Exercise – 17B

1. The perimeter of a rectangular plot of land is 80 m and its breadth is 16 m. Find the length and area of the plot.

Sol:

As, a perimeter $80m$

$\Rightarrow 2(length + breath) = 80$

$\Rightarrow 2(length + 16) = 80$

$\Rightarrow 2 \times length + 32 = 80$

$\Rightarrow 2 \times length = 80 - 32$

$\Rightarrow length = \frac{48}{2}$

$\therefore length = 24\,m$

Now, the area of the plot $= length \times breadth$

$= 24 \times 16$

$= 384 m^2$

So, the length of the plot is 24 m and its area is 384 m^2.

2. The length of a rectangular park is twice its breadth and its perimeter is 840 m. Find the area of the park.

Sol:

Let the breadth of the rectangular park be b.

$\therefore$ Length of the rectangular park $= l = 2b$

Perimeter = 840 m

$\Rightarrow 840 = 2(l + b)$

$\Rightarrow 840 = 2(2b + b)$

$\Rightarrow 840 = 2(3b)$

$\Rightarrow 840 = 6b$

$\Rightarrow b = 140\ m$

Thus, we have:

$l = 2b$

$= 2 \times 140$

$= 280\ m$

Area $= l \times b$

$= 280 \times 140$

$= 39200\ m^2$

3. One side of a rectangle is 12 cm long and its diagonal measure 37 cm. Find the other side and the area of the rectangle.

Sol:

One side of the rectangle = 12 cm

Diagonal of the rectangle = 37 cm

The diagonal of a rectangle forms the hypotenuse of a right-angled triangle. The other two sides of the triangle are the length and the breadth of the rectangle.

Now, using Pythagoras' theorem, we have:

$$(one\ \ side)^2+(other\ \ side)^2=(hypotenuse)^2$$

$$\Rightarrow (12)^2+(other\ side)^2=(37)^2$$

$$\Rightarrow 144+(other\ side)^2=1369$$

$$\Rightarrow (other\,side)^2=1329-144$$

$$\Rightarrow (other\ \ side)^2=1225$$

$$\Rightarrow other\ \ side=\sqrt{1225}$$

$$\Rightarrow other\ \ side=35\ cm$$

Thus, we have:

Length = 35 cm

Breadth = 12 cm

Area of the rectangle $=35\times12=420\ cm^2$

4. The area of a rectangular plot is $462m^2$ and is length is 28 m. Find its perimeter.

Sol:

Area of the rectangular plot $=462\ m^2$

Length $(l)=28\ m$

Area of a rectangle = Length $(l)\times$Breath(b)

$$=462=28\times b$$

$$\Rightarrow b=16.5\ m$$

Perimeter of the plot $=2(l+b)$

$$=2(28+16.5)$$

$$=2\times44.5$$

$$=89\,m$$

5. A lawn is in the form of a rectangle whose sides are in the ratio 5 : 3. The area of the lawn is $3375m^2$. Find the cost of fencing the lawn at ₹ 65 per metre.

Sol:

Let the length and breadth of the rectangular lawn be $5x\ m$ and $3x\ m$, respectively.
Given:
Area of the rectangular lawn $= 3375 m^2$

$\Rightarrow 3375 = 5x \times 3x$

$\Rightarrow 3375 = 15x^2$

$\Rightarrow \frac{3375}{15} = x^2$

$\Rightarrow 225 = x^2$

$\Rightarrow x = 15$

Thus, we have:

$l = 5x = 5 \times 15 = 75\ m$

$b = 3x = 3 \times 15 = 45\ m$

Perimeter of the rectangular lawn $= 2(l + b)$

$= 2(75 + 45)$

$= 2(120)$

$= 240 m$

Cost of fencing 1 m lawn = Rs 65

$\therefore$ Cost of fencing 240 m lawn $= 240 \times 65 = Rs\ 15{,}600$

6. A room is 16 m long and 13.5 m broad. Find the cost of covering its floor with 75-m-wide carpet at ₹ 60 per metre.

Sol:

As, the area of the floor = length $\times$ breadth

$= 16 \times 13.5$

$= 216 m^2$

And, the width of the carpet = 75 m

So, the length of the carpet required $= \frac{Area\ of\ the\ floor}{Width\ of\ the\ carpet}$

$= \frac{216}{75}$

$= 2.88\ m$

Now, the cost of the carpet required $= 2.88 \times 60 = 172.80$

Hence, the cost of covering the floor with carpet is 172.80.

Disclaimer: The answer given in the textbook is incorrect. The same has been rectified above.

7. The floor of a rectangular hall is 24 m long and 18 m wide. How many carpets, each of length 2.5 m and breadth 80 cm, will be required to cover the floor of the hall?

Sol:

Given:

Length = 24 m

Breath = 18 m

Thus, we have:

Area of the rectangular hall $= 24\times 18$

$= 432\, m^2$

Length of each carpet $= 2.5\, m$

Breath of each carpet $= 80\, cm = 0.80\ m$

Area of one carpet $= 2.5\times 0.8 = 2\ m^2$

Number of carpets required $= \dfrac{Area\ of\ the\ hall}{Area\ of\ the\ carpet} = \dfrac{432}{2} = 216$

Therefore, 216 carpets will be required to cover the floor of the hall.

8. A 36-m-long, 15-m-borad verandah is to be paved with stones, each measuring 6dm by 5 dm. How many stones will be required?

Sol:

Area of the verandah = Length × Breadth = 36 × 15 = 540 m^2

Length of the stone = 6 dm = 0. 6 m

Breadth of the stone = 5 dm = 0.5 m

Area of one stone $= 0.6\times 0.5 = 0.3\ m^2$

Number of stones required $= \dfrac{Area\ of\ the\ verendah}{Area\ of\ the\ stone}$

$= \dfrac{540}{0.3}$

$= 1800$

Thus, 1800 stones will be required to pave the verandah.

9. The area of rectangle is $192 cm^2$ and its perimeter is 56 cm. Find the dimensions of the rectangle.

Sol:

Area of the rectangle $= 192\ cm^2$

Perimeter of the rectangle $= 56\ cm$

Perimeter = 2(length + breath)

$\Rightarrow 56 = 2(l+b)$

$\Rightarrow l+b = 28$

$\Rightarrow l = 28 - b$

Area = length $\times$ breath

$\Rightarrow 192 = (28 - b) x b$

$\Rightarrow 192 = 28b - b^2$

$\Rightarrow b^2 - 28b + 192 = 0$

$\Rightarrow (b - 16)(b - 12) = 0$

$\Rightarrow b = 16 \text{ } or \text{ } 12$

Thus, we have;

$l = 28 - 12$

$\Rightarrow l = 28 - 12$

$\Rightarrow l = 16$

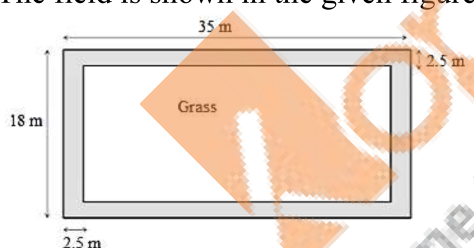
We will take length as 16 cm and breath as 12 cm because length is greater than breath by convention.

10. A rectangular park 358 m long and 18 m wide is to be covered with grass, leaving 2.5 m uncovered all around it. Find the area to be laid with grass.

Sol:

The field is planted with grass, with 2.5 m uncovered on its sides.

The field is shown in the given figure.



Thus, we have;

Length of the area planted with grass $35 - (2.5 + 2.5) = 35 - 5 = 30\,m$

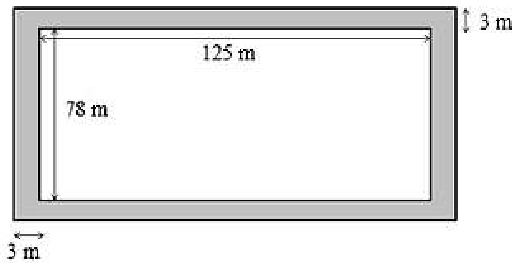
Width of the area planted with grass $= 18 - (2.5 + 2.5) = 18 - 5 = 13\,m$

Area of the rectangular region planted with grass $= 30 \times 13 = 390\,m^2$

11. A rectangular plot measure 125 m by 78 m. It has gravel path 3 m wide all around on the outside. Find the area of the path and the cost of gravelling it at ₹ 75 per m^2

Sol:

The plot with the gravel path is shown in the figure.



Area of the rectangular plot $= l \times b$

Area of the rectangular plot $= 125 \times 78 = 9750 \ m^2$

Length of the park including the path $= \ 125 + 6 = 131 m$

Breadth of the park including the path $= 78 + 6 = 84 m$

Area of the plot including the path

$= 131 \times 84$

$= 11004 \ m^2$

Area of the path $= 11004 - 9750$

$= 1254 m^2$

Cost of gravelling $1 \ m^2$ of the path = Rs 75

Cost of gravelling $1254 \ m^2$ of the path $= 1254 \times 75$

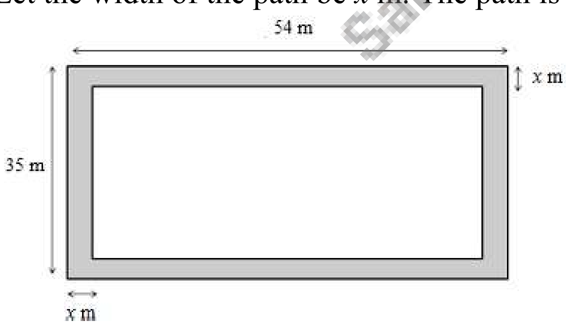
$= Rs$ 94050

12. A footpath of uniform width runs all around the inside of a rectangular field 54m long and 35 m wide. If the area of the path is $420 m^2$, find the width of the path.

Sol:

Area of the rectangular field $= 54 \times 35 = 1890 \ m^2$

Let the width of the path be *x* m. The path is shown in the following diagram:



Length of the park excluding the path $= (54 - 2x) m$

Breadth of the park excluding the path $= (35 - 2x) m$

Thus, we have:

Area of the path $= 420 \ m^2$

$\Rightarrow 420 = 54 \times 35 - (54 - 2x)(35 - 2x)$

$\Rightarrow 420 = 1890 - \left(1890 - 70x - 108x + 4x^2\right)$

$\Rightarrow 420 = -4x^2 + 178x$

$\Rightarrow 4x^2 - 178x + 420 = 0$

$\Rightarrow 2x^2 - 89x + 210 = 0$

$\Rightarrow 2x^2 - 84x - 5x + 210 = 0$

$\Rightarrow 2x\left(x - 42\right) - 5\left(x - 42\right) = 0$

$\Rightarrow \left(x - 42\right)\left(2x - 5\right) = 0$

$\Rightarrow x - 42 = 0 \ or \ 2x - 5 = 0$

$\Rightarrow x = 42 \ or \ x = 2.5$

The width of the path cannot be more than the breath of the rectangular field.

$\therefore x = 2.5 \ m$

Thus, the path is $2.5m$ wide.

13. The length and breadth of a rectangular garden are in the ratio 9:5. A path 3.5 m wide, running all around inside it has an area of $1911m^2$. Find the dimensions of the garden.

Sol:

Let the length and breadth of the garden be $9x$ m and $5x$ m, respectively,

Now,

Area of the garden $= \left(9x \times 5x\right) = 45x^2$

Length of the garden excluding the path $= \left(9x - 7\right)$

Breadth of the garden excluding the path $= \left(5x - 7\right)$

Area of the path $= 45x^2 = \left[\left(9x - 7\right)\left(5x - 7\right)\right]$

$\Rightarrow 1911 = 45x^2 - \left[45x^2 - 63x - 35x + 49\right]$

$\Rightarrow 1911 = 45x^2 - 45x^2 + 63x + 35x - 49$

$\Rightarrow 1911 = 98x - 49$

$\Rightarrow 1960 = 98x$

$\Rightarrow x = \dfrac{1960}{98}$

$\Rightarrow x = 20$

Thus, we have:

Length $= 9x = 20 \times 9 = 180m$

Breadth $= 5x = 5 \times 20 = 100 \ m$

14. A room 4.9 m long and 3.5 m board is covered with carpet, leaving an uncovered margin of 25 cm all around the room. If the breadth of the carpet is 80 cm, find its cost at ₹ 80 per metre.

Sol:

Width of the room left uncovered = 0.25 m

Now,

Length of the room to be carpeted $= 4.9 - (0.25 + 0.25) = 4.9 - 0.5 = 4.4\ m$

Breadth of the room be carpeted $= 3.5 - (0.25 + 0.25) = 3.5 - 0.5 = 3m$

Area to be carpeted $= 4.4 \times 3 = 13.2\ m^2$

Breadth of the carpet 80 cm = 0.8 m

We know:

Area of the room = Area of the carpet

Length of the carpet = $\frac{Area\ of\ the\ room}{Breadth\ of\ the\ carpet}$

$= \frac{13.5}{0.8}$

$= 16.5m$

Cost of 1 m carpet = Rs 80

Cost of 16.5 m carpet $= 80 \times 16.5 = Rs\,1,320$

15. A carpet is laid on floor of a room 8 m by 5 m. There is border of constant width all around the carpet. If the area of the border is $12m^2$ find its width.

Sol:

Let the width of the border be x m.

The length and breadth of the carpet are 8 m and 5 m, respectively.

Area of the carpet $= 8 \times 5 = 40m^2$

Length of the carpet without border $= (8 - 2x)$

Breadth of carpet without border $= (5 - 2x)$

Area of the border $12m^2$

Area of the carpet without border $= (8 - 2x)(5 - 2x)$

Thus, we have:

$12 = 40 - [(8 - 2x)(5 - 2x)]$

$\Rightarrow 12 = 40 - (40 - 26x + 4x^2)$

$\Rightarrow 12 = 26x - 4x^2$

$\Rightarrow 26x - 4x^2 = 12$

$\Rightarrow 4x^2 - 26x + 12 = 0$

$\Rightarrow 2x^2 - 13x + 6 = 0$

$\Rightarrow (2x-1)(x-6) = 0$

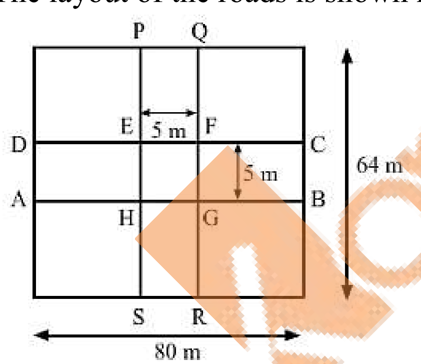
$\Rightarrow 2x - 1 = 0 \; and \; x - 6 = 0$

$\Rightarrow x = \frac{1}{2} \; and \; x = 6$

Because the border cannot be wider than the entire carpet, the width of the carpet is $\frac{1}{2} m$, i.e., 50 cm.

16. A 80 m by 64 m rectangular lawn has two roads, each 5 m wide, running through its middle, one parallel to its length and the other parallel to its breadth. Find the cost of gravelling the reads at ₹ $40 \, per \, m^2$.

Sol:
The length and breadth of the lawn are 80 m and 64 m, respectively.
The layout of the roads is shown in the figure below:



Area of the road ABCD = 80 × 5 = 400 m^2

Area of the road PQRS = 64 × 5 = 320 m^2

Clearly, the area EFGH is common in both the roads

Area EFGH = 5 × 5 = 25 m^2

Area of the roads = 400 + 320 – 25

= 695 m^2

Given:

Cost of gravelling 1 m^2 area = Rs 40

Cost of gravelling 695 m^2 area = 695×40

= Rs 27,800

17. The dimensions of a room are 14 m x 10 m x 6.5 m There are two doors and 4 windows in the room. Each door measures 2.5 m x 1.2 m and each window measures 1.5 m x 1 m. Find the cost of painting the four walls of the room at ₹ $35 \, per \, m^2$.

Sol:
The room has four walls to be painted
Area of these walls $= 2(l \times h) + 2(b \times h)$
$= (2 \times 14 \times 6.5) + (2 \times 10 \times 6.5)$
$= 312\, m^2$
Now,
Area of the two doors $= (2 \times 2.5 \times 1.2) = 6\ m^2$
Area of the four windows $= (4 \times 1.5 \times 1) = 6\ m^2$
The walls have to be painted; the doors and windows are not to be painted.
$\therefore$ Total area to be painted $= 312 - (6+6) = 300\ m^2$
Cost for painting $1m^2 = Rs\ 35$
Cost for painting $300m^2 = 300 \times 35 = Rs\,10,500$

18. The cost of painting the four walls of a room 12 m long at ₹ $30\, per\, m^2$ is ₹ $7560\, per\, m^2$ and the cost of covering the floor with the mat at ₹ $25\, per\, m^2$ is ₹ 2700. Find the dimensions of the room.
Sol:
As, the rate of covering the floor = ₹ $25\ per\ m^2$
And, the cost of covering the floor = ₹ 2700
So, the area of the floor $= \frac{2700}{25}$
$\Rightarrow length \times breadth = 108$
$\Rightarrow 12 \times breadth = 108$
$\Rightarrow breadth = \frac{108}{12}$
$\therefore breadth = 9\, m$
Also,
As, the rate of painting the four walls = ₹ $30\ per\ m^2$
And, the cost of painting the four walls = ₹ 7560
So, the area of the four walls $= \frac{7560}{30}$
$\Rightarrow 2(\text{length+breadth})\text{height} = 252$
$\Rightarrow 2(12+9)\text{height} = 252$
$\Rightarrow 2(21)\text{height} = 252$
$\Rightarrow 42 \times height = 252$

$\Rightarrow \text{height} = \frac{252}{42}$

$\therefore \text{height} = 6m$

So, the dimensions of the room are $12m \times 9m \times 6m$.

19. Find the area and perimeter of a square plot of land whose diagonal is 24 m long.

Sol:

Area of the square $= \frac{1}{2} \times Diagonal^2$

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

$= 288\ m^2$

Now, let the side of the square be $x\ m$.

Thus, we have:

$Area = Side^2$

$\Rightarrow 288 = x^2$

$\Rightarrow x = 12\sqrt{2}$

$\Rightarrow x = 16.92$

Perimeter $= 4 \times \text{Side}$

$= 4 \times 16.92$

$= 67.68m$

Thus, the perimeter of thee square plot is $67.68m$.

20. Find the length of the diagonal of a square whose area is $128cm^2$. Also, find its perimeter.

Sol:

Area of the square $= 128\ cm^2$

Area $= \frac{1}{2}d^2$ (where d is a diagonal of the square)

$\Rightarrow 128 = \frac{1}{2}d^2$

$\Rightarrow d^2 = 256$

$\Rightarrow d = 16cm$

Now,

$Area = Side^2$

$\Rightarrow 128 = Side^2$

$\Rightarrow Side = 11.31cm$

Perimeter $=4(Side)$

$=4(11.31)$

$=45.24\ cm$

21. The area of a square filed is 8 hectares. How long would a man take to cross it diagonally by walking at the rate of 4 km per hour?

Sol: Given, area of square field = 8 hectares

$=8\times0.01[1\ hectare=0.01km^2]$

$=0.08km^2$

Now, area of square field = $(\text{si}\,de\text{ of square})^2=0.08$

$\Rightarrow$ side of square field = $\sqrt{0.08}=\frac{2\sqrt{2}}{10}=\frac{\sqrt{2}}{5}=km$

Distance covered by man along the diagonal of square field = length of diagonal

$\sqrt{2}\ Side=\sqrt{2}\times\frac{\sqrt{2}}{5}=\frac{2}{5}km$

Speed of walking = 4km/h

$\therefore$ Time taken = $\frac{\text{distane}}{\text{Speed}}=\frac{2}{5\times4}=\frac{2}{20}=\frac{1}{10}$

= 0.1 hour

$=\frac{1}{10}\times60\,\text{min}=6\,\text{min}\,utes$

22. The cost of harvesting a square field at ₹ 900 per hectare is ₹ 8100. Find the cost of putting a fence around it at ₹ 18 per meter.

Sol:

As, the rate of the harvesting = ₹900 *per* hectare

And, the cost of harvesting = ₹8100

So, the area of the square field $=\frac{8100}{900}=9$ hectare

$\Rightarrow$ the area $=90000\ m^2$ (As, 1 hectare = 10000 m^2)

$\Rightarrow(side)^2=90000$

$\Rightarrow side=\sqrt{90000}$

So, side $=300\,m$

Now, perimeter of the field $=4\times side$

$=4\times300$

$=1200\ m$

Since, the rate of putting the fence $= ₹18 \ per \ m$

So, the cost of putting the fence $= 1200 \times 18 = ₹21,600$

23. The cost of fencing a square lawn at ₹ 14 per meter is ₹ 28000. Find the cost of mowing the lawn at ₹ 54 $per\,100\,m^2$

Sol:

Cost of fencing the lawn $Rs\ 28000$

Let l be the length of each side of the lawn. Then, the perimeter is $4l$.

We know:

$Cost = Rate \times Perimeter$

$\Rightarrow 28000 = 14 \times 41$

$\Rightarrow 28000 = 56l$

$Or,$

$$l = \frac{28000}{56} = 500m$$

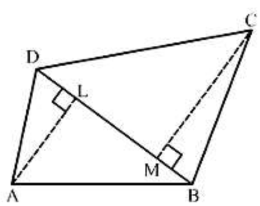
Area of the square lawn $= 500 \times 500 = 250000\ m^2$

Cost of moving $100\,m^2$ of the lawn $= Rs\ 54$

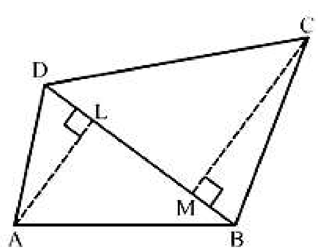
Cost of moving $1\ m^2$ of the lawn $= Rs\,\frac{54}{100}$

$\therefore$ Cost of moving $250000\,m^2$ of the lawn $= \frac{250000 \times 54}{100} = Rs\ 135000$

24. In the given figure ABCD is quadrilateral in which diagonal BD = 24 cm, $AL \perp BD$ and $CM \perp BD$ such that AL = 9cm and CM = 12 cm. Calculate the area of the quadrilateral.



Sol:



We have,

$BD = 24cm, AL = 9cm, CM = 12cm, AL \perp BD \text{ and } CM \perp BD$

Area of the quadrilateral $= ar(\Delta ABD) + ar(\Delta BCD)$

$= \frac{1}{2} \times BD \times AL + \frac{1}{2} \times BD \times CM$

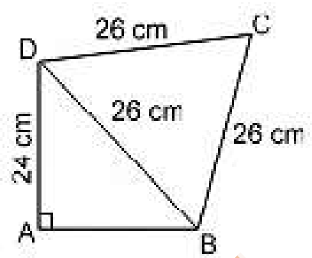
$= \frac{1}{2} \times 24 \times 9 + \frac{1}{2} \times 24 \times 12$

$= 108 + 144$

$= 252\ cm^2$

So, the area of the quadrilateral ABCD is $252\ cm^2$.

25. Find the area of the quadrilateral ABCD in which AD = 24 cm, $\angle BAD = 90°$ and ΔBCD is an equilateral triangle having each side equal to 26 cm. Also, find the perimeter of the quadrilateral.



Sol:

ΔBDC is an equilateral triangle with side $a = 26\ cm.$

Area of $\Delta BDC = \frac{\sqrt{3}}{4} a^2$

$= \frac{\sqrt{3}}{4} \times 26^2$

$= \frac{1.73}{4} \times 676$

$= 292.37\ cm^2$

By using Pythagoras theorem in the right – angled triangle ΔDAB, we get:

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

$\Rightarrow 24^2 + AB^2 = 26^2$

$\Rightarrow AB^2 = 26^2 - 24^2$

$\Rightarrow AB^2 = 676 - 576$

$\Rightarrow AB^2 = 100$

$\Rightarrow AB = 10\,cm$

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

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

$= 120\,cm^2$

Area of the quadrilateral

$= \text{Area of } \Delta BCD + \text{Area of } \Delta ABD$

$= 292.37 + 120$

$= 412.37\,cm^2$

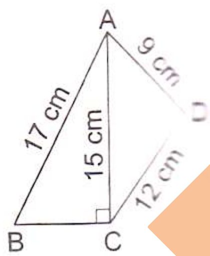
Perimeter of the quadrilateral

$= AB + AC + CD + AD$

$= 24 + 10 + 26 + 26$

$= 86\,cm$

26. Find the perimeter and area of the quadrilateral ABCD in which AB = 17 cm, AD = 9 cm, CD = 12 cm, $\angle ACB = 90°$ and AC = 15 cm.



Sol:

In the right angled ΔACB:

$AB^2 = BC^2 + AC^2$

$\Rightarrow 17^2 = BC^2 + 15^2$

$\Rightarrow 17^2 - 15^2 = BC^2$

$\Rightarrow 64 = BC^2$

$\Rightarrow BC = 8\,cm$

Perimeter $= AB + BC + CD + AD$

$= 17 + 8 + 12 + 9$

$= 46\,cm$

Area of $\Delta ABC = \frac{1}{2}(b \times h)$

$= \frac{1}{2}(8 \times 15)$

$= 60\,cm^2$

In ΔADC :

$AC^2 = AD^2 + CD^2$

So, ΔADC is a right – angled triangle at D.

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

$= \frac{1}{2} \times 9 \times 12$

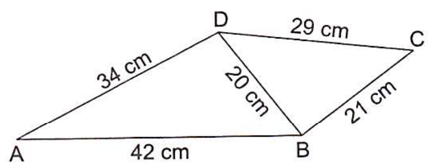
$= 54\ cm^2$

$\therefore$ Area of the quadrilateral = Area of ΔABC + Area of ΔADC

$= 60 + 54$

$= 114\ cm^2$

27. Find the area of the quadrilateral ABCD in which in AB = 42 cm, BC = 21 cm, CD = 29 cm, DA = 34 cm and diagonal BD = 20 cm.



Sol:

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

$s = \frac{1}{2}(a+b+c)$

$s = \frac{42+20+34}{2}$

$s = 48\ cm$

Area of $\Delta ABD = \sqrt{48(48-42)(48-20)(48-34)}$

$= \sqrt{48 \times 6 \times 28 \times 14}$

$= \sqrt{112896}$

$= 336\ cm^2$

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

$s = \frac{1}{2}(a+b+c)$

$s = \frac{21+20+29}{2}$

$s = 35 cm$

Area of $\Delta BDC = \sqrt{35(35-29)(35-20)(35-21)}$

$= \sqrt{35\times6\times15\times14}$

$= \sqrt{44100}$

$= 210\ cm^2$

$\therefore$ Area of quadrilateral ABCD = Area of ΔABD + Area of ΔBDC

$= 336 + 210$

$= 546\, cm^2$

28. Find the area of a parallelogram with base equal to 25 cm and the corresponding height measuring 16.8 cm.

Sol:

Given:

Base = 25 cm

Height $= 16.8\ cm$

$\therefore$ Area of the parallelogram = Base $\times$ Height $= 25\,cm \times 16.8\ cm = 420\,cm^2$

29. The adjacent sides of a parallelogram are 32 cm and 24 cm. If the distance between the longer sides is 17.4 cm, find the distance between the shorter sides.

Sol:

Longer side = 32 cm

Shorter side = 24 cm

Let the distance between the shorter sides be x cm.

Area of a parallelogram = Longer side $\times$ Distance between the longer sides

= Shorter side $\times$ Distance between the shorter sides

or, $32 \times 17.4 = 24 \times x$

or, $x = \frac{32\times17.4}{24} = 23.2\ cm$

$\therefore$ Distance between the shorter sides $= 23.2\,cm$

30. The area of a parallelogram is $392\,m^2$. If its altitude is twice the corresponding base, determined the base and the altitude.

Sol:

Area of the parallelogram $= 392\,m^2$

Let the base of the parallelogram be b m.

Given:

Height of the parallelogram is twice the base

$\therefore$ Height = $2b$ m

Area of a parallelogram = Base $\times$ Height

$\Rightarrow 392 = b \times 2b$

$\Rightarrow 392 = 2b^2$

$\Rightarrow \frac{392}{2} = b^2$

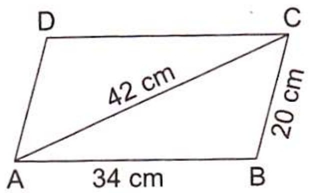
$\Rightarrow 196 = b^2$

$\Rightarrow b = 14$

$\therefore$ Base $= 14\,m$

Altitude $= 2 \times$ Base $= 2 \times 14 = 28\,m$

31. The adjacent sides of a parallelogram ABCD measure 34 cm and 20 cm, and the diagonal AC measures 42 cm. Find the area of the parallelogram.



Sol:

Parallelogram ABCD is made up of congruent ΔABC and ΔADC

Area of triangle $ABC = \sqrt{s(s-a)(s-b)(s-c)}$ (Here, s is the semi-perimeter)

Thus, we have:

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

$s = \frac{34+20+42}{2}$

$s = 48\,cm$

Area of $\Delta ABC = \sqrt{48(48-34)(48-20)(48-42)}$

$= \sqrt{48 \times 14 \times 28 \times 6}$

$= 336\ cm^2$

Now,

Area of the parallelogram $= 2 \times$ Area of ΔABC

$= 2 \times 336$

$= 672\ cm^2$

32. Find the area of the rhombus, the length of whose diagonals are 30 cm and 16 cm. Also, find the perimeter of the rhombus.

Sol:

Area of the rhombus $= \frac{1}{2} \times d_1 \times d_2$, where d_1 and d_2 are the lengths of the diagonals

$= \frac{1}{2} \times 30 \times 16$

$= 240\ cm^2$

Side of thee rhombus $= \frac{1}{2}\sqrt{d_1^2 + d_2^2}$

$= \frac{1}{2}\sqrt{30^2 + 16^2}$

$= \frac{1}{2}\sqrt{1156}$

$= \frac{1}{2} \times 34$

$= 17\ cm$

Perimeter of the rhombus $= 4a$

$= 4 \times 17$

$= 68\ cm$

33. The perimeter of a rhombus is 60 cm. If one of its diagonal us 18 cm long, find
(i) the length of the other diagonal, and
(ii) the area of the rhombus.

Sol:

Perimeter of a rhombus = 4a (Here, a is the side of the rhombus)

$\Rightarrow 60 = 4a$

$\Rightarrow a = 15\ cm$

(i) Given:

One of the diagonals is 18 cm long

$d_1 = 18 cm$

Thus, we have:

$Side = \frac{1}{2}\sqrt{d_1^2 + d_2^2}$

$\Rightarrow 15 = \frac{1}{2}\sqrt{18^2 + d_2^2}$

$\Rightarrow 30 = \sqrt{18^2 + d_2^2}$

Squaring both sides, we get:

$\Rightarrow 900 = 18^2 + d_2^2$

$\Rightarrow 900 = 324 + d_2^2$

$\Rightarrow d_2^2 = 576$

$\Rightarrow d_2 = 24\ cm$

$\therefore$ Length of the other diagonal = 24 cm

(ii) Area of the rhombus $= \frac{1}{2} d_1 \times d_2$

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

$= 216\, cm^2$

34. The area of rhombus is $480\, cm^2$, and one of its diagonal measures 48 cm. Find
(i) the length of the other diagonal,
(ii) the length of each of the sides
(iii) its perimeter

Sol:

(i) Area of a rhombus, $= \frac{1}{2} \times d_1 \times d_2$, where d_1 and d_2 are the lengths of the diagonals.

$\Rightarrow 480 = \frac{1}{2} \times 48 \times d_2$

$\Rightarrow d_2 = \frac{480 \times 2}{48}$

$\Rightarrow d_2 = 20\, cm$

$\therefore$ Length of the other diagonal = 20 cm

(ii) Side $= \frac{1}{2}\sqrt{d_1^2 + d_2^2}$

$= \frac{1}{2}\sqrt{48^2 + 20^2}$

$= \frac{1}{2}\sqrt{2304 + 400}$

$= \frac{1}{2}\sqrt{2704}$

$= \frac{1}{2} \times 52$

$= 26\ cm$

$\therefore$ Length of the side of the rhombus $= 26\ cm$

(iii) Perimeter of the rhombus = $4 \times$ Side

$= 4 \times 26$

$= 104\ cm$

35. The parallel sides of trapezium are 12 cm and 9cm and the distance between them is 8 cm. Find the area of the trapezium.

Sol:

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

$= \frac{1}{2} \times (12+9) \times 8$

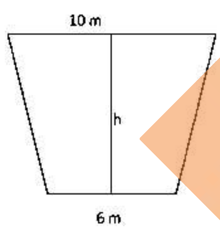
$= 21 \times 4$

$= 84\ cm^2$

So, the area of the trapezium is $84\ cm^2$.

36. The shape of the cross section of a canal is a trapezium. If the canal is 10 m wide at the top, 6 m wide at the bottom and the area of its cross section is $640 m^2$, find the depth of the canal.

Sol:



Area of the canal $= 640 m^2$

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

$\Rightarrow 640 = \frac{1}{2} \times (10+6) \times h$

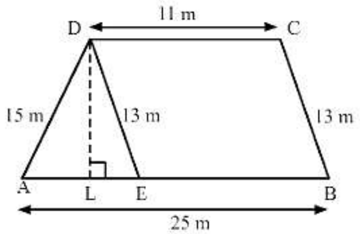
$\Rightarrow \frac{1280}{16} = h$

$\Rightarrow h = 80 m$

Therefore, the depth of the canal is 80 m.

37. Find the area of trapezium whose parallel sides are 11 m and 25 m long, and the nonparallel sides are 15 m and 13 m long.

Sol:



Draw $DE \parallel BC$ and DL perpendicular to AB.

The opposite sides of quadrilateral DEBC are parallel. Hence, DEBC is a parallelogram

$\therefore DE = BC = 13m$

Also,

$AE = (AB - EB) = (AB - DC) = (25 - 11) = 14m$

For ΔDAE:

Let:

$AE = a = 14m$

$DE = b = 13m$

$DA = c = 15m$

Thus, we have:

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

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

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

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

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

$= \sqrt{7056}$

$= 84\ m^2$

Area of $\Delta DAE = \frac{1}{2} \times AE \times DL$

$\Rightarrow 84 = \frac{1}{2} \times 14 \times DL$

$\Rightarrow \frac{84 \times 2}{14} = DL$

$\Rightarrow DL = 12\ m$

Area of trapezium $= \frac{1}{2} \times (Sum\ of\ \ parallel\ sides) \times (Dis\tan ce\ between\ them)$

$$= \frac{1}{2} \times (11 + 25) \times 12$$
$$= \frac{1}{2} \times 36 \times 12$$
$$= 216\ m^2$$