وزارة التعليم العالي والبحث العلمي

المعهد التقني / السماوة

المساحة

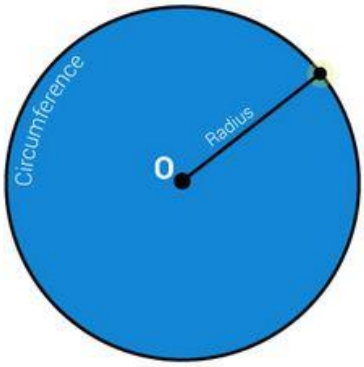
اسم المادة : Mathematics and Spherical Triangles

اسم المدرسة : م . م لقاء طارق هادي

- Circular sector
- Circular segment
- Area and Perimeter of a Sector

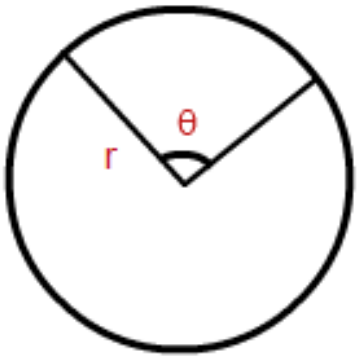
Circle-

A circle is a shape which is made up of an infinite number of points in a plane that are located at a fixed distance from a point called as the center of the circle. The fixed distance from any of these points to the center is known as the radius of the circle.



Arc-

A part of a curve lying on the circumference of a circle.

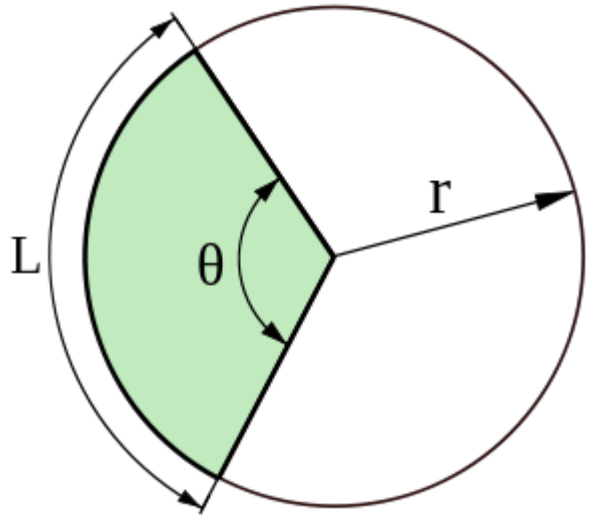


Length of an arc of a sector- The length of an arc is given as-

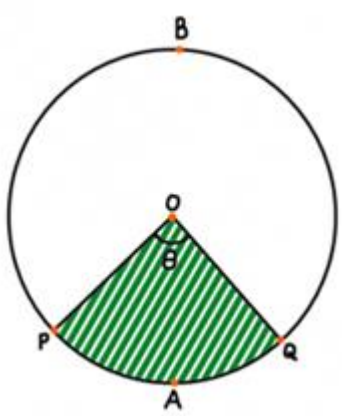
$\theta/360 \times 2\pi r$

Circular sector

A **circular sector** or **circle sector** (symbol: ⌔), is the portion of a disk enclosed by two radii and an arc, where the smaller area is known as the minor sector and the larger being the major sector. In the diagram, θ is the central angle ,r the radius of the circle, and L is the arc length of the minor sector

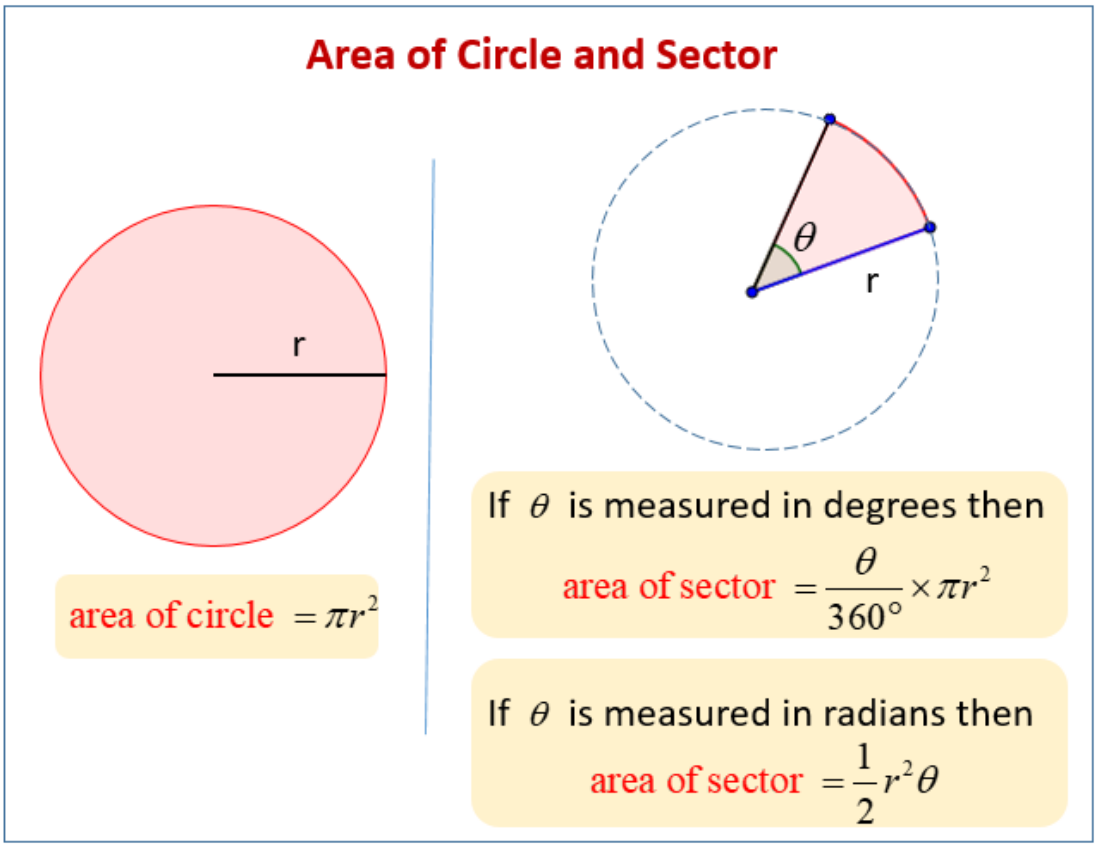


In the figure below, *OPBQ* is known as the **Major Sector** and *OPAQ* is known as the **Minor Sector.** As Major represent big or large and Minor represent Small, which is why they are known as Major and Minor Sector respectively.



We know that a full circle is 360 degrees in measurement. Area of a circle is given as π times the square of its radius length. So if a sector of any circle of radius r measures θ, area of the sector can be given by:

Area of sector = $\theta/360\times\pi r^2$



Circular segment

- Circular segment, a circular segment (symbol: ⌓) is a region of a circle which is "cut off" from the rest of the circle by a secant or a chord.

Solved Examples:

Examples 1: For a given circle of radius 4 units, the angle of its sector is 45°. Find the area of the sector.

Solution: Given, radius r = 4 units

Angle θ = 45°

Area of the sector =($\theta/360^o$)×πr^2

= $45^0/360^0 \times 22/7 \times 4^2$=6.28 sq.units

Example 2: If the angle of the sector with radius 4 units is 45°, then find the length of the sector.

Solution: Area = $(\theta/360°) \times \pi r^2$

$= (45°/360°) \times (22/7) \times 4 \times 4$

= 6.28 square units

The length of the same sector = $(\theta/360°) \times 2\pi r$

$l = (45°/360°) \times 2 \times (22/7) \times 4$

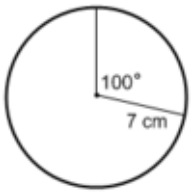
$l = 3.14$

Example 3: Find the area of the sector.

$$\text{Area of Sector} = \frac{\text{central angle}}{360°} \times \text{Area of whole circle}$$

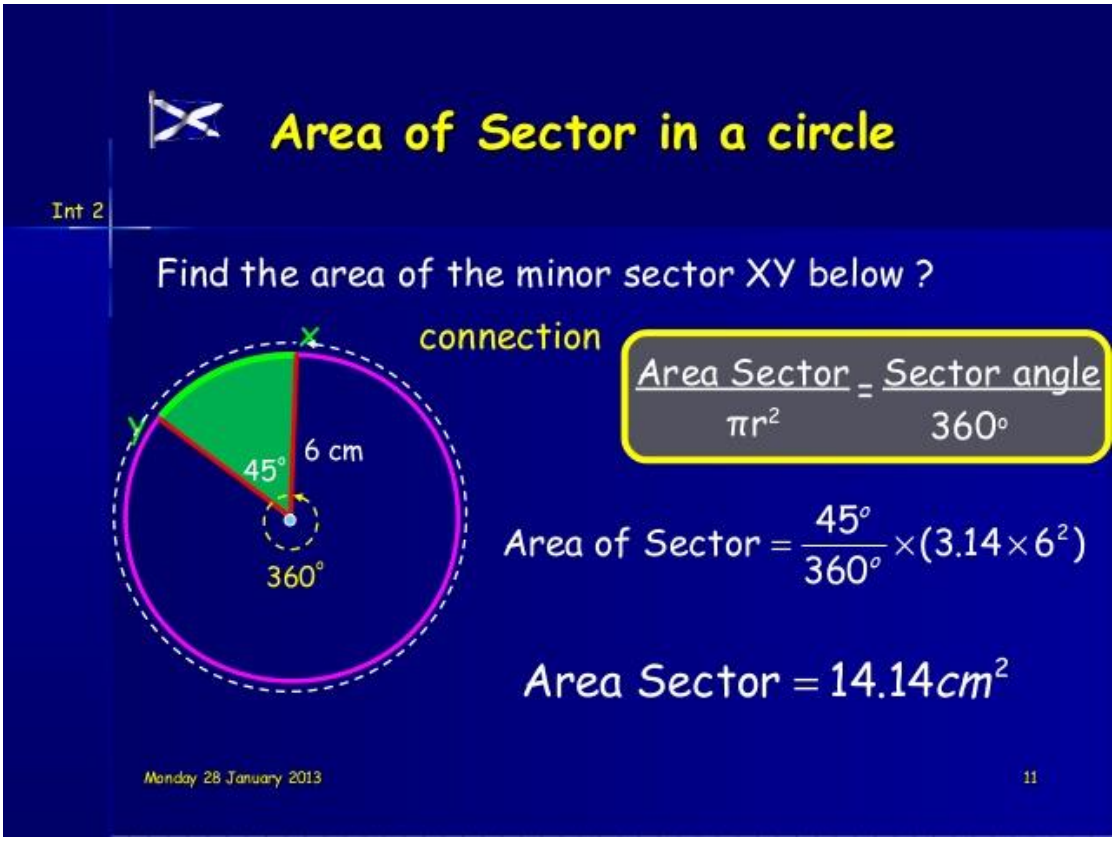
$$\boxed{A = \frac{\theta}{360°} \times \pi r^2}$$

Example:



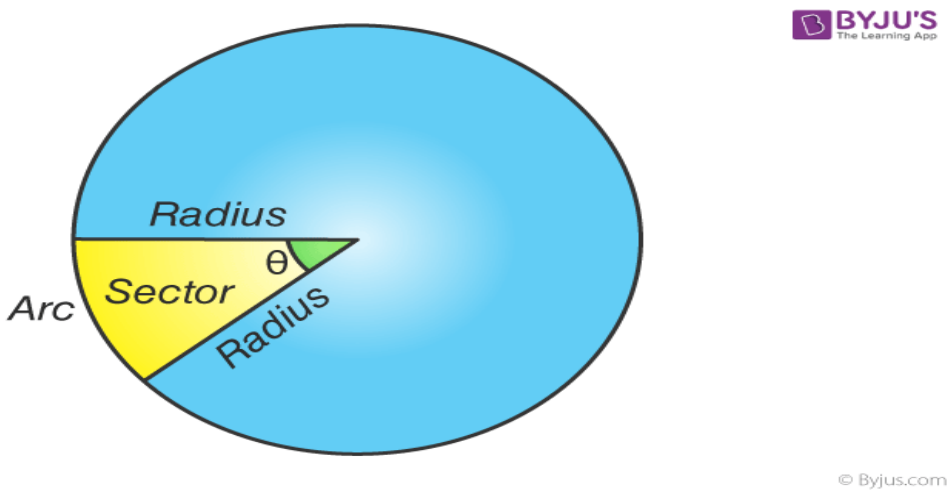
$$A = \frac{100°}{360°} \times \pi(7\text{cm})^2$$

$$A = 13.611\pi \text{ cm}^2$$



Perimeter of a Sector

The perimeter of the sector of a circle is the length of two radii along with the arc that makes the sector. In the following diagram, a sector is shown in yellow colour.



The perimeter should be calculated by doubling the radius and then adding it to the length of the arc.

Perimeter of a Sector Formula

The formula for the perimeter of the sector of a circle is given below :

Perimeter of sector = 2 radius + arc length

Arc length is calculated using the relation :

Arc length = $l = (\theta/360) \times 2\pi r$

The **Circumference (or) perimeter of a circle = $2\pi R$**

Perimeter of a Sector = 2 Radius + $((\theta/360) \times 2\pi r)$

Example 1 : Find the perimeter of the sector with $\theta = 60°$, $r = 42$ and $\pi = 22/7$.

Solution :

Length of the arc is

$$L = \theta/360° \cdot 2\pi r$$

Substitute $\theta = 60°$, $r = 42$ and $\pi = 22/7$.

$$L = 60°/360° \cdot 2 \cdot 22/7 \cdot 42$$

$$L = 1/6 \cdot 2 \cdot 22 \cdot 6$$

$$L = 1 \cdot 2 \cdot 22$$

$$L = 44 \text{ cm}$$

Perimeter of sector is

$$= L + 2r$$

Substitute $L = 44$ and $r = 42$.

$$= 44 + 2(42)$$

$$= 44 + 84$$

$$= 128 \text{ cm}$$

Example 2 : Find the length of arc, if the perimeter of sector is 45 cm and radius is 10 cm.

Solution :

$$\text{Perimeter of sector} = 45 \text{ cm}$$

$$L + 2r = 45$$

Substitute 10 for r.

$$L + 2(10) = 45$$

$$L + 20 = 45$$

$$L = 45 - 20$$

$$L = 25 \text{ cm}$$

Example 3 : Find the radius of sector whose perimeter of the sector is 30 cm and length of the arc is 16 cm.

Solution :

$$\text{Perimeter of sector} = 30 \text{ cm}$$

$$l + 2r = 30$$

Substitute 16 for l.

$$16 + 2r = 30$$

Subtract 16 from each side.

$$2r = 14$$

Divide each side by 2.

$$r = 7 \text{ cm}$$

Homework

Examples 1: Find the area of the sector with a central angle of 30° and a radius of 9 cm.

Example 2 : Find the perimeter of the sector with $\theta = 120°$, $r = 21$ and $\pi = 22/7$.