Basic Mathematics_22103_UO4.1

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Unit 4: Mensuration

Topic : Area and dimensions of plane figures

Course Outcome:

►   **Co 4 :** Solve the problems based on measurement of regular closed figures and regular solids.

►   **Learning Objectives:**
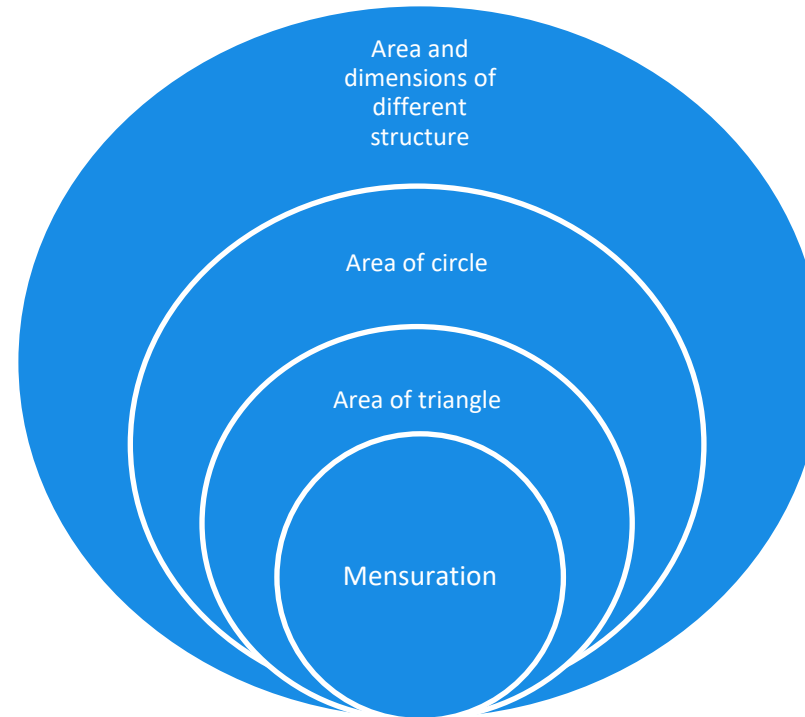
Calculate the area of given triangle and circle.

Contents

1. Different formulae for area of triangle.

2. Area of circle.

3. Examples to compute area of regular closed figures.

Concept Map

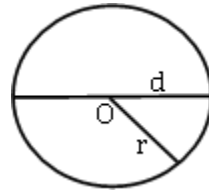Maharashtra State Board of Technical Education

Mensuration deals with length, area and volume of different kinds of shape- both plane and solid.

The area of a plane figure is a measure of the amount of space inside it.

1) **Circle :**

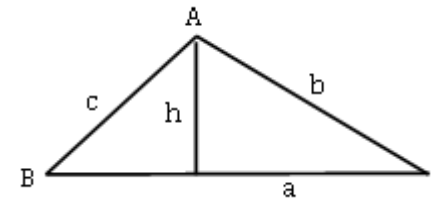Circumference = $\pi d = 2\pi r$

Area= πr^2

2) **Triangle:**

Area $= \dfrac{1}{2} base \times height = \dfrac{1}{2} a \times h$

A$= \dfrac{1}{2} bc \sin A = \dfrac{1}{2} ac \sin B = \dfrac{1}{2} ab \sin C$

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

where $s = \dfrac{a+b+c}{2}$ s is semi perimeter. This formula is called Heron's Formula.

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

Examples:

1)Find the area of the ring between two concentric circles whose circumferences are 77cm. and 55cm.

Solution:

Circumference of bigger circle $= 2\pi r_1 = 77$

$r_1 = \dfrac{77}{2\pi}$

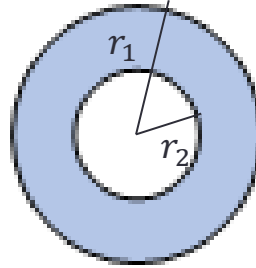Circumference of smaller circle $= 2\pi r_2 = 55$

$r_2 = \dfrac{55}{2\pi}$

Shaded area $= \pi(r_1)^2 - \pi(r_2)^2$

$$= \pi \left(\dfrac{77}{2\pi}\right)^2 - \pi \left(\dfrac{55}{2\pi}\right)^2$$

$$= \dfrac{1}{4\pi}\left(77^2 - 55^2\right)$$

$$= \dfrac{7}{4(22)}(2904)$$

$$= 231 \text{ sq.cm}$$

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2)Find the area of a triangular plot whose base is 17.2cm & height 19.60 cm.

Ans: We know area of triangle is

$$\text{Area} = \frac{1}{2}(\text{base} \times \text{height})$$

$$\Rightarrow \text{Area} = \frac{1}{2}(17.2 \times 19.60)$$

$$\Rightarrow \text{Area} = 168.56 \text{ cm}^2.$$

3) Find the area of a triangle whose sides are 4 cm, 6 cm and 8 cm.

Ans: Let $a = 4 \text{ cm}; b = 6 \text{ cm}; c = 8 \text{ cm}$

$\therefore$ semiperimeter $= s = \dfrac{a+b+c}{2}$

$\Rightarrow \quad s = \dfrac{4+6+8}{2} = 9 \text{ cm}$

$\therefore \quad \text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$ by Heron's formula

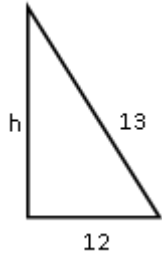$\Rightarrow \quad \text{Area} = \sqrt{9(5)(3)(1)}$

$\therefore \quad \text{Area} = \sqrt{135}$

$\Rightarrow \quad \text{Area} = 11.62 \text{ cm}^2.$

4) A park is in the form of a right angled triangle with hypotenuse 13cm. If one of the side is 12 cm, find the cost of levelling at the rate of `10 per sq.cm.

Ans: By Pythagoras theorem

$$h^2 + 12^2 = 13^2$$

$$h^2 = 169 - 144$$

$$h^2 = 25$$
$$h = 5 \ cm$$

$$\therefore \text{Area} = \frac{1}{2}(\text{base} \times \text{height})$$

$$= = \frac{1}{2}(12 \times 5) = 30 \ \text{cm}^2$$

Cost of levelling$= 30 \times 10$

$$= \ 300. \ \text{Rs}$$

Application of Concept/ Examples in real life:

- ► In engineering applications and in daily life ,often one needs to estimate the cost of various aspects ,the amount of production which indirectly deals with mensuration.

- ► Calculating area is an important skill used by many people in their daily work.

- ► Builders and tradespeople often need to work out the areas and dimensions of the structures they are building, and so do architects, designers and engineers.

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Summary:

So today we learned….

- ► Formulae for Area of triangle.

- ► Formula to find area of circle.

- ► To solve different problems related to area of regular closed figures.

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1) The area of an equilateral triangle is $81\sqrt{3}\ cm^2$. Find its height.

    a) $\sqrt{27}$ cm   b) $3\sqrt{3}$ cm.
    c) $\sqrt{3}$ cm.   d) $9\sqrt{3}$ cm.

2) Find the area between two concentric circles whose radii are 4m and 2m..

    a) $23.1\ m^2$ b)$37.7\ m^2$
    c) $30\ m^2$.   d) $30\ m^2$

3) A park is in the form of a right angled triangle with hypotenuse 50cm. If one of the side is 40 cm, find the cost of levelling at the rate of 3 per sq.cm.

    a) Rs 1800.   b) Rs 1600
    c) Rs 1850   d) Rs 1900

Ans: 1) d 2) b 3) a

Thank you

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