

LESSON PLAN FOR CLASS X MATHEMATICS

EXPERIENTIAL LEARNING

BOARD: CBSE

CHAPTER: AREAS RELATED TO CIRCLE

PREREQUISITE KNOWLEDGE

- **CIRCLES:**
CLASS IX
- **AREA AND PERIMETER OF CIRCLE:**
CLASS VII

SHORT DISCRIPTION OF THE LESSON

- The lesson will introduce learners to the formulae of calculating the Area of the Sector of the circle and Length of the segment of the circle.
- The learners will also recall the formulae of Area of circle, Circumference of the circle and the Area of Isosceles and Equilateral triangles.

OBJECTIVES

- ➔ **Introduction**
- ➔ **Perimeter and Area of a Circle**
- ➔ **Sector and Segment of a Circle**
- ➔ **Areas of Sector and Segment of a Circle**
- ➔ **Areas of Combinations of Plane Figures**
- ➔ **Summary**

AIDS

- AUDIO VISUAL AIDS
- RELEVANT MODULES FROM INTERNET
(ACTIVITY TO FIND OUT AREA OF CIRCLE)

INTRODUCTION

Many objects in our daily life are circular in some form or other. Let us have a look at the objects given here.



INTRODUCTION



We observe that components of some objects are of the shape of segment and sector of a circle.

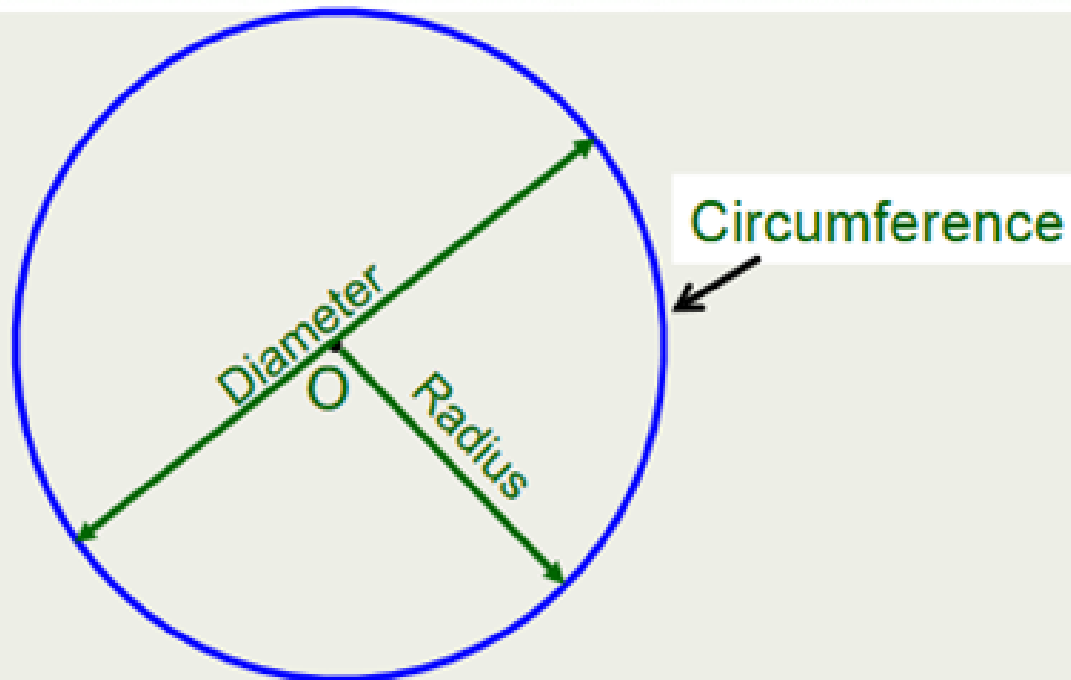
PROCEDURE

TEACHER – STUDENT ACTIVITIES

Perimeter and Area of a Circle

CIRCUMFERENCE – CONSTANT π

Ratio of circumference and diameter of a circle is always constant and this constant ratio is denoted by the Greek letter 'pi'



CIRCUMFERENCE OF CIRCLE

$$\frac{\text{Circumference}}{\text{Diameter}} = \pi$$

$$\text{Circumference} = \pi \times \text{Diameter}$$

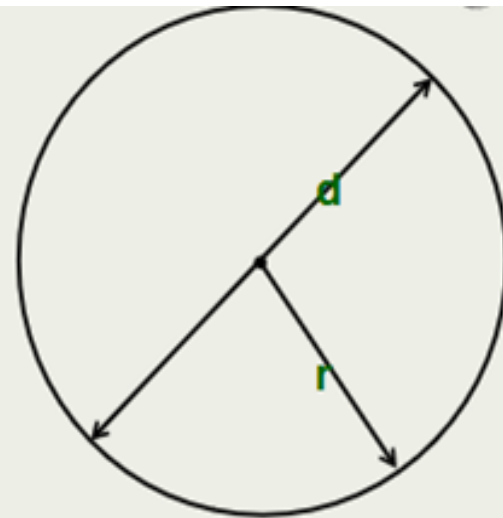
$$= \pi \times d$$

$$= \pi \times 2 \times \text{Radius}$$

$$(\because \text{Diameter} = 2 \times \text{Radius})$$

$$= 2 \times \pi \times r$$

$$= 2\pi r \quad (r = \text{radius})$$



Test Your Knowledge

If the circumference of a circle exceeds its diameter by 16.8 cm then the radius of the circle is



3.91 cm



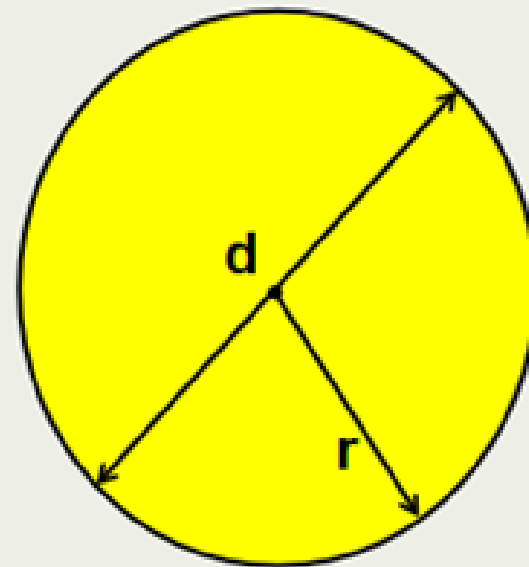
3.92 cm



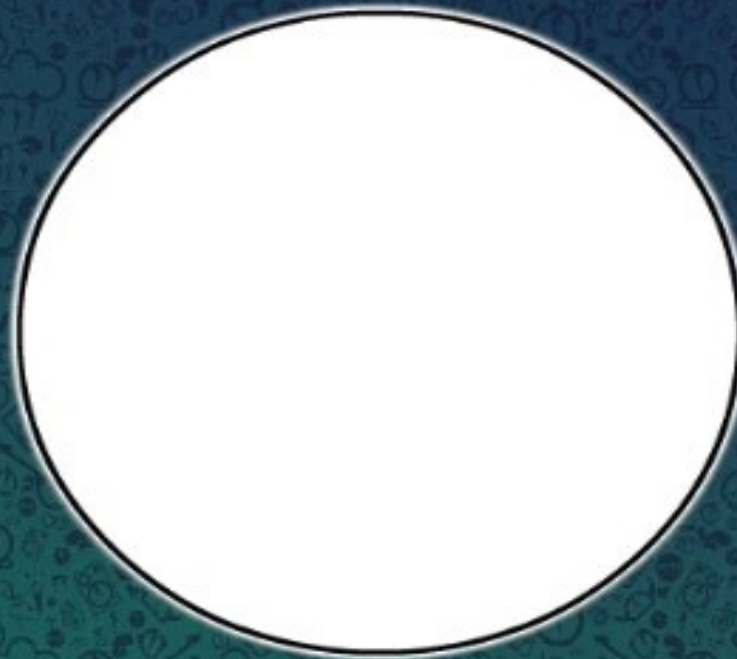
4.92 cm



4.93 cm

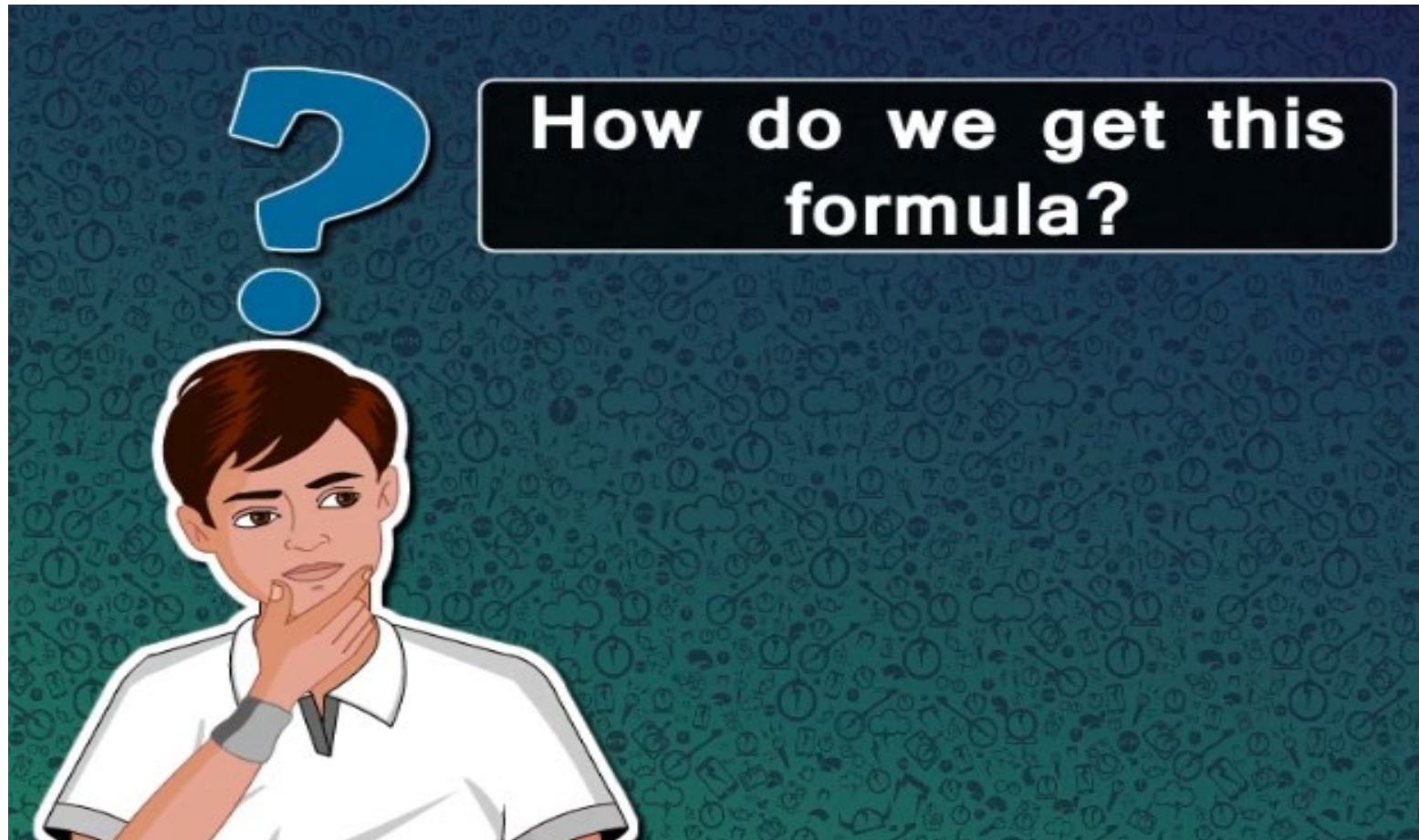


AREA OF CIRCLE



Area of Circle $= \pi r^2$

$$\text{AREA} = \pi r^2$$

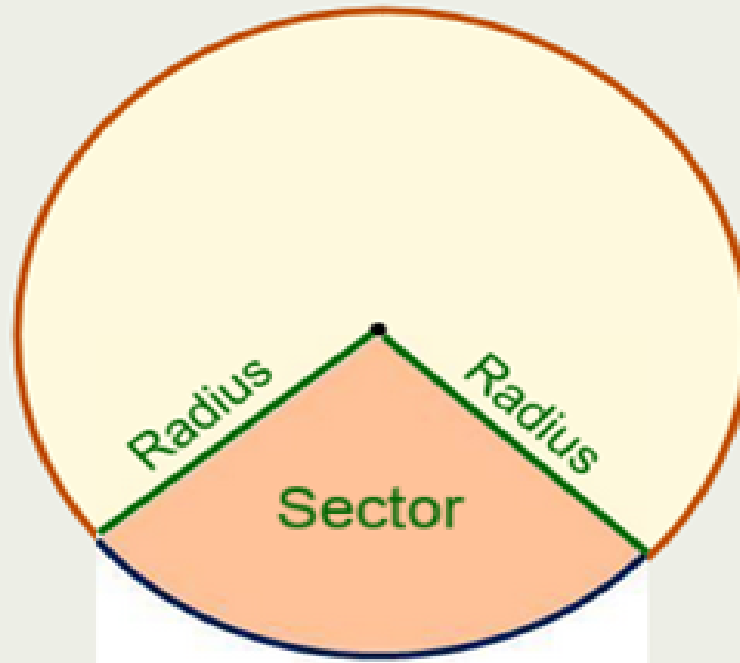


ACTIVITY

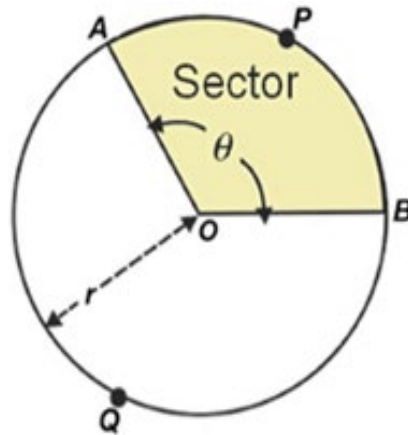
- DERIVATION OF FORMULA: πr^2
- <https://www.youtube.com/watch?v=YokKp3pwVFc&feature=share>

Sector and Segment of a Circle

Sector of a Circle



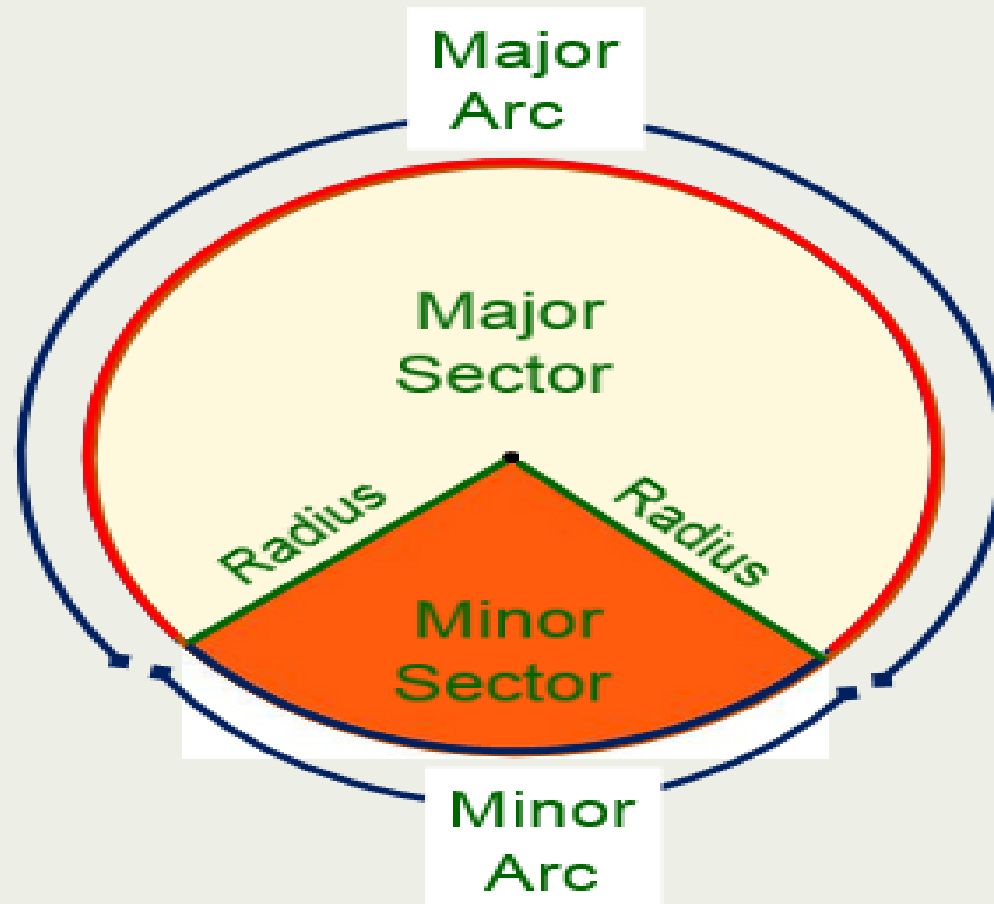
Part of the circular region enclosed by two radii and the corresponding arc is known as a sector of the circle.



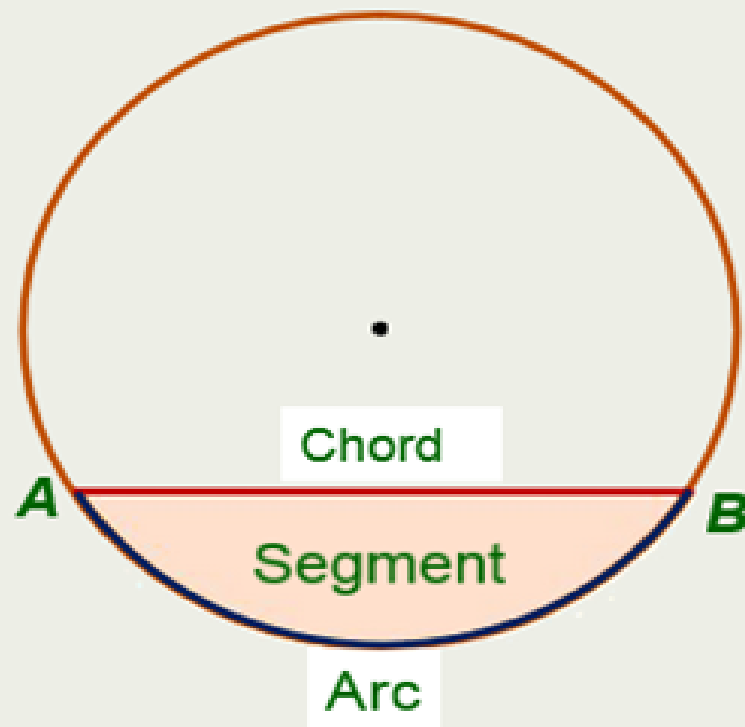
The shaded region $OAPB$ is a sector of the circle with centre O . $\angle AOB$ is called the angle of the sector.

$OAPB$ is called minor sector, $OAQB$ is called major sector and angle of major sector is $360^\circ - \angle AOB$.

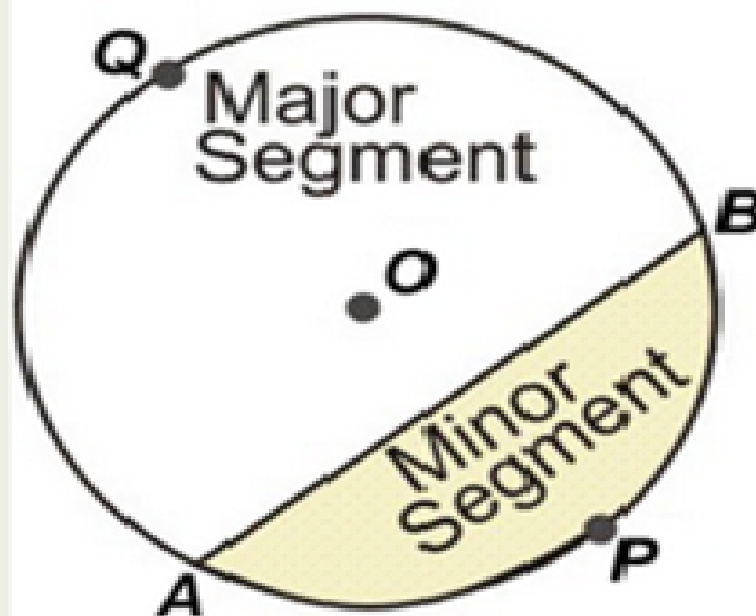
Related Terms



Segment of a Circle

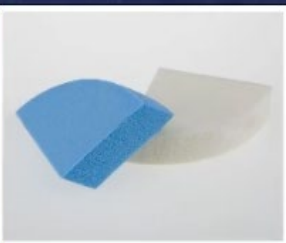


Part of the circular region enclosed between a chord and the corresponding arc is called a segment of the circle.



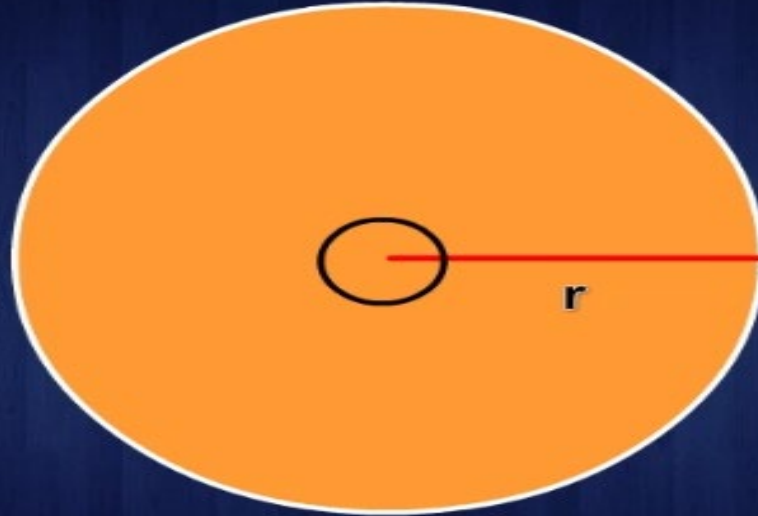
Region APB is called minor segment and region AQB is called major segment.

Areas of Sector and Segment of a Circle



What is the area of one piece of pizza?

AREA OF SECTOR: $\pi r^2 / 360$



Area of a Circle = πr^2 , (r is the radius of the circle.)

Area of a sector of angle 360° = πr^2

Test Your Knowledge

The area of the sector ZOM is



251.43 cm^2



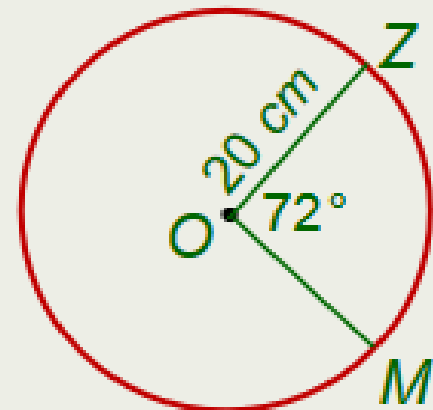
252.43 cm^2



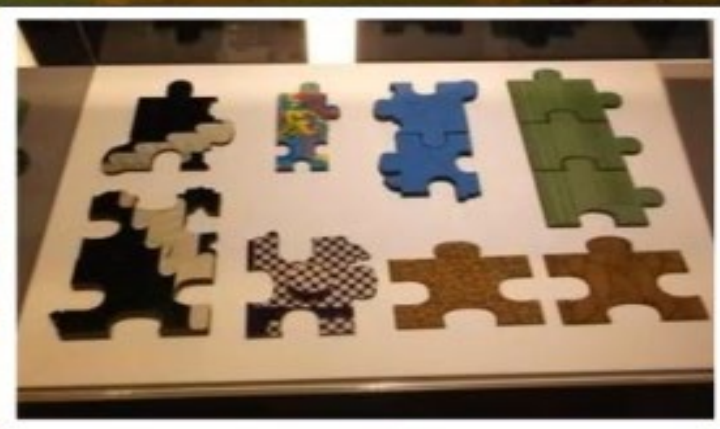
251.43 m^2



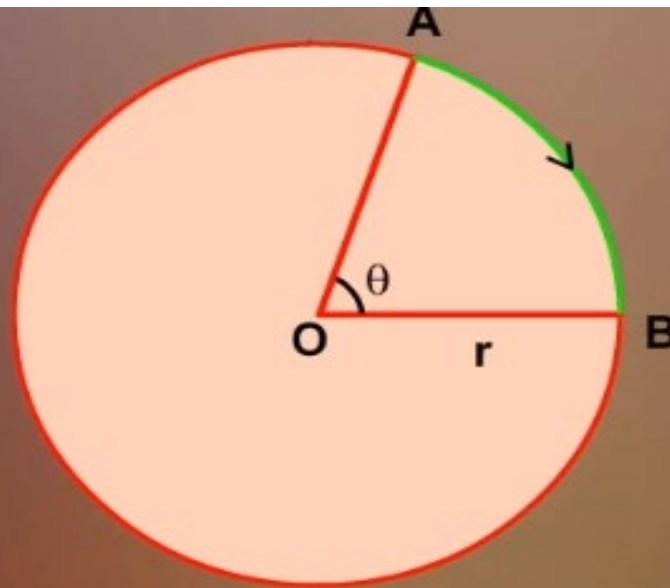
252.43 m^2



Arc Length of a Circle



LENGTH OF ARC OF A CIRCLE



If the subtended angle is measured in degrees, instead of in radians, then arc length

$$l = \left(\frac{\theta^\circ}{360} \right) \times 2\pi r$$

EXAMPLE

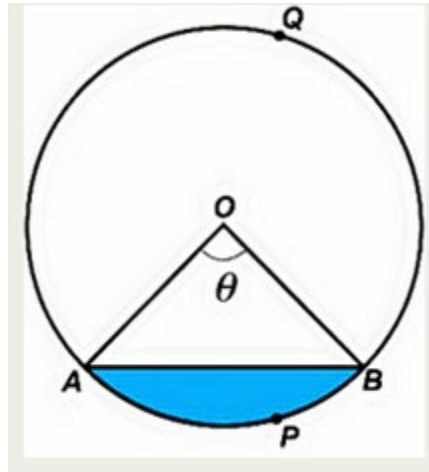
In a circle of radius 8 cm, central angle θ intercepts an arc of length 10 cm. Find the degree measure of the central angle.

$$\text{Length of the arc} = \frac{2\pi r\theta}{360} = 10 \text{ cm (given)}$$

So, we have

$$\theta = \frac{10 \times 360}{2\pi \times 8} = 71.65 \approx 72^\circ$$

AREA OF SEGMENT OF A CIRCLE



$$\begin{aligned}\text{Area}(\text{segment } APB) &= \text{Area}(\text{sector } OAPB) - \text{Area of } \triangle OAB \\ &= \frac{\pi r^2 \theta}{360} - \text{Area of } \triangle OAB\end{aligned}$$

Area of triangle OAB can be found by using the formula $(1/2) \times \text{base} \times \text{height}$

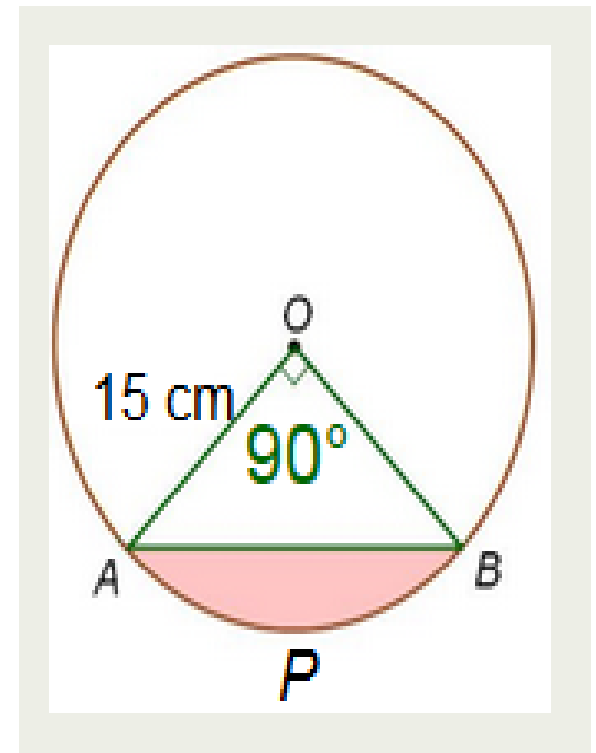


EXAMPLE

Find area of shaded segment.

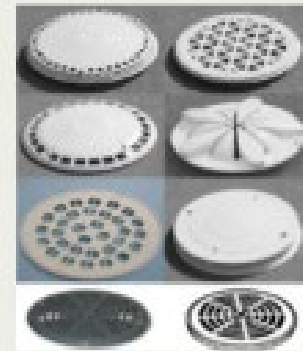
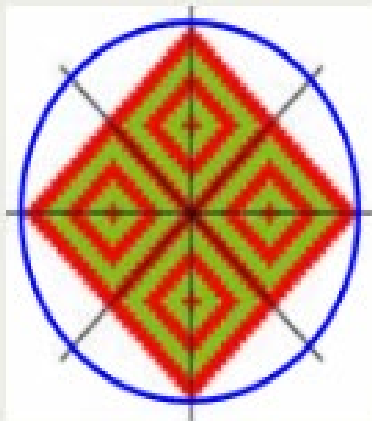
$$\begin{aligned}\text{Area}(\text{sector } OAPB) &= \frac{\pi r^2 \theta}{360} \\ &= \frac{\pi (15)^2 90}{360} = 176.63 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\text{Area}(\triangle AOB) &= \frac{1}{2} \times \text{base} \times \text{height} \\ &= \frac{1}{2} \times 15 \times 15 = 112.50 \text{ cm}^2\end{aligned}$$



Areas of Combination of Plane Figures

Areas of Combinations of Plane Figures



Pictures above are examples of combinations of plane figures. Areas of such figures are found by calculating areas of individual figures constituting them.

EXAMPLE

Area between two concentric circles is 770 cm^2 and radius of outer circle is 21 cm . Find radius of the inner circle.

Let the radius of the inner circle be $r \text{ cm}$.

Area between concentric circles $= 770 \text{ cm}^2$

$$\pi[(21)^2 - (r)^2] = 770$$

$$441 - r^2 = 245$$

$$r^2 = 441 - 245$$

$$= 196$$

$$r = \sqrt{196} = 14 \text{ cm}$$



SUMMARY

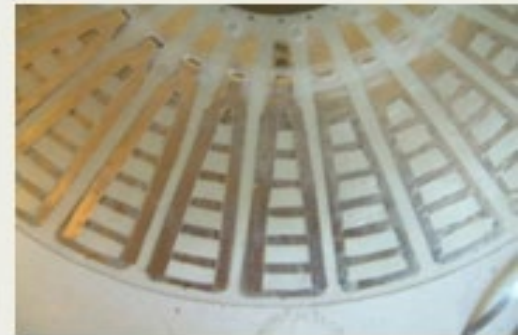
- Circumference of a circle $= \pi d$
- Area of a circle $= \pi r^2$
- Area of a sector of a circle with radius r and angle with degrees measure $\theta = \frac{\theta}{360} \times r^2$

SUMMARY

- Length of an arc of a sector of a circle with radius r and angle with degree measure θ is $\frac{2\pi r\theta}{360}$.
- Area of segment of a circle
= Area of the corresponding sector – Area of $\triangle$ inscribed

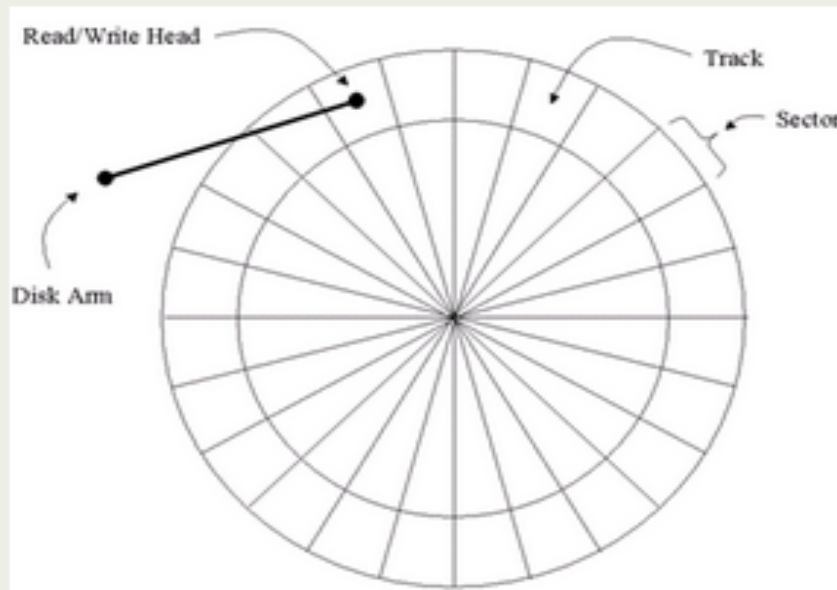
REAL LIFE APPLICATIONS

Segments and sectors are also used in architecture and design of buildings, machines etc.



REAL LIFE APPLICATIONS

A sector is used in computer disk storage as a subdivision of a track on a magnetic disk or optical disc. A fixed amount of user-accessible data is stored at each sector stores.



EXPECTED OUTCOME

- After studying the lesson the students will be able to explain the formulae of finding the area of sector and length of arc of the circle.
- They will be able to relate the objects in the daily life and can easily find out the areas of those particular objects.
- They will be able to solve all the questions based upon the formulae taught.

HOMework

- NCERT EXERCISES 12.1 – 12.3
- XAM IDEA EXERCISES

ASSESSMENT

- Class test and Extra questions from previous years Board Questions from Shiv Das and Vidya Publications