e-Edge Education Centre

EEE- CONCEPT CAPSULE (AREAS RELATED TO CIRCLES)

AREAS RELATED TO CIRCLES

CIRCLE: The set of points which are at a constant distance of units from a fixed point *O* is called a circle with centre *O* and radius = *r* units. The circle is denoted by *C*(*O*, *r*).

The fixed point *O* is called the centre and the constant distance *r* units is called its radius.

Length of arc, area of sector

Let an arc *AB* make an angle $\theta^o < 180^o$ at the centre of a circle of radius *r*. Then, we have

(i) Length of the arc $\overset{\frown}{PQ} = \frac{2\pi r\,\theta}{360} = \ell$

(ii) Area of the sector $= \frac{\pi r^2\theta}{360}$

$$= \left(\frac{1}{2}\times\frac{2\pi r\,\theta}{360}\times r\right) = \left(\frac{1}{2}\times l\times r\right)$$

(iii) Perimeter of the sector $= \left(2r + \frac{2\pi r\,\theta}{360}\right)$

Circumference and area of a circle

For a circle of radius *r*, we have

(i) Circumference of the circle = $2\pi r$

(ii) Area of the circle = πr^2

(iii) Area of the semicircle = $\frac{1}{2}\pi r^2$

(iv) Perimeter of the semicircle = $(\pi r + 2r)$

Area of a ring

Let *R* and *r* be the outer and inner radii of a ring.

Then, area of the ring = $\pi(R^2 - r^2)$.

Rotating wheels

(i) Distance moved by a wheel in 1 rotation = circumference of the wheel

(ii) Number of rotations in 1 minute $= \frac{\text{distance moved in 1 minute}}{\text{circumference}}$

Rotation of the hands of a clock

(i) Angle described by the minute hand of a clock in 60 minutes = 360^o.

(ii) Angle described by the hour hand of a clock in 12 hours = 360^o.

Area of segment

(a) Area of the minor segment *PRQP* = (area of the sector *OPRQO*) – (area of ΔOPQ) $= \left(\frac{\pi r^2\theta}{360} - \frac{1}{2}r^2\sin\theta\right)$

(b) Area of the major segment *QSPQ*

= (area of the circle) – (area of the minor segment *PRQP*)