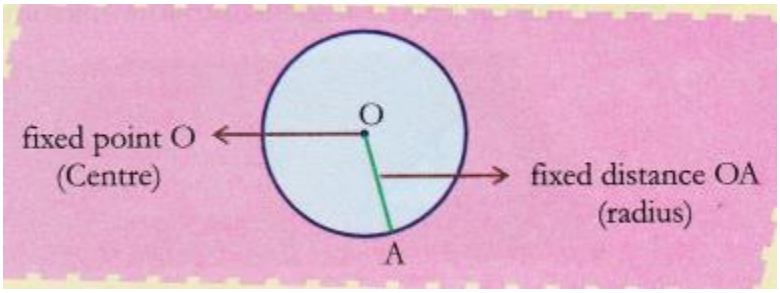
Area of Circle by Paper Cutting and Pasting Method

Objective

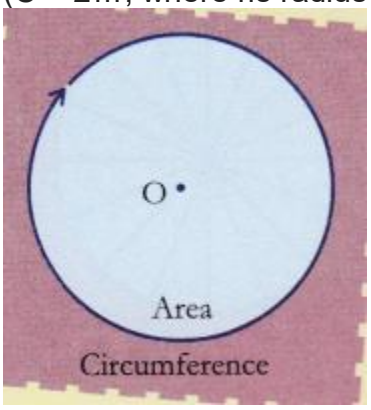
To obtain the formula for area of the circle i.e., πr^2 by paper cutting and pasting method.

Prerequisite Knowledge

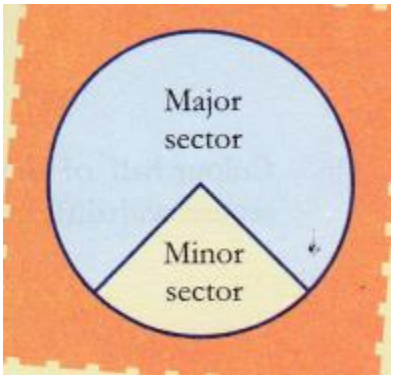
1. **Definition of circle:** A circle is the locus of a point in a plane which moves in such a way that its distance from a fixed point remains constant. Fixed point is known as centre and the fixed distance is known as radius of the circle.



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



4. **Area of rectangle:** length x breadth.
5. **Sectors of a circle.**

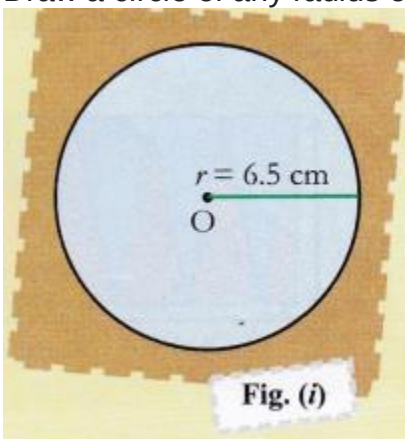


Materials Required

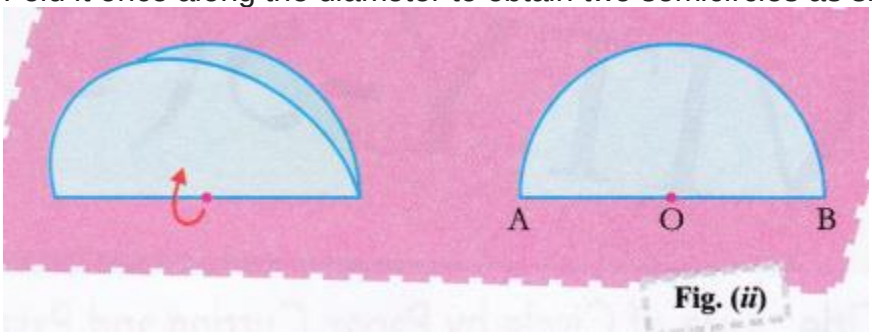
White paper, coloured sketch pen, a pair of scissors, fevicol, geometry box.

Procedure

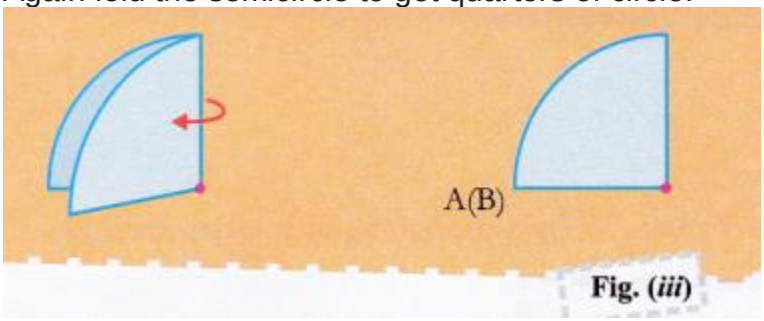
1. Draw a circle of any radius on a sheet of paper (Take r = 6.5 cm) using compass



2. Fold it once along the diameter to obtain two semicircles as shown in fig. (ii).



3. Again fold the semicircle to get quarters of circle.



4. Repeat this process of folding upto four folds and then it looks like a small sector as shown in fig. (iv).

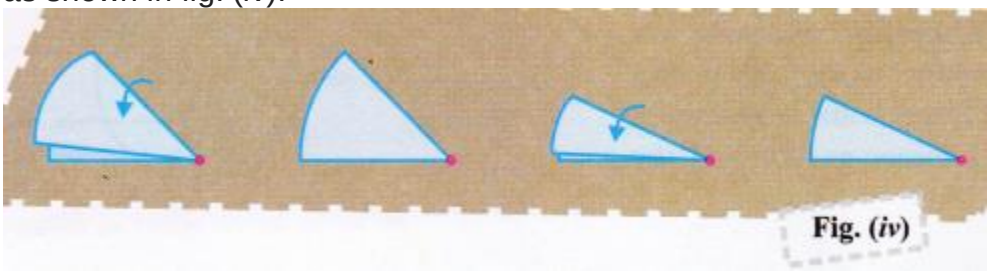


Fig. (*iv*)

5. Press and unfold the circle. It is divided into 16 equal sectors.

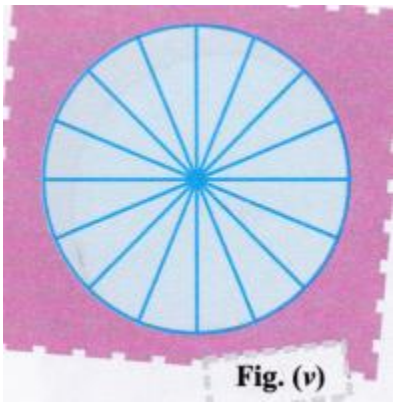


Fig. (*v*)

6. Colour half of this circle i.e. 8 parts with one sectors with colour say blue and remaining 8 sectors different colour say orange.

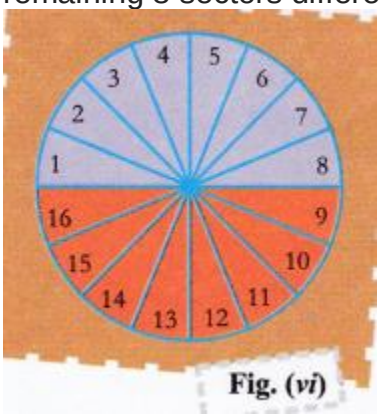


Fig. (*vi*)

7. Cut these sixteen different sectors of circle.
8. Cut one of the sector of orange colour into two equal parts as shown in the fig. (vii).

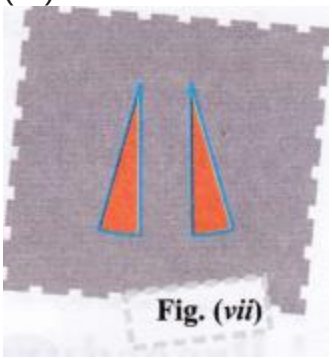


Fig. (*vii*)

9. Arrange these seventeen sectors (one orange sector is divided in two parts) in alternate manner so that they form a rectangular shape as shown in fig. (viii).

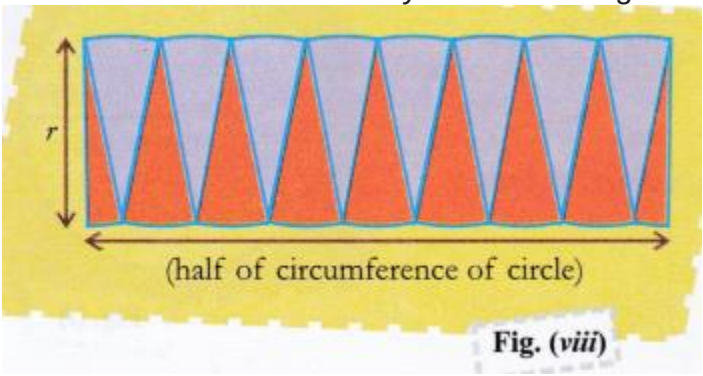


Fig. (*viii*)

Observation

1. Area of the rectangular shape so formed with seventeen sectors is same as the area of circle.
2. Length of the rectangular shape = $\frac{1}{2}$ x circumference of circle = $\frac{1}{2}$ x $2\pi r = \pi r$.
3. Breadth of the rectangular shape = radius of circle
   ∴ Area of the rectangle = L x B = $\pi r \times r = \pi r^2$ sq. units.

Result

Area of a circle with radius r = πr^2.

Learning Outcome

1. The figure formed by arranging 17 sectors of a circle is almost a rectangle.
2. As we increase the number of sectors of the circle, the figure of rectangle becomes better and better.
3. Through this activity, students will learn to find the approximate result for the area of a circle.

Activity Time

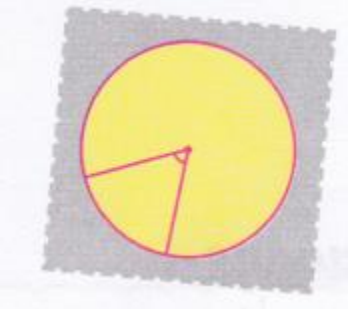
Find out the area of a circle of radius 6.3 cm by dividing the circle into 32 sectors.

Viva Voce

Question 1.
Define concentric circles.
Answer:

Circles having same centre and different radii are called concentric circles.

Question 2.
Define sector
Answer:
It is the part of a circle between two radii and corresponding arc.



Question 3.
What shape will you obtain, if you rotate a circle along diameter ?
Answer:
Sphere

Question 4.
What is the area of a circular ring?
Answer:
$\pi(R^2 - r^2)$, where R = internal radius and r = internal radius of the ring.

Multiple Choice Questions

Question 1.
What is the radius of the circle if length of the arc is 22 cm and central angle is 30° ?
(a) 21cm
(b) 24 cm
(c) 42 cm
(d) None of these

Question 2.
Area of a quadrant of a circle in the form of its diameter d is
(a) $\frac{\pi d^2}{8}$
(b) $\frac{\pi d^2}{16}$
(c) $\frac{\pi d^2}{4}$
(d) None of these

Question 3.
If a chord subtends a right angle at the centre, then area of the corresponding segment
(a) $\left(\frac{\pi}{4} - \frac{1}{2}\right)$ r^2
(b) $\left(\frac{\pi}{4} + \frac{1}{2}\right)$
(c) $\left(\frac{1}{2} - \frac{\pi}{4}\right)$
(d) None of these

Question 4.
Perimeter of sector of a circle of radius r is
(a) $\frac{\pi r\theta}{180^0}$
(b) $\frac{\pi r\theta}{180^0}$ + 2r
(c) $\frac{2\pi r\theta}{360^0}$ – 2r
(d) None of these

Question 5.
Angle described by hour hand in 12 hours is
(a) 180°
(b) 720°
(c) 360°
(d) None of these

Answers

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