CBSE Class- 9 Important Queations

Chapter – 12

Herons Formula

Section - A

(1) An isosceles right triangle has an area 8cm^2. The length of its hypotenuse is

1. **cm** $\sqrt{16}$
2. **cm** $\sqrt{48}$
3. **cm** $\sqrt{32}$
4. $\sqrt{24}$ **cm**

Ans. (c) $\sqrt{32}$ cm

(2) The sides of a triangle are 35 cm, 54 cm, and 61 cm, respectively. The length of its longest altitude is

1. **cm** $26\sqrt{5}$
2. **28 cm**
3. **10cm** $\sqrt{5}$
4. **24** $\sqrt{5}$ **cm**

Ans. (d) 24 $\sqrt{5}$ cm

Q.3 The sides of a triangle are 56 cm, 60 cm. and 52 cm. long. The area of the triangle is.

1. **4311 cm^2**
2. **4322 cm^2**
3. **2392 cm^2**
4. **None of these**

Ans. (d) None of these

Q.4 The area of an equilateral triangle is 16 $\sqrt{3}$ **m2. Its perimeter is**

1. **24m**
2. **12m**
3. **306 m**
4. **48m**

Ans. (a) 24m

Q.5 The perimeter of a triangle is 30 cm. Its sides are in the ratio 1 : 3 : 2, then its smallest side is.

1. **15 cm**
2. **5cm**
3. **1 cm**
4. **10 cm.**

Ans. 5 cm.

Section - B

Q.6 Find the area of a triangular garden whose sides are 40m., 90m and 70m. (use $\sqrt{5}$ = 2.24)

Ans. 1344 sq.m.

Q.7 Find the cost of leveling a ground in the form of a triangle with sides 16m, 12m and 20m at Rs. 4 per sq. meter.

Ans. 384

Q.8 Find the area of a triangle, two sides of which are 8cm and 11 cm and the perimeter is 32 cm.

Ans. $8\sqrt{30}$ cm^2

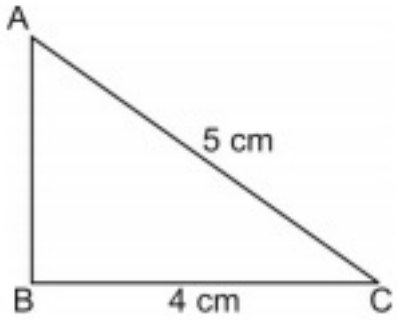
Q.9 The area of an isosceles triangle is 12 cm^2. If one of its equal side is 5cm. Find its base.

Ans. 6cm.

Q.10 Find the area of a right triangle whose sides containing the right angle are 5cm and 6cm.

Ans. 15 cm^2

Q.11 Find the area of the adjoin figure if AB?BC



Ans. 6cm^2

Section - C

Q.12 The diagonals of a rhombus are 24 cm and 10 cm. Find its area and perimeter.

Ans. 120 sq cm. 52 cm.

Q.13 Two side of a parallelogram are 10 cm and 7cm. One of its diagonals is 13 cm. Find the area.

Ans. 40 $\sqrt{3}$ cm^2

Q.14 A rhombus shaped sheet with perimeter 40 cm and one diagonal 12 cm, is painted on both sides at the rate of ` 5 per m^2. Find the cost of painting.

Ans. 960

Q.15 The sides of a quadrilateral ABCD are 6cm, 8cm, 12 cm and 14 cm (taken in order) respectively, and the angle between the first two sides is a right angle.
Find its area.

Ans. 24($\sqrt{6}$ +1) cm^2

Q.16 The perimeter of an isosceles triangle is 32 cm. The ratio if the equal side to its base is 3 : 2. Find the area of the triangle.

Ans. 32 $\sqrt{2}$ cm^2

Q.17 The sides of a triangular field are 41m, 40m and 9m. Find the number of flower beds that can be prepared in the field, if each flower bed needs 900 cm^2 space.

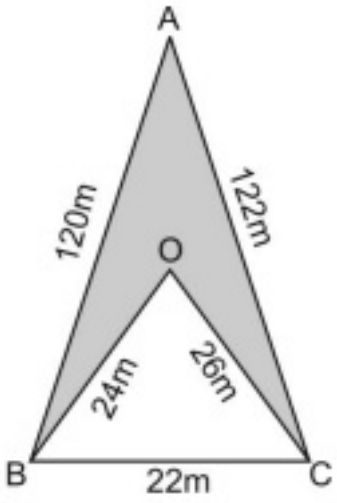
Ans. 2000

Q.18 The perimeter of a triangular ground is 420 m and its sides are in the ratio 6 : 7 : 8. Find the area of the triangular ground.

Ans. 2100 $\sqrt{15}$ m^2

Section - D

Q.19 Calculate the area of the shaded region.



Ans. 1074 m^2

Q.20 If each sides of a triangle is double, then find the ratio of area of the new triangle thus formed and the given triangle.

Q.21 A field is in the shape of a trapezium whose parallel sides are 25m and 10m. If its non-parallel sides are 14m and 13m, find its area.

Ans. 196sq.m.

Q.22 An umbrella is made by stitching 10 triangular pieces of cloth of 5 different colour each piece measuring 20 cm, 50 cm and 50 cm. How much cloth of each colour is

required for one umbrella?
($\sqrt{6}$ =2.45)

Ans. 980 cm^2 each.

Q.23 A triangle and a parallelogram have the same base and some 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.

Ans. 12 cm.

CBSE Class 9 Mathemaics

Important Questions

Chapter 12

Herons Formula

1 Marks Quetions

1. The measure of each side of an equilateral triangle whose area is $\sqrt{3}$ cm^2 is

(A) 8 cm

(B) 2 cm

(C) 4 cm

(D) 16 cm

Ans. (B) 2 cm

2. Measure of each side of an equilateral triangle is 12cm. Its area is given by

(A) $9\sqrt{3}$ sq cm

(B) $18\sqrt{3}$ sq cm

(C) $27\sqrt{3}$ sq cm

(D) $36\sqrt{3}$ sq cm

Ans. D) $36\sqrt{3}$ sq cm

3. Two adjacent side of a parallelogram are 74cm and 40cm one of Its diagonals is 102cm. area of the ||gram is

(A) 612 sq m

(B) 1224 sq m

(C) 2448 sq m

(D) 4896 sq m

Ans. (C) 2448 sq m

4.

(B) 8 cm

(C) 6 cm

(D) 5 cm

Ans. (A) 10 cm

5. The perimeter of a triangle is 60cm. If its sides are in the ratio 1:3:2, then its smallest side is

(a) 15

(b) 5

(c) 10

(d) none of these.

Ans. (c) 10

6. The perimeter of a triangle is 36cm. If its sides are in the ratio 1:3:2, then its largest side is

(a) 6

(b) 12

(c) 18

(d) none of these

Ans. (c) 18

7. If the perimeter of a rhombus is 20cm and one of the diagonals is 8cm. The area of the rhombus is

(a) 24 sq cm

(b) 48 sq cm

(c) 50 sq cm

(d) 30 sq cm

Ans. (a) 24 sq cm

8. One of the diagonals of a rhombus is 12cm and area is 54 sq cm. the perimeter of the rhombus is

(a) 72 cm

(b) $\sqrt[3]{10}$ cm

(c) $\sqrt[6]{10}$ cm

(d) $\sqrt[12]{10}$cm

Ans. (d) $\sqrt[12]{10}$cm

9. The side of a triangle is 12 cm, 16 cm, and 20 cm. Its area is

(A) 100sq cm

(B) 90sq cm

(C) 96sq cm

(D) 120sq cm.

Ans. (C) 96sq cm

10. The side of an equilateral triangle is $4\sqrt{3}cm$. Its area is.

(A) $12\sqrt{3}$ **sq cm**

(B) $12\sqrt{6}$ **sq cm**

(C) $12\sqrt{10}$ **sq cm**

(D) $6\sqrt{10}$ **sq cm.**

Ans. (A) $12\sqrt{3}$ sq cm

11. It the perimeter of a rhombus is 20sq cm and one of the diagonals is 8 cm. then the area of the rhombus is

(A) 40sq cm

(B) 24sq cm

(C) 20sq cm

(D) 13sq cm.

Ans. (B) 24sq cm

12. One of the diagonals of a rhombus is 12 cm and Its area is 54sq cm. the perimeter of the rhombus is.

(A) 10 cm

(B) 8 cm

(C) 6 cm

(D) $12\sqrt{10}$ **cm.**

Ans. (D) $12\sqrt{10}$ cm.

13. The lengths of the side of a triangular park are 90m, 70m and 40m, find Its area.

(A) 1340 sq m

(B) 1344 sq m

(C) 1440 sq m

(D) 1444 sq m

Ans. (B) 1344 sq m

14. An equilateral triangle has a side 50cm long. Find the area of the triangles.

(A) 625 $\sqrt{3}$ sq cm

(B) 625 $\sqrt{6}$ sq m

(C) 256 $\sqrt{6}$ sq m

(D) 625 $\sqrt{10}$ sq m

Ans. (A) 625 $\sqrt{3}$ sq cm

15. The area of an isosceles triangle is 12 sq cm. If one of the equal side is 5 cm, then the length of the base is

(A) 4 cm

(B) 5 cm

(C) 6 cm

(D) 8 cm

Ans. (C) 6 cm

16. Find the area of triangle whose side is 6 cm, 10 cm and 15cm.

(A) 404.9 sq cm

(B) 405.9 sq cm

(C) 402.9 sq cm

(D) 410sq cm

Ans. (A) 404.9 sq cm

17. If side of equilateral triangle is 25 m. Its area is

(a) $\frac{625}{4}\sqrt{3}$ sq cm

(b) $54\sqrt{3}$ sq cm

(c) $5\sqrt{3}$ sq cm

(d) $\sqrt{3}$ sq cm

Ans. (a) $\frac{625}{4}\sqrt{3}$ sq cm

18. The perimeter of an equilateral triangle is 48 cm. Its area is

(a) $18\sqrt{3}$ sq cm

(b) $72\sqrt{3}$ sq cm

(c) $64\sqrt{3}$ sq cm

(d) $60\sqrt{3}$ sq cm

Ans. (c) $64\sqrt{3}$ sq cm

19. If area of isosceles triangle is 48 sq cm and length of one of its equal sides is 10 m, then what is the base?

(a) 16 cm or 12 cm

(b) 12 cm or 14 cm

(c) 14 cm or 16 cm

(d) 16 cm or 18 cm

Ans. (a) 16 cm or 12 cm

20. If AB = 14 cm, BC = 13 cm, CD = 17 cm, DA = 8 cm and AC = 15 cm then area of quadrilateral ABCD is

(a) 150 sq cm

(b) 144 sq cm

(c) 142 sq cm

(d) 140 sq cm

Ans. (b) 144 sq cm

CBSE Class 9 Mathemaics

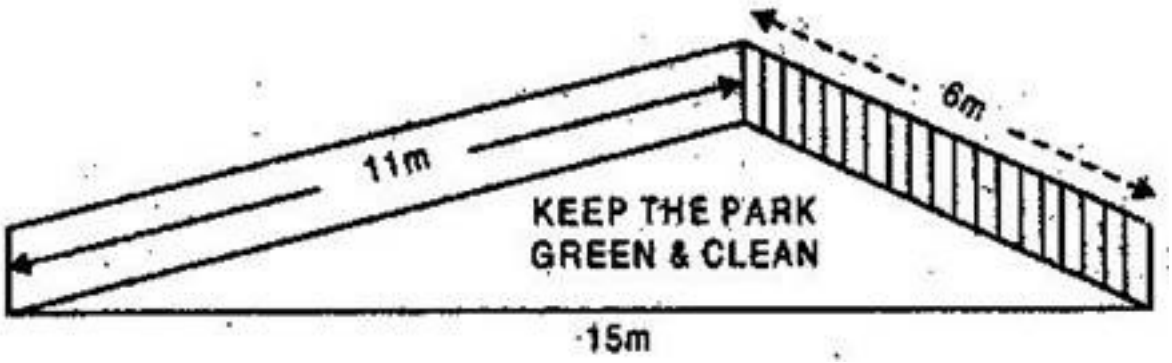
Important Questions

Chapter 12

Herons Formula

2 Marks Quetions

1. There is slide in a park. One of its side walls has been painted in some colour with a message "KEEP THE PARK GREEN AND CLEAN", (see figure). If the sides of the wall are 15 m, 11 m and 6 m, find the area painted in colour.



Ans. Since, sides of coloured triangular wall are 15 m, 11 m and 6 m.

∴ Semi-perimeter of coloured triangular wall

$= \frac{15+11+6}{2} = \frac{32}{2} = 16$ m

Now, Using Heron's formula,

Area of coloured triangular wall

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

$= \sqrt{16(16-15)(16-11)(16-6)}$

$= \sqrt{16\times1\times5\times10} = 20\sqrt{2}m^2$

Hence area painted in blue colour = $20\sqrt{2}m^2$

2. Find the area of a triangle two sides of which are 18 cm and 10 cm and the perimeter is 42 cm.

Ans. Given: a = 18 cm, b = 10 cm.

Since Perimeter = 42 cm

$\Rightarrow a+b+c$ =42

$\Rightarrow$ 18 + 10 + c = 42

$\Rightarrow$ c = 42 – 28 = 14 cm

$\therefore$ Semi-perimeter of triangle

= $\frac{18+10+14}{2}$ = 21 cm

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

= $\sqrt{21(21-18)(21-10)(21-14)}$

= $\sqrt{21\times3\times11\times7}$

= $\sqrt{7\times3\times3\times11\times7}$

= $21\sqrt{11}$

= 21×3.3

= $69.3\ cm^2$

3. Sides of a triangle are in the ratio of 12: 17: 25 and its perimeter is 540 cm. Find its area.

Ans. Let the sides of the triangle be $12x, 17x$ and $25x$.

Therefore, $12x+17x+15x$ = 540

$\Rightarrow 54x=540 \Rightarrow x$ = 10

$\therefore$ The sides are 120 cm, 170 cm and 250 cm.

Semi-perimeter of triangle $(s)=\frac{120+170+250}{2}$ = 270 cm

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

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

= $\sqrt{270\times150\times100\times20}$

= $9000\ cm^2$

4. An isosceles triangle has perimeter 30 cm and each of the equal sides is 12 cm. Find the area of the triangle.

Ans. Given: a = 12 cm, b = 12 cm

Since Perimeter = 30 cm $\Rightarrow a+b+c$ =30

$\Rightarrow$ 12 + 12 + c = 30

$\Rightarrow c$ = 30 – 24 = 6 cm

$\therefore$ Semi-perimeter of triangle = $\frac{12+12+6}{2}$ = 15 cm

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

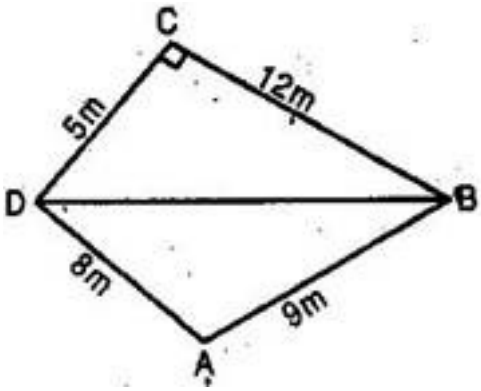
= $\sqrt{15(15-12)(15-12)(15-6)}$

= $\sqrt{15\times3\times3\times9}$

= $\sqrt{5\times3\times3\times3\times3\times3}$

= $9\sqrt{15}cm^2$

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



Ans. Since BD divides quadrilateral ABCD in two triangles:

(i) Right triangle BCD and (ii) ΔABD.

In right triangle BCD, right angled at C,

Therefore, Base = CD = 5 m and Altitude = BC = 12 m

$\therefore$ Area of ΔBCD = $\frac{1}{2} \times CD \times BC$

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

In ΔABD, AB = 9 m, AD = 8 m

And BD = $\sqrt{CD^2 + BC^2}$ [Using Pythagoras theorem]

$\Rightarrow$ BD = $\sqrt{(5)^2 + (12)^2}$

= $\sqrt{25+144}$ = $\sqrt{169}$ = 13 m

Now, Semi=perimeter of ΔABD = $\frac{9+8+13}{2}$ = 15 m

Using Heron's formula,

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

= $\sqrt{15(15-9)(15-8)(15-13)}$

= $\sqrt{15\times6\times7\times2}$

= = $6\sqrt{35} = 6\times5.91\,m^2$

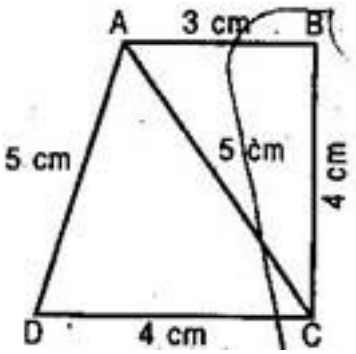
$= 35.4\,m^2$ (approx.)

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

= 30 + 35.4

$= 65.4\,m^2$

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



Ans. In quadrilateral ABCE, diagonal AC divides it in two triangles, ΔABC and ΔADC.

In ΔABC, Semi-perimeter of ΔABC = $\frac{3+4+5}{2}$ = 6 cm

Using Heron's formula,

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

$= \sqrt{6(6-3)(6-4)(6-5)}$

$= \sqrt{6\times3\times2\times1} = 6\ cm^2$

Again, In ΔADC, Semi-perimeter of ΔADC = $\frac{4+5+5}{2}$ = 7 cm

Using Heron's formula, Area of ΔABC = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{7(7-4)(7-5)(7-5)}$

$= \sqrt{7\times3\times2\times2} = 2\sqrt{21}$

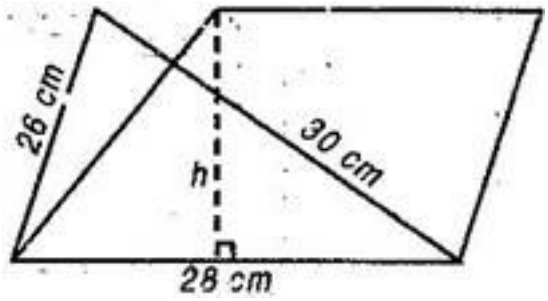
$= 2\times4.6 = 9.2\ cm^2$ (approx.)

Now area of quadrilateral ABCD = Area of ΔABC + Area of ΔADC

= 6 + 9.2

$= 15.2\ cm^2$

7. A triangle and a parallelogram have the same base and the same area. If the sides of the triangle are 26 cm, 29 cm and 30 cm and the parallelogram stands on the base 28 cm, find the height of the parallelogram.



Ans. Semi-perimeter of triangle (s) = $\frac{26+28+30}{2}$ = 42 cm

Using Heron's formula,

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

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

= $\sqrt{42\times16\times14\times12} = 336\ cm^2$

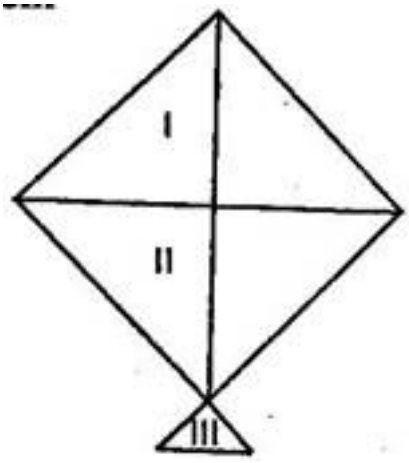
According to question, Area of parallelogram = Area of triangle

$\Rightarrow$ Base $\times$ Corresponding height = 336

$\Rightarrow$ 28 $\times$ Height = 336

$\Rightarrow$ Height = 12 cm

8. A kite is 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 figure.



How much paper of each side has been used in it?

Ans. Let ABCD is a square of side a cm and diagonals AC = BD = 32 cm

In right triangle ABC, $AB^2 + BC^2 = AC^2$ [Using Pythagoras theorem]

$\Rightarrow a^2 + a^2 = (32)^2$

$\Rightarrow 2a^2 = 32\times32$

$\Rightarrow a^2 = \frac{32 \times 32}{2}$ = 512

$\Rightarrow$ Area of square $= 512\ cm^2$ [Area of square = $side \times side$]

Diagonal BD divides the square in two equal triangular parts I and II.

$\therefore$ Area of shaded part I = Area of shaded part II = $\frac{1}{2} \times 512 = 256\ cm^2$

Now, semi-perimeter of shaded part III $(s) = \frac{6+6+8}{2}$ = 10 cm

Area of shaded part III = $\sqrt{s(s-a)(s-b)(s-c)}$

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

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

$= 8 \times 2.236 = 17.88\ cm^2$

9. An umbrella is made by stitching 10 triangles pieces of cloth of two different colour, each piece measuring 20 cm 50 cm and 50 cm. How much cloth of each colour is required for the umbrella?

Ans. a=20cm, b=50cm

$\therefore$ cloth required for each colour

$= 5 \times$ Area of one triangle piece

$= 5 \times \frac{a}{4}\sqrt{4b^2 - a^2}$

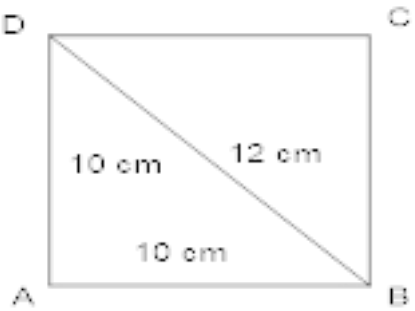
$= 5 \times \frac{20}{4}\sqrt{4(50)^2 - (20)^2}\ sq$ cm

$= 25 \times 40\sqrt{6}$ sq cm

$=1000\times\sqrt{6}$ sq cm

Thus, $(1000\sqrt{6})$ sq cm cloth of each colour is required

10. The perimeter of a rhombus ABCD is 40cm. find the area of rhombus of Its diagonals BD measures 12cm



Ans. $\therefore AB=BC=CD=DA=\frac{40}{4}cm$ 10cm

now in $\triangle ABD$,

AB=10cm, BD =12cm and DA=10cm

$\therefore$ S=$\frac{10+12+10}{2}cm$ =16cm

Area of $\therefore$ by herons pormula

$\triangle ABD=\sqrt{16(16-10)\ (16-12)\ (16-10)}$

$=\sqrt{16\times6\times4\times6}$ =48sq cm

$\therefore$ area of rhombus ABCD $=2\times$ area of $\triangle ABD$

$=2\times48$sq cm

=96 sq cm

11. Find area of triangle with two sides as 18cm & 10cm and the perimeter is 42cm.

Ans. Let a=18 cm, b=10 cm

Perimeter =42cm

$\therefore a+b+c=42cm$

So, C=14 cm

$\therefore$ S$=\frac{a+b+c}{2}=\frac{18+10+14}{2}$ = 21 cm

new area of triangles = $=\sqrt{21(21-18)\ (21-10)\ (21-14)}$

$=\sqrt{21\times3\times11\times7}$

$=21\sqrt{11}\ sq$ cm

12. Find the area of in isosceles triangle, the measure of one of Its equals side being 'b' and the third side 'a'.

Ans. Here

$S=\frac{a+b+c}{2}units=\frac{a+2b}{2}$ units

$\therefore$ area of $\triangle=\sqrt{(\frac{a+2b}{2})(\frac{a+2b}{2}-a)(\frac{a+2b}{2}-b)(\frac{a+2b}{2}-c)}$

$=\sqrt{(\frac{a+2b}{2})(\frac{2b-a}{2})\frac{a}{2}\times\frac{a}{2}}$ sq units

$=\frac{a}{4}\sqrt{4b^2-a^2}\ sq$ units

13. Find the cost of leveling the ground in the form of a triangle having its sides are 40 m, 70 m and 90 m at Rs 8 per square meter. [use $\sqrt{5}$ = 2.24]

Ans. Here S = $\frac{40+70+90}{2}$ m = 100 m

$\therefore$ Area of a triangular ground = $\sqrt{100\ (100-40)\ (100-70)\ (100-90)}$ sq m

= $\sqrt{100\times60\times30\times10}$ sq m

= $(10\times10\times\sqrt[6]{5})$ sq m

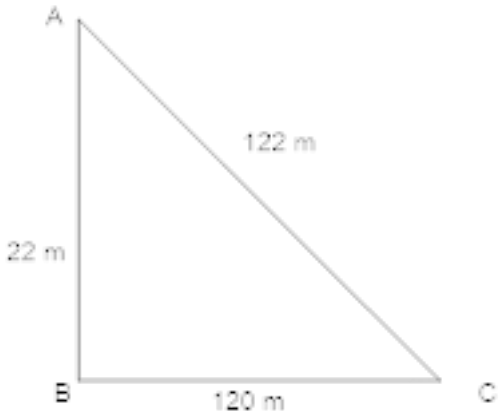
= (600×2.24) sq m

= 1344 sq m

$\therefore$ Cost of leveling the ground = Rs (8×1344)

=Rs 10752

14. The triangular side's walls of a flyover have been used for advertisements. The sides of the walls are 122m, 22m and 120m. The advertisement yield on earning of Rs 5000 per m^2 per year. A company hired one of its walls for 4 months. How much rent did it pay?



Ans. The lengths of the sides of the walls are 122m, 22m and 120m.

As,

$120^2 + 22^2$

= 14400 +484

= 14884

= $(122)^2$

∴ Walls are in the form of right triangles

Area of one wall = $\frac{1}{2} \times Base \times height$

= $\frac{1}{2} \times 120 \times 22$ sq m

= 1320 sq m.

Rent = Rs 5000/sq m per year

∴ Rent for 4 month

= Rs $\left[\frac{5000 \times 1320 \times 4}{12}\right]$

= Rs 22,00,000

15. Find the perimeter and area of a triangle whose sides are of length 2cm, 5cm and 5cm.

Ans. Here, a = 2cm, b = 5cm and c = 5cm

∴ Perimeter = a+ b+ c = (2 + 5 + 5) = 12 cm

S = semi perimeter

= $\frac{12}{2}$ = 6 cm

using Heron's formula,

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

= $\sqrt{6\ (6-2)\ (6-5)\ (6-5)}$ sq cm

= $\sqrt{24}$ sq cm

= 4.9 sq cm

16. There is a slide in a park. One of its sides wall has been painted in some colour with a message "KEEF THE CITY GREEN AND CLEAN".

If the sides of the wall are 15m, 11m and 6m. Find the area painted in colour.

Ans. ∴ The sides of the wall is in the triangular from with sides,

A = 15 m, b = 6 m and c = 11 m

∴ S = $\frac{15+6+11}{2}$ m

= 16 m

∴Area to be painted in colour = Area of the side wall

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

= $\sqrt{16\ (16-5)\ (16-6)\ (16-11)}$ sq m

= $\sqrt[4]{50}$ sq m

= $\sqrt[20]{2}$ sq m

17. Find the area of isosceles triangle whose side is 14 m, 12 m, 14m?

Ans. $S = \frac{14+12+14}{2} = 20m$

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

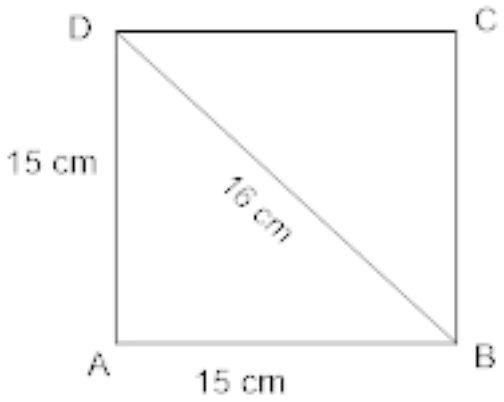
$= \sqrt{20(20-14)(20-12)(20-14)}$

$= \sqrt{20\times6\times8\times6}$

$= 6\sqrt{160} = 6\times12.6$

= 75.6

18. The perimeter of a rhombus ABCD is 60 cm. find the area of the rhombus of Its diagonal BD measures 16 cm?



Ans. As side of rhombus are equal.

$\therefore AB=BC=CD=DA=\frac{60}{4}=15cm$

$in\Delta ABD,$

$S=\frac{15+15+16}{2}=23cm$

So,

Area of, $\Delta ABD=\sqrt{23(23-15)(23-15)(23-16)}$

$= \sqrt{23\times8\times8\times7}=8\sqrt{23\times7}$

$= 8 \times 12.7$ =101.6 sq cm

Area of rhombus = $2 \times 101.6 = 203.2$ sq cm

19. Find the cost of leveling the ground in the from of a triangle having Its side as 70 cm, 50 cm, and 60 cm, at Rs 7 per square meter.

Ans. $S = \frac{70+50+60}{2} = \frac{180}{2} = 90cm$

$\therefore$ area of triangle $= \sqrt{90(90-70)(90-50)(90-60)}$

$= \sqrt{90 \times 20 \times 40 \times 30}$

=1469.7 sq m

$\therefore$ cost of levelling the ground= RS (7×1469.7)

=10287.9

20. Find the area of a triangle two side of the triangle are 18 cm, and 12 cm. and the perimeter is 40 cm.

Ans. *Let* a=18 cm, b=12 cm and C=?

So, a+b+c=40 cm

18+12+C=40

C=(40-30)cn =10cm

$\therefore$ S= $\frac{18+12+10}{2}$ =20 cm

$\therefore$ area of triangle= $\sqrt{20(20-18)(20-12)(20-10)}$

$= \sqrt{20 \times 2 \times 8 \times 10}$ sq cm

=56.56 sq cm

21. Find the area of triangle whose side is 42m, 56m and 70m?

Ans. S = $\frac{42+56+70}{2}$ m = $\frac{168}{2}$ m or 84

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

= $\sqrt{84\ (84-42)\ (84-56)\ (84-70)\ \text{sq m}}$

= 42$\times$28 sq m

= 1176sq m

22. Find the area of an isosceles triangle, the measure of one of Its equal side being b and the third side a.

Ans. S = $\frac{a+b+b}{2}$ units = $\frac{a+2b}{2}$ units

$\therefore$ Area of triangle = $\sqrt{\frac{a+2b}{2}\times\left(\frac{a+2b}{2}-a\right)\left(\frac{a+2b}{2}-a\right)\left(\frac{a+2b}{2}-a\right)}$ units

= $\sqrt{\left(\frac{a+2b}{2}\right)\times\left(\frac{2b-a}{2}\right)\times\frac{a}{2}\times\frac{a}{2}}$ units

= $\frac{a}{4}\sqrt{4b^2-a^2}$ sq units

23. Find the area of equilateral triangle whose side is 12 cm using Heron's formula.

Ans. S = $\frac{12+12+12}{2}\,cm$

$= \frac{36}{2}$ cm = 18 cm

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

$= \sqrt{18\ (18-12)\ (18-12)\ (18-12)}$

$= \sqrt{18\ \times 6\times 6\times 6}$

$= 36\sqrt{3}$ sq cm

24. Find the area of isosceles triangle whose equal side is 6 cm, 6 cm and 8 cm.

Ans. S = $\frac{6+6+8}{2}\ cm$

$= \frac{20}{2} = 10\ cm$

$\therefore$ Area of isosceles triangle = $\sqrt{10\ (10-6)\ (10-6)\ (10-8)}$

$= \sqrt{10\times 4\times 4\times 2}$ sq cm

= 17.8 sq cm

25. Find the area of an isosceles triangles, the measure of one of its equal sides being 10 cm and the third side is 6 cm.

Ans. S = $\frac{10+10+6}{2} = \frac{26}{2} = 13cm$

$\therefore$ Area if tringle= $\sqrt{13\ (13-5)\ (13-5)\ (13-6)}$ sq cm

$= \sqrt{13\times 3\times 3\times 7}$ sq cm

$= 3\sqrt{91}$ sq cm

26. Find the area of equilateral triangle the length of one of its sides being 24 cm.

Ans. a = b = c = 24 cm

$$\therefore\ S = \frac{24+24+24}{2}\ \text{cm} = \frac{72}{2}\ \text{cm}$$

=36 cm

$\therefore$ Area of triangle= $\sqrt{36\ (36-24)\ (36-24)\ (36-24)}$ sq cm

=246.12 sq cm

27. Find the perimeter and area of a triangle whose sides are 3 cm, 4 cm and 10 cm?

Ans. Perimeter = 3+4+5

= 12 cm

$$\therefore\ S = \text{semiperimeter} = \frac{12}{2}$$

Or = 6cm

Area of triangle = $\sqrt{6\ (6-3)\ (6-4)\ (6-5)}$ sq cm

= 6 sq cm

28. Using Heron's formula, find area of triangle whose sides are 6 cm, 8 cm and 10 cm?

Ans. $S = \frac{6+8+10}{2} = \frac{24}{2}$

=12 cm

$\therefore$ Area of triangle= $\sqrt{12\ (12-6)\ (12-8)\ (12-10)}$ sq cm

=24 sq cm

CBSE Class 9 Mathemaics

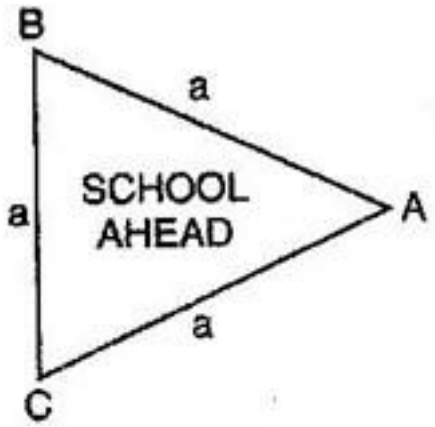
Important Questions

Chapter 12

Herons Formula

3 Marks Quetions

1. A traffic signal board, indicating 'SCHOOLAHEAD' is an equilateral triangle with side 'a'. Find the area of the signal board, using Heron's formula. If its perimeter is 180 cm, what will be the area of the signal board?



Ans. Let the Traffic signal board is Δ ABC.

According to question, Semi-perimeter of Δ ABC $(s) = \frac{a+a+a}{2} = \frac{3a}{2}$

Using Heron's Formula, Area of triangle ABC = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{\frac{3a}{2}\left(\frac{3a}{2}-a\right)\left(\frac{3a}{2}-a\right)\left(\frac{3a}{2}-a\right)}$

$= \sqrt{\frac{3a}{2}\times\frac{a}{2}\times\frac{a}{2}\times\frac{a}{2}} = \sqrt{3\left(\frac{a}{2}\right)^4}$

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

Now, Perimeter of this triangle = 180 cm

$\Rightarrow$ Side of triangle (a) = $\frac{180}{3}$ = 60 cm

$\Rightarrow$ Semi-perimeter of this triangle = $\frac{180}{2}$ = 90 cm

Using Heron's Formula, Area of this triangle = $\sqrt{s(s-a)(s-b)(s-c)}$

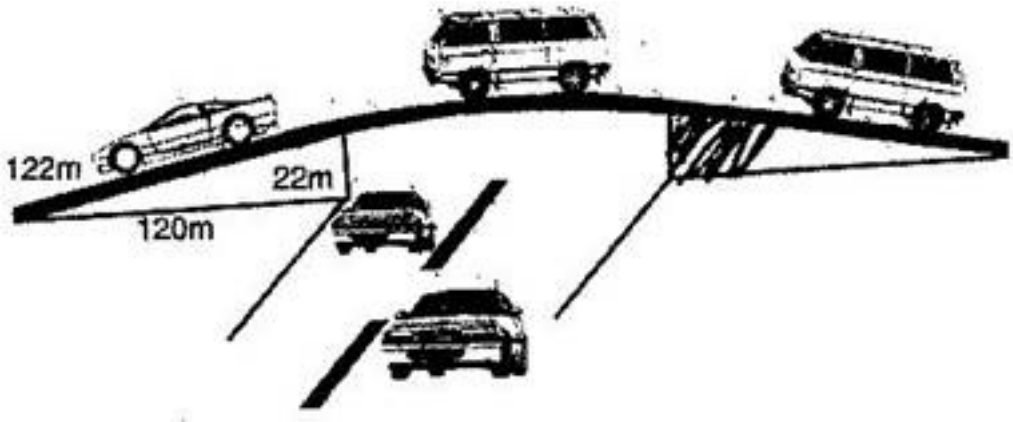
= $\sqrt{90(90-60)(90-60)(90-60)}$

= $\sqrt{90\times 30\times 30\times 30}$

= $30\times 30\sqrt{3}$

= $900\sqrt{3}cm^2$

2. The triangular side walls of a flyover has been used for advertisements. The sides of the walls are 122 m, 22 m and 120 m (see figure). The advertisement yieldan earning of Rs. 5000 per $\mathbf{m}^2$ per year. A company hired one of its walls for 3 months, how much rent did it pay?



Ans. Given: a = 122 m, b = 22 m and c = 120 m

Semi-perimeter of triangle (s) = $\frac{122+22+120}{2}$ = $\frac{264}{2}$ = 132 m

Using Heron's Formula,

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

= $\sqrt{132(122-132)(132-22)(132-120)}$

= $\sqrt{132\times10\times110\times12}$

= $\sqrt{11\times12\times10\times10\times11\times12}$

$=10\times11\times12$

$= 1320\ m^2$

∵ Rent for advertisement on wall for 1 year = Rs. 5000 per m^2

∴ Rent for advertisement on wall for 3 months for $1320\ m^2$ = $\frac{5000}{12}\times3\times1320$

= Rs. 1650000

Hence rent paid by company = Rs. 16,50,000

3. Radha made a picture of an aeroplane with coloured paper as shown in figure. Find the total area of the paper used.

Ans. Area of triangular part I: Here, Semi-perimeter $(s)=\frac{5+5+1}{2}$ = 5.5 cm

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

= $\sqrt{5.5(5.5-5)(5.5-5)(5.5-1)}$

= $\sqrt{5.5\times0.5\times0.5\times4.5}$ = $0.75\sqrt{11}$

= $0.75\times3.31=2.4825\ cm^2$

Area of triangular part II = $Length \times Breadth$

= $6.5 \times 1 = 6.5\ cm^2$

Area of triangular part III (trapezium): $\frac{1}{2}(AB + DC) \times AE$

= $\frac{1}{2}$ (AB + DC) $\times \sqrt{AD^2 - DE^2}$

= $\frac{1}{2}$ (1 + 2) $\times \sqrt{1 - .025}$

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

= $\frac{3 \times 1.732}{4}$

= $1.299\ cm^2$

Area of triangular parts IV & V: $2\left(\frac{1}{2} \times 1.5 \times 6\right)$

= $9cm^2$

$\therefore$ Total area = 2.4825 + 6.2 + 1.299 + 9

= $19.28\ cm^2$

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

Ans. Here, AB = BC = CD = DA = 30 m and Diagonal AC = 48 m which divides the rhombus ABCD in two congruent triangle.

$\therefore$ Area of Δ ABC = Area of Δ ACD

Now, Semi-perimeter of Δ ABC (s) = $\frac{30+30+48}{2}$ = 54 m

Now Area of rhombus ABCD = Area of Δ ABC + Area of Δ ACD

= 2 x Area of Δ ABC [$\because$ Area of Δ ABC = Area of Δ ACD]

= $2\sqrt{s(s-a)(s-b)(s-c)}$ [Using Heron's formula]

= $2\times\sqrt{54(54-30)(54-30)(54-48)}$

= $2\times\sqrt{54\times24\times24\times6}$ = $2\times6\times24$

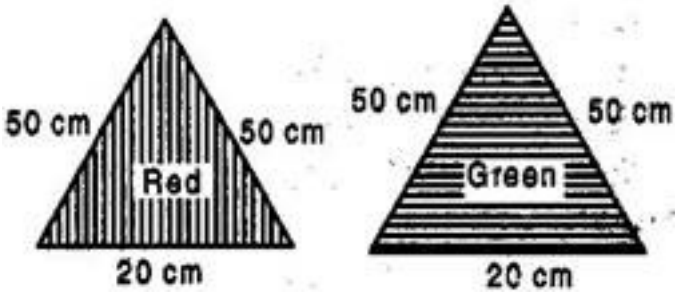
= $864\ m^2$

$\because$ Field available for 18 cows to graze the grass = $864\ m^2$

$\therefore$ Field available for 1 cow to graze the grass = $\frac{864}{18} = 48\ m^2$

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

Ans. Here, sides of each of 10 triangular pieces of two different colours are 20 cm, 50 cm and 50 cm.



Semi-perimeter of each triangle (s) = $\frac{20+50+50}{2}$ = 60 cm

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

= $\sqrt{60(60-20)(60-50)(60-50)}$

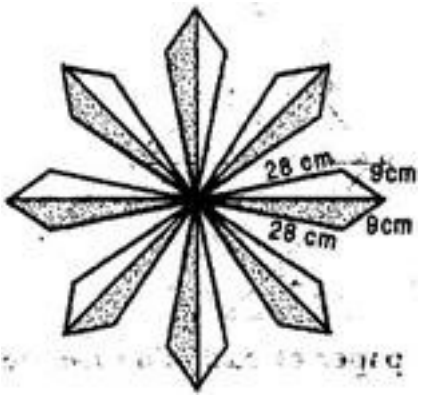
= $\sqrt{60\times40\times10\times10}$ = $200\sqrt{6}cm^2$

According to question, there are 5 pieces of red colour and 5 pieces of green colour.

$\therefore$ Cloth required for 5 red pieces = $5\times200\sqrt{6}$ = $1000\sqrt{6}cm^2$

And Cloth required to 5 green pieces = $5\times200\sqrt{6}$ = $1000\sqrt{6}cm^2$

6. 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 figure). Find the cost of polishing the tiles at the rate of 50 paise per cm^2.



Ans. Here, Sides of a triangular shaped tile area 9 cm, 28 cm and 35 cm.

Semi-perimeter of tile (s) = $\frac{9+28+35}{2}$ = 36 cm

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

= $\sqrt{36(36-9)(36-28)(36-35)}$

= $\sqrt{36\times27\times8\times1}$ = $36\sqrt{6}$

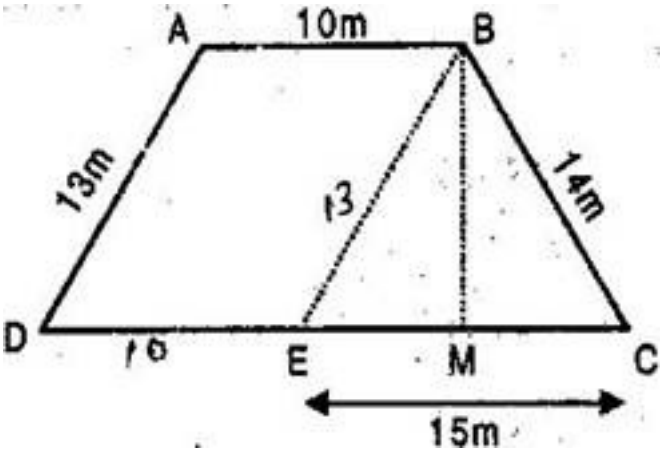
= 36×2.45 = $88.2\ cm^2$ (approx.)

$\therefore$ Area of 16 such tiles $=16\times88.2=1411.2\ cm^2$ (Approx.)

$\because$ Cost of polishing $1\ cm^2$ of tile = Rs. 0.50

$\therefore$ Cost of polishing $1411.2\ cm^2$ of tile = Rs. 0.50×1411.2 = Rs. 705.60 (Approx.)

7. 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.



Ans. Let ABCD be a field in the shape of trapezium and parallel side AB = 10 m & CD = 25 m

And Non-parallel sides AD = 13 m and BC = 14 m

Draw BM $\perp$ DC and BE $\parallel$ AD so that ABED is a parallelogram.

$\therefore$ BE = AD = 13 m and DE = AB = 10 m

Now in Δ BEC, Semi-perimeter $(s)=\dfrac{13+14+15}{2}$

= 21 m

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

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

= $\sqrt{21\times8\times7\times6}$ = $84\ m^2$

And Area of Δ BEC = $84\ m^2$

$\Rightarrow \frac{1}{2}\times EC\times BM$ = 84

$\Rightarrow \frac{1}{2}\times15\times BM$ = 84

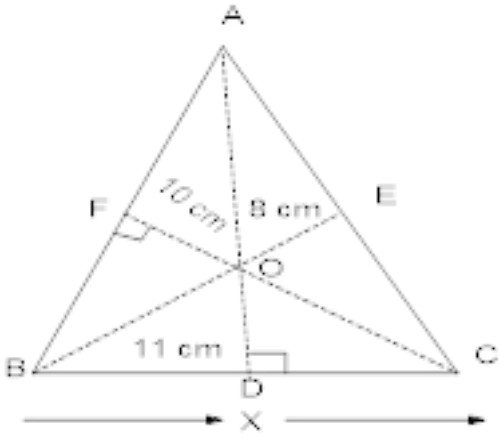
$\Rightarrow$ BM = $\frac{84\times2}{15}$ = 11.2 m

Now area of trapezium ABCD = $\frac{1}{2}(AB + CD)\times BM$

= $\frac{1}{2}(10+25)\times11.2$

= $196\ m^2$

8. From a point in the interior of an equilateral triangle perpendiculars drawn to the three sides are 8 cm, 10 cm and 11 cm respectively. Find the area of the triangle to the nearest cm. (use $\sqrt{3}=1.73$)



Ans. Let each side of the equilateral $\triangle$ ABC measure be x cm.

Let OD= 11cm, OE =8cm and OF=10cm

Join OA, OB and OC

$$Now\ ar(\triangle ABC) = ar(\triangle OBC) + ar(\triangle OCA) + ar(\triangle OAB)$$

$$= \left(\frac{1}{2}x\times 11 + \frac{1}{2}x\times 8 + \frac{1}{2}x\times 10\right) \text{ Sq cm}$$

$$= \frac{29}{2}x \text{ sq cm} \quad \rightarrow \quad (1)$$

But area of equilateral $\triangle$, the measure of whose each side of x

$$= \frac{\sqrt{3}}{4}\ x^2 \text{ sq cm} \quad \rightarrow \quad (ii)$$

From (i) and (ii)

$$\frac{\sqrt{3}}{4}x^2 = \frac{29}{2}x$$

$$\therefore x = \frac{4\times 29}{\sqrt{3}\times 2} = \frac{58}{\sqrt{3}}$$

$$\therefore \text{ area of } \Delta ABC = \frac{29}{2}\times\frac{58}{\sqrt{3}} = \frac{841\sqrt{3}}{3} \text{ sq cm}$$

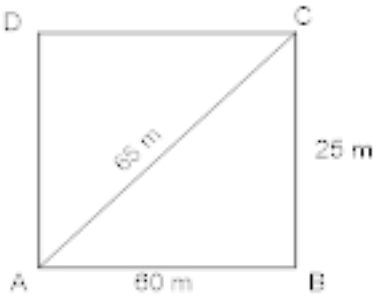
$$= \frac{841\times 1.73}{3} = 485 \text{ sq cm}$$

9. A parallelogram, the length of whose side is 60 m and 25 m has one diagonal 65 m long. Find the area of the parallelogram.

Ans. AB=DC=60cm, BC=AD= 25m and AC=65m

Area of parallelogram ABCD= Area of ΔABC + area of ΔACD

= 2 Area of ΔABC [$\because$ar ΔABC =ar ΔABD]



Now

$$S= \frac{60+65+25}{2} m = 75m$$

$$\therefore \text{ area of } \Delta ABC = \sqrt{S(s-a)(s-b)(s-c)}$$

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

$$=(5\times 3\times 5\times 2\times 5) \text{ sq m}$$

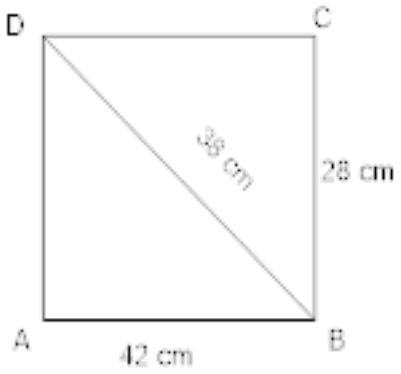
=750 sq m ....(II)

From (i) and (ii), we get

Area of

$$11^{gm} \text{ ABCD} = 2\times 750 = 15000 \text{ sq m.}$$

10. A parallelogram, the measures of whose adjacent sides are 28 cm and 42 cm, has one diagonals 38cm. Find Its altitude on the side 42cm.



Ans. AB=DC=42cm=C

BC=AD= 28cm =b

And BD=38cm=a

Let A be the area of Δ ABD

Now, $S=\frac{38+28+42}{2}=54cm$

A= $\sqrt{54(54-38)(58-28)(54-42)}$

$=\sqrt{54\times16\times26\times12}$ sq cm.

$=144\sqrt{13}$ sq cm

$\therefore$ area of ΔABD

again area of Δ ABD $=\frac{1}{2}base\times altitude$

$=\frac{1}{2}\times42\times h\ sq\ cm,$ whare h cm is altitude

=21 h sq cm

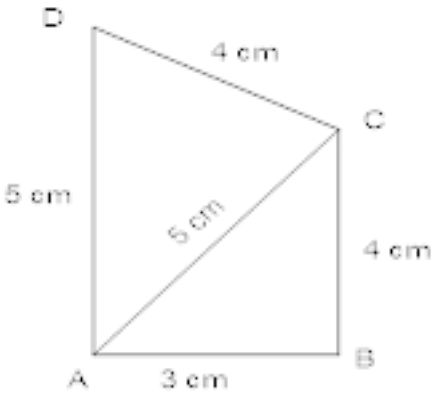
From (i) and (ii), we get

$21h=144\sqrt{13}$

$$h=\frac{144\sqrt{13}}{21}=\frac{48\sqrt{13}}{7}cm$$

Thus, required altitude $=\frac{48\sqrt{13}}{7}cm$

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



Ans. ∴Area of quadrilateral ABC=area of ΔABC + area of ΔACD(i)

For ΔABC, $S=\frac{3+4+5}{2}=6cm$

$\therefore$ Area of $\Delta ABC=\sqrt{6(6-3)(6-4)(6-5)}$

$=\sqrt{6\times3\times2\times1}$ sq cm = 6sq cm ...(i)

For ΔACD, S= $\frac{5+4+5}{2}=7$cm

$\therefore$ area of ΔACD

13. Find the base of an isosceles triangles whose area is 12cm and the length of one of the equal side is 5cm.

Ans. ∴ Area of an isosceles triangle = $\frac{a}{4}\sqrt{4b^2-a^2}$

$\therefore \frac{a}{4}\sqrt{4b^2-a^2}$ = 12

or $\frac{a}{4}\sqrt{100-a^2}$ = 12

Squaring both sides, we have

$a^2\left(100-a^2\right)$ = 144 × 16

= 2304

or a^4-100a^2+2304 = 0

or $\left(a^2-64\right)\ \left(a^2-36\right)$ = 0

∴ Either a^2 = 64 i.e. a = ± 8

or a^2 = 36 i.e. a = ± 6

∴ Required base = 8 cm or 6 cm

14. The perimeter of a triangle is 450m and its sides are in the ratio of 13:12:5. Find the area of the triangle.

Ans. Let the sides of the triangle be 13x, 12x and 5x

Perimeter of a triangle = 450 m

∴ 13x + 12x + 5x = 450 m

or 30x = 450

∴ x = 15

∴ The sides are 13 × 15, 12 × 15, and 5 × 15

I.e. 195 m, 180 m and 75 m

$\therefore S = \frac{a+b+c}{2} = \frac{450}{2} = 225$ m

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

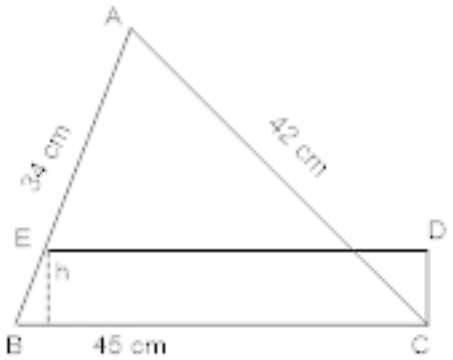
= $\sqrt{225\ (225-195)\ (225-180)\ (225-75)}$ sq m

= $\sqrt{225\times30\times45\times150}$ sq m

= $(15\times15\times2\times3\times5)$ sq m

= 6750 sq m.

15. The sides of a triangle are 39cm, 42cm and 45cm. A parallelogram stands on the greatest side of the triangle and has the same area as that of the triangle. Find the height of the parallelogram.



Ans. To find the area of ΔABC

$S = \frac{45+42+39}{2}$ cm

= 63 cm

$\therefore$ Area of ΔABC = $\sqrt{63\ (63-45)\ (63-42)\ (63-39)}$ sq cm

= $\sqrt{63\times18\times21\times24}$ sq cm

= $9 \times 7 \times 2 \times 3 \times 2$ sq cm

= 756 sq cm

Let h be the height of the parallelogram

Now,

Area of parallelogram BCDE = Area of $\triangle$ABC

$\therefore$ h $\times$ BC = 756

or 45h = 756

h = $\frac{756}{45}$

h = 16.8 cm

Hence, height of the parallelogram = 16.8 cm

16. The students of a school staged a rally for cleanliness campaign. They walked through the lanes in two groups. One group walked through the lanes AB, BC and CA whiles the other group through the lanes AC, CD and DA [fig1.1]. Then they cleaned the area enclosed within their lanes. If AB=9m, BC=40m, CD=15m, DA=28m and $\angle B$ =90^o, which group cleaned more area and by how much? Find also the total area cleaned by the students.

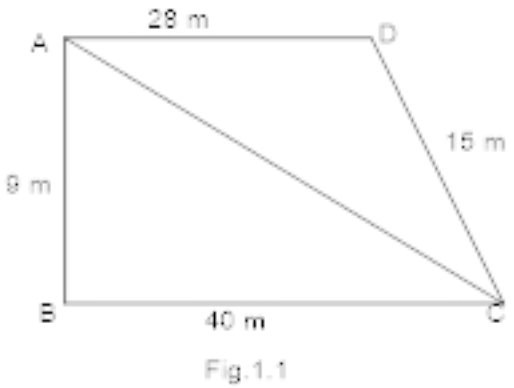


Fig.1.1

Ans. We have, right angle $\triangle$ABC,

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

$AC^2 = 9^2 + 40^2$

$AC^2 = 1681$

$\therefore$ AC = 41

The first group has to clean the area of Δ ABC which is right angled triangle

Now,

Area of Δ ABC = $\frac{1}{2} \times 40 \text{ m} \times 9 \text{ m}$

= 180 sq m

The second group has to clean the area of Δ ACD which has AD=28 m,

DC=15m and AC=41

Hence,

S = $\frac{28+15+41}{2}$

= 42 m

$\therefore$ Area of Δ ACD = $\sqrt{42\,(42-28)\,(42-15)\,(42-41)}$ sq m

= $\sqrt{42 \times 14 \times 27 \times 1}$ sq m

= $\sqrt{7 \times 3 \times 2 \times 7 \times 2 \times 9 \times 3}$ sq m

= 126 sq m

$\therefore$ First group cleaned more = (180 – 126) sq m

= 54 sq m

$\therefore$ Total area cleaned by students = (180 + 126) sq m

= 306 sq m

17. A traffic signal board indicating 'school ahead' is an equilateral triangle with side 'a' find the area of the signal board using heron's. Its perimeter is 180 cm, what will be Its area?

Ans. $S = \frac{a+a+a}{2} \text{ units} = \frac{3a}{2} units$

$\therefore$ Area of triangle= $\sqrt{\frac{3a}{2} \times (\frac{3a}{2} - a)(\frac{3a}{2} - a)(\frac{3a}{2} - a)}$

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

$= \frac{a^2}{4}\sqrt{3} \text{ sq units}$

Now, perimeter = 180 cm

$\therefore \text{each side} = \frac{180}{3} = 60cm$

$\therefore \text{Area of signal board} = \frac{\sqrt{3}}{4} (60)^2 \text{ sq cm}$

$= 900\sqrt{3} \text{ sq cm}$

18. A parallelogram the length of whose sides are 80m, and 40m has one diagonal 75m long. Find the area of the parallelogram?

Ans. $AB = DC = 80cm$

$BC = AD = 40cm$ and AC = 75 cm

In ΔABC, S= $\frac{80+40+75}{2}$ =97.5 cm

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

= $\sqrt{97.5(97.5-80)(97.5-40)(97.5-75)}$ sq m

$=\sqrt{97.5\times17.5\times57.5\times22.5}$ sq m

$=\sqrt{2207460.94}$

=1485.75 sq m

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

$=2\times1485.7$

=2971.4 sq m

19. The side of a triangular field is 52m, 56m, and 60m find the cost of leveling the field Rs 18 per meter, if a space of 4cm is to be left for entry gate.

Ans. Side of the field are 52m, 56m and 60m.

$\therefore$ S= $\frac{52+56+60}{2}$ =84m

$\therefore$ Area of field = $\sqrt{84(84-52)(84-56)(84-60)}$ Sq m

$=\sqrt{(7\times12)(2\times16(4\times7)(12\times2)}$ sq m

$=\sqrt{7\times7\times12\times12\times2\times2\times4\times16}$ sq m

=1344 sq m

$\therefore$ Total cost of levelling the field $=$ Rs18×1344

=Rs 24192

20. A floral design of a floor is made up of 16 tiles which are triangular. The side of the triangle being 9 cm, 28 cm, and 35 cm. find the cost of polishing the tiles, at RS 50 paisa/sq cm.

Ans. For each triangular tile, we have

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

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

$$=\sqrt{36(36-35)(36-28)(36-9)}\ \text{sq cm}$$

$$=36\sqrt{6}\ \text{sq cm}$$

$$\therefore\ \text{Area of 16 tile}=16\times 36\sqrt{6}\ \text{sq cm}$$

$$\therefore\ \text{cost of polishing}=\text{Rs}\left[\frac{1}{2}\times 16\times 36\sqrt{6}\right]=\text{Rs}\ 288\sqrt{6}$$

$$=\text{Rs}(288\times 2.45)=\text{Rs}\ 705.60$$

21. The measure of one side of a right triangle is 42m. If the difference in lengths of Its hypotenuse and other side is 14 cm, find the measure of two unknown side?

Ans. Let AB = y and AC = x and BC = 42 cm

$\therefore$ By the given condition,

x - y = 14 (i)

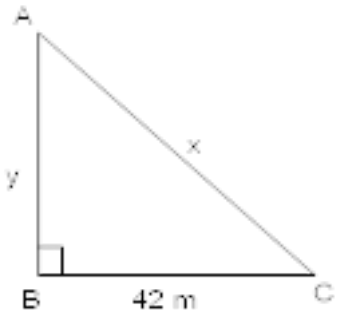
By Pythagoras theorem,

$$x^2-y^2=1764$$

(x + y) (x – y) = 1764

$\therefore$ 14 (x + y) = 1764 using (ii)

$$\therefore x + y = \frac{1764}{14} = 126 \quad \text{(iii)}$$



Adding (ii) and (iii), we get

2x = 140

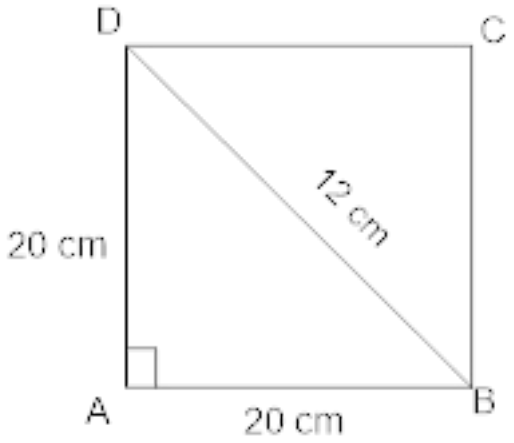
i.e. x = 70

$\therefore$ y = 126-x

y = 126 – 70

= 56

22. The perimeter of a rhombus ABCD is 80 cm. find the area of rhombus if Its diagonal BD measures 12 cm.



Ans. $\therefore$ AB = BC = CD = DA = $\frac{80}{4} = 20$ cm

Now in ΔABD,

$\therefore$S = $\frac{20+20+12}{2}$ =26

so,

Area of ΔABD = $\sqrt{26\times6\times6\times14}$ sq cm

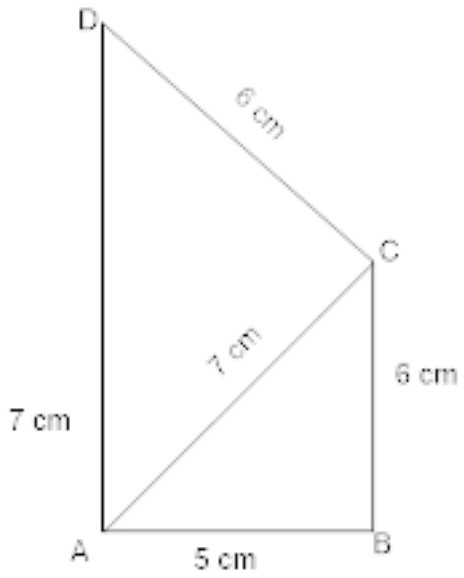
= 114.4 sq cm

Area of rhombus = $2\times area\ of\ \Delta ABD$

= 2 $\times$ 114.4 sq cm

= 228.8 sq cm

23. Find area of quadrilateral ABCD in which AB= 5 cm, BC= 6 cm, CD 6 cm, DA =7cm, And AC=7 cm.



Ans. Area of quadrilateral ABCD = Area of Δ ABC + Area of ΔACD (i)

In ΔABC,

S = $\frac{5+6+7}{2}$ = 9 cm

$\therefore$ Area of ΔABC = $\sqrt{9\ (9-5)(9-6)(9-7)}$ sq cm

= $\sqrt{9\times4\times3\times2}$ sq cm

= $6\sqrt{6}$ sq cm =14.4 sq cm

In ΔACD,

S = $\frac{7+7+6}{2}$ = 10 cm

$\therefore$ Area of ΔACD = $\sqrt{10\ (10-7)(10-7)(10-6)}$ sq cm

= $\sqrt{10\times3\times3\times4}$ sq cm

= 18.9 sq cm

Area of quadrilateral ABCD = (14.4 + 18.9) sq cm

= 33.3 sq cm.

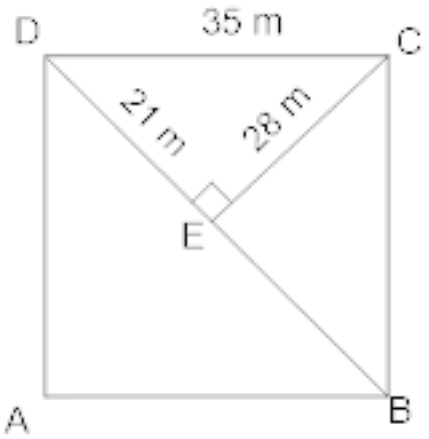
24. Shashi Kant has a vegetable garden in the shape of a rhombus. The length of each side of garden is 35 m And Its diagonal is 42 m long. After growing the vegetables in it. He wants to divide it in seven equal parts And look after each part once a week. Find the area of the garden which he has to look after daily.

Ans. Let ABCD be garden

$\therefore$ DC = 35 m . . . . . (Given)

DB = 42 m . . . . . (Given)

Draw CE $\perp$ DB



We know that the diagonals of a rhombus bisect each other at right angles.

$\therefore$ DE = $\frac{1}{2}$ DB = $\frac{1}{2} \times 42$ or 21 m

Now

$CE^2 = CD^2 - DE^2$

$= 35^2 - 21^2$

= 784

CE = 28 m

Now area of ΔDBC, = $\frac{1}{2} \times DB \times CE$

= $\frac{1}{2} \times 42 \times 28$

= 588 sq m

$\therefore$ Area of the garden ABCD = 2×588 sq m

= 1176 sq m

Area of the garden he has to look after, daily

$= \frac{1176}{7}$ sq m

= 168 sq m

25. The perimeter of a triangle is 480 meters and its sides are in the ratio of 1:2:3. Find the area of triangle?

Ans. Let the sides of the triangle be x, 2x, 3x

Perimeter of the triangle = 480 m

$\therefore$ x + 2x + 3x = 480 m

6x = 480 m

x = 80 m

$\therefore$ The sides are 80 m, 160 m, 240 m

So,

$$S = \frac{80+160+240}{2} = \frac{480}{2}$$
$$= 240 \text{ m}$$

And,

$$\therefore \quad \text{Area of triangle} = \sqrt{s\,(s-a)\,(s-b)\,(s-c)} \text{ sq m}$$

$$= \sqrt{240\,(240-80)\,(240-160)\,(240-240)} \text{ sq m}$$

= 0 sq m

$\therefore$ Triangle doesn't exist with the ratio 1:2:3 whose perimeter is 480 m.

26. Find the cost of leveling the ground in the form of equilateral triangle whose side is 12 m at Rs 5 per square meter.

Ans. Here, sides are 12 m, 12 m, 12 m,

$$\therefore S = \frac{12+12+12}{2}$$

= 18 cm

And,

$\therefore$ Area of equilateral triangle = $\sqrt{s\,(s-a)\,(s-b)\,(s-c)}$ sq m

$= \sqrt{18\,(18-12)\,(18-12)\,(18-12)}$ sq m

$= \sqrt{18\times6\times6\times6}$ sq m

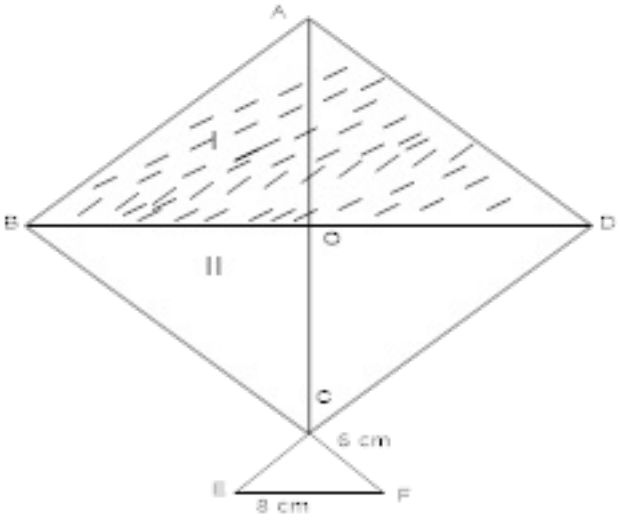
$= \sqrt{6\times3\times6\times6\times6}$ sq m

$= 36\sqrt{3}$ sq m

$\therefore$ Cost of leveling ground = $Rs\,(5\times36\times1.73)$

= Rs 311.4 m

27. A kite in the shape of a square with diagonal 32 cm and an isosceles triangle of base 8 cm and side 6 cm each is to be made of three different shades. How much paper of each shade has been used in it? (use $\sqrt{5}$ = 2.24)



Ans. Let ABCD be the square and ΔCEF be an isosceles triangle.

Let the diagonals bisect each other at O.

Then,

AO = $\frac{1}{2} \times 32$ cm

= 16 cm

Area of shaded portion I = $\frac{1}{2} \times 16 \times 32 \ sq \ cm$

= 256 sq cm

And,

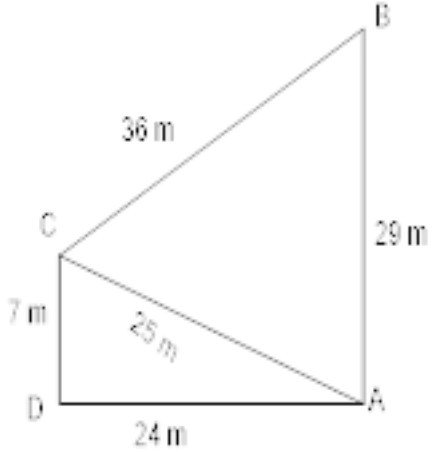
Area of portion III = $\frac{a}{4}\sqrt{4b^2 - a^2}$

$= \frac{8}{4}\sqrt{4 \times (6)^2 - 8}$

$= 17.92$ sq cm

Thus, the papers of three shades required are 256 sq cm, 256 sq cm and 17.92 sq cm.

28. The sides of a quadrangular field, taken in order are 29 m, 36 m, 7m and 24 m respectively. The angle contained by the last two sides is a right angle. Find its area.



Ans. In $\triangle$ADC, which are right angles?

$\therefore \ AC^2 = AD^2 + DC^2$

$= (24)^2 + (7)^2$

$= 576+49=625$

$= \therefore AC = \sqrt{625} = 25$

Area of quad ABCD =Area of ΔADC+ Area of ΔABC $\rightarrow$ (I)

Area of ΔADC= $\frac{1}{2}$ AD $\times$CD $= \frac{1}{2} \times 24 \times 7$ *sq m*

= 84 sq m $\rightarrow$ (II)

For ΔABC,

$\therefore S = \frac{36+25+29}{2} M = 45M$

$\therefore$ Area of $\Delta ABC, = \sqrt{45(45-36)(45-25)(45-29)}$

$= 360$ sq m $\rightarrow$ (III)

From (I), (II) and (III) we get area of quadrilateral ABCD = (84+360) sq m = 444 sq m

29. Find the area of a triangle whose perimeter is 180 cm and two of its sides are 80 cm and 18 cm. hence calculate the altitude of the triangle taking the longest side as base.

Ans. Let a= 80 cm and b=18 cm, perimeter = 180 cm

$\therefore 180 = a+b+c = 80+18+c$

c = 82cm

Now, $S = \frac{180}{2} = 90$ cm

$\therefore$ Area of triangle $= \sqrt{90(90-80)(90-18)(90-82)}$

$= \sqrt{90 \times 10 \times 72 \times 8}$ sq cm

= 720 sq cm

The longest side of triangle is 82 cm

Let h cm be length of altitude corresponding to longest side.

CBSE Class 9 Mathemaics

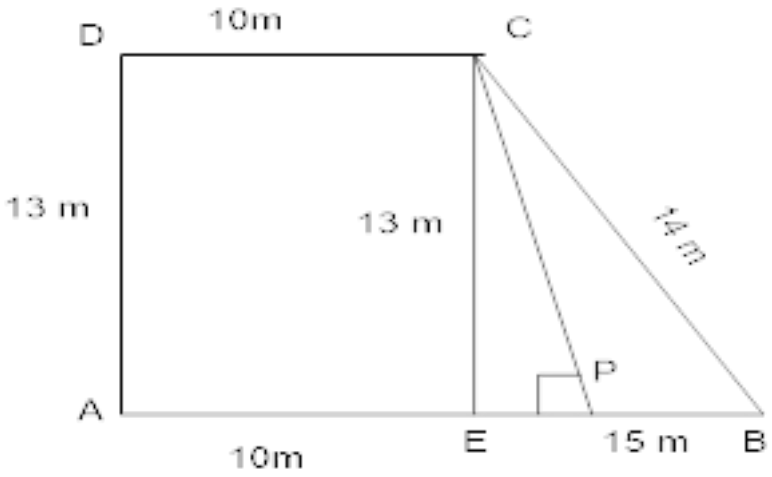
Important Questions

Chapter 12

Herons Formula

4 Marks Quetions

1. A field in the shape of a trapezium whose parallel side are 25m and 10m. The non-parallel side are 14 m and 13 m. Find the area of the field.



Ans. AB=25m, CD =10m

AD=13m and BC=14

Draw EC $\parallel$ AD and CP $\perp$ EB

Now CE =AD=13m and

EB=AB-AE= (25-10) m= 15m

In ΔBCE, a=15m, b=14m and C=13 m

$$\therefore S = \frac{a+b+c}{2} = \frac{15+14+13}{2}$$

=21 m

$\therefore$ area of $\Delta BCE = \sqrt{21(21-15)(21-14)(21-13)}$

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

=84 sq m ....(i)

Also area of $\Delta BCE = \frac{1}{2} \times BE \times CP$

$CP = \frac{2 area \text{ of } \Delta BCE}{BE} = \frac{2 \times 84}{15}$ m $= \frac{56}{5}$ m [using (i)]

Now, area of parallelogram $AECD = Base \times height$

$= 10 \times \frac{56}{5}$ m $= 112$ sq m ....(ii)

Thus area of trapezium ABCD = area of parallelogram + area of ΔBCE

=112 sq m +84 sq m [using (i) and (ii)]

=196 sq m

2. The perimeter of a right triangle is 24 cm. If its hypotenuse is 10 cm, find the other two sides. Find its area by using the formula area of a right triangle. Verify your result by using Heron's formula.

Ans. Let x and y be the two lines of the right $\angle$.

$\therefore$ AB = x cm, BC = y cm and AC = 10 cm

$\therefore$ By the given condition,

Perimeter = 24 cm

Or x + y = 14 (1)

By Pythagoras theorem,

$x^2 + y^2 = (10)^2$

= 100 (2)

From (1), $(x+y)^2 = (14)^2$

Or $x^2 + y^2 + 2xy = 196$

$\therefore$ 100 + 2xy =196 from (2)

xy = $\frac{96}{2}$

= 48 sq cm (3)

Area of ΔABC = $\frac{1}{2}xy$ sq cm

= $\frac{1}{2} \times 48$ sq cm

=24 sq cm (4)

again,

$(x-y)^2 = (x+y)^2 - 4xy$

$= (14)^2 - 4 \times 48$

Or x-y = ± 2

(i) When, x-y = 2 and x+y = 14, then 2x = 16

or x = 8, y = 6

(ii) When, X – y = -2 and x + y = 14, then 2x = 12

Or x = 6, y = 8

Verification by using Heron's formula:

Sides are 6 cm, 8 cm and 10 cm

S = $\frac{24}{2}$ = 12 cm

Area of ΔABC = $\sqrt{12\,(12-6)\,(12-8)\,(12-10)}$ sq cm

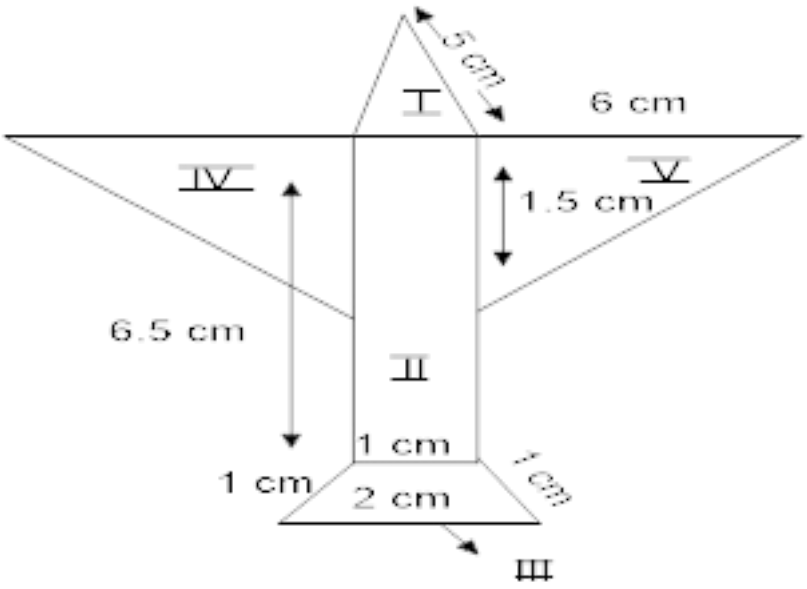
= $\sqrt{12\times6\times4\times2}$ sq cm

= 24 sq cm

Which is same as found in (4)

Thus, the result is verified.

3. Radha made a picture of an aero plane with colored paper as shown in fig. find the total area of the paper used.



Ans. Area (1) = area of isosceles triangle with a =1 cm and b = 5 cm

$=\frac{a}{4}\sqrt{4b^2-a^2}$

$= \frac{1}{4}\sqrt{100-1} = \frac{\sqrt{99}}{4}$ sq cm (approx)

Area (ii) = area of rectangle with

L = 6.5 cm and b=1 cm

$= 6.5 \times 1$ sq cm $= 6.5$ sq cm

Area (iii) = Area of trapezium

$= 3 \times$ Area of equilateral Δ with side $= 1$ cm

$= 3 \times \frac{\sqrt{3}}{4} \times (1)^2$ sq cm

$= \frac{3 \times 1.732}{4}$ or $\frac{5.196}{4}$ sq cm

= 1.3 sq cm (approx.)

Area of (IV + V) = $2 \times \frac{1}{2} \times 6 \times 1.5\ sq\ cm = 9$sq cm

$\therefore$ total area of the paper used = Area (I+II+III+IV+V)

= (2.5+6.5+1.3+9) sq cm

=19.3 sq cm