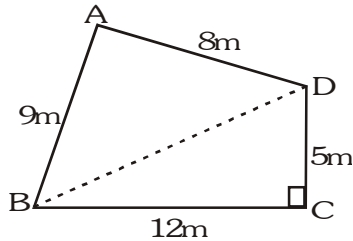


Ex - 12.2

Q1. A park, in the shape of a quadrilateral ABCD has $\angle C = 90^\circ$, $AB = 9$ m, $BC = 12$ m, $CD = 5$ m, $AD = 8$ m. How much area does it occupy ?

Sol. Join the diagonal AD of the quadrilateral ABCD.



$$BD^2 = BC^2 + CD^2 = (12)^2 + (5)^2 = 169$$

$$\Rightarrow BD = \sqrt{169} = 13 \text{ m}$$

Area of right angle $\triangle BCD$

$$= \frac{1}{2} \times BC \times CD = \frac{1}{2} \times 12 \times 5 \text{ m}^2 = 30 \text{ m}^2$$

Now, the sides of the $\triangle ABD$ are 9m in, 13 m and 8 m.

Semiperimeter of $\triangle ABD$

$$S = \frac{9\text{m} + 13\text{m} + 8\text{m}}{2} = 15 \text{ m.}$$

$$\text{The area of the } \triangle ABD = \sqrt{15 \times (15 - 9) \times (15 - 13) \times (15 - 8)} \text{ m}^2$$

$$\Rightarrow \sqrt{15 \times 6 \times 2 \times 7} \text{ m}^2 = \sqrt{5 \times 3 \times 3 \times 2 \times 2 \times 7}$$

$$\Rightarrow 6 \times 5.916 \text{ m}^2 \text{ (approx.)} = 35.495 \text{ m}^2 \text{ (approx.)}$$

$$= 35.5 \text{ (approx.)}$$

Thus area of the quadrilateral ABCD

$$= \text{ar} (\triangle BCD) + \text{ar} (\triangle ABD)$$

$$= 30 \text{ m}^2 + 35.5 \text{ m}^2 \text{ (approx.)} = 65.5 \text{ m}^2 \text{ (approx.)}$$

Q2. Find the area of quadrilateral ABCD in which $AB = 3$ cm, $BC = 4$ cm, $CD = 4$ cm, $DA = 5$ cm and $AC = 5$ cm.

Sol. $a = 4$

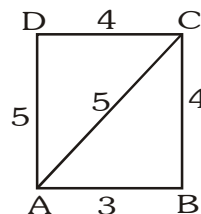
$$b = 5$$

$$c = 3$$

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

Area of $\triangle ABC$

$$= \frac{1}{2} \times \text{Base} \times \text{Height.} = \frac{1}{2} \times 3 \times 4 = 6 \text{ cm}^2$$



For ΔACD $a = 4, b = 5, c = 5$

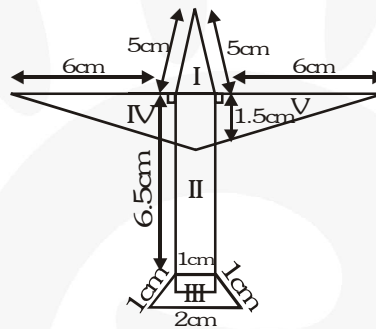
$$s = \frac{a+b+c}{2} = \frac{14}{2} = 7 \text{ cm}$$

\therefore Area of ΔACD

$$\begin{aligned} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{7(7-4)(7-5)(7-5)} \\ &= \sqrt{7 \times 3 \times 2 \times 2} \\ &= 2\sqrt{21} \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{area of quadrilateral } ABCD &= 6 + 2\sqrt{21} \\ &\cong 15.2 \text{ cm}^2 \end{aligned}$$

Q3. Radha made a picture of an aeroplane with coloured paper as shown in Fig. find the total area of the paper used.



Sol. It is triangular part and its sides are 5 cm, 5 cm, 1 cm. Here, semiperimeter of the triangle

$$s = \frac{5\text{cm} + 5\text{cm} + 1\text{cm}}{2} = \frac{11}{2} \text{ cm}$$

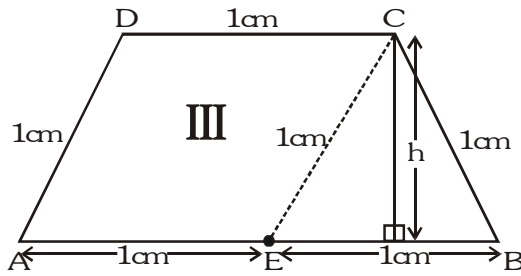
Area of part I in figure

$$\begin{aligned} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{\frac{11}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{9}{2}} \text{ cm}^2 \\ &= \frac{3}{4} \sqrt{11} \text{ cm}^2 = \frac{3}{4} \times 3.31 \text{ cm}^2 = 2.482 \text{ (approx.)} \end{aligned}$$

Area of part II in figure

$$= 6.5 \times 1 \text{ cm}^2 = 6.5 \text{ cm}^2$$

Area of part III in figure



$$\text{Area of } \triangle BEC = \frac{\sqrt{3}}{4} (1)^2 \text{ cm}^2 = \frac{\sqrt{3}}{4} \text{ cm}^2$$

Let h be the height of the $\triangle BEC$ i.e., height of the trapezium.

$$\frac{1}{2} \times BE \times h = \frac{\sqrt{3}}{4}$$

$$\Rightarrow \frac{1}{2} \times 1 \times h = \frac{\sqrt{3}}{4} \Rightarrow h = \frac{\sqrt{3}}{2} \text{ cm}$$

Area of Trapezium ABCD

$$= \frac{1}{2} (\text{sum of parallel sides}) (\text{height})$$

$$= \frac{1}{2} (1 + 2) \left(\frac{\sqrt{3}}{2}\right) \text{ cm}^2$$

$$= \frac{3}{4} \sqrt{3} \text{ cm}^2 = \frac{3}{4} \times 1.732 \text{ (approx.)}$$

$$= 1.299 \text{ (approx.)} = 1.3 \text{ (approx.)}$$

Area of part IV in figure

$$= \frac{1}{2} \times 1.5 \times 6 \text{ cm}^2 = 4.5 \text{ cm}^2$$

Area of part V in figure

$$= \frac{1}{2} \times 1.5 \times 6 \text{ cm}^2 = 4.5 \text{ cm}^2$$

Total area of the paper used

$$= \text{part (I + II + III + IV + V)}$$

$$= 2.482 \text{ cm}^2 + 6.5 \text{ cm}^2 + 1.3 \text{ cm}^2 + 4.5 \text{ cm}^2 + 4.5 \text{ cm}^2$$

$$= (10.282 + 9) \text{ cm}^2 \text{ (approx.)}$$

$$= 19.282 \text{ cm}^2 \text{ (approx.)}$$

$$= 19.3 \text{ cm}^2 \text{ (approx.)}$$

- Q4.** A triangle and a parallelogram have the same base and the same area. If the sides of the triangle are 26 cm, 28 cm and 30 cm, and the parallelogram stands on the base 28 cm, find the height of the parallelogram.

Sol. Semiperimeter of $\triangle ABC$

$$s = \frac{26 + 28 + 30}{2} = 42 \text{ cm}$$

$$s - a = 42 - 26 = 16 \text{ cm}$$

$$s - b = 42 - 28 = 14 \text{ cm}$$

$$s - c = 42 - 30 = 12 \text{ cm}$$

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

$$= \sqrt{42 \times 16 \times 14 \times 12} \text{ cm}^2 = \sqrt{14 \times 3 \times 4 \times 4 \times 14 \times 4 \times 3} \text{ cm}^2$$

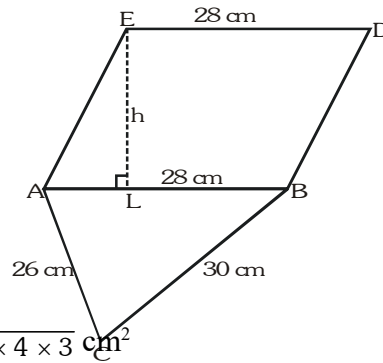
$$= 14 \times 4 \times 3 \times 2 \text{ cm}^2 = 336 \text{ cm}^2$$

\therefore Area of parallelogram = Area of triangle [Given]

$$h \times AB = 336$$

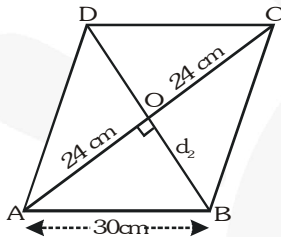
$$h \times 28 = 336 \text{ cm}^2$$

$$h = \frac{336}{28} = 12 \text{ cm}$$



Q5. A rhombus shaped field has green grass for 18 cows to graze. If each side of the rhombus is 30 cm and its longer diagonal is 48 cm, how much area of grass field will each cow be getting?

Sol. Since the diagonals of a Rhombus bisect each other at right angles



$$\therefore OB = \sqrt{(30)^2 - (24)^2} = \sqrt{324} = 18 \text{ cm}$$

$$\Rightarrow \text{diagonal of } d_2 = 2 \times OB = 2 \times 18 = 36 \text{ cm}$$

$$\therefore \text{Area of a Rhombus} = \frac{1}{2} \times d_1 \times d_2 = \frac{1}{2} \times 48 \times 36 = 864 \text{ cm}^2 [d_1 = 48 \text{ cm (given)}]$$

$$\text{Total area of grass field for 18 cows} = 864 \text{ cm}^2$$

$$\text{Area of grass grazed by each cow} = \frac{864}{18} = 48 \text{ cm}^2.$$

Q6. An umbrella is made by stitching 10 triangular pieces of cloth of two different colours (see Fig.) each piece measuring 20 cm, 50 cm and 50 cm. How much cloth of each colour is required for the umbrella ?



Sol. Sides of a triangular piece of coloured cloth are 20 cm, 50 cm and 50 cm.

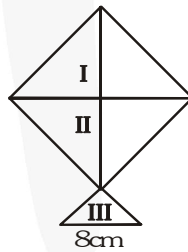
$$\text{Its semiperimeter} = \frac{20\text{cm} + 50\text{cm} + 50\text{cm}}{2} = 60\text{cm}$$

$$\text{Then, the area of one triangular piece} = \sqrt{60 \times 10 \times 10 \times 40} \text{ cm}^2 = 200\sqrt{6} \text{ cm}^2$$

There are 5 triangular pieces one colour and 5 of the other colour.

$$\text{Then total area of cloth of each colour (two colours)} = 5 \times 200\sqrt{6} \text{ cm}^2 = 1000\sqrt{6} \text{ cm}^2$$

Q7. A kite in the shape of a square with a diagonal 32 cm and an isosceles triangle of base 8 cm and sides 6 cm each is to be made of three different shades as shown in Fig. How much paper of each shade has been used in it ?



Sol. Area of paper shade I

$$= \frac{1}{2} \left[\frac{1}{2} \times 32 \times 32 \right]$$

$$= 256 \text{ cm}^2$$

$$\text{Area of paper shade II} = 256 \text{ cm}^2$$

Area of paper of shade III

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

$$b = 6 \text{ cm}$$

$$c = 6 \text{ cm}$$

$$s = \frac{a+b+c}{2} = \frac{8+6+6}{2} = 10\text{cm}$$

∴ Area of paper of shade III

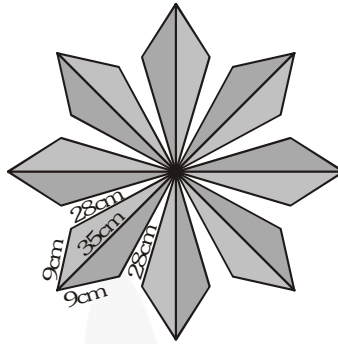
$$= \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{10(10-8)(10-6)(10-6)}$$

$$= \sqrt{10 \cdot 2 \cdot 4 \cdot 4} = 8\sqrt{5}$$

$$= 17.85 \text{ cm}^2$$

- Q8.** A floral design on a floor is made up of 16 tiles which are triangular, the sides of the triangle being 9 cm, 28 cm and 35 cm (See Fig.). Find the cost of polishing the tiles at the rate of 50 p per cm^2 .



Sol. Sides of a triangular tile are 9cm, 28 cm and 35 cm.

$$\text{Its semiperimeter} = \frac{9\text{cm} + 28\text{cm} + 35\text{cm}}{2} = 36\text{cm}$$

$$\text{Area of one tile} = \sqrt{36 \times 27 \times 8 \times 1} \text{ cm}^2 = 36\sqrt{6} \text{ cm}^2$$

Total area of 16 tiles

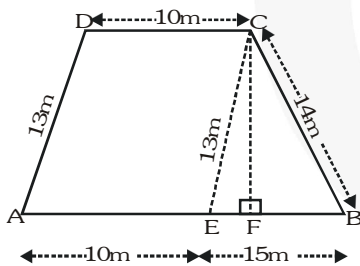
$$\begin{aligned} &= 576\sqrt{6} \text{ cm}^2 \\ &= 576 \times 2.45 \text{ cm}^2 \text{ (approx.)} \\ &= 1411.20 \text{ cm}^2 \text{ (approx.)} \end{aligned}$$

Total cost of polishing at the rate of 50p per cm^2

$$= \text{Rs.}1411.20 \times \text{cm}^2 = \text{Rs.}705.60$$

- Q9.** A field is in the shape of a trapezium whose parallel sides are 25 m and 10 m. The non-parallel sides are 14 m and 13 m. Find the area of the field.

Sol. Through C draw $CE \parallel DA$



Draw $CF \perp AB$

In $\triangle BCE$, we have

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

$$s - a = 21 - 15 = 6 \text{ m}$$

$$s - b = 21 - 14 = 7 \text{ m}$$

$$s - c = 21 - 13 = 8 \text{ m}$$

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

$$= \sqrt{21 \times 6 \times 7 \times 8} \text{ m}^2$$

$$= 7 \times 4 \times 3 = 84 \text{ m}^2$$

Now, area of $\triangle BCE = 84 \text{ m}^2$

$$\Rightarrow \frac{1}{2} \times \text{Base} \times \text{Altitude} = 84 \text{ m}^2$$

$$\Rightarrow \frac{1}{2} \times 15 \times h = 84$$

$$\Rightarrow h = \frac{84 \times 2}{15} \text{ m}$$

$$\Rightarrow h = \text{Distance between parallel sides of trapezium} = \frac{168}{15} \text{ m}$$

Area of parallelogram, AECD = base \times height

$$= 10 \times \frac{168}{15} = 56 \times 2 = 112 \text{ m}^2$$

$$\begin{aligned} \therefore \text{Area of trapezium ABCD} &= \text{Area of parallelogram AECD} + \text{Area of } \triangle BCE \\ &= 112 + 84 = 196 \text{ m}^2 \end{aligned}$$