

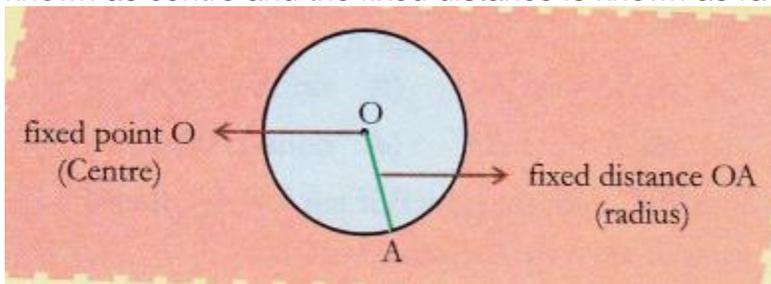
Area of Circle by Coiling Method

Objective

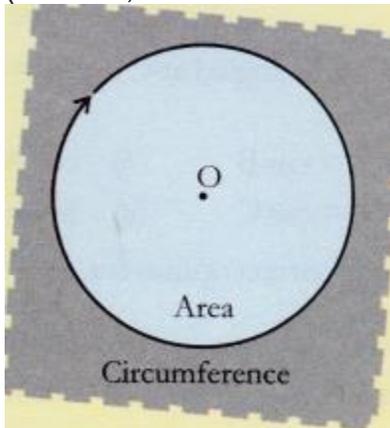
To obtain the formula for area of a circle i.e. πr^2 by coiling method.

Prerequisite Knowledge

1. **Definition of circle :** A circle is the locus of a point in a plane which moves in such a way that its distance from a fixed point remains constant. Fixed point is known as centre and the fixed distance is known as radius of the circle.



2. **Area of the circle :** It is the measure of the region of a plane enclosed by it.
3. **Circumference of the circle:** Total length of its boundary
($C = 2\pi r$, where r is radius of the circle)



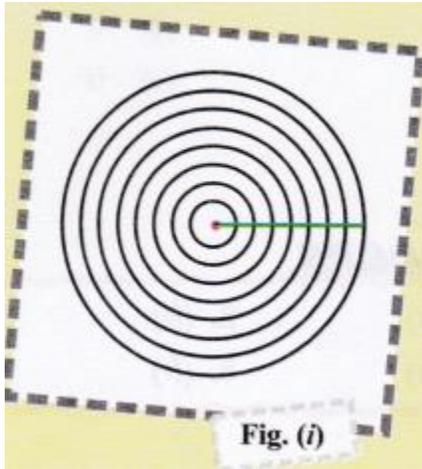
4. **Area of triangle :** $\frac{1}{2} \times \text{Base} \times \text{height}$
5. **Concentric circles:** Circles having same centre.

Materials Required

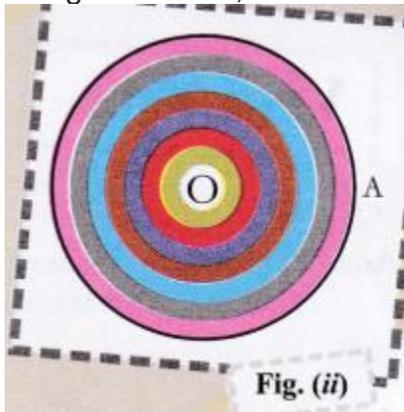
Thick string or coloured threads, cutter, a pair of scissors, fevicol, geometry box.

Procedure

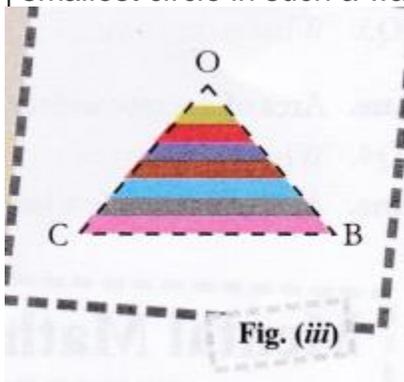
1. Construct a circle of radius r , (take $r = 3.5$ cm) using compass and draw concentric circles of smaller radius as shown in fig. (i).



2. Fill the area of drawn circle with concentric circles made of different coloured strings or thread, so that there is no gap between the threads as shown in fig. (ii).



3. Last smallest circle be a point circle.
4. With the help of scissors, cut the coloured circular threads along the radius OA.
5. Open all the threads and arrange each thread as a straight line.
6. Place each thread one over another starting from thread of the largest circle to the smallest circle in such a way that it forms a triangular shape as shown in fig. (iii).



Observation

1. The triangular shape so formed out of the threads, area of the circle is the same as the area of triangular shaped.
2. Base of the triangle is the circumference of the circle (The largest thread) i.e. Base of $\Delta = 2\pi r$
3. Vertical height of the triangular shape = radius of the circle.
4. Area of $\Delta = \frac{1}{2} \times B \times H$
 $= \frac{1}{2} \times 2\pi r \times r$
 $= \pi r^2$
 \therefore area of the circle of radius $r = \pi r^2$

Result

The figure formed in this activity is almost the shape of the triangle, therefore the area of this triangle so formed is equal to the area of the circle i.e. πr^2 sq. units.

Learning Outcome

Students observe that the area of the circle is πr^2 i.e. half the product of its circumference and radius.

Activity Time

1. Using the above activity find the area of circle taking radius as 4.2 cm.
2. Using the above activity find the area of circle taking radius as 4.9 cm.

Viva Voce

Question 1.

How will you define a circle?

Answer:

A circle is the locus of a point in a plane which moves in such a way that its distance from a fixed point remains constant. The fixed point is known as centre of the circle and the fixed distance is known as the radius of the circle.

Question 2.

Mention the area of circle in terms of diameter.

Answer:

Area of circle = $\frac{\pi d^2}{4}$, where d is the diameter of circle. .

Question 3.

What is the formula to find the area of a sector of a circle of radius r and its central angle θ ?

Answer:

Area of a sector with central angle $\theta = \frac{\pi r^2 \theta}{360^\circ}$

Question 4.

What is the area of rectangle ?

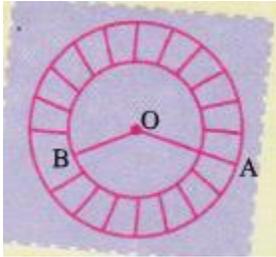
Answer:

Area of rectangle = length x breadth.

Multiple Choice Questions

Question 1.

Find the area of a ring shown in figure if $OA = 10$ cm and $OB = 8$ cm.



- (a) 30π cm²
- (b) 36π cm²
- (c) 18π cm²
- (d) none of these

Question 2.

If the area of a minor segment of a circle is π cm² and radius is 7 cm, then what is the area of its major segment ?

- (a) 48π cm²
- (b) 49π cm²
- (c) 7π cm²
- (d) none of these

Question 3.

Find out the length of a circular arc subtending an angle of 60° at the centre and radius 14 cm.

- (a) 14 cm
- (b) 44 cm
- (c) $\frac{44}{3}$ cm
- (d) none of these

Question 4.

If a thread of length a cm is converted into a circle, then find its area.

- (a) $\frac{a}{4\pi}$

- (b) $\frac{a^2}{4}$
- (c) $\frac{a^2}{4\pi^2}$
- (d) $\frac{a^2}{4\pi}$

Question 5.

Find the central angle of a circle of radius 21 cm if the length of the arc is 22 cm.

- (a) 30°
- (b) 60°
- (c) 45°
- (d) 100°

Answers

- 1. (b)
- 2. (a)
- 3. (c)
- 4. (d)
- 5. (b)