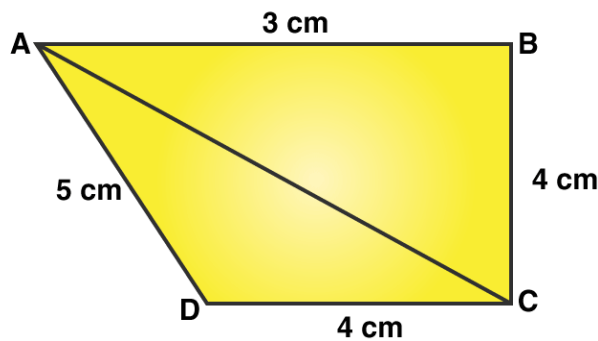


Exercise 12.2

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Question 1: Find the area of the quadrilateral ABCD in which AB = 3 cm, BC = 4 cm, CD = 4 cm, DA = 5 cm and AC = 5 cm.

Solution:



Area of the quadrilateral ABCD = Area of $\triangle ABC$ + Area of $\triangle ADC$ (1)

$\triangle ABC$ is a right-angled triangle which B.

Area of $\triangle ABC$ = $\frac{1}{2}$ x Base x Height

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

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

$$= 6$$

Area of $\triangle ABC$ = 6 cm^2 (2)

Now, In $\triangle CAD$,

Sides are given, apply Heron's Formula.

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

$$\text{Semi Perimeter, } s = \frac{(a+b+c)}{2}$$

Where, a, b and c are sides of a triangle

$$\text{Perimeter} = 2s = AC + CD + DA$$

$$2s = 5 \text{ cm} + 4 \text{ cm} + 5 \text{ cm}$$

$$2s = 14 \text{ cm}$$

$$s = 7 \text{ cm}$$

$$\text{Area of the } \triangle CAD = \sqrt{7 \times (7-5) \times (7-4) \times (7-5)}$$

$$\begin{aligned} &= \sqrt{7 \times 2 \times 3 \times 2} \\ &= 2\sqrt{21} \\ &= 9.16 \end{aligned}$$

$$\text{Area of the } \triangle CAD = 9.16 \text{ cm}^2 \dots(3)$$

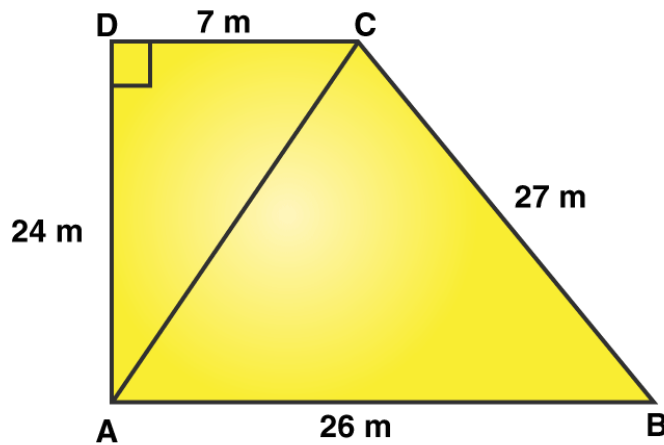
Using equation (2) and (3) in (1), we get

$$\text{Area of quadrilateral ABCD} = (6 + 9.16) \text{ cm}^2$$

$$= 15.16 \text{ cm}^2.$$

Question 2: The sides of a quadrilateral field, taken in order are 26 m, 27 m, 7 m, 24 m respectively. The angle contained by the last two sides is a right angle. Find its area.

Solution:



Here,
 $AB = 26\text{ m}$, $BC = 27\text{ m}$, $CD = 7\text{ m}$, $DA = 24\text{ m}$

AC is the diagonal joined at A to C point.

Now, in $\triangle ADC$,

From Pythagoras theorem;

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

$$AC^2 = 14^2 + 7^2$$

$$AC = 25$$

Now, area of $\triangle ABC$

All the sides are known, Apply Heron's Formula.

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

$$\text{Semi Perimeter, } s = \frac{(a+b+c)}{2}$$

Where, a, b and c are sides of a triangle

$$\text{Perimeter of } \triangle ABC = 2s = AB + BC + CA$$

$$2s = 26 \text{ m} + 27 \text{ m} + 25 \text{ m}$$

$$s = 39 \text{ m}$$

$$\text{Area of a triangle} = \sqrt{39 \times (39 - 25) \times (39 - 26) \times (39 - 27)}$$

$$= \sqrt{39 \times 14 \times 13 \times 12}$$
$$= \sqrt{85176}$$

$$= 291.84$$

$$\text{Area of a triangle ABC} = 291.84 \text{ m}^2$$

Now, for area of $\triangle ADC$, (Right angle triangle)

$$\text{Area} = \frac{1}{2} \times \text{Base} \times \text{Height}$$

$$= \frac{1}{2} \times 7 \times 24$$

$$= 84$$

Thus, the area of a $\triangle ADC$ is 84 m^2

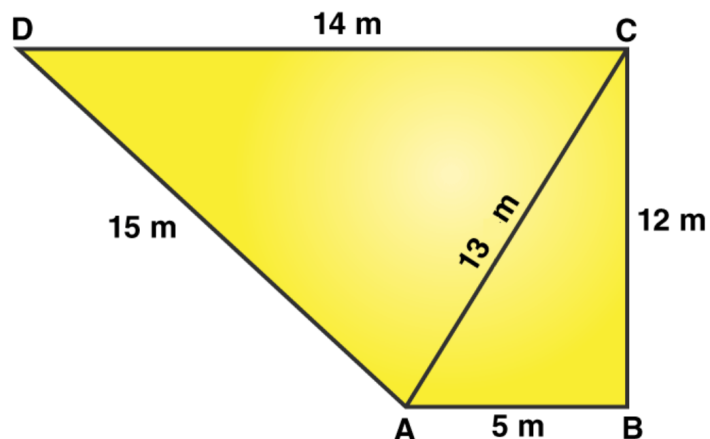
Therefore, Area of rectangular field ABCD = Area of $\triangle ABC$ + Area of $\triangle ADC$

$$= 291.84 \text{ m}^2 + 84 \text{ m}^2$$

$$= 375.8 \text{ m}^2$$

Question 3: The sides of a quadrilateral, taken in order as 5, 12, 14, 15 meters respectively, and the angle contained by first two sides is a right angle. Find its area.

Solution:



Here, AB = 5 m, BC = 12 m, CD = 14 m and DA = 15 m

Join the diagonal AC.

Now, area of $\triangle ABC = \frac{1}{2} \times AB \times BC$

$$= \frac{1}{2} \times 5 \times 12 = 30$$

Area of $\triangle ABC$ is 30 m^2

In $\triangle ABC$, (right triangle).

From Pythagoras theorem,

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

$$AC^2 = 5^2 + 12^2$$

$$AC^2 = 25 + 144 = 169$$

$$\text{or } AC = 13$$

Now in $\triangle ADC$,

All sides are known, Apply Heron's Formula:

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

$$\text{Semi Perimeter, } s = \frac{(a+b+c)}{2}$$

Where, a, b and c are sides of a triangle

$$\text{Perimeter of } \triangle ADC = 2s = AD + DC + AC$$

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

$$s = 21 \text{ m}$$

$$\text{Area of } \triangle ADC = \sqrt{21 \times (21 - 13) \times (21 - 14) \times (21 - 15)}$$

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

$$= 84$$

$$\text{Area of } \triangle ADC = 84 \text{ m}^2$$

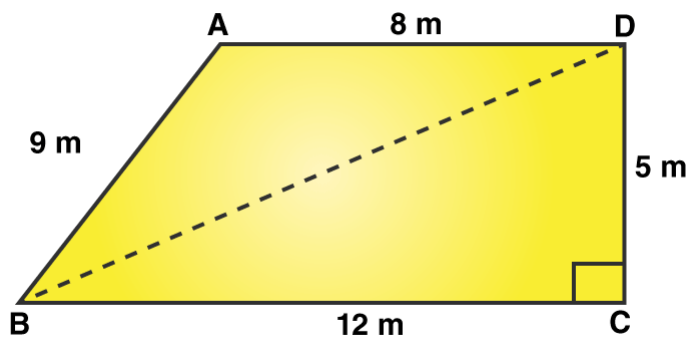
$$\text{Area of quadrilateral ABCD} = \text{Area of } \triangle ABC + \text{Area of } \triangle ADC$$

$$= (30 + 84) \text{ m}^2$$

$$= 114 \text{ m}^2$$

Question 4: A park in the shape of a quadrilateral ABCD, has $\angle C = 90^\circ$, $AB = 9 \text{ m}$, $BC = 12 \text{ m}$, $CD = 5 \text{ m}$, $AD = 8 \text{ m}$. How much area does it occupy?

Solution:



Here, $AB = 9 \text{ m}$, $BC = 12 \text{ m}$, $CD = 5 \text{ m}$, $DA = 8 \text{ m}$.

And BD is a diagonal of $ABCD$.

In right $\triangle BCD$,
From Pythagoras theorem;

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

$$BD^2 = 12^2 + 5^2 = 144 + 25 = 169$$

$$BD = 13 \text{ m}$$

$$\text{Area of } \triangle BCD = \frac{1}{2} \times BC \times CD$$

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

$$= 30$$

RD Sharma Solutions for Class 9 Maths Chapter 12 Heron's Formula

Area of $\triangle BCD = 30$
 m^2

Now, In $\triangle ABD$,

All sides are known, Apply Heron's Formula:

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

$$\text{Semi Perimeter, } s = \frac{(a+b+c)}{2}$$

Where, a, b and c are sides of a triangle

Perimeter of $\triangle ABD = 2s = 9\text{ m} + 8\text{ m} + 13\text{ m}$

$s = 15\text{ m}$

$$\text{Area of the } \triangle ABD = \sqrt{15 \times (15 - 9) \times (15 - 8) \times (15 - 13)}$$

$$= \sqrt{15 \times 6 \times 7 \times 2}$$

$$= 6\sqrt{35}$$

$= 35.49$

Area of the $\triangle ABD = 35.49\text{ m}^2$

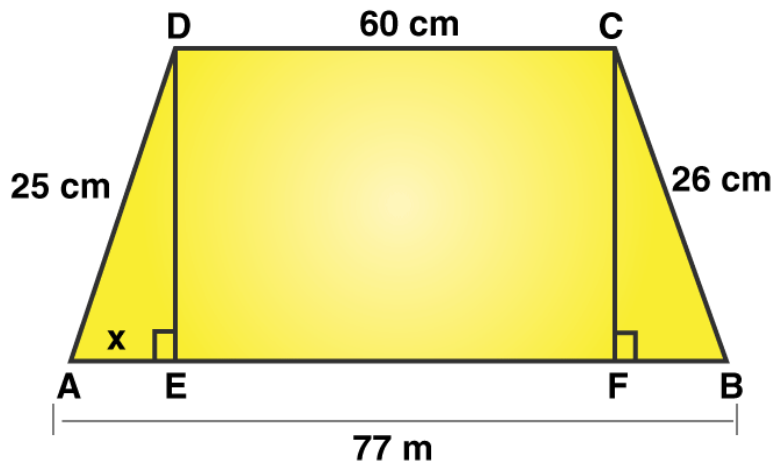
Area of quadrilateral ABCD = Area of $\triangle ABD$ + Area of $\triangle BCD$

$= (35.496 + 30)\text{ m}^2$

$= 65.5\text{ m}^2$.

Question 5: Two parallel sides of a trapezium are 60 m and 77 m and the other sides are 25 m and 26 m. Find the area of the trapezium.

Solution:



Given: $AB = 77 \text{ m}$, $CD = 60 \text{ m}$, $BC = 26 \text{ m}$ and $AD = 25 \text{ m}$

AE and CF are diagonals.

DE and CF are two perpendiculars on AB.

Therefore, we get, $DC = EF = 60 \text{ m}$

Let's say, $AE = x$

Then $BF = 77 - (60 + x)$

$BF = 17 - x \dots(1)$

In right $\triangle ADE$,

From Pythagoras theorem,

$$DE^2 = AD^2 - AE^2$$

$$DE^2 = 25^2 - x^2 \dots(2)$$

In right $\triangle BCF$

From Pythagoras theorem,

$$CF^2 = BC^2 - BF^2$$

$$CF^2 = 26^2 - (17-x)^2$$

[Using (1)]

Here, $DE = CF$

$$\text{So, } DE^2 = CF^2$$

$$(2) \Rightarrow 25^2 - x^2 = 26^2 - (17-x)^2$$

$$625 - x^2 = 676 - (289 - 34x + x^2)$$

$$625 - x^2 = 676 - 289 + 34x - x^2$$

$$238 = 34x$$

$$x = 7$$

$$(2) \Rightarrow DE^2 = 25^2 - (7)^2$$

$$DE^2 = 625 - 49$$

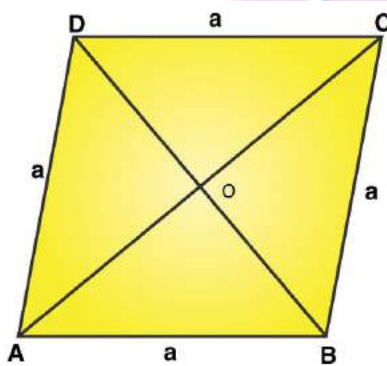
$$DE = 24$$

$$\text{Area of trapezium} = \frac{1}{2} \times (60 + 77) \times 24 = 1644$$

Area of trapezium is 1644 m^2 (Answer)

Question 6: Find the area of a rhombus whose perimeter is 80 m and one of whose diagonal is 24 m.

Solution:



Perimeter of a rhombus = 80 m (given)

We know, Perimeter of a rhombus = $4 \times \text{side}$

Let a be the side of a rhombus.

$$4 \times a = 80$$

$$\text{or } a = 20$$

One of the diagonal, $AC = 24$ m (given)

Therefore $OA = \frac{1}{2} \times AC$

$$OA = 12$$

In $\triangle AOB$,

Using Pythagoras theorem:

$$OB^2 = AB^2 - OA^2 = 20^2 - 12^2 = 400 - 144 = 256$$

$$\text{or } OB = 16$$

Since diagonal of rhombus bisect each other at 90 degrees.

And $OB = OD$

$$\text{Therefore, } BD = 2 OB = 2 \times 16 = 32 \text{ m}$$

$$\text{Area of rhombus} = \frac{1}{2} \times BD \times AC = \frac{1}{2} \times 32 \times 24 = 384$$

$$\text{Area of rhombus} = 384 \text{ m}^2.$$

Question 7: A rhombus sheet, whose perimeter is 32 m and whose diagonal is 10 m long, is painted on both the sides at the rate of Rs 5 per m^2 . Find the cost of painting.

Solution:

$$\text{Perimeter of a rhombus} = 32 \text{ m}$$

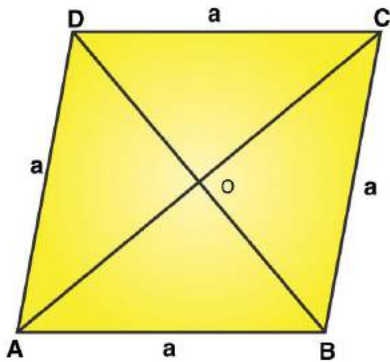
$$\text{We know, Perimeter of a rhombus} = 4 \times \text{side}$$

$$\Rightarrow 4 \times \text{side} = 32$$

$$\text{side} = a = 8 \text{ m}$$

Each side of rhombus is 8 m

$$AC = 10 \text{ m (Given)}$$



Then, $OA = \frac{1}{2} \times AC$

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

$$OA = 5 \text{ m}$$

In right triangle AOB,
From Pythagoras theorem;

$$OB^2 = AB^2 - OA^2 = 8^2 - 5^2 = 64 - 25 = 39$$

$$OB = \sqrt{39} \text{ m}$$

$$\text{And, } BD = 2 \times OB$$

$$BD = 2\sqrt{39} \text{ m}$$

$$\text{Area of the sheet} = \frac{1}{2} \times BD \times AC = \frac{1}{2} \times (2\sqrt{39} \times 10) = 10\sqrt{39}$$

$$\text{Area of the sheet is } 10\sqrt{39} \text{ m}^2$$

Therefore, cost of printing on both sides of the sheet, at the rate of Rs. 5 per m^2

$$= \text{Rs. } 2 \times (10\sqrt{39} \times 5) = \text{Rs. } 625.$$