CBSE Test Paper 03

CH-12 Herons Formula

1. The product of difference of semi-perimeter and respective sides of $\triangle ABC$ are given as 13200 m^3.The area of $\triangle ABC$, 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. $\sqrt{\frac{15}{2}}$ 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:

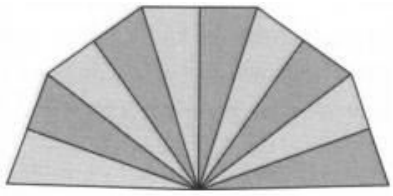
The total space inside the boundary of the triangle is called the_____of the triangle.

8. 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.

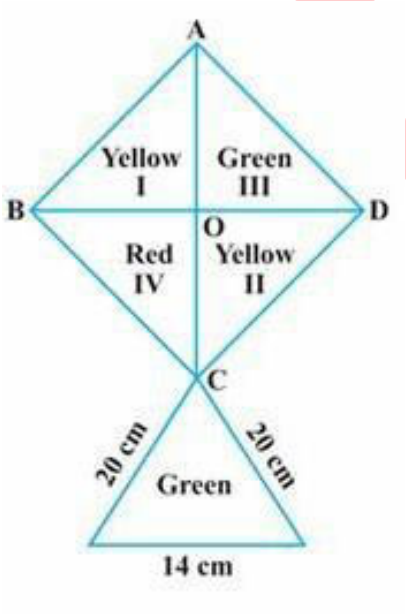


12. Find the area of an isosceles triangle, whose equal sides are of length 15 cm each and third side is 12 cm.

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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CH-12 Herons Formula

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

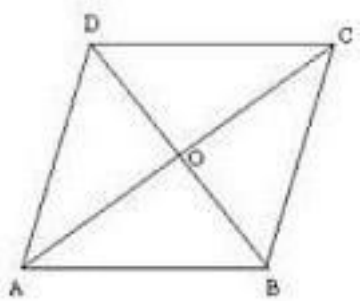
   = $\sqrt{5(5-4)(5-4)(5-2)}$

   = $\sqrt{5 \times 1 \times 1 \times 3}$

   = $\sqrt{15}$ sq. cm

3. (b) 52 cm

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



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

   In triangle OBC,

   BC = $\sqrt{12^2 + 5^2} = \sqrt{144 + 25}$ = 13 cm

   Perimeter of rhombus = 4 $\times$ side = 4 $\times$ 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,

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

$\Rightarrow 4 + 4x = 36$

$\Rightarrow\ x = 8$ cm

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

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

5. (d) 24 cm^2

Explanation:

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

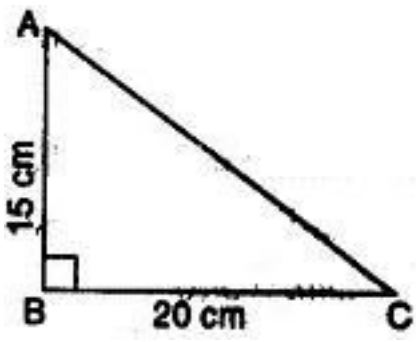
Area of triangle = $\frac{1}{2}$ x Base x Perpendicular

= $\frac{1}{2}$ x 8 x 6

= 24 sq cm

6. 10 cm

7. area

8. 

Area of the right triangle

= $\frac{1}{2}$ $\times$ base $\times$ height

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

$= 150 \text{ cm}^2$

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

Now perimeter = 32

$\therefore$ x + y + 11 = 32

$\Rightarrow$ x + y = 21 ...(i)

Also x - y = 5 ...(ii)

Solving (i) and (ii), we get

$\Rightarrow$ x = 13 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

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

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

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

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

$\therefore$ 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.

$\therefore$ Total area of 5 Nos of triangular strips of one type = 5 $\times$ 168 = 840 cm^2

12. Length of equal sides of isosceles triangle = b= 15 cm

And the length of remaining side = a = 12 cm

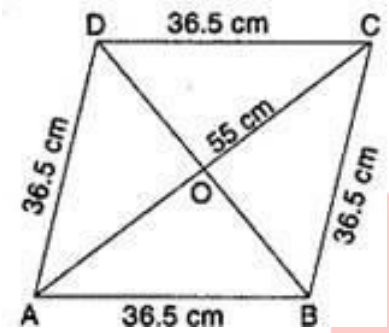
Area of isosceles triangle= $= \frac{a}{4}\sqrt{4 \times b^2 - a^2}$

$= \frac{12}{4}\sqrt{4 \times 15^2 - 12^2} = \frac{12}{4}\sqrt{900 - 144}$

$= 3\sqrt{756} = 3 \times 6\sqrt{21} = 18\sqrt{21}\,cm^2$

Therefore area of isosceles triangle is $18\sqrt{21}\,cm^2$.

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

$\therefore$ 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 $\times$ 27.5 $\times$ 3

= 660 cm^2

$\therefore$ Area of the rhombus ABCD = 2 Area of the $\triangle$ABC

= 2 $\times$ 660 = 1320 cm^2

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 m^2

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 $\triangle ABC$)

$= 2\left(\frac{1}{2} \times 44 \times 22\right) = 2(44 \times 11)$

= 968 cm^2.

$\therefore$ Paper of Red shade needed to make the kite

$= \frac{1}{4}\left(968\text{cm}^2\right) = 242\text{cm}^2$

Paper of yellow shade needed to make the kite = (242 + 242) = 484 cm^2.

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

$s = \frac{a+b+c}{2} = \frac{20+20+14}{2} = \frac{54}{2} = 27\text{cm}$

Area of $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$ [Using Heron's Formula]

$= \sqrt{27(27-20)(27-20)(27-14)}$

$= \sqrt{27 \times 7 \times 7 \times 13} = 21\sqrt{39}$

$= 21 \times 6.245 = 131.15\text{cm}^2$

Paper of Green shade needed to make the kite

= (242 + 131.15) cm^2 = 373.15 cm^2.

Hence, paper of Red, yellow and green shade needed to make the kite is 242 cm^2,484 cm^2 and 373.15 cm^2 respectively.