Topic

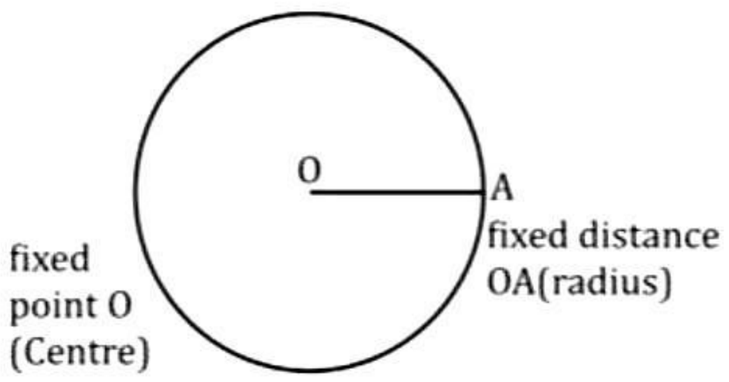
Area of Circle by Paper Cutting and Pasting

Objective

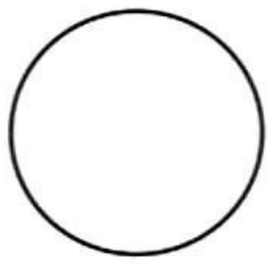
To obtain the formula for the area of the circle i.e., πr^2 by paper cutting and pasting method.

Previous Knowledge Required

1. **Definition of the circle:** A circle is the locus of a point in a plane that moves in such a way that its distance from a fixed point remains constant. The fixed point is known as the Centre and the fixed distance is known as the 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. Fig.(i)
   ($C = 2\pi r$, where r is the radius of the circle)



Circumference
Fig.(i)

4. **Area of rectangle:** length × breadth.
5. **Sectors of a circle.** Fig.(ii)

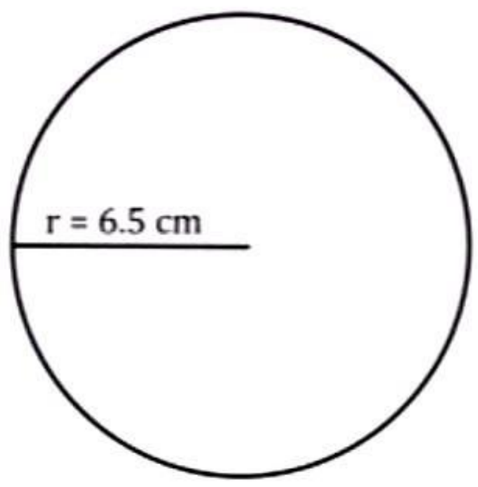
Fig.(ii)

Material 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 a compass.



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

Fig.(iii)

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

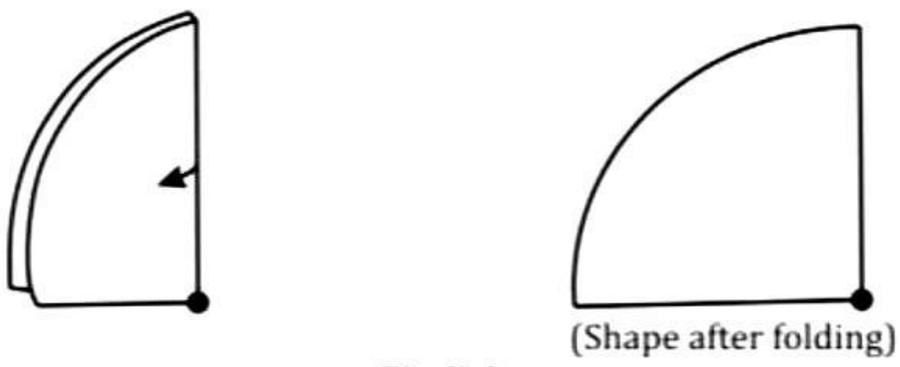


Fig.(iv)

4. Repeat this process of folding up to four folds and then it looks like a small sector.

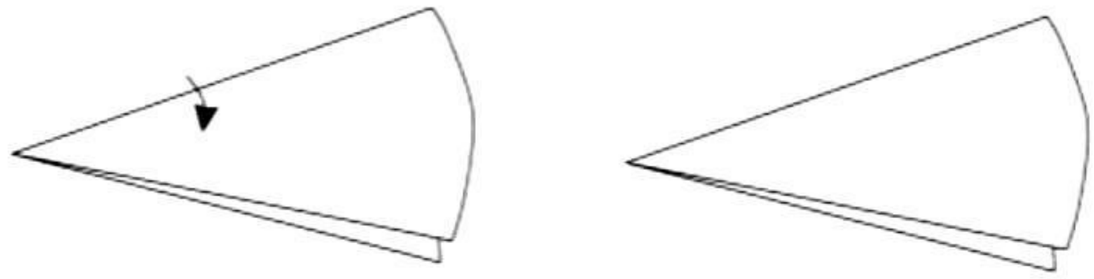


Fig.(v)

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

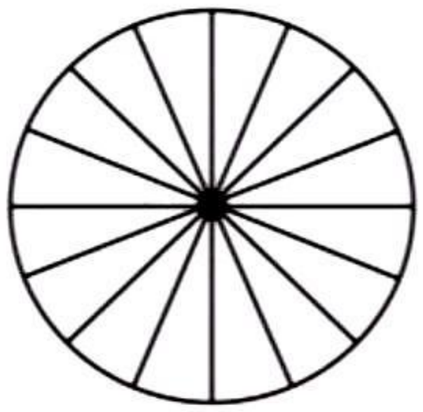


Fig.(vi)

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

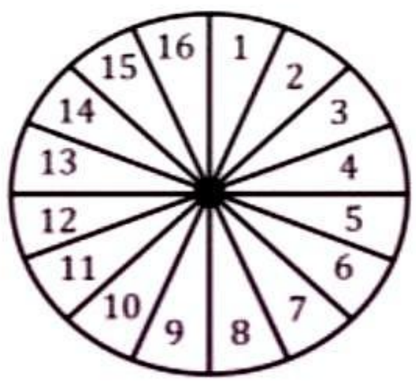
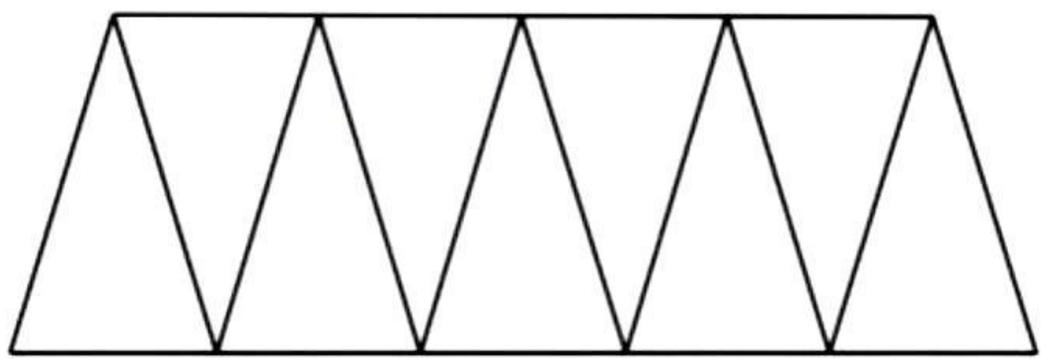


Fig.(vii)

7. Cut these sixteen different sectors of the circle. Cut one of the sectors of orange colour into two equa parts as shown in Fig.(viii).

Fig.(viii)

8. Arrange these seventeen sectors (one orange sector is divided into two parts) in alternate manner s that they form a rectangular shape as shown in Fig.(ix)



Half of circumference of circle

Fig.(ix)

Observation

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

Result

Area of a circle with radius $r = \pi r^2$.

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 the rectangle becomes better and bett
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.

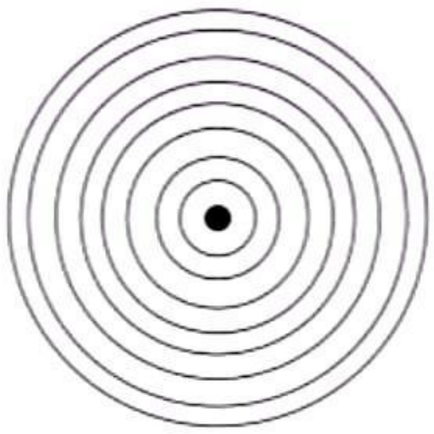
VIVA VOCE

Q 1. What shape will you obtain if you rotate a circle along diameter?

Ans. Sphere

Q 2. Define concentric circles.

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



Q 3. What is the area of a circular ring?

Ans. $\pi(R^2 - r^2)$, where R = external radius and r = internal radius of the ring.

Q 4. Define sector of a circle.

Ans. It is the part of a circle between two radii and the corresponding arc.

MULTIPLE CHOICE QUESTIONS

Q 1. What is the radius of the circle if the length of the arc is 22 cm and the central angle is 30°?

(a) 21cm (b) 24 cm (c) 42 cm (d) None of these

Q 2. The 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

Q 3. If a chord subtends a right angle at the centre, then the area of the corresponding segment.

(a) $\left(\frac{\pi}{4} - \frac{1}{2}\right) r^2$ (b) $\left(\frac{\pi}{4} + \frac{1}{2}\right) r^2$ (c) $\left(\frac{1}{2} - \frac{\pi}{4}\right) r^2$ (d) None of these

Q 4. The perimeter of the sector of a circle of radius r is:

(a) $\frac{\pi r\theta}{180^\circ}$ (b) $\frac{\pi r\theta}{180^\circ} + 2r$ (c) $\frac{2\pi r\theta}{360^\circ} - 2r$ (d) None of these

Q 5. Angle described by hour hand in 12 hours is:

(a) 180° (b) 720° (c) 360° (d) None of these

Answer Key

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