SHIKSHA CLASSES

Sub. : Maths
Std. IX (CBSE)

Answer Paper

10 : Heron's Formula

Total Marks : 30

Section I (Each 1 Marks)

Multiple choice Questions (MCQs)

Q.1 : Heron's formula is :

Ans : d) $\Delta = \sqrt{s(s-a)(s-b)(s-c)}, 2s = a+b+c$.

Q.2 : The angles of a triangle are in the ratio 3 : 5 : 7, the triangle is :

Ans : a) An acute angled triangle

Q.3 : The length of each side of an equilateral triangle having an area of $9\sqrt{3}$ cm² is.

Ans : d) 6cm

Q.4 : If each side of a scalene $\triangle$ is doubled then area would be increased by

Ans : a) 300%

Q.5 : An isosceles right triangle has area 9cm². The length of its hypotenuse is.

Ans : d) 6cm

Q.6 : Area of a triangle is equal to:

Ans : c) ½(Base x Height)

Q.7 : The area of an equilateral triangle having side length equal to $\sqrt{3}/4$ cm (using Heron's formula) is:

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

Q.8 : The base of a right triangle is 8 cm and the hypotenuse is 10 cm. Its area will be

Ans : a) 24 cm²

Q.9 : If the area of an equilateral triangle is $16\sqrt{3}\ \text{cm}^2$, then the perimeter of the triangle is

Ans : b) 24 cm

For question number 10 to 11 two statement are given one labeled Assertion and other labeled Reason select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below

Q.10 : Assertion: the area of an equilateral triangle having each side 4 cm is $4\sqrt{3}\ \text{cm}^2$

Reason: Area of an equilateral triangle $= (\sqrt{3}/4) \times a^2$

Ans : a) both Assertion and reason are correct and reason is correct explanation for Assertion

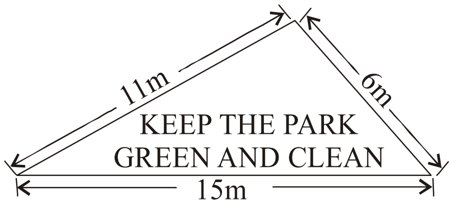
Q.11 : Assertion: The right angled triangle if hypotenus is $5\sqrt{2}$ cm then other two side equal to 5 cm each

Reason: in right angled triangle base² + perpendicular² = hypotenus²

Ans : a) both Assertion and reason are correct and reason is correct explanation for Assertion

Section B (Each 2 Marks)

Q.12 : There is a slide in a park. One of its side walls has been painted in some colour with a message "KEEP THE PARK GREEN AND CLEAN". If the sides of the wall are 15m, 11m and 6m. Find the area painted in colour. (see figure)



Ans : The side of the slides are 15 m, 11 m and 6 m

$$S = \frac{a+b+c}{2} = \frac{15+11+6}{2} = 16\text{m}$$

Area of triangle slide

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

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

$$= \sqrt{16 \times 1 \times 5 \times 10}$$

$$= \sqrt{800} = 20\sqrt{2}\text{m}^2$$

Q.13 : The edges of a triangular board are 6 cm, 8 cm and 10 cm. Find the cost of painting it at ₹ 0.09 per cm².

Ans : Let $a = 6$ cm, $b = 8$ cm and $c = 10$ cm

$$s = \frac{6+8+10}{2}$$

$$s = \frac{24}{2} = 12\text{cm}$$

Area of triangle

$$= \sqrt{12(12-6)(12-8)(12-10)}$$

$$= \sqrt{12 \times 6 \times 4 \times 2}$$

$$= \sqrt{4 \times 3 \times 3 \times 2 \times 4 \times 2}$$

$$= 4 \times 3 \times 2$$

$\therefore$ Area of = $= 24 \text{ cm}^2$

cost of paintaing trianglular board

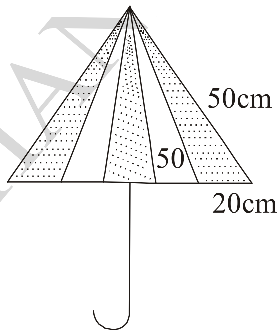
$$= 24 \times 0.09$$

$$= ₹\ 2.16$$

$\therefore$ cost of painting is 2 rupees and 16 paise.

OR

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



Ans : The sides of a trianglular piece are 20 cm, 50 cm and 50 cm.

$$\therefore \quad S = \frac{a+b+c}{2} = \frac{20+50+50}{2} = 60 \text{ cm}$$

Area of one triangular piece =

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

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

$$= \sqrt{60 \times 40 \times 10 \times 10}$$

$$= 200\sqrt{6} \text{ cm}^2$$

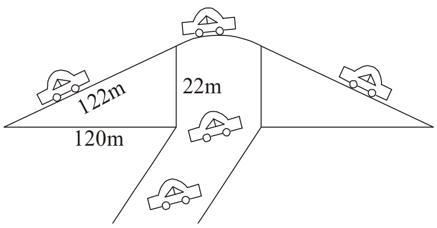
$\therefore$ Area of cloth of each colour for five triangular pieces

$$= 5 \times 200\sqrt{6} = 1000\sqrt{6} \text{ cm}^2$$

Section C (Each 3 marks)

Q.14 : The triangular side-wall of a flyover have been used for advertisements. The sides of the walls are 122m, 22m

and 120m (see figure). The advertisements yield an earning of ₹ 5000 per m² per year. A company hired one of its walls for 3 months, how much rent did it pay?



Ans : The sides of the triangular wall are

a = 122 m, b = 22 m, c = 120 m

$$\therefore \quad S = \frac{a+b+c}{2} = \frac{122+22+120}{2}$$

$$= \frac{264}{2} = 132\text{m}$$

Area of triangular wall

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

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

$$= \sqrt{132 \times 10 \times 110 \times 12}$$

= 10 × 11 × 12 = 1320 m²

Cost of hiring the walls for three months.

= Area × Rate × time

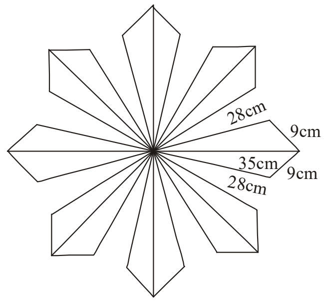
$$= 1320 \times 5000 \times \frac{1}{4}$$

= ₹1650000

(3 months = $\frac{1}{4}$ years)

OR

A floral design on a floor is made up of 16 tiles which are triangular, the sides of the triangle being 9cm, 28cm, and 35cm (see in figure) find the cost of polishing the tiles at the rate of 50 P per cm².



Ans : Here, the sides of one tile are 28 cm, 35 cm and 9 cm.

$\therefore$ Perimeter of triangular tile = 28 + 35 + 9

= 72

$$\Rightarrow \text{S(semi perimeter)} = \frac{72}{2} = 36\text{cm}$$

Area of one tile = $\sqrt{36(36-28)(36-35)(36-9)}$

$= \sqrt{36 \times 8 \times 1 \times 27} = \sqrt{7776}$

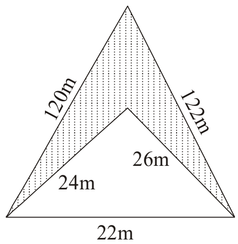
= 88.2 cm²

Area of 16 tiles = 16 × 88.2 = 1411.2 cm²

Cost of polishing = ₹$\frac{1}{2}$ × 1411.2

= ₹ 705.60

Q.15 : Calculate the area of the shaded region in the given figure.



Ans : For the triangle having the sides 122 m, 120 m and 22 m.

$$S = \frac{122+120+22}{2} = 132$$

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

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

$$= \sqrt{132 \times 10 \times 12 \times 110}$$

= 1320 m²

For the triangle having the sides 22 m, 24 m and 26 m.

$$\therefore S = \frac{22+24+26}{2} = 36$$

Area of the shaded region

$$= \sqrt{36(36-22)(36-24)(36-26)}$$

$$= \sqrt{36 \times 14 \times 12 \times 10}$$

$$= 24\sqrt{105}$$

$= 24 \times 10.25\ m^2$

$= 246\ m^2$

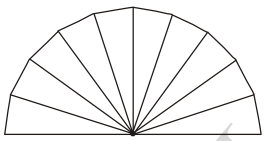
Therefore, the area of the shaded region

$= 1320 - 246$

$= 1074\ m^2$

Section - D

Q.16 : A hand fan is made by stitching 10 equal size triangular strips of two different types of paper as shown in fig. The dimensiens of equal strips one 25 cm, 25 cm and 14 cm. Find the area of each type of paper needed to make the hand fan.



Ans : For one triangular strip :

a = 25 cm, b = 25 cm, c = 14 cm

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

$$= \frac{25+25+14}{2}$$

$$s = \frac{64}{2} = 32 \text{ cm}$$

$\therefore$ Area of 1 triangular strip

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

$$= \sqrt{32(32-25)(32-25)(32-14)}$$

$$= \sqrt{32 \times 7 \times 7 \times 18}$$

$$= 7\sqrt{32 \times 18}$$

$$= 7\sqrt{16 \times 2 \times 2 \times 9}$$

$$= 7 \times 4 \times 2 \times 3$$

$$= 168 \text{ cm}^2$$

$\therefore$ Area of 1 triangular strip $= 168 \text{ cm}^2$

$\therefore$ Area of 5 triangular strip $= 168 \times 5$

$\therefore$ Area of 5 first typs of strips

$= 840 \text{ cm}^2$ & 5 second type of strips

$= 840 \text{ cm}^2$.

OR

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

Ans : Let a, b, c be the sides of the triangle and s be semi perimeter

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

or $2s = a + b + c$ ..... (i)

Area of the triangle

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

According to the statement, the sides of the new triangle will be 2a, 2b and 2c let s' be the semi perimeter of the new triangle

$s' = \frac{2a+2b+2c}{2} = a+b+c$ ..... (iii)

From (i) and (iii)

$s' = 2s$

Area of the new triangle

$$= \sqrt{s'(s'-2a)(s'-2b)(s'-2c)}$$

$$= \sqrt{2s(2s-2a)(2s-2b)(2s-2c)}$$

$$= \sqrt{16s(s-a)(s-b)(s-c)}$$

$$= 4\sqrt{s(s-a)(s-b)(s-c)} \qquad \text{..... (iv)}$$

Therefore, the required ratio,

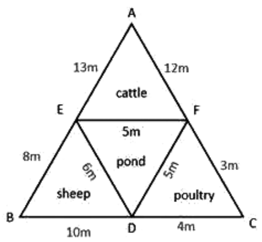
$$= \frac{4\sqrt{s(s-a)(s-b)(s-c)}}{\sqrt{s(s-a)(s-b)(s-c)}}$$

$$= \frac{4}{1} = 4:1$$

SECTION - E

Q.17 : Case Study : (Any Four) **4**

A farmer has a triangular plot of land with a pond at the centre, which he uses to rear his cattle, sheep and poultry, as shown below.



Now using the given information answer the following.

i) Find the area of field used for cattle rearing.

Ans : a) $30m^2$

ii) Find the area of field used to raise sheep.

Ans : b) $24m^2$

iii) Find the area of field used to raise poultry.

Ans : d) $6m^2$

iv) Find the area of pond.

Ans : c) $12m^2$

v) Find the cost of cleaning the pond at the rate of Rs.250 per m^2.

Ans : c) Rs.3000

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