

Exercise 12.1

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Question 1: Find the area of a triangle whose sides are respectively 150 cm, 120 cm and 200 cm.

Solution:

We know, 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

Here, a = 150 cm

b = 120 cm

c = 200 cm

Step 1: Find s

$$s = (a+b+c)/2$$

$$s = (150+200+120)/2$$

$$s = 235 \text{ cm}$$

Step 2: Find Area of a triangle

$$\text{Area} = \sqrt{235 \times (235 - 150) \times (235 - 120) \times (235 - 200)}$$

$$= \sqrt{235 \times (85) \times (115) \times (35)}$$

$$= \sqrt{80399375}$$

$$= 8966.56$$

Area of triangle is 8966.56 sq.cm.

Question 2: Find the area of a triangle whose sides are respectively 9 cm, 12 cm and 15 cm.

Solution:

We know, 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

Here, a = 9 cm

b = 12 cm

c = 15 cm

Step 1: Find s

$$s = (a+b+c)/2$$

$$s = (9 + 12 + 15)/2$$

$$s = 18 \text{ cm}$$

Step 2: Find Area of a triangle

$$\text{Area} = \sqrt{(18(18-9)(18-12)(18-15))}$$

$$= \sqrt{18 \times 9 \times 6 \times 3}$$

$$= \sqrt{2916}$$

$$= 54$$

Area of triangle is 54 sq.cm.

Question 3: Find the area of a triangle two sides of which are 18 cm and 10 cm and the perimeter is 42 cm.

Solution:

Given:

$a = 18$ cm, $b = 10$ cm, and perimeter = 42 cm

Let c be the third side of the triangle.

Step 1: Find third side of the triangle, that is c

We know, perimeter = $2s$,

$$2s = 42$$

$$s = 21$$

$$\text{Again, } s = (a+b+c)/2$$

Put the value of s , we get

$$21 = (18+10+c)/2$$

$$42 = 28 + c$$

$$c = 14 \text{ cm}$$

Step 2: Find area of triangle

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

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

$$= \sqrt{21 \times 3 \times 11 \times 7}$$

$$= \sqrt{4851}$$

$$= 21\sqrt{11}$$

$$\text{Area} = 21\sqrt{11} \text{ square cm.}$$

Question 4: In a triangle ABC, AB = 15cm, BC = 13cm and AC = 14cm. Find the area of triangle ABC and hence its altitude on AC.

Solution:

Let the sides of the given triangle be AB = a, BC = b, AC = c respectively.

Here, a = 15 cm

b = 13 cm

c = 14 cm

From 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

$$s = (15+13+14)/2 = 21$$

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

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

$$= \sqrt{7056}$$

$$= 84$$

$$\text{Area} = 84 \text{ cm}^2$$

Let, BE is a perpendicular on AC

Now, area of triangle = $\frac{1}{2}$ x Base x Height

$$\frac{1}{2} \times BE \times AC = 84$$

$$BE = 12 \text{ cm}$$

Hence, altitude is 12 cm.

Question 5: The perimeter of a triangular field is 540 m and its sides are in the ratio 25:17:12. Find the area of the triangle.

Solution:

Let the sides of a given triangle be $a = 25x$, $b = 17x$, $c = 12x$ respectively,

Given, Perimeter of triangle = 540 cm

$$2s = a + b + c$$

$$a + b + c = 540 \text{ cm}$$

$$25x + 17x + 12x = 540 \text{ cm}$$

$$54x = 540 \text{ cm}$$

$$x = 10 \text{ cm}$$

So, the sides of a triangle are

$$a = 250 \text{ cm}$$

$$b = 170 \text{ cm}$$

$$c = 120 \text{ cm}$$

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

$$= 540/2$$

$$= 270$$

$$s = 270 \text{ cm}$$

From Heron's Formula;

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

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

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

$$= \sqrt{81000000}$$

$$= 9000$$

Hence, the area of the triangle is 9000 cm².