



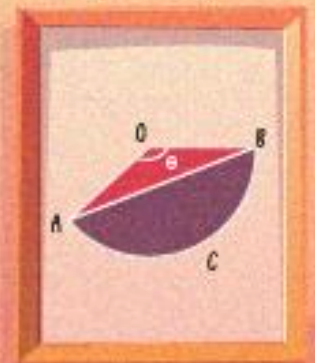
## *Areas Related to Circle*



# Topics



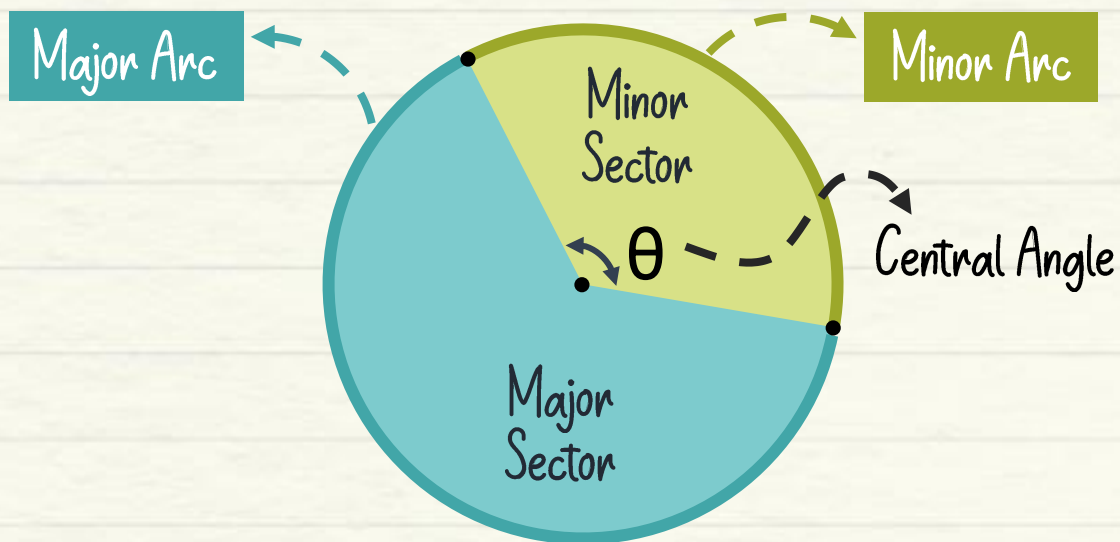
1. Area of sector
2. Area of segment
3. Area of combined plane figures



# 1. Area of Sector

## Sector

A sector of a circle is the portion of an area enclosed by two radii and an arc.



Area of minor sector

$$\frac{\theta}{360^\circ} \times \pi r^2$$

Area of major sector

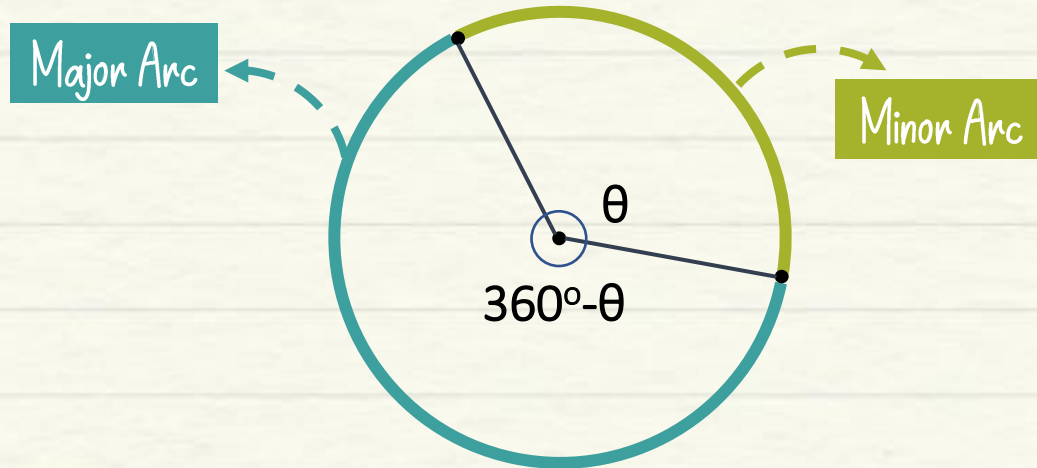
$$\frac{360^\circ - \theta}{360^\circ} \times \pi r^2$$



Central angle  $\theta$  must be in degrees.

If  $\theta$  is given in radians, multiply it with  $\frac{180^\circ}{\pi}$  to convert in degrees.

## Length of Arc



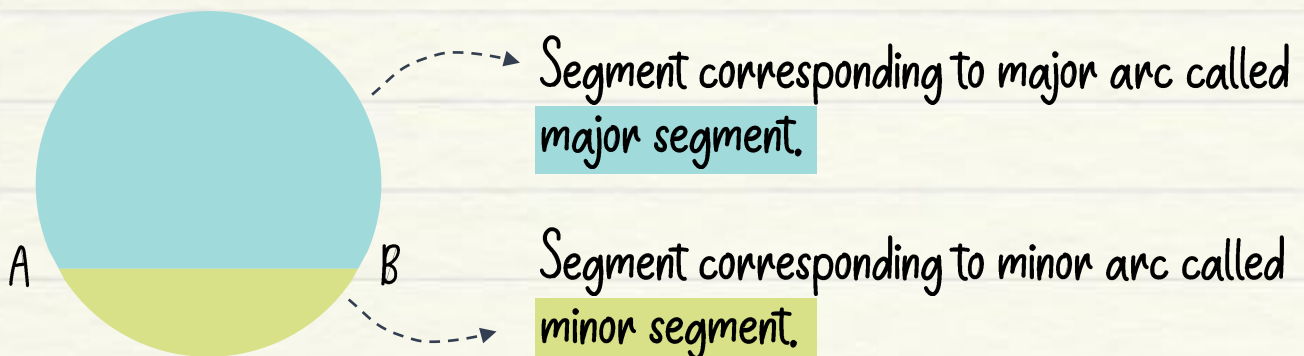
$$\text{Length of minor arc} = \frac{\theta}{360^\circ} \times 2\pi r$$

$$\text{Length of major arc} = \frac{360^\circ - \theta}{360^\circ} \times 2\pi r$$

## 2. Area of Segment

### Segment

A segment of a circle can be defined as a region bounded by a chord and a corresponding arc lying between the chord's endpoints.



## Area of Segment

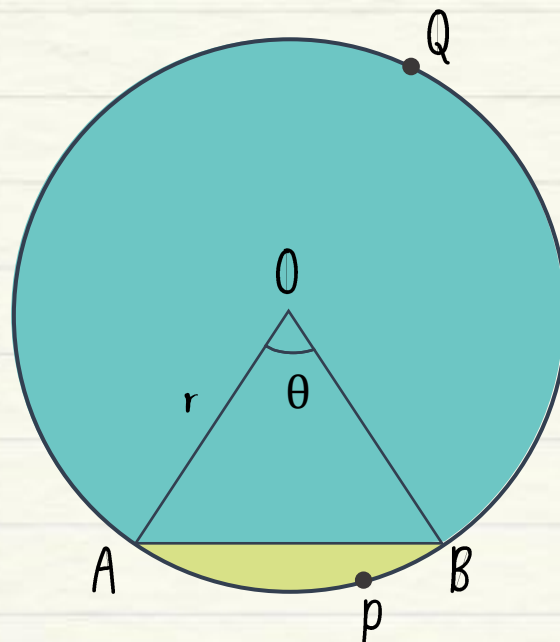
When  $\theta$  is given in degrees,

$$\text{Area of a segment} = \left(\frac{1}{2}\right) \times r^2 \times \left[\left(\frac{\pi}{180^\circ}\right) \theta - \sin \theta\right]$$

When  $\theta$  is given in radians,

$$\text{Area of a segment} = \left(\frac{1}{2}\right) \times r^2 [\theta - \sin \theta]$$

Area of major segment = Area of sector OAQB + Area of  $\triangle OAB$



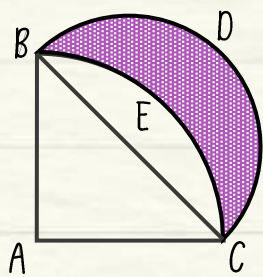
Area of minor segment = Area of the sector OAPB - Area of  $\triangle OAB$

### 3. Area of Combined Plane Figures

#### General Formula

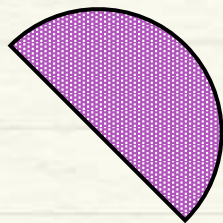
Areas of shaded region = Area of entire figure – Area of non shaded region

#### Example



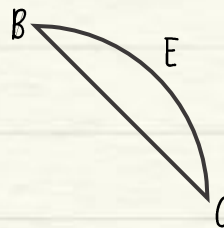
Area of  
shaded figure

=



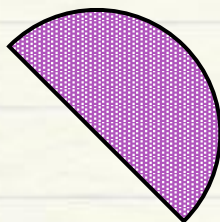
Area of  
semicircle

–

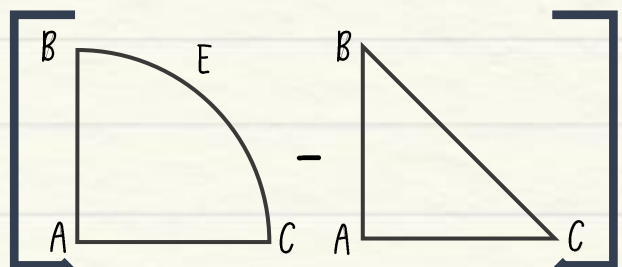


Area of minor  
segment

=



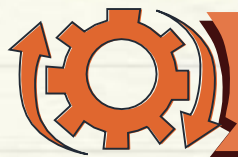
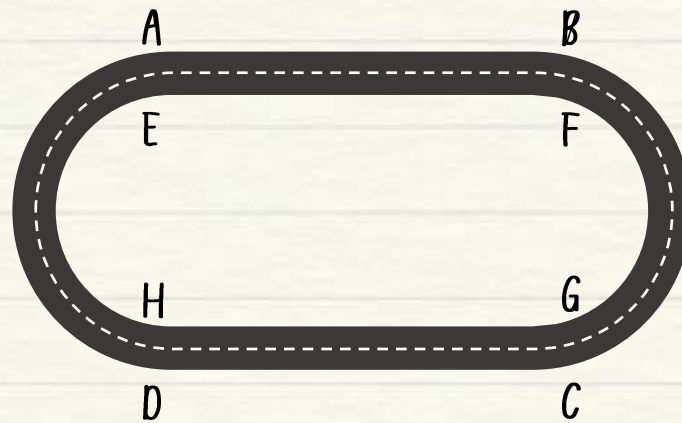
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= Area of semicircle – (Area of sector ABEC – Area of  $\triangle ABC$ )



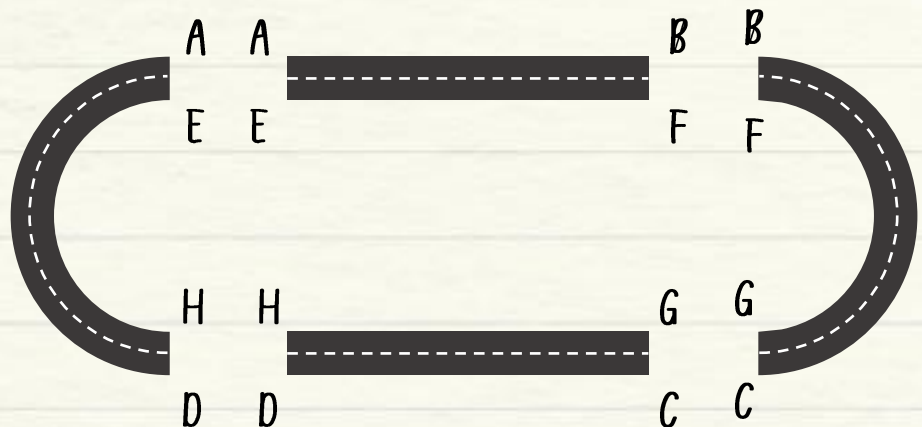
Find the area of the track.



## Methodology

### Step 1

Simplify the given figure into known standard shapes.



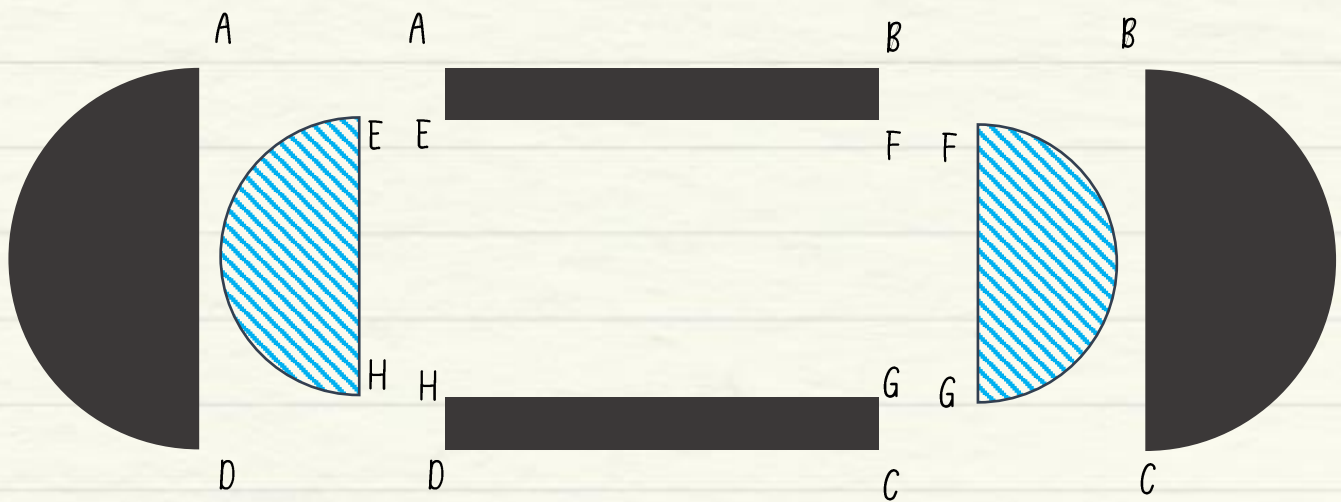
### Step 2

Apply the formula of area on each shape.

= Area of rectangle **ABFE** + Area of rectangle **HGCD**  
+ Area of the **sidetracks**

### Step 3

To find the area of the required region, add or subtract the areas of the standard figures as per the requirement.



$$\begin{aligned}
 &= \text{Area of rectangle } ABFE + \text{Area of rectangle } HGCD \\
 &+ \\
 &(\text{Area of semicircle with diameter } AD - \text{Area of semicircle with diameter } EH) \\
 &+ \\
 &(\text{Area of semicircle with diameter } BC - \text{Area of semicircle with diameter } FG)
 \end{aligned}$$



## Mind Map

