = One round of fence of a circular ground

$\therefore$ Circumference of a circular ground $= 1540$ m

Circumference of circular ground $= \pi \times$ diameter

$$\therefore 1540 = \frac{22}{7} \times \text{diameter}$$

$$\therefore \text{Diameter} = \frac{1540 \times 7}{22}$$

$$= 70 \times 7$$

$$\therefore \text{Diameter} = 490 \text{ m}$$

Radius of circular ground (r) $= \frac{\text{Diameter}}{2}$

$$= \frac{490}{2}$$

$$= 245 \text{ m}$$

$\therefore$ Area of circular ground $= \pi r^2$

$$= \frac{22}{7} \times (245)^2$$

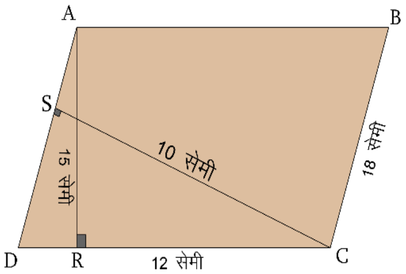
$$= \frac{22}{7} \times 245 \times 245$$

$$= 22 \times 35 \times 245$$

$= 188650$ sqm

$\therefore$ Area of circular ground is 188650 sqm .

16. In the adjoining figure, □ABCD is a parallelogram. Observe the figure and answer the following questions.



(i) Find area of □ABCD if DC as a base.

(ii) Find area of □ABCD if AD as a base.

(iii) Write the observation of both areas.

Solution : (i) □ABCD is a parallelogram.

base (DC) = 12 m , height (AR) = 15 cm

Area of a parallelogram = base $\times$ height

$= 12 \times 15 = 180$

$\therefore$ Area of □ABCD is 180 sqm if DC as a base.

(ii) $\because$ l (BC) $= l$ (AD) = 18 m

$\therefore$ base (AD) = 18 m , height (CS) = 10 cm

Area of a parallelogram = base $\times$ height

$= 18 \times 10 = 180$

$\therefore$ Area of □ABCD is 180 sqm if AD as a base.

(iii) observation : The area of □ABCD, if DC as a base and the are of □ABCD, if AD as a base both are same.

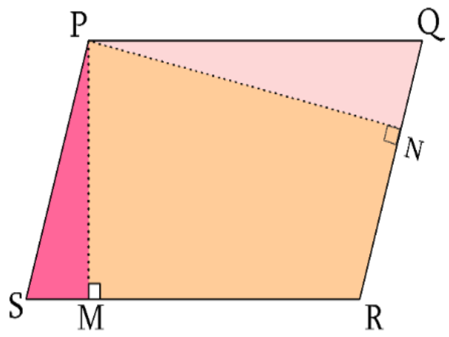
It is 180 sqm.

17. In the adjoining figure, □PQRS , is a parallelogram. Seg PM ⊥ side SR and seg PN ⊥ side QR.

l (PQ) = 16 m ,

l (PM) = 7m and l (PS) = 14 cm

then find l (PN)



Solution : The opposite sides of parallelogram are congruent

Side PQ ≅ side PR

Side PS ≅ side QR

l (PQ) = 16 m , l (PM) = 7m and l (PS) = 14 cm

Area of a parallelogram = base × height

$$= 16 \times 7 = 112 \text{ sqm}$$

$$\therefore l\,(PN) = \frac{\text{Area of a parallelogram}}{\text{base(PS)}}$$

$$= \frac{112}{14}$$

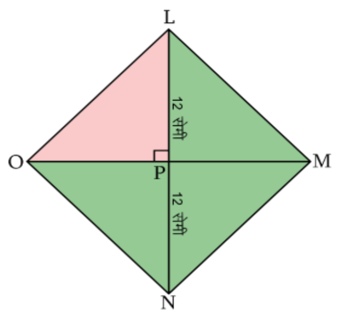
$$= 8$$

∴ l (PN) = 8 cm

18. If perimeter of a rhombus is 52 cm and length of one diagonal is 24 cm, what is the area of rhombus?

Solution : □ LMNO is a rhombus and

l (LN) = 24 cm



Perimeter of a rhombus $=$ side $\times$ 4

$$\therefore 52 = l\,(\text{LO}) \times 4$$

$$\therefore l\,(\text{LO}) = \frac{52}{4}$$

$$\therefore l\,(\text{LO}) = 13 \text{ cm}$$

Diagonals of rhombus bisect each other.

$$\therefore l\,(\text{LP}) = \frac{1}{2} \times 24$$

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

$$= 12$$

Diagonals of rhombus are perpendicular to each other.

hyp LN $\perp$ hyp OM

$$\therefore m\angle\text{LPO} = 90^0$$

In a right angled ΔLPO,

By Pythagoras theorem,

$$l\,(\text{LO})^2 = l(\text{LP})^2 + l(\text{PO})^2$$

$$(13)^2 = (12)^2 + l(\text{PO})^2$$

$$\therefore l(\text{PO})^2 = (13)^2 - (12)^2$$

$$= 169 - 144 = 25$$

$$\therefore l(\text{PO})^2 = (5)^2$$

$$\therefore l(\text{PO}) = 5\text{cm.}$$

Diagonals of rhombus bisect each other

$$\therefore l(\text{PO}) = \frac{1}{2}\, l(\text{MO})$$

$\therefore 5 = \frac{1}{2}\, l(\text{MO})$

$\therefore l(\text{MO}) = 10$ cm

$\therefore$ **The length of the diagonals of rhombus is 24 cm and 10 cm Respectively.**

Area of a rhombus $= \frac{1}{2} \times$ **Product of lengths of the diagonals**

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

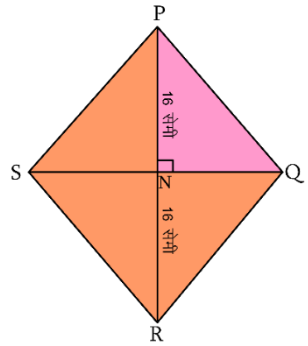
$= 120$

$\therefore$ **Area of a rhombus is 120 sqm.**

19. If length of a diagonal of a rhombus is 32 cm and its area is 384 sqm , find its perimeter.

Solution : Let □ PQRS be a rhombus . Area of the rhombus = 384 sqm.

Hypotenuse $= l\,(\text{PR}) = 32$ **cm**



Area of a rhombus $= \frac{1}{2} \times$ **Product of lengths of diagonals**

$\therefore \text{A}\,(\square\ \text{PQRS}) = \frac{1}{2} \times l\,(\text{PR}) \times l\,(\text{SQ})$

$384 = \frac{1}{2} \times 32 \times l\,(\text{SQ})$

$\therefore l(\text{SQ}) = \frac{384}{2} = 24$ cm

Diagonals of rhombus bisect each other.

$\therefore\ l(\mathrm{NQ}) = \frac{1}{2} \times l(\mathrm{SQ}) = \frac{1}{2} \times 24 = 12\ \mathrm{cm}$

And $l(\mathrm{PN}) = \frac{1}{2} \times\ l(\mathrm{PR}) = \frac{1}{2} \times 32 = 16\ \mathrm{cm}$

Diagonals of rhombus are perpendicular to each other.

hyp PR $\perp$ hyp SQ

$\therefore\ m\angle \mathrm{PNQ} = 90^0$

In a right angled ΔPNQ,

By Pythagoras theorem,

$l\ (\mathrm{PQ})^2 = l(\mathrm{PN})^2 + \ l\ (\mathrm{NQ})^2$

$= (16)^2 + (12)^2$

$= 256 + 144$

$= 400$

$\therefore\ l\ (\mathrm{PQ})^2 = \ (20)^2$

$\therefore\ l\ (\mathrm{PQ}) = \ 20$

The side of the rhombus is 20 cm

$\therefore$ **Perimeter of the rhombus = side $\times$ 4**

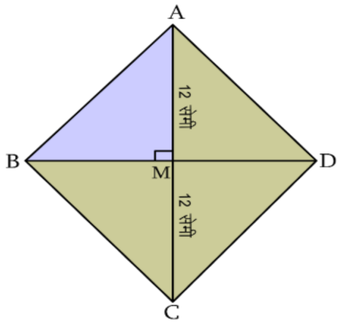
$= 20 \times 4$

$= 80$ **cm.**

$\therefore$ **The perimeter of the rhombus is 80 cm.**

20 . If the side of a rhombus is 15 cm and length of one diagonal is 24 cm, what will be the area of quadrilateral?

Solution :



□ABCD is a rhombus.

The lengths of all three sides of a rhombus are equal.

$\therefore l(AB) = l(BC) = l(CD) = l(DA) = 15$ cm

$l(AC) = 24$ cm

Diagonals of rhombus bisect each other.

$\therefore l(AM) = \frac{1}{2} l(AC)$

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

$= 12$ cm

Diagonals of rhombus perpendicular to each other.

hyp AC $\perp$ hyp BD

$\therefore m\angle AMB = 90^0$

In a right angled ΔAMB,

By Pythagoras theorem,

$l(AB)^2 = l(AM)^2 + l(BM)^2$

$$\therefore (15)^2 = (12)^2 + \ l(\text{BM})^2$$

$$l(\text{BM})^2 = (15)^2 - \ l(12)^2$$

$$= 225 - 144$$

$$= 81$$

$$\therefore l(\text{BM})^2 = (9)^2$$

$$\therefore l(\text{BM}) = 9 \text{ cm}$$

Diagonals of rhombus bisect each other.

$$\therefore l(\text{BM}) = \frac{1}{2} \times l(\text{BD})$$

$$\therefore 9 = \frac{1}{2} \times l(\text{BD})$$

$$\therefore l(\text{BD}) = 9 \times 2 = 18 \text{ cm}$$

Area of a rhombus $= \frac{1}{2} \times$ **product of lengths of diagonals**

$$= \frac{1}{2} \times l(\text{AC}) \times l(\text{BD})$$

$$= \frac{1}{2} \times 24 \times 18$$

$$= 12 \times 18$$

$$= 216 \text{ sqm}$$

$\therefore$ **Area of a rhombus is 216 sqm.**

21. The floor of a room consists of 3000 tiles which are rhombus shaped and each of its diagonal are 45 cm and 30 cm in length respectively. Find the total cost of polishing all the titles at the rate of 12 rupees per square metre.

Solution : The number of tiles which are rhombus shaped = 3000

In each rhombus , the length of the diagonals are 45 cm and 30 cm respectively.

Area of rhombus shaped tile

$= \frac{1}{2} \times$ Product of lengths of diagonals.

$= \frac{1}{2} \times 45 \times 30$

$= 45 \times 15$

= 675 sqm

∴ Area of rhombus shaped flooring = the number of the tiles × area of rhombus shaped tile

= 3000 × 675 = 2025000 sqm

The rate of polishing a tile is in square metre.

So, convert 2025000 sq cm into sqm.

∴ 2025000 sq cm = $2025000 \times \frac{1}{100}$ m $\times \frac{1}{100}$

= 202.5 sqm

The rate of polishing each tile is 12 rupees per square metre.

$\therefore$ **The total cost of polishing tiles $= 202.5 \times 12$**

$= 2430$ rupees.

$\therefore$ **The total cost of polishing all the titles is 2430 rupees.**

22. The lengths of diagonals of a rhombus are 48 cm and 20 cm. Find

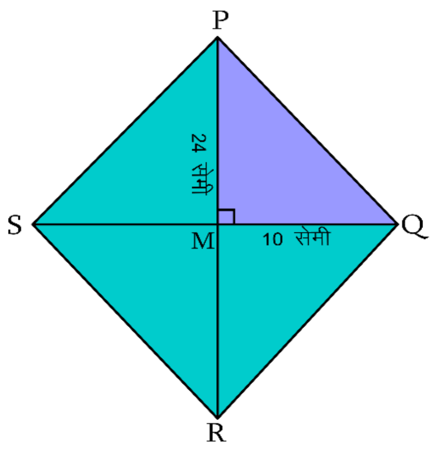
(i) the area of rhombus

(ii) the length of the side of rhombus

(iii) the perimeter of a rhombus.

Solution :

(i) The lengths of diagonals of a rhombus are 48 cm and 20 cm respectively.



Area of a rhombus $= \frac{1}{2} \times$ product of lengths of diagonals.

$$= \frac{1}{2} \times 48 \times 20$$

$$= 24 \times 30$$

$$= 480 \text{ sqm}$$

$\therefore$ **Area of a rhombus is 480 sqm**

(ii) Diagonals of rhombus bisect each other.

$$\therefore l\,(PM) = \frac{1}{2} \times l(PR) = \frac{1}{2} \times 48 = 24 \text{ cm}$$

And $l(\text{MQ}) = \frac{1}{2} \times l(\text{SQ}) = \frac{1}{2} \times 20 = 10$ cm

Diagonals of rhombus are perpendicular to each other.

hyp PR $\perp$ hyp SQ

$\therefore$ m$\angle$PMQ $= 90^0$

In right angled ΔPMQ,

By Pythagoras theorem,

$l(\text{PQ})^2 = l(\text{PM})^2 + l(\text{MQ})^2$

$= (24)^2 + (10)^2$

$= 576 + 100$

$= 676$

$\therefore l(\text{PQ})^2 = (26)^2$

$\therefore l(\text{PQ}) = 26$ cm

$\therefore$ The length of the side of a rhombus is 26 cm.

(iii) Perimeter of a rhombus = side $\times$ 4

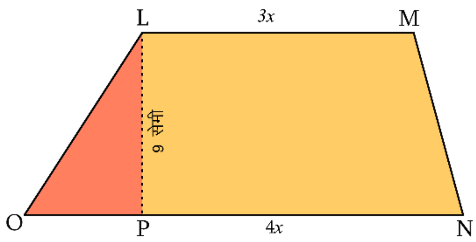
$= 26 \times 4$

$= 104$ cm

$\therefore$ The perimeter of rhombus is 104 cm.

23. The ratio of length of the two parallel sides of a trapezium is 3:4 . If the distance between parallel sides is a 9 cm and area is 126 sqcm then find the lengths of parallel sides of the trapezium.

Solution :



Let us , consider the lengths of the parallel sides are 3*x* and 4*x* respectively.

Distance between parallel sides = LP = 9 cm

A (□LMNO) = 126 sqcm

Area of the trapezium $= \frac{1}{2} \times$ **(sum of the lengths of parallel sides)** $\times$ **height**

$$= \frac{1}{2}[l(LM) + l(ON)] \times l(LP)$$

$$126 = \frac{1}{2} \times (3x + 4x) \times 9$$

$$= \frac{1}{2} \times 7x \times 9$$

$$\therefore 7x = \frac{126 \times 2}{9}$$

$$\therefore 7x = 14 \times 2$$

$$\therefore x = \frac{28}{7}$$

$$\therefore x = 4$$

$$\therefore 3x = 3 \times 4 = 12 \text{ cm}$$

$$4x = 4 \times 4 = 16 \text{ cm}$$

$\therefore$ **The lengths of parallel sides are 12 cm and 16 cm**

24. The two parallel sides and the distance between them are in the ratio 3:4:2. If the area of the trapezium is 175 sqm then find its height.

Solution : Suppose the two parallel sides and the distance between them be $3x$, $4x$, $2x$ respectively.

Area of the trapezium $= \frac{1}{2} \times$ **(sum of the lengths of parallel sides)** $\times$ **height**

$$\therefore 175 = \frac{1}{2} \times (3x + 4x) \times 2x$$

$$\therefore 175 = \frac{1}{2} \times 7x \times 2x$$

$$\therefore 175 = \frac{1}{2} \times 14x^2$$

$$\therefore 7x^2 = 175$$

$$\therefore x^2 = \frac{175}{7}$$

$$\therefore x^2 = (5)^2$$

$$\therefore x = 5$$

The distance between parallel sides means the height of

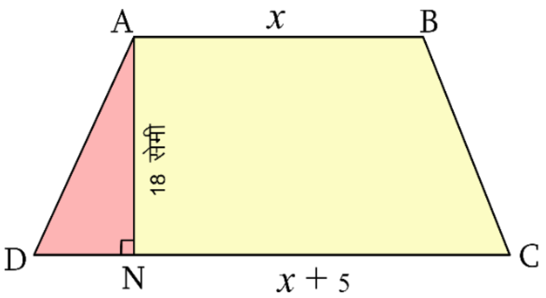
the trapezium i.e. h.

$\therefore 2x = 2 \times 5 = 10$ cm

$\therefore$ Height of the trapezium is 10 cm.

25. If the area of a trapezium is 279 sqcm and the distance between parallel sides is 18 cm. If one of these sides is greater than 5 cm than the other, what is the length of parallel sides ? what is the sum of parallel sides of trapezium ?

Solution :



Given : Area of the trapezium = 279 sqcm

Distance between parallel sides (h) = 18 cm

Area of the trapezium = $\frac{1}{2} \times$ (sum of the lengths of parallel sides) $\times$ height

$\therefore 279 = \frac{1}{2} \times$ (sum of the lengths of parallel sides) $\times 18$

$\therefore$ Sum of the lengths of parallel sides .

$$= \frac{279 \times 2}{18} = \frac{279}{9} = 31$$

The small side of the trapezium (AB) $= x$ and the big side of the trapezium (DC) $= x + 5$

$$\therefore x + x + 5 = 31$$

$$\therefore 2x + 5 = 31$$

$$\therefore 2x = 31 - 5$$

$$\therefore 2x = 26$$

$$\therefore x = 13$$

The small side of the trapezium (AB) $= x =$ 13cm

The big side of the trapezium (DC) $= x + 5$

$$= 13 + 5 = 18cm$$

$\therefore$ The lengths of the parallel sides are 13 cm and 18 cm respectively.

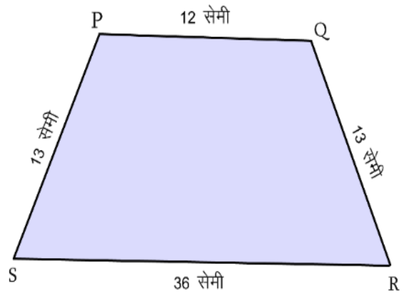
Sum of the lengths of parallel sides is 31 cm.

26. ☐ PQRS is a trapezium.

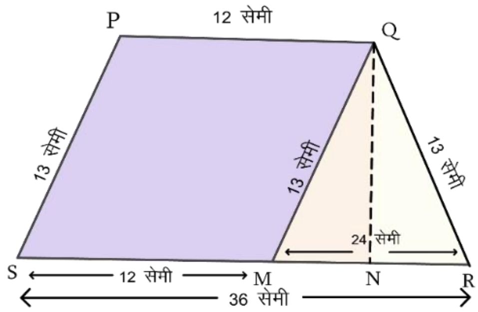
l(PQ) = 12 cm, l(QR) = 13 cm,

l(SR) = 36 cm and l(PS) = 13 cm

find the area of ☐PQRS



Solution :



☐PQRS is a trapezium.

Side PQ ∥ side SR ,

Draw side PS ∥ side QM ,

l(SR) = 36 cm , l(PQ) = 12 cm, l(SM) = 12 cm,

l(PS) = l(QM) = 13 cm.

$l(SR) = l(SM) + l(MR)$

$\therefore l(MR) = l(SR) = l(SM) = 36 - 12 = 24$ cm

In ΔQMR,

$l(MR) = a = 24$ cm , $l(QR) = b = 13$ cm and

$l(QM) = a = 13$ cm

Semi perimeter of $\Delta QMR = \dfrac{a + b + c}{2}$

$$= \frac{24 + 13 + 13}{2}$$

$$= \frac{50}{2}$$

$$= 25 \text{ cm}$$

$$\text{Area of } \Delta\text{QMR} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{25(25-24)(25-13)(25-13)}$$

$$= \sqrt{25 \times 1 \times 12 \times 12}$$

$$= 5 \times 12 \text{ …… (By taking square root)}$$

$$= 60 \text{ sqcm}$$

Now, draw seg QN $\perp$ side SR

$$\text{Area of } \Delta\text{QMR} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times l(\text{MR}) \times l(\text{QN})$$

$$\therefore 60 = \frac{1}{2} \times 24 \times l(\text{QN})$$

$$\therefore 60 = 12 \times l(\text{QN})$$

$$\therefore l(\text{QN}) = \frac{60}{12} = 5$$

$$\therefore l(\text{QN}) = \text{h} = 5 \text{ cm}$$

$$\therefore \text{ Area of the trapezium} = \frac{1}{2} \times (\text{sum of the lengths of parallel sides}) \times \text{heights}$$

$$= \frac{1}{2} \times [l(SR) + l(PQ)] \times l(QN)$$

$$= \frac{1}{2} \times (36 + 12) \times 5$$

$$= \frac{1}{2} \times 48 \times 5$$

$$= 24 = 5$$

$$= 120 \text{ sqcm}$$

∴ Area of □PQRS is 120 sqcm.

27. □EFGH is a parallelogram.

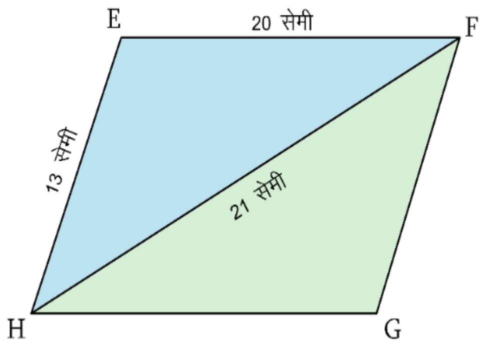
l(EF) = 20 cm,

l(EH) = 13 cm and

l(FH) = 21 cm. To

find the area of □EFGH

Complete the following activity.



$\boxed{}$ is a parallelogram

Area of □EFGH = $\boxed{}$ × Area of ΔEFH

In ΔEFH,

l(EF) = a = $\boxed{}$ cm, l(EH) = b = $\boxed{}$ cm , l(HF) = c = $\boxed{}$ cm

Semi perimeter of ΔEFH = s = $\dfrac{\boxed{}+\boxed{}+\boxed{}}{2}$ ……. (formula)

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

$$= \frac{\square}{2}$$

$$= \square \text{ cm}$$

$$\text{Area of } \Delta EFH = \sqrt{s(s-\square)(s-\square)(s-\square)} \text{ …….. (formula)}$$

$$= \sqrt{27(27-\square)(27-\square)(27-\square)}$$

$$= \sqrt{27 \times \square \times \square \times \square}$$

$$= \sqrt{3 \times 3 \times 3 \times \square \times \square \times \square} \text{ …….. (By factorising)}$$

$$= 3 \times \square \times \square \times \square \text{ ….. (By taking square root)}$$

$$\text{Area of } \Delta EFH = \square \text{ sqm}$$

$$\text{Area of a a parallelogram} = \square \times \text{Area of } \Delta EFH$$

$$= \square \times \square$$

$$= \square \text{ sqm}$$

$\therefore$ **Area of parallelogram EFGH is $\square$ sqm.**

Solution :

$\boxed{\square \text{ EFGH}}$ **is a parallelogram**

$$\text{Area of } \square EFGH = \boxed{2} \times \text{Area of } \Delta EFH$$

In ΔEFH,

$l(\text{EF}) = a = \boxed{20}$ cm, $l(\text{EH}) = \text{b} = \boxed{13}$ cm ,

$l(\text{HF}) = \text{c} = \boxed{21}$ cm

Semi perimeter of $\Delta\text{EFH} = \text{s} = \frac{\boxed{a} + \boxed{\text{b}} + \boxed{\text{c}}}{2}$ ……. (formula)

$= \frac{\boxed{20} + \boxed{13} + \boxed{21}}{2}$

$= \frac{\boxed{54}}{2}$

$= \boxed{27}$ cm

Area of $\Delta\text{EFH} = \sqrt{s(s-a)(s-\text{b})(s-c)}$ …….. (formula)

$= \sqrt{27(27-\boxed{20})(27-\boxed{13})(27-\boxed{21})}$

$= \sqrt{27 \times \boxed{7} \times \boxed{14} \times \boxed{6}}$

$= \sqrt{3 \times 3 \times 3 \times \boxed{7} \times \boxed{2 \times 7} \times \boxed{2 \times 3}}$ …… (By factorising)

$= 3 \times \boxed{3} \times \boxed{7} \times \boxed{2}$….. (By taking square root)

Area of $\Delta\text{EFH} = \boxed{126}$ sqcm

Area of a a parallelogram $= \boxed{2} \times$ Area of ΔEFH

$= \boxed{2} \times \boxed{126}$

$= \boxed{252}$ sqcm

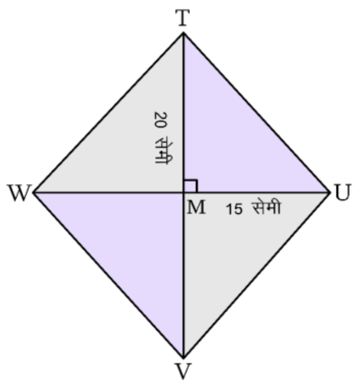
$\therefore$ Area of parallelogram EFGH is $\boxed{252}$ sqcm.

28. lengths of the two diagonals of a rhombus are in the ratio 4:3 and its area is 600 sqcm. To find the length of its side, complete the following activity.

Let us, consider the lengths of the two diagonals of a rhombus be $4x$, $\square$ respectively.

$\therefore$ Area of a rhombus $= \frac{1}{2} \times \square$

….. (formula)



$$\therefore 600 = \frac{1}{2} \times (\square \times \square)$$

$$\therefore 600 = \frac{1}{2} \times \square\, x^2$$

$$\therefore \square\, x^2 = 600$$

$$\therefore x^2 = \frac{600}{\square}$$

$$\therefore x^2 = \square$$

$$\therefore x = \square$$

$\therefore$ Diagonals of a rhombus $= 4x = 4 \times \square = \square$ cm

and $3x = 3 \times \square = \square$ cm

In the figure, $l(\text{TM}) = \square$ cm,

$l(\text{MU}) = \square$ cm

hyp TV $\perp$ hyp WU

$\therefore$ m$\angle$TMU $= \square$

In a right angled ΔTMU,

By Pythagoras theorem,

$$l(\mathrm{TU})^2 = l\,(\mathrm{TM})^2 + l(\mathrm{MU})^2$$

$$\therefore l(\mathrm{TU})^2 = \boxed{} + \boxed{}$$

$$= \boxed{} + \boxed{}$$

$$= \boxed{}$$

$$\therefore l(\mathrm{TU}) = \boxed{}\ \mathrm{cm}$$

$\therefore$ **The side of rhombus TUVW is $\boxed{}$ cm.**

Solution :

Let us, consider the lengths of the two diagonals of a rhombus be $4x$, $\boxed{3x}$ respectively.

$\therefore$ **Area of a rhombus = $\frac{1}{2}\times$ $\boxed{\text{product of lengths of the diagonals}}$ ….. (formula)**

$$\therefore 600 = \frac{1}{2}\times(\boxed{4x}\times\boxed{3x})$$

$$\therefore 600 = \frac{1}{2}\times\boxed{12}\,x^2$$

$$\therefore \boxed{6}\,x^2 = 600$$

$$\therefore x^2 = \frac{600}{\boxed{6}}$$

$$\therefore x^2 = \boxed{100}$$

$$\therefore x = \boxed{10}$$

$\therefore$ **Diagonals of a rhombus = $4x = 4\times\boxed{10} = \boxed{40}$ cm** and $3x = 3 \times \boxed{10} = \boxed{30}$ cm

In the figure, $l(\text{TM}) = \boxed{20}$ cm, $l(\text{MU}) = \boxed{15}$ cm

hyp TV ⊥ hyp WU

$\therefore$ m∠TMU = $\boxed{90^0}$

In right angled ΔTMU,

By Pythagoras theorem,

$l(\text{TU})^2 = l\, l\, (\text{TM})^2 + l(\text{MU})^2$

$\therefore l(\text{TU})^2 = \boxed{(20)^2} + \boxed{(15)^2}$

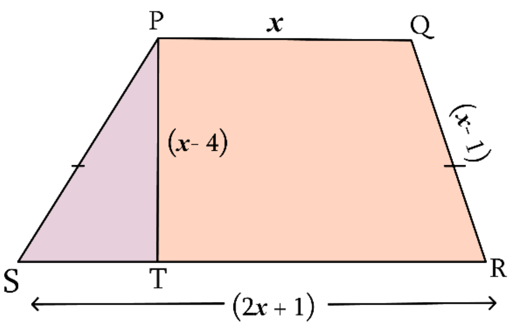
$= \boxed{400} + \boxed{225}$

$= \boxed{625}$

$\therefore l(\text{TU}) = \boxed{25}$ cm

$\therefore$ The side of rhombus TUVW is $\boxed{25}$ cm.

29. In the adjacent figure ◻PQRS is a trapezium. Side PQ ∥ side SR and its area is 33 sq cm. To find the lengths of all the sides, complete the following activity.



$\boxed{}$ is a trapezium.

Side PQ || side SR

Area of trapezium PQRS $= \frac{1}{2} \times$ **sum of the lengths of parallel sides** $\times \boxed{}$ **….. (formula)**

$$= \frac{1}{2} \times [l(PQ) + l(SR)] \times l\boxed{}$$

$$\therefore 33 = \frac{1}{2} \times (x + 2x + 1) \times \boxed{}$$

$$\therefore 33 \times \boxed{} = (3x + 1) \times \boxed{}$$

$$\therefore \boxed{} = 3x^2 - \boxed{}x + \boxed{}x - \boxed{}$$

$$\therefore 3x^2 - \boxed{}x - \boxed{} - \boxed{} = 0$$

$$\therefore 3x^2 - \boxed{}x + \boxed{} - 70 = 0$$

$$\therefore 3x(\boxed{}) + 10(\boxed{}) = 0$$

$$\therefore (3x + 10)(\boxed{}) = 0$$

$$\therefore 3x + 10 = 0 \text{ or } (\boxed{}) = 0$$

$$\therefore 3x = -10 \quad \text{or} \quad \therefore x = \boxed{}$$

$$\therefore x = \frac{-10}{3}$$

But , the length must not be negative

$$\therefore x \neq \frac{-10}{3} \qquad \therefore x = \boxed{} \text{ cm}$$

$$\therefore l(PQ) = x = \boxed{} \text{ cm}$$

$$\therefore l(SR) = 2x + 1 = 2 \times \boxed{} + 1 = \boxed{} \text{ cm}$$

$$\therefore l(PS) = l(QR) = x - 1 = \boxed{} - 1 = \boxed{} \text{ cm}$$

Solution : $\boxed{\square\ \text{PQRS}}$ **is a trapezium.**

Side PQ ∥ Side SR

Area of trapezium PQRS $= \frac{1}{2} \times$ **sum of the lengths of parallel sides** $\times \boxed{\text{height}}$ **….. (formula)**

$$= \frac{1}{2} \times [l(PQ) + l(SR)] \times l\,\boxed{PT}$$

$$\therefore 33 = \frac{1}{2} \times (x + 2x + 1) \times \boxed{(x-4)}$$

$$\therefore 33 \times \boxed{2} = (3x+1) \times \boxed{(x-4)}$$

$$\therefore \boxed{66} = 3x^2 - \boxed{12}\,x + \boxed{1}\,x - \boxed{4}$$

$$\therefore 3x^2 - \boxed{11}\,x - \boxed{4} - \boxed{66} = 0$$

$$\therefore 3x^2 - \boxed{11}\,x - 70 = 0$$

$$\therefore 3x^2 - \boxed{21}\,x + \boxed{10x} - 70 = 0$$

$$\therefore 3x\left(\boxed{(x-7)}\right) + 10\left(\boxed{(x-7)}\right) = 0$$

$$\therefore (3x+10)(\boxed{x-7}) = 0$$

$$\therefore 3x + 10 = 0 \text{ or } (\boxed{x-7}) = 0$$

$$\therefore 3x = -10 \quad \text{or} \quad \therefore x = \boxed{0}$$

$\therefore x = \frac{-10}{3}$

But , the length must not be negative.

$\therefore x \neq \frac{-10}{3}$ $\therefore x = \boxed{7}$ cm

$\therefore l(\text{PQ}) = x = \boxed{7}$ cm

$\therefore l(\text{SR}) = 2x + 1 = 2 \times \boxed{7} + 1 = \boxed{15}$ cm

$\therefore l(\text{PS}) = l(\text{QR}) = x - 1 = \boxed{7} - 1 = \boxed{6}$ cm

30. Write the following statement true or false.

1. The rectangle is formed from the parallelogram so areas of both the figures are equal.

Ans : True

2. Base of parallelogram is breath of the rectangle and its height is the Length of the rectangle.

Ans : False, Base of parallelogram is length of the rectangle and its height is the breadth of the rectangle.

3. The two diagonals of the rhombus are intersected to each other then the formed triangles are equilateral triangle.

Ans : False, The two diagonals of the rhombus are intersected to each other then the formed triangles are right angled triangle.

4. Diagonals of a rhombus are perpendicular bisectors of each other.

Ans : True

5. If the diagonals of a rhombus intersect each other then two right angled triangles are formed ?

Ans : False, if the diagonals of a rhombus intersects each other then four right angled triangles are formed.

6. Areas of four right angled triangles are equal, if the diagonals of a rhombus interacts each other.

Ans : True

7. The side of a square is doubled, the area becomes doubled.

Ans : False, the side of a square is doubled, the area becomes 4 times as large.

8. Height of the trapezium is the distance between the parallel sides.

Ans : True

9. If the length and breadth of a rectangle are doubled, then the area of the rectangle becomes doubled.

Ans : False, it the length and breadth of a rectangle are doubled, then the area of the rectangle becomes 4 times as large.

10. Both pairs of the opposite sides of a trapezium are parallel to each other.

Ans : False, Only one pair of the opposite side of a trapezium is parallel to each other.

11. The mathematician Aryabhatta invented the formula to find the area of a triangle, if lengths of the three sides of a triangle are given.

Ans : False, the mathematician Heron invented the formula to find the area of a triangle, if lengths of the three sides of a triangle are given.

12. There is no change in the area of a rectangle if its length is doubled and breadth halved.

Ans : True

13. Generally the plots, fields are of the shape of irregular polygons.

Ans : True

14. As increasing the number of equal parts of the circle, the shape of the figure is more and more like that of a rectangle.

Ans : True

15. If the radius of the circle is doubled then its area increases by four times .

Ans : True

16. Aera of a parallelogram is found if and only if its perimeter is given.

Ans. False, Aera of a square is found if and only if its perimeter is given.

32. Match the following pairs

Group ‘A’	Group ‘B’
1) Area of a rhombus	a) $\sqrt{s(s-a)(s-b)(s-c)}$
2) Area of a trapezium	b) $\frac{1}{2}\times$ Products of lengths of diagonals
3) Area of a parallelogram	c) $s = \frac{a+b+c}{2}$
4) Semi perimeter of a triangle	d) $\frac{1}{2}\times$ (sum of the lengths of parallel sides) $\times$ height
5) Heron’s formula	e) base $\times$ height

Ans :

Group 'A'	Group 'B'
1) Area of a rhombus	b) $\frac{1}{2} \times$ products of lengths of diagonals
2) Area of a trapezium	d) $\frac{1}{2} \times$ (Sum of the lengths of parallel sides) $\times$ height
3) Area of a parallelogram	e) base $\times$ height
4) Semi perimeter of a triangle	c) $s = \frac{a+b+c}{2}$
5) Heron's formula	a) $\sqrt{s(s-a)(s-b)(s-c)}$

2.

Group ‘A’	**Group ‘B’**
1) 100 sqm	**(*a*) Nearly 100 sqm**
2) 1 Hectare	**(b) Nearly 0.4 hectare**
3) 1 Guntha	**(c) 10000 sqm**
4) 1 Acre	**(d) 1 are**

Ans :

Group ‘A’	**Group ‘B’**
1) 100 sqm	**(d) 1 are**
2) 1 Hectare	**(c) 10000 sqm**
3) 1 Guntha	**(*a*) Nearly 100 sqm**
4) 1 Acre	**(b) Nearly 0.4 hectare**

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