CBSE Test Paper 03 CH-12 Herons Formula

- 1. The product of difference of semi-perimeter and respective sides of riangle ABC are given as 13200 m^3 . The area of riangle ABC, if its semi-perimeter is 132 m, is given by
 - a. 1320 m^2
 - b. $13200 \ m^2$
 - c. $132 \ m^2$
 - d. $20\sqrt{33}~m^2$
- 2. The area of an isosceles triangle having base 2 cm and the length of one of the equal sides 4 cm, is
 - a. $4\sqrt{15}~cm^2$
 - b. $\sqrt{15}~cm^2$
 - c. $2\sqrt{15}~cm^2$
 - d. $\sqrt{rac{15}{2}} \ cm^2$
- 3. The diagonal of a rhombus are 24 cm and 10 cm. Then its perimeter is
 - a. 40 cm
 - b. 52 cm
 - c. 26 cm
 - d. 68 cm
- 4. Each of the equal sides of an isosceles triangle is 2 cm greater than its height. If the base of the triangle is 12 cm, then its area is
 - a. 48 *cm*²

- b. 36 cm^2
- c. 40 *cm*²
- d. 24 cm^2
- 5. The base of a right triangle is 8 cm and hypotenuse is 10 cm. Its area will be
 - a. 48 cm^2
 - b. 80 cm^2
 - c. 40 cm^2
 - d. 24 cm^2
- 6. Fill in the blanks:

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

7. Fill in the blanks:

The total space inside the boundary of the triangle is called the ______ of the triangle.

- Find the area of a right triangle in which the sides containing the right angle measure 20 cm and 15 cm.
- 9. Find the area of the triangle having perimeter 32 cm, one side 11 cm and difference of other two sides is 5 cm
- 10. Using Heron's formula, find the area of an equilateral triangle the length of whose one side is a.
- 11. A hand fan is made by stitching 10 equal size triangular strips of two different types of paper as shown in a given figure. The dimensions of equal strips are 25 cm, 25 cm and 14 cm. Find the area of each type of paper needed to make the hand fan.



- 12. Find the area of an isosceles triangle, whose equal sides are of length 15 cm each and third side is 12 cm.
- 13. The perimeter of a rhombus is 146 cm. One of its diagonals is 55 cm. Find the length of the other diagonal and area of the rhombus.
- 14. 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.
- 15. How much paper of each shade is needed to make a kite given in Figure, in which ABCD is a square with diagonal 44 cm?



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Solution

1. (a) 1320 m^2

Explanation:

Given: (s - a) (s - b) (s - c) = 13200 m and s = 132 m Area of triangle = $\sqrt{s(s - a) (s - b) (s - c)}$ = $\sqrt{13200 \times 132}$ = 1320 sq. m 2. (b) $\sqrt{15} \ cm^2$ Explanation: s = $\frac{4+4+2}{2}$ = 5 cm Area of triangle = $\sqrt{s(s - a) (s - b) (s - c)}$ = $\sqrt{5(5 - 4) (5 - 4) (5 - 2)}$ = $\sqrt{5 \times 1 \times 1 \times 3}$ = $\sqrt{15}$ sq. cm

3. (b) 52 cm

Explanation: Since diagonals of a rhombus bisect each other at right angle.

$$D = \frac{24}{2} = 12 \text{ cm and } OC = \frac{10}{2} = 5 \text{ cm}$$

In triangle OBC,
$$BC = \sqrt{12^2 + 5^2} = \sqrt{144 + 25} = 13 \text{ cm}$$

Perimeter of rhombus = 4 × side = 4 × 13 = 52 cm

4. (a) 48 cm^2

Explanation: Let the height of the isosceles triangle be x cm

Then length of equal side = (x + 2) cm

Since altitude of isosceles triangle bisects the base. Then in a right angled triangle,

$$(x+2)^2 = x^2 + 6^2$$

 $\Rightarrow 4 + 4x = 36$
 $\Rightarrow x = 8 \text{ cm}$

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

$$=\frac{1}{2} \ge 12 \ge 8 = 48$$
 sq.cm

5. (d) 24 cm^2

Explanation:

Perpendicular = $\sqrt{10^2-8^2}=\sqrt{100-64}=\sqrt{36}$ = 6 cm

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

- $=\frac{1}{2} \ge 8 \ge 6$
- = 24 sq cm
- 6. 10 cm
- 7. area



 $= \frac{1}{2} \times 20 \times 15 \text{ cm}^2$ $= 150 \text{ cm}^2$

9. Let the sides of the triangle are 11, x, y cm.

Now perimeter = 32

$$\therefore x + y + 11 = 32$$

$$\Rightarrow x + y = 21 \dots (i)$$
Also $x - y = 5 \dots (ii)$
Solving (i) and (ii), we get

$$\Rightarrow x = 13 \text{ and } y = 8$$
Now, 2s = 32
Thus, s = 16 cm
Using Heron's formula,
Area of triangle = $\sqrt{s(s - 11)(s - x)(s - y)}$
= $\sqrt{16(16 - 11)(16 - 13)(16 - 8)} = 8\sqrt{30} \text{ cm}^2$

10. 'a' = a, 'b' = a, 'c' = a

$$\therefore s = \frac{'a'+b'+'c'}{2}$$

$$s = \frac{a+a+a}{2} = \frac{3a}{2}$$

$$\therefore$$
 Area of the equilateral triangle

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

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

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

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

11. Let a, b and c are the sides of triangular strips and s is the semi-perimeter. $\Rightarrow s = \frac{1}{2} (a + b + c) = \frac{1}{2} (25 + 25 + 14) = 32 \text{ cm}$ $\therefore \text{ Area of one triangular strip} = \sqrt{s(s-a)(s-b)(s-c)}$ $= \sqrt{32(32-25)(32-25)(32-14)}$

$$= \sqrt{32 \times 7 \times 7 \times 18}$$
$$= 168 \text{ cm}^2$$

Now there are 5 strips of each paper.

- . Total area of 5 Nos of triangular strips of one type = 5 imes 168 = 840 cm²
- 12. Length of equal sides of isosceles triangle = b= 15 cm And the length of remaining side = a = 12 cm Area of isosceles triangle= $= \frac{a}{4}\sqrt{4 \times b^2 - a^2}$ $= \frac{12}{4}\sqrt{4 \times 15^2 - 12^2} = \frac{12}{4}\sqrt{900 - 144}$ $= 3\sqrt{756} = 3 \times 6\sqrt{21} = 18\sqrt{21} \text{ cm}^2$ Therefore area of isosceles triangle is $18\sqrt{21} \text{ cm}^2$.

13. Length of a side of the rhombus = $\frac{146}{4}$ cm = 36.5 cm.



For $\triangle ABC$

a = 36.5 cm, b = 55 cm, c = 36.5 cm $s = \frac{a+b+c}{2}$ $= \frac{36.5+55+36.5}{2} = \frac{128}{2}$ = 64 cm ∴ Area of $\Delta ABC = \sqrt{S(s-a)(s-b)(s-c)}$ $= \sqrt{64(64-36.5)(64-55)(64-36.5)}$ $= \sqrt{64(27.5)(9)(27.5)}$ = 8 × 27.5 × 3 = 660 cm² ∴ Area of the rhombus ABCD = 2 Area of the $\triangle ABC$ = 2 × 660 = 1320 cm² Area of rhombus ABCD $\Rightarrow \frac{1}{2} d_1d_2 = 1320$ where d_1 , d_2 are the diagonals $\Rightarrow \frac{1}{2} (55)d_2 = 1320$ $\Rightarrow d_2 = \frac{1320 \times 2}{55}$ $\Rightarrow d_2 = 48$ cm. 14. The sides of the triangle field are in the ratio 25:17:12.

Let the sides of triangle be 25x, 17x and 12x. Perimeter of this triangle = 540 m 25x + 17x + 12x = 540 m 54x = 540 m x = 10 m Sides of triangle will be 250 m, 170 m, and 120 m Semi-perimeter (s) = $\frac{Perimeter}{2} = \frac{540}{2} = 270$ m By Heron's formula: Area of triangle = $\sqrt{s(s - a)(s - b)(s - c)}$ = $\sqrt{270(270 - 120)(270 - 170)(270 - 250)}$ = $\sqrt{270 \times 150 \times 100 \times 20}$ = 9000 m²

So, area of the triangle is 9000 m^2 .

15. Each diagonal of square = 44 cm

So, AC = BD = 44 cm

And as diagonal of a square bisect each other at right angles

So,

BO =
$$\frac{1}{2}$$
 BD = $\frac{1}{2} \times 44$ = 22 cm

 \therefore Area of square ABCD = 2(area of riangle ABC)

$$=2\left(rac{1}{2} imes 44 imes 22
ight)=2(44 imes 11)$$

 $= 968 \text{ cm}^2$.

... Paper of Red shade needed to make the kite

$$=rac{1}{4}ig(968{
m cm}^2ig)=242{
m cm}^2$$

Paper of yellow shade needed to make the kite = (242 + 242) = 484 cm².

Let us find the area of a triangle with sides 20 cm, 20 cm and 14 cm which is at the bottom of the square ABCD.

a = 20 cm, b = 20 cm and c = 14 cm

Now, semi-perimeter

$$s = rac{a+b+c}{2} = rac{20+20+14}{2} = rac{54}{2} = 27 ext{cm}$$

Area of $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$ [Using Heron's Formula]
 $= \sqrt{27(27-20)(27-20)(27-14)}$
 $= \sqrt{27 imes 7 imes 7 imes 13} = 21\sqrt{39}$
 $= 21 imes 6.245 = 131.15 ext{cm}^2$

Paper of Green shade needed to make the kite

= (242 + 131.15) cm² = 373.15 cm².

Hence, paper of Red, yellow and green shade needed to make the kite is 242 cm²,484 cm² and 373.15 cm² respectively.