Exercise – 17A

1.

Sol:

Given: base = 24 cm, corresponding height $=14.5\ cm$

Area of a triangle $=\frac{1}{2}\times base\times$ corresponding height

$=\frac{1}{2}\times 24\times 14.5$

$=174\ cm^2$

2.

Sol:

Let the sides of the triangle be $a=20\ cm, b=34\ cm$ and $c=42\ cm.$

Let s be the semi-perimeter of the triangle.

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

$s=\frac{1}{2}(20+34+42)$

$s=48cm$

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

$\Rightarrow \sqrt{48(48-20)(48-34)(48-42)}$

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

$\Rightarrow \sqrt{112896}$

$\Rightarrow 336\ cm^2$

Length of the longest side is 42 cm.

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

$\Rightarrow 336=\frac{1}{2}\times 42\times h$

$\Rightarrow 672=42h$

$\Rightarrow \frac{672}{42}=h$

$\Rightarrow h=16cm$

The height corresponding to the longest side is 16 cm.

3.

Sol:

Let the sides of triangle be $a = 18\ cm, b = 24cm$ and $c = 30\ cm.$

Let s be the semi-perimeter of the triangle.

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

$$s = \frac{1}{2}(18+24+30)$$

$$s = 36\,cm$$

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

$$= \sqrt{36(36-18)(36-24)(36-30)}$$

$$= \sqrt{36\times18\times12\times6}$$

$$= \sqrt{46656}$$

$$= 216\ cm^2$$

The smallest side is 18 cm long. This is the base.

Now, area of a triangle $= \frac{1}{2}\times b\times h$

$$\Rightarrow 216 = \frac{1}{2}\times18\times h$$

$$\Rightarrow 216 = 9h$$

$$\Rightarrow \frac{216}{9} = h$$

$$\Rightarrow h = 24\,cm$$

The height corresponding to the smallest side is 24 cm.

4.

Sol:

Let the sides of a triangle be $5x\,m, 12x\,m$ and $13x\,m.$

Since, perimeter is the sum of all the sides,

$$5x + 12x + 13x = 150$$

$$\Rightarrow 30x = 150$$

Or, $x = \frac{150}{30} = 5$

The lengths of the sides are:

$a = 5 \times 5 = 25\ m$

$b = 12 \times 5 = 60\ m$

$c = 13 \times 5 = 65\ m$

Semi-perimeter (s) of the triangle $= \frac{Perimeter}{2} = \frac{25 = 60 + 65}{2} = \frac{150}{2} = 75 m$

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

$= \sqrt{75(75-25)(75-60)(75-65)}$

$= \sqrt{75 \times 50 \times 15 \times 10}$

$= \sqrt{562500}$

$= 750\ m^2$

5.

Sol:

Let the sides of the triangular field be 25*x*, 17*x* and 12*x*.

As, perimeter = 540 m

$\Rightarrow 25x + 17x + 12x = 540$

$\Rightarrow 54x = 540$

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

$\Rightarrow x = 10$

So, the sides are 250 m, 170 m and 120 m.

Now, semi-perimeter, $s = \frac{250 + 170 + 120}{2} = \frac{540}{2} = 270 m$

So, area of the filed $= \sqrt{270(270-250)(270-170)(270-120)}$

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

$= \sqrt{3^3 \times 10 \times 2 \times 10 \times 10^2 \times 3 \times 5 \times 10}$

$= 3^2 \times 10^3$

$= 9000\ m^2$

Also, the cost of ploughing the field $= \frac{9000 \times 40}{100} = 3,600$

6.

Sol:

The perimeter of a right-angled triangle = 40 cm

Therefore, $a+b+c=40\ cm$

Hypotenuse = 17 cm

Therefore, c = 17cm

$a+b+c=40cm$

$\Rightarrow a+b+17=40$

$\Rightarrow a+b=23$

$\Rightarrow b=23-a$ ....(i)

Now, using Pythagoras theorem, we have:

$a^2+b^2=c^2$

$\Rightarrow a^2+(23-a)^2=17^2$

$\Rightarrow a^2+529-46a+a^2=289$

$\Rightarrow 2a^2-46a+529-289=0$

$\Rightarrow 2a^2-46a+240=0$

$\Rightarrow a^2-23a+120=0$

$\Rightarrow (a-15)(a-8)=0$

$\Rightarrow a=15\ or\ a=8$

Substituting the value of $a=15,$ in equation (i) we get:

$b=23-a$

$=23-15$

$=8\ cm$

If we had chosen $a=8cm,$ then, $b=23-8=15\ cm$

In any case,

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

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

$=60\ cm^2$

7.

Sol:

Given:

Area of the triangle $=60\ cm^2$

Let the sides of the triangle be a, b and c, where a is the height, b is the base and c is hypotenuse of the triangle.

$a-b=7\,cm$

$a=7+b \qquad ....(1)$

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

$\Rightarrow 60=\frac{1}{2}\times b\times(7+b)$

$\Rightarrow 120=7b+b^2$

$\Rightarrow b^2+7b-120=0$

$\Rightarrow (b+15)(b-8)=0$

$\Rightarrow b=-15 \text{ or } 8$

Side of a triangle cannot be negative.
Therefore, b = 8 cm.
Substituting the value of b = 8 cm, in equation (1):

$a=7+8=15\ cm$

Now, $a=15\ cm, b=8cm$

Now, in the given right triangle, we have to find third side.

$(Hyp)^2=(First\ \ side)^2+(Second\ \ side)^2$

$\Rightarrow Hyp^2=8^2+15^2$

$\Rightarrow Hyp^2=64+225$

$\Rightarrow Hyp^2=289$

$\Rightarrow Hyp=17\,cm$

So, the third side is 17 cm.
Perimeter of a triangle = a + b + c.
Therefore, required perimeter of the triangle 15 + 8 + 1740 cm

8.

Sol:
Given:

Area of triangle $=24cm^2$

Let the sides be a and b, where a is the height and b is the base of triangle

$a-b=2\,cm$

$a=2+b \qquad ....(1)$

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

$\Rightarrow 24 = \frac{1}{2} \times b \times (2+b)$

$\Rightarrow 48 = b + \frac{1}{2} b^2$

$\Rightarrow 48 = 2b + b^2$

$\Rightarrow b^2 + 2b - 48 = 0$

$\Rightarrow (b+8)(b-6) = 0$

$\Rightarrow b = -8 \ or \ 6$

Side of a triangle cannot e negative.

Therefore, $b = 6cm.$

Substituting the value of b=6 cm in equation (1), we get:

$a = 2+6 = 8 \ cm$

Now, $a = 8cm, b = 6cm$

In the given right triangle we have to find third side. Using the relation

$(Hyp)^2 = (Oneside)^2 + (Otherside)^2$

$\Rightarrow Hyp^2 = 8^2 + 6^2$

$\Rightarrow Hyp^2 = 64 + 36$

$\Rightarrow Hyp^2 = 100$

$\Rightarrow Hyp = 10cm$

So, the third side is 10 cm

So, perimeter of the triangle $= a+b+c$

$= 8+6+10$

$= 24cm$

9.

Sol:

(i) The area of the equilateral triangle $= \frac{\sqrt{3}}{4} \times side^2$

$= \frac{\sqrt{3}}{4} \times 10^2$

$= \frac{\sqrt{3}}{4} \times 100$

$= 25\sqrt{3} \, cm^2$

Or $25 \times 1.732 = 43.3 cm^2$

So, the area of the triangle is $25\sqrt{3} \ cm^2 \ or \ 43.3 \ cm^2$.

(ii) As, area of the equilateral triangle $= 25\sqrt{3}\ cm^2$

$\Rightarrow \frac{1}{2} \times Base \times Height = 25\sqrt{3}$

$\Rightarrow \frac{1}{2} \times 10 \times Height = 25\sqrt{3}$

$\Rightarrow 5 \times Height = 25\sqrt{3}$

$\Rightarrow Height = \frac{25\sqrt{3}}{5} = 5\sqrt{3}$

Or height $= 5 \times 1.732 = 8.66\ m$

$\therefore$ The height of the triangle is $5\sqrt{3}\ cm$ or $8.66\ cm$.

10.

Sol:

Let the side of the equilateral triangle be x cm.

As, the area of an equilateral triangle $= \frac{\sqrt{3}}{4}(side)^2 = \frac{x^2\sqrt{3}}{4}$

Also, the area of the triangle $= \frac{1}{2} \times Base \times Height = \frac{1}{2} \times x \times 6 = 3x$

So, $\frac{x^2\sqrt{3}}{4} = 3x$

$\Rightarrow \frac{x\sqrt{3}}{4} = 3$

$\Rightarrow x = \frac{12}{\sqrt{3}}$

$\Rightarrow x = \frac{12}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$\Rightarrow x = \frac{12\sqrt{3}}{3}$

$\Rightarrow x = 4\sqrt{3}\ cm$

Now, area of the equilateral triangle $= 3x$

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

$= 12\sqrt{3}$

$= 12 \times 1.73$

$= 20.76\ cm^2$

11.

Sol:

Area of equilateral triangle $= 36\sqrt{3}\ cm^2$

Area of equilateral triangle $= \left(\frac{\sqrt{3}}{4} \times a^2\right)$, where a is the length of the side

$\Rightarrow 36\sqrt{3} = \frac{\sqrt{3}}{4} \times a^2$

$\Rightarrow 144 = a^2$

$\Rightarrow a = 12\,cm$

Perimeter of a triangle $= 3a$

$= 3 \times 12$

$= 36\,cm$

12.

Sol:

Area of equilateral triangle $= 81\sqrt{3}\ cm^2$

Area of equilateral triangle $= \left(\frac{\sqrt{3}}{4} \times a^2\right)$, where a is the length of the side

$\Rightarrow 81\sqrt{3} = \frac{\sqrt{3}}{4} \times a^2$

$\Rightarrow 324 = a^2$

$\Rightarrow a = 18\ cm$

Height of triangle $= \frac{\sqrt{3}}{2} \times a$

$= \frac{\sqrt{3}}{2} \times 18$

$= 9\sqrt{3}\ cm$

13.

Sol:

Base = 48 cm

Hypotenuse 50 cm

First we will find the height of the triangle; let the height be ‘p’.

$\Rightarrow (Hypotenuse)^2 = (base)^2 + p^2$

$\Rightarrow 50^2 = 48^2 + p^2$

$\Rightarrow p^2 = 50^2 - 48^2$

$\Rightarrow p^2 = (50-48)(50+48)$

$\Rightarrow p^2 = 2 \times 98$

$\Rightarrow p^2 = 196$

$\Rightarrow p = 14\,cm$

Area of the triangle $= \frac{1}{2} \times base \times height$

$= \frac{1}{2} \times 48 \times 14$

$= 336\ cm^2$

14.

Sol:

Hypotenuse = 65 cm

Base = 60 cm

In a right angled triangle,

$(Hypotenuse)^2 = (Base)^2 + (Perpendicular)^2$

$\Rightarrow (65)^2 = (60)^2 + (perpendicular)^2$

$\Rightarrow (65)^2 - (60)^2 + (perpendicular)^2$

$\Rightarrow (perpendicular)^2 = (65-60)(65+60)$

$\Rightarrow (perpendicular)^2 = 5 \times 125$

$\Rightarrow (perpendicular)^2 = 625$

$\Rightarrow (perpendicular)^2 = 25\ cm$

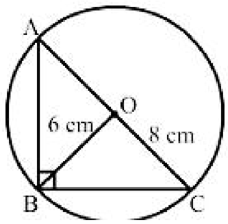
Area of triangle $= \frac{1}{2} \times base \times perpendicular$

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

$= 750\ cm^2$

15.

Sol:



Given: radius = 8 cm
Height = 6 cm
Area = ?
In a right angled triangle, the center of the circumference is the midpoint of the hypotenuse.
Hypotenuse $= 2\times$(radius of circumference) for a right triangle
$= 2\times 8$
$= 16\,cm$
So, hypotenuse = 16 cm
Now, base = 16 cm and height = 6 cm
Area of the triangle $= \frac{1}{2}\times base\times height$
$= \frac{1}{2}\times 16\times 6$
$= 48\ cm^2$

16.

Sol:
In a right isosceles triangle, base = height = a
Therefore,
Area of a triangle $= \frac{1}{2}\times base\times height = \frac{1}{2}\times a\times a = \frac{1}{2}a^2$
Further, given that area of isosceles right triangle $= 200\,cm^2$
$\Rightarrow \frac{1}{2}a^2 = 200$
$\Rightarrow a^2 = 400$
$or,\ a = \sqrt{400} = 20\ cm$
In an isosceles right triangle, two sides are equal $('a')$ and the third side is the hypotenuse, i.e., ‘c’
Therefore, $c = \sqrt{a^2 + a^2}$
$= \sqrt{2a^2}$
$= a\sqrt{2}$

$= 20 \times 1.41$

$= 28.2\ cm$

Perimeter of the triangle $= a + a + c$

$= 20 + 20 + 28.2$

$= 68.2\,cm$

The length of the hypotenuse is 28.2 cm and the perimeter of the triangle is 68.2 cm.

17.

Sol:

Given:

Base = 80 cm

Area = 360 cm^2

Area of an isosceles triangle $= \left(\frac{1}{4} b\sqrt{4a^2 - b^2}\right)$

$\Rightarrow 360 = \frac{1}{4} \times 80\sqrt{4a^2 - 80^2}$

$\Rightarrow 360 = 20\sqrt{4a^2 - 6400}$

$\Rightarrow 18 = 2\sqrt{a^2 - 1600}$

$\Rightarrow 9 = \sqrt{a^2 - 1600}$

Squaring both the sides, we get:

$\Rightarrow 81 = a^2 - 1600$

$\Rightarrow a^2 = 1681$

$\Rightarrow a = 41\ cm$

Perimeter $= (2a + b)$

$= [2(41) + 80] = 82 + 80 = 162\ cm$

So, the perimeter of the triangle is 162 cm.

18.

Sol:

Let the height of the triangle be h cm.

Each of the equal sides measures $a = (h+2)cm\ and\ b = 12\ cm(base)$

Now,

Area of the triangle = Area of the isosceles triangle

$\Rightarrow \frac{1}{2} \times base \times height = \frac{1}{4} \times b\sqrt{4a^2 - b^2}$

$\Rightarrow \frac{1}{2} \times 12 \times h = \frac{1}{4} \times 12 \times \sqrt{4(h+2)^2 - 144}$

$\Rightarrow 6h = 3\sqrt{4h^2 + 16h + 16 - 144}$

$\Rightarrow 2h = \sqrt{4h^2 + 16h + 16 - 144}$

On squaring both the sides, we get:

$\Rightarrow 4h^2 = 4h^2 + 16h + 16 - 144$

$\Rightarrow 16h - 128 = 0$

$\Rightarrow h = 8$

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

$= \frac{1}{2} \times 12 \times 8$

$= 48\ cm^2$

19.

Sol:

Let:

Length of each of the equal sides of the isosceles right-angled triangle = a = 10 cm

And.

Base = Height = a

Area of isosceles right – angled triangle $= \frac{1}{2} \times Base \times Height$

The hypotenuse of an isosceles right – angled triangle can be obtained using Pythagoras' theorem

If *h* denotes the hypotenuse, we have:

$h^2 = a^2 + a^2$

$\Rightarrow h = 2a^2$

$\Rightarrow h = \sqrt{2}a$

$\Rightarrow h = 10\sqrt{2}\ cm$

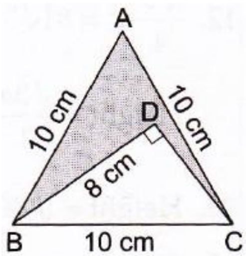
$\therefore$ Perimeter of the isosceles right-angled triangle $= 2a + \sqrt{2}a$

$= 2 \times 10 + 1.41 \times 10$

$= 20 + 14.1$

$= 34.1\ cm$

20.



Sol:

Given:

Side if equilateral triangle $ABC = 10\ cm$

$BD = 8\ cm$

Area of equilateral $\Delta ABC = \frac{\sqrt{3}}{4}a^2$ (where $a = 10\,cm$)

Area of equilateral $\Delta ABC = \frac{\sqrt{3}}{4}\times 10^2$

$= 25\sqrt{3}$

$= 25\times 1.732$

$= 43.30\ cm^2$

In the right ΔBDC, we have:

$BC^2 = BD^2 + CD^2$

$\Rightarrow 10^2 = 8^2 + CD^2$

$\Rightarrow CD^2 = 10^2 - 8^2$

$\Rightarrow CD^2 = 36$

$\Rightarrow CD = 6$

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

$= \frac{1}{2}\times 8\times 6$

$= 24\ cm^2$

Area of the shaded region $=$ Area of $\Delta ABC -$ Area of ΔBDC

$= 43.30 - 24$

$= 19.3\ cm^2$

Exercise – 17B

1.

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.

Sol:

Let the breadth of the rectangular park be b.

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.

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 $= 35 \times 12 = 420\ cm^2$

4.

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 $= 2(l + b)$

$$= 2(28 + 16.5)$$

$$= 2 \times 44.5$$

$$= 89\, m$$

5.

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.

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.

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.

Sol:

Area of the verandah = Length $\times$ Breadth = 36 $\times$ 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.

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

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

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

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

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

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

Thus, we have;

$l = 28 - 12$

$\Rightarrow l = 28 - 12$

$\Rightarrow l = 16$

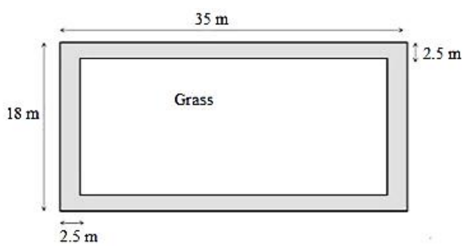
We will take length as 16 cm and breath as 12 cm because length is greater than breath by convention.

10.

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 $35-(2.5+2.5)=35-5=30\,m$

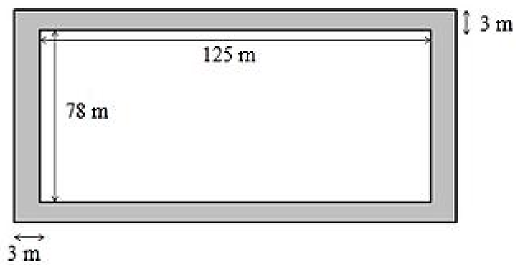
Width of the area planted with grass $=18-(2.5+2.5)=18-5=13\,m$

Area of the rectangular region planted with grass $=30\times13=390\,m^2$

11.

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 $= 1254 \times 75$

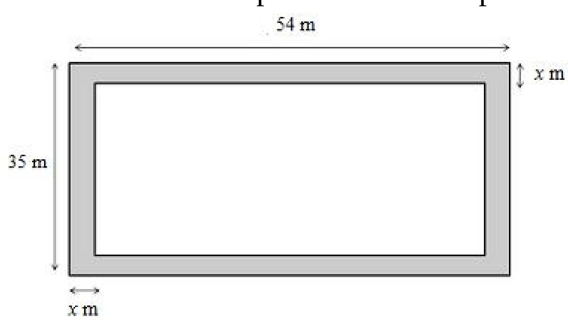
$= Rs \ 94050$

12.

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 $= 420 \ m^2$

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

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

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

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

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

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

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

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

$\Rightarrow x - 42 = 0 \text{ or } 2x - 5 = 0$

$\Rightarrow x = 42 \text{ or } x = 2.5$

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.

Sol:

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

Now,

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

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

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

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

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

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

$\Rightarrow 1911 = 98x - 49$

$\Rightarrow 1960 = 98x$

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

$\Rightarrow x = 20$

Thus, we have:

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

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

14.

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

$=\frac{13.5}{0.8}$

$=16.5\,m$

Cost of 1 m carpet = Rs 80

Cost of 16.5 m carpet $=80\times 16.5=Rs1,320$

15.

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 $=8\times 5=40\,m^2$

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

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

Area of the border $12\,m^2$

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

Thus, we have:

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

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

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

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

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

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

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

$\Rightarrow 2x - 1 = 0 \text{ and } x - 6 = 0$

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

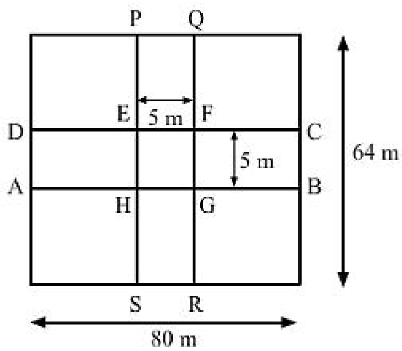
Because the border cannot be wider than the entire carpet, the width of the carpet is $\frac{1}{2}m$, i.e., 50 cm.

16.

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.

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.

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 $= \frac{7560}{30}$

$\Rightarrow 2(\text{length+breadth})\text{height} = 252$

$\Rightarrow 2(12+9)\text{height} = 252$

$\Rightarrow 2(21)\text{height} = 252$

$\Rightarrow 42 \times height = 252$

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

$\therefore$ height $= 6m$

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

19.

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 $= 4 \times$ Side

$= 4 \times 16.92$

$= 67.68m$

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

20.

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.

Sol: Given, area of square field = 8 hectares

$= 8 \times 0.01 [1\ hectare = 0.01 km^2]$

$= 0.08 km^2$

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 = $\frac{\text{distane}}{\text{Speed}} = \frac{2}{5 \times 4} = \frac{2}{20} = \frac{1}{10}$

= 0.1 hour

= $\frac{1}{10} \times 60 \min = 6 \min utes$

22.

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 $= 4 \times side$

$= 4 \times 300$

$= 1200\ m$

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

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

23.

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 $= 500 \times 500 = 250000\ m^2$

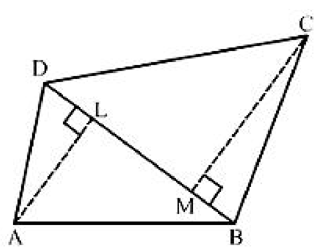
Cost of moving $100\,m^2$ of the lawn $= Rs\ 54$

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.

Sol:



We have,

$BD = 24cm, AL = 9cm, CM = 12cm, AL \perp BD \; and \; CM \perp BD$

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

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

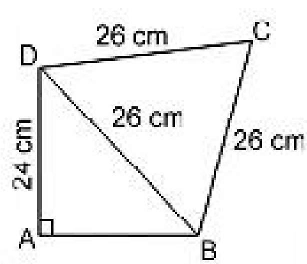
$= \frac{1}{2} \times 24 \times 9 + \frac{1}{2} \times 24 \times 12$

$= 108 + 144$

$= 252 \; cm^2$

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

25.



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

$=$ Area of $\Delta BCD +$ Area of ΔABD

$= 292.37 + 120$

$= 412.37\, cm^2$

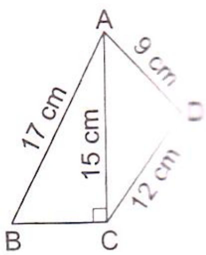
Perimeter of the quadrilateral

$= AB + AC + CD + AD$

$= 24 + 10 + 26 + 26$

$= 86\, cm$

26.



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.

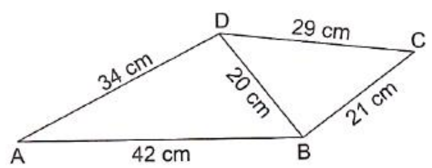
$$\text{Area of } \Delta ADC = \frac{1}{2} \times b \times h$$
$$= \frac{1}{2} \times 9 \times 12$$
$$= 54\ cm^2$$

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

$= 60 + 54$

$= 114\ cm^2$

27.



Sol:

$$\text{Area of } \Delta ABD = \sqrt{s(s-a)(s-b)(s-c)}$$
$$s = \frac{1}{2}(a+b+c)$$
$$s = \frac{42+20+34}{2}$$
$$s = 48\ cm$$
$$\text{Area of } \Delta ABD = \sqrt{48(48-42)(48-20)(48-34)}$$
$$= \sqrt{48 \times 6 \times 28 \times 14}$$
$$= \sqrt{112896}$$
$$= 336\ cm^2$$
$$\text{Area of } \Delta BDC = \sqrt{s(s-a)(s-b)(s-c)}$$
$$s = \frac{1}{2}(a+b+c)$$
$$s = \frac{21+20+29}{2}$$
$$s = 35\,cm$$

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

$= \sqrt{35 \times 6 \times 15 \times 14}$

$= \sqrt{44100}$

$= 210\ cm^2$

$\therefore$ Area of quadrilateral ABCD = Area of $\Delta ABD +$ Area of ΔBDC

$= 336 + 210$

$= 546\, cm^2$

28.

Sol:

Given:

Base = 25 cm

Height $= 16.8\ cm$

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

29.

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, $x = \dfrac{32 \times 17.4}{24} = 23.2\ cm$

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

30.

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

$\Rightarrow 392 = b \times 2b$

$\Rightarrow 392 = 2b^2$

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

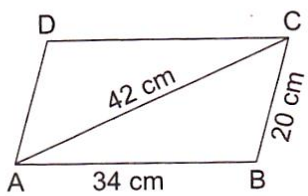
$\Rightarrow 196 = b^2$

$\Rightarrow b = 14$

$\therefore$ Base $= 14m$

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

31.



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:

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

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

$s = 48cm$

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.

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.

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.

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.

Sol:

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

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

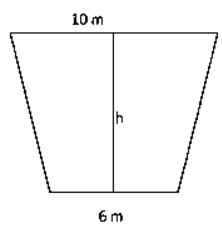
$= 21 \times 4$

$= 84\ cm^2$

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

36.

Sol:



Area of the canal $= 640\, m^2$

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

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

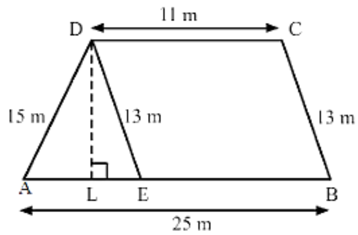
$\Rightarrow \frac{1280}{16} = h$

$\Rightarrow h = 80\, m$

Therefore, the depth of the canal is 80 m.

37.

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

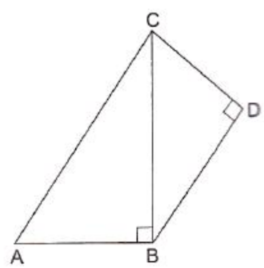
$= \frac{1}{2} \times (11 + 25) \times 12$

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

$= 216\ m^2$

Exercise - Formative Assessment

1.



Answer: (b) 114 cm^2

Sol:

Using Pythagoras theorem in ΔABC, we get:

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

$\Rightarrow AB = \sqrt{AC^2 - BC^2}$

$= \sqrt{17^2 - 15^2}$

$= 8 cm$

Area of $\Delta ABC = \frac{1}{2} \times AB \times BC$

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

$= 60\ cm^2$

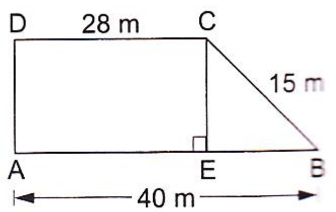
Area of $\Delta BCD = \frac{1}{2} \times BD \times CD$

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

$= 54\ cm^2$

$\therefore$ Area of quadrilateral $ABCD = Ar(\Delta ABC) + Ar(\Delta BCD) = 54 + 60 = 114 cm^2$

2.



Answer: (a) $306\ m^2$

Sol:

In the given figure, AECD is a rectangle.

Length $AE =$ Length $CD = 28 m$

Now,

$BE = AB - AE = 40 - 28 = 12 m$

Also,

$AD = CE = 9 m$

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

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

$= \frac{1}{2} \times (28 + 40) \times 9$

$= \frac{1}{2} \times 68 \times 9$

$= 306\ m^2$

In the given figure, if DA is perpendicular to AE, then it can be solved, otherwise it cannot be solved.

3.

Answer: (c) 12.5 cm

Sol:

Let the sides of the triangle be $12x\ cm$, $14x\ cm\ and\ 25x\ cm$

Thus, we have

Perimeter $= 12x + 14x + 25x$

$\Rightarrow 25.5 = 51x$

$\Rightarrow x = \frac{25.5}{51} = 0.5$

$\therefore$ Greatest side of the triangle $25x = 25 \times 0.5 = 12.5\ cm$

4.

Answer: (c) $52\ cm^2$

Sol:

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

$= \frac{1}{2} \times (9.7 + 6.3) \times 6.5$

$= 8 \times 6.5$

$= 52.0\ cm^2$

5.

Sol:

Given:

Side of the equilateral triangle = 10cm

Thus we have:

Area of the equilateral triangle $= \frac{\sqrt{3}}{4} side^2$

$= \frac{\sqrt{3}}{4} \times 10 \times 10$

$= 25 \times 1.732$

$= 43.3\ cm^2$

6.

Sol:

Area of an isosceles triangle:

$= \frac{1}{4} b\sqrt{4a^2 - b^2}$ (Where *a* is the length of the equal sides and *b* is the base)

$= \frac{1}{4} \times 24\sqrt{4(13)^2 - 24^2}$

$= 6\sqrt{4 \times 169 - 576}$

$= 6\sqrt{676 - 576}$

$= 6\sqrt{100}$

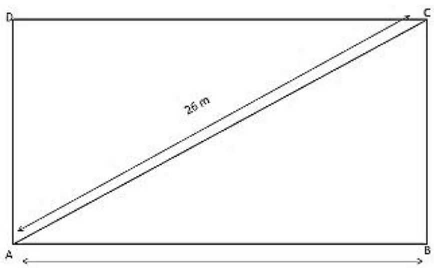
$= 6 \times 10$

$= 60\ cm^2$

7.

Sol:

Let the rectangle ABCD represent the hall.



Using the Pythagoras theorem in the right-angled triangle ABC, we have

$Diagonal^2 = Length^2 + Breadth^2$

$\Rightarrow Breadth = \sqrt{Diagonal^2 - Length^2}$

$\Rightarrow \sqrt{26^2 - 24^2}$

$= \sqrt{676 - 576}$

$= \sqrt{100}$

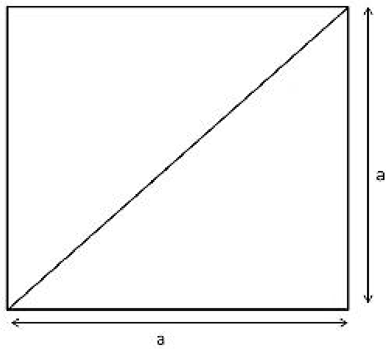
$= 10\,m$

$\therefore$ Area of the hall = $\text{Length} \times \text{Breadth} = 24 \times 10 = 240\ m^2$

8.

Sol:

The diagonal of a square forms the hypotenuse of an isosceles right triangle. The other two sides are the sides of the square of length a cm.



Using Pythagoras theorem, we have:

$\text{Diagonal}^2 = a^2 + a^2 = 2a^2$

$\Rightarrow Diagonal = \sqrt{2}a$

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

$\Rightarrow 24 = \sqrt{2}a$

$\Rightarrow a = \frac{24}{\sqrt{2}}$

$\Rightarrow a = \frac{24}{\sqrt{2}}$

Area of the square $= Side^2 = \left(\frac{24}{\sqrt{2}}\right)^2 = \frac{24 \times 24}{2} = 288\ cm^2$

9.

Sol:

Area of the rhombus $= \frac{1}{2}$(Product of diagonal)

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

$= 480\ cm^2$

10.

Sol:

To find the area of the triangle, we will first find the semiperimeter of the triangle

Thus, we have:

$s=\frac{1}{2}(a+b+c)=\frac{1}{2}(42+34+20)=\frac{1}{2}\times 96=48\ cm$

Now,

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

$=\sqrt{48(48-42)(48-34)(48-20)}$

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

$=\sqrt{112896}$

$=336\ cm^2$

11.

Sol:

Let the length and breadth of the lawn be $5x$ m and $3x\,m$, respectively.

Now,

Area of the lawn $=5x\times 3x=5x^2$

$\Rightarrow 15x^2=3375$

$\Rightarrow x=\sqrt{\frac{3375}{15}}$

$\Rightarrow x=\sqrt{225}=15$

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

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

$\therefore$ Perimeter of the lawn $=2$ (Length + breadth) $=2(75+45)=2\times 120=240\ m$

Total cost of fencing the lawn at Rs 20 per meter $=240\times 20=Rs\ 4800$

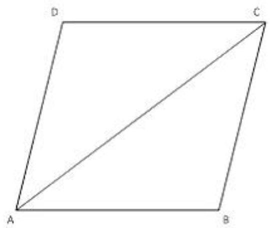
12.

Sol:

Given:

Sides are 20 cm each and one diagonal is of 24 cm.

The diagonal divides the rhombus into two congruent triangles, as shown in the figure below.



We will now use Hero's formula to find the area of triangle ABC.
First, we will find thee semiperimeter

$s=\frac{1}{2}(a+b+c)=\frac{1}{2}(20+20+24)=\frac{64}{2}=32\,m$

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

$=\sqrt{32(32-20)(32-20)(32-24)}$

$=\sqrt{32\times12\times12\times8}$

$=\sqrt{36864}$

$=192\ cm^2$

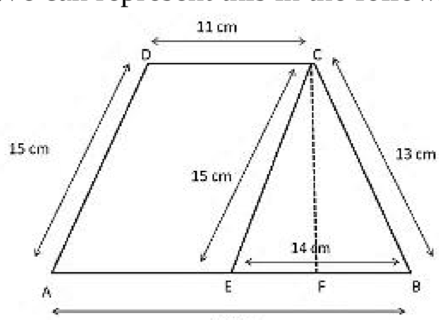
Now,

Area of the rhombus $=2\times$ Area of triangle $ABC=192\times2=384\ cm^2$

13.

Sol:

We will divide the trapezium into a triangle and a parallelogram
Difference in the lengths of parallel sides $=25-11=14\,cm$
We can represent this in the following figure:



Trapezium ABCD is divide into parallelogram AECD and triangle CEB.
Consider triangle CEB.
In triangle CEB, we have,

$EB=25-11=14\,cm$

Using Hero's theorem, we will first evaluate the semi-perimeter of triangle CEB and then evaluate its area.

Semi-perimeter $s=\frac{1}{2}(a+b+c)=\frac{1}{2}(15+13+14)=\frac{42}{2}=21\ cm$

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

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

$=\sqrt{21\times6\times8\times7}$

$=\sqrt{7056}$

$=84\,cm^2$

Also,

Area of triangle $CEB=\frac{1}{2}(Base\times height)$

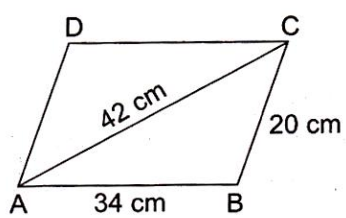
Height of triangle $CEB=\frac{Area\times2}{Base}=\frac{84\times2}{14}=12\ cm$

Consider parallelogram $AECD$.

Area of parallelogram AECD $=Height\times Base=AE\times CF=12\times11=132\,cm^2$

Area of trapezium $ABCD=Ar(\Delta BEC)+Ar$ (parallelogram AECD) $=132+84=216\ cm^2$

14.



Sol:

The diagonal of a parallelogram divides it into two congruent triangles. Also, the area of the parallelogram is the sum of the areas of the triangles.

We will now use Hero's formula to calculate the area of triangle ABC.

Semiperimeter, $s=\frac{1}{2}(34+20+42)=\frac{1}{2}(96)=48\,cm$

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

$=\sqrt{48(48-42)(48-34)(48-20)}$

$=\sqrt{48\times6\times14\times28}$

$=\sqrt{112826}$

$= 336\ cm^2$

Area of the parallelogram $= 2 \times$ Area $\Delta ABC = 2 \times 336 = 672\ cm^2$

15.

Sol:
Given:
Cost of fencing = Rs 2800
Rate of fencing = Rs 14
Now,

Perimeter $= \frac{Total\ \cos t}{Rate} = \frac{2800}{14} = 200\,m$

Because the lawn is square, its perimeter is 4 *a*, where *a* is the side of the square)

$\Rightarrow 4a = 200 \Rightarrow a = \frac{200}{4} = 50\,m$

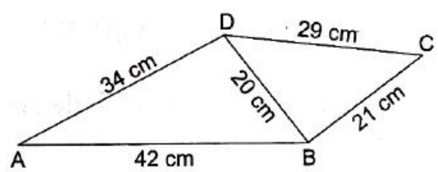
Area of the lawn $= Side^2 = 50^2 = 2500\ m^2$

Cost for mowing the lawn per $100\,m^2 = Rs\,54$

Cost for mowing the lawn per $1m^2 = Rs\frac{54}{100}$

Total cost for mowing the lawn per $2500\ m^2 = \frac{54}{100} \times 2500 = Rs\ 1350$

16.



Sol:
Quadrilateral ABCD is divided into triangles $\Delta ABD\ and\ \Delta BCD.$
We will now use Hero's formula
For ΔABD:

Semiperimeter, $s = \frac{1}{2}(42 + 30 + 34) = \frac{96}{2} = 48\ cm$

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

$= \sqrt{48(48-42)(48-34)(48-20)}$

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

$= \sqrt{112896}$

$= 336\ cm^2$

For ΔBCD:

$s = \frac{1}{2}(20+21+29) = \frac{70}{2} = 35\ cm$

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

$= \sqrt{35(35-20)(35-21)(35-29)}$

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

$= \sqrt{44100}$

$= 210\ cm^2$

Thus, we have:

Area of quadrilateral $ABCD = Ar(\Delta ABD) + Ar(BDC) = 336 + 210 = 546\ cm^2$

17.

Sol:

Area of the rhombus $= \frac{1}{2}$(Product of diagonals) $= \frac{1}{2}(120\times44) = 2640\ m^2$

Area of the parallelogram = Base $\times$ Height = 66 $\times$Height

Given:

The area of the rhombus is equal to the area of the parallelogram.

Thus, we have

$66\times Height = 2640$

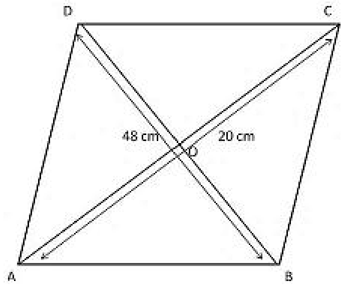
$\Rightarrow Height = \frac{2640}{66} = 40\,m$

$\therefore$ Corresponding height of the parallelogram = 40 m

18.

Sol:

Diagonals of a rhombus perpendicularly bisect each other. The statement can help us find a side of the rhombus. Consider the following figure.



ABCD is the rhombus and AC and BD are the diagonals. The diagonals intersect at point O.

We know

$\angle DOC = 90°$

$DO = OB = \frac{1}{2}DB = \frac{1}{2}\times 48 = 24\ cm$

Similarly,

$AO = OC = \frac{1}{2}AC = \frac{1}{2}\times 20 = 10\,cm$

Using Pythagoras theorem in the right angled triangle ΔDOC, we get

$DC^2 = \sqrt{DO^2 + OC^2}$

$= \sqrt{24^2 + 10^2}$

$= \sqrt{576 + 100}$

$= \sqrt{676}$

$= 26\ cm$

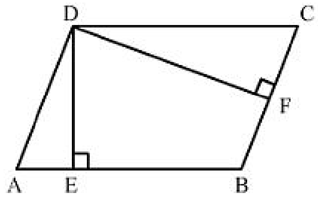
Dc is a side of the rhombus

We know that in a rhombus, all sides are equal.

$\therefore$ Perimeter of $ABCD = 26\times 4 = 104\ cm$

19.

Sol:



Area of a parallelogram = Base $\times$Height

$\therefore AB\times DE = BC\times DF$

$\Rightarrow DE = \frac{BC\times DF}{AB}$

$= \frac{27 \times 12}{36}$

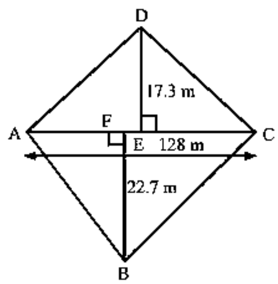
$= 9\ cm$

$\therefore$ Distance between thee longer sides $= 9\ cm$

20.

Sol:

The field, which is represented as ABCD, is given below



The area of the field is the sum of the areas of triangles ABC and ADC.

Area of the triangle $ABC = \frac{1}{2}(AC \times BF) = \frac{1}{2}(128 \times 22.7) = 1452.8\, m^2$

Area of the triangle $ADC = \frac{1}{2}(AC \times DE) = \frac{1}{2}(128 \times 17.3) = 1107.2\ m^2$

Area of the field = Sum of the areas of both the triangles $= 1452.8 + 1107.2 = 2560\ m^2$