

Exercise 15.2

Find, in terms of π , the length of the arc that subtends an angle of 30° at the centre of a circle of radius of 4 cm.

Solution:

Given,

Radius = 4 cm

Angle subtended at the centre 'O' = 30°

We know that,

Length of arc = $\frac{\theta}{360} \times 2\pi r$ cm

Length of arc = $\frac{30}{360} \times 2\pi \times 4$ cm = $\frac{2\pi}{3}$ cm

Thus, the length of arc that subtends an angle of 30° degrees is $\frac{2\pi}{3}$ cm

1. Find the angle subtended at the centre of a circle of radius 5 cm by an arc of length $\frac{5\pi}{3}$ cm.

Solution:

Given,

Radius = 5 cm

Length of arc = $\frac{5\pi}{3}$ cm

We know that,

Length of arc = $\frac{\theta}{360} \times 2\pi r$ cm

$\frac{5\pi}{3} = \frac{\theta}{360} \times 2\pi \times 5$

Solving for θ ,

$\theta = 60^\circ$

Thus, the angle subtended at the centre of circle is 60°

2. An arc of length 20π cm subtends an angle of 144° at the centre of a circle. Find the radius of the circle.

Solution:

Given,

Length of arc = 20π cm

And, θ = Angle subtended at the centre of circle = 144°

We know that,

Length of arc = $\frac{\theta}{360} \times 2\pi r$ cm

$\frac{\theta}{360} \times 2\pi r$ cm = $\frac{144}{360} \times 2\pi r$ cm = $\frac{4\pi}{5} \times r$ cm

From the question, we can equate

20π cm = $\frac{4\pi}{5} \times r$ cm

$r = 25$ cm.

Thus, the radius of the circle is 25 cm.

3. An arc of length 15 cm subtends an angle of 45° at the centre of a circle. Find in terms of π , the radius of the circle.

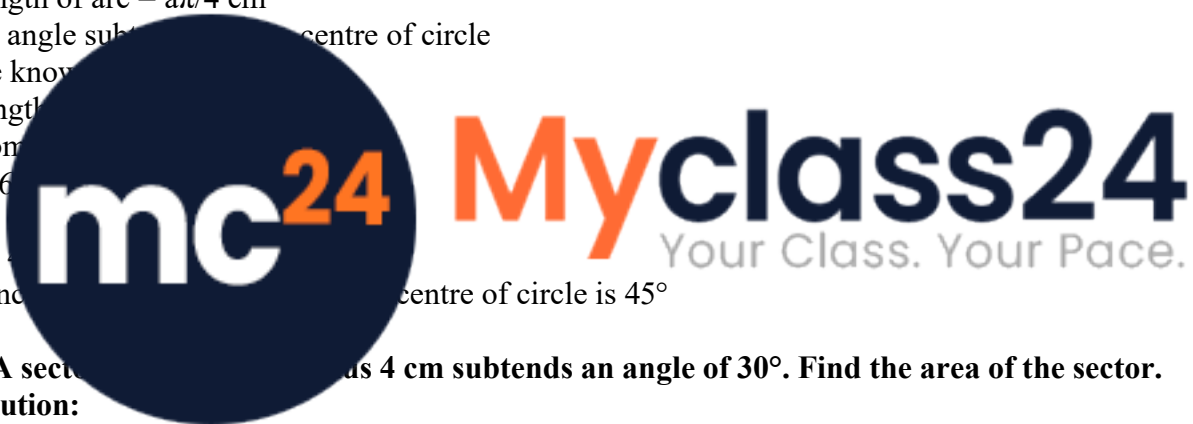
Solution:



Given,
Length of arc = 15 cm
 θ = Angle subtended at the centre of circle = 45°
We know that,
Length of arc = $\frac{\theta}{360} * 2\pi r$ cm
 = $\frac{45}{360} * 2\pi r$ cm
From the question, we can equate
 $15 \text{ cm} = \frac{45}{360} * 2\pi * r$ cm
 $15 = \pi r/4$
Radius = $15 * 4 / \pi = 60/\pi$
Therefore, the radius of the circle is $60/\pi$ cm.

**4. Find the angle subtended at the centre of a circle of radius 'a' cm by an arc of length $(a\pi/4)$ cm.
Solution:**

Given,
Radius = a cm
Length of arc = $a\pi/4$ cm
 θ = angle subtended at the centre of circle
We know that,
Length of arc = $\frac{\theta}{360} * 2\pi r$ cm
From the question, we can equate
 $\frac{a\pi}{4} = \frac{\theta}{360} * 2\pi * a$
 $\theta = 45^\circ$
Hence, the angle subtended at the centre of circle is 45°



**5. A sector of a circle with radius 4 cm subtends an angle of 30° . Find the area of the sector.
Solution:**

Given,
Radius = 4 cm
Angle subtended at the centre O = 30°
We know that,
Area of the sector = $\frac{\theta}{360} * \pi r^2$
 = $\frac{30}{360} * \pi 4^2 = 1/12 * \pi 16 = 4\pi/3$
Therefore, the area of the sector of the circle = $4\pi/3$ cm²

**6. A sector of a circle of radius 8 cm contains an angle of 135° . Find the area of sector.
Solution:**

Given,
Radius = 8 cm
Angle subtended at the centre O = 135°
We know that,
Area of the sector = $\frac{\theta}{360} * \pi r^2$

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$$\begin{aligned}\text{Area of the sector} &= 135/360 * \pi 8^2 \\ &= 24\pi \text{ cm}^2\end{aligned}$$

Therefore, Area of the sector calculated is $24\pi \text{ cm}^2$

7. The area of a sector of a circle of radius 2 cm is $\pi \text{ cm}^2$. Find the angle contained by the sector.

Solution:

Given,

Radius = 2 cm

Angle subtended at the centre 'O'

Area of sector of circle = $\pi \text{ cm}^2$

We know that,

$$\begin{aligned}\text{Area of the sector} &= \theta/360 * \pi r^2 \\ &= \theta/360 * \pi 2^2 \\ &= \pi\theta/90\end{aligned}$$

From the question, we can equate

$$\pi = \pi\theta/90$$

On solving, we have

$$\theta = 90^\circ$$

Hence, the angle subtended at the centre of circle is 90°

8. The area of a sector of a circle of radius 5 cm is $5\pi \text{ cm}^2$. Find the angle contained by the sector.

Solution:

Given,

Radius

Angle

Area of sector = $5\pi \text{ cm}^2$

We know that,

$$\begin{aligned}\text{Area of the sector} &= \theta/360 * \pi r^2 \\ &= \theta/360 * \pi 5^2 \\ &= 5\pi\theta/72\end{aligned}$$

From the question, we can equate

$$5\pi = 5\pi\theta/72$$

On solving, we have

$$\theta = 72^\circ$$

Hence, the angle subtended at the centre of circle is 72°

9. Find the area of the sector of a circle of radius 5 cm, if the corresponding arc length is 3.5 cm.

Solution:

Given,

Radius = 5 cm

Length of arc = 3.5 cm

Let θ = angle subtended at the centre of circle

We know that,

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$$\begin{aligned} \text{Length of arc} &= \theta/360 * 2\pi r \text{ cm} \\ &= \theta/360 * 2\pi(5) \end{aligned}$$

From the question, we can equate

$$3.5 = \theta/360 * 2\pi(5)$$

$$3.5 = 10\pi * \theta/360$$

$$\theta = 360 \times 3.5 / (10\pi)$$

$$\theta = 126 / \pi$$

$$\begin{aligned} \text{Now, the area of the sector} &= \theta/360 * \pi r^2 \\ &= (126 / \pi) / 360 * \pi(5)^2 \\ &= 126 \times 25 / 360 = 8.75 \end{aligned}$$

Hence, the area of the sector = 8.75 cm²

10. In a circle of radius 35 cm, an arc subtends an angle of 72° at the centre. Find the length of the arc and area of the sector.

Solution:

Given,

Radius = 35 cm

Angle subtended at the centre = 72°

We know,

Length

$$= \theta/360 * 2\pi r = 72/360 * 2\pi * 35 = 14\pi = 14(22/7) = 44 \text{ cm}$$

Next,

Area

$$= \theta/360 * \pi r^2 = 72/360 * \pi * 35 * 35$$

$$= 72/360 * \pi * 1225$$

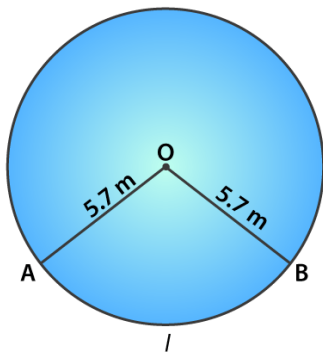
$$= 72/360 * 22/7 * 1225 = 770 \text{ cm}^2$$

$$\text{Area of the sector} = 770 \text{ cm}^2$$

Hence, the length of the arc is 44cm and the area of the sector is 770 cm².

11. The perimeter of a sector of a circle of radius 5.7 m is 27.2 m. Find the area of the sector.

Solution:



Given,

Radius = 5.7 cm = OA = OB [from the figure shown above]

Perimeter of the sector = 27.2 m

Let the angle subtended at the centre be θ

We know that,

$$\text{Length of arc} = \theta/360 * 2\pi r \text{ m}$$

$$\text{Now, Perimeter of the sector} = \theta/360 * 2\pi r + OA + OB$$

$$27.2 = \theta/360 * 2\pi * 5.7 \text{ cm} + 5.7 + 5.7$$

$$27.2 - 11.4 = \theta/360 * 2\pi * 5.7$$

$$15.8 = \theta/360 * 2\pi * 5.7$$

$$\theta = 158.8^\circ$$

$$\text{So, the area of the sector} = \theta/360 * \pi r^2$$

$$\text{Area of the sector} = 158.8/360 * \pi * 5.7^2$$

Solving the above, we get

$$\text{Area of the sector} = 45.03 \text{ m}^2$$

12. The perimeter of a certain sector of a circle of radius is 5.6 m and 27.2 m. Find the area of the sector.

Solution:



Given

$$\text{Radius} = OA = OB$$

$$\text{Perimeter of the sector} = (\text{arc length}) + OA + OB = 27.2$$

Let the angle subtended at the centre be θ

We know that,

$$\text{Length of arc} = \theta/360 * 2\pi r \text{ cm}$$

$$\theta/360 * 2\pi r \text{ cm} + OA + OB = 27.2 \text{ m}$$

$$\theta/360 * 2\pi r \text{ cm} + 5.6 + 5.6 = 27.2 \text{ m}$$

Solving the above, we get

$$\theta = 163.64^\circ$$

$$\text{Now, the Area of the sector} = \theta/360 * \pi r^2$$

$$\text{Area of the sector} = 163.64/360 * \pi * 5.6^2 = 44.8$$

$$\text{Therefore, the area of the sector} = 44.8 \text{ m}^2$$