

Areas Related to Circles

1. A **circle** is a set of points in a plane that are at an equal distance from a fixed point. The fixed point is called the centre of circle and equal distance is called the radius of the circle.
2. A line segment joining the centre of the circle to a point on the circle is called its **radius**.
3. A line segment joining any two points of a circle is called a **chord**. A chord passing through the centre of circle is called its **diameter**.
5. The distance around the boundary of the circle is called **the perimeter or the circumference** of the circle.
6. Circumference (perimeter) of a circle = πd or $2\pi r$, where d is the diameter, r is the radius of the circle and $\pi = \frac{22}{7}$.
7. Perimeter of a semi circle or protractor = $\pi r + 2r$
8. Perimeter of a quadrant = $\frac{1}{4}$ Circumference + $2r = \frac{\pi r}{2} + 2r$
9. Distance moved by a wheel in 1 revolution = Circumference of the wheel.

$$\text{Number of revolutions in one minute} = \frac{\text{Distance moved in 1 minute}}{\text{Circumference}}$$

10. The region enclosed inside a circle is called its **area**.

$$11. \text{Area of a circle} = \pi r^2$$

$$12. \text{Area of a semi circle} = \frac{1}{2} \pi r^2$$

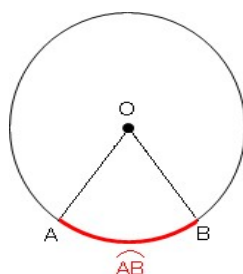
$$13. \text{Area of a quadrant} = \frac{1}{4} \text{Area of circle} = \frac{1}{4} \pi r^2$$

14. Circles having the same centre but different radii are called **concentric circles**.

$$\text{Area enclosed by two concentric circles} = \pi R^2 - \pi r^2 = \pi (R^2 - r^2) = \pi (R + r)(R - r)$$

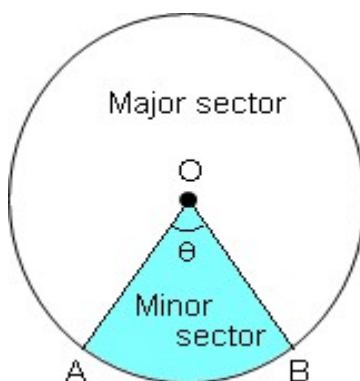
Where, R and r are radii of two concentric circles

15. The part of the circumference between the two end points of the chord is called an **arc**. In the figure, arc \widehat{AB} is shown.



16. A diameter of circle divides a circle into two equal arcs, each known as a **semi-circle**.
17. An arc of a circle whose length is less than that of a semicircle of the same circle is called a **minor arc**.
18. An arc of a circle whose length is greater than that of a semicircle of the same circle is called a **major arc**.
19. Length of an arc = $\frac{\pi r \theta}{180^\circ}$
20. The region bounded by an arc of a circle and two radii at its end points is called a **sector**.

If the central angle of a sector is more than 180° , then the sector is called a **major sector** and if the central angle is less than 180° , then the sector is called a **minor sector**.



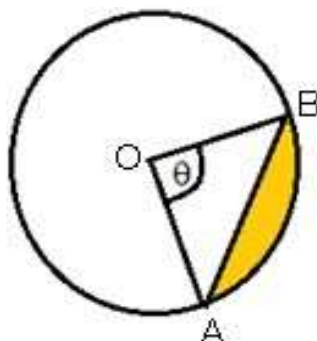
21. Perimeter of sector of angle $\theta = \frac{\pi r \theta}{180^\circ} + 2r$

22. Area of a sector of angle $\theta = \frac{\pi r^2 \theta}{360^\circ}$

23. Area of major sector = $\pi r^2 - \text{Area of minor sector}$

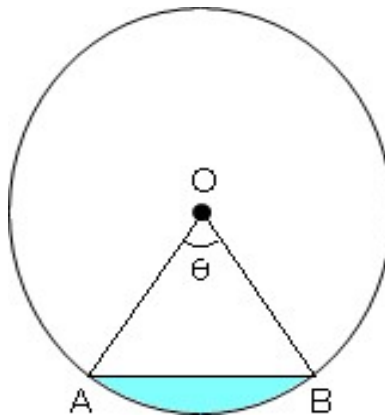
24. A chord divides the interior of a circle into two parts, each called a segment.

The segment which is smaller than the portion of semi-circle is called the **minor segment** and the segment which is larger than the portion of semi-circle is called the **major segment**. In the circle shown, the yellow portion is the minor segment while the non-shaded portion is the major segment.



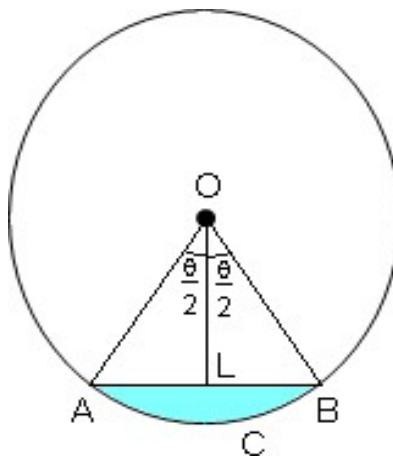
25. Perimeter of segment of angle $\theta = \frac{\pi r \theta}{180^\circ} + \overline{AB}$

26. Area of minor segment = Area of sector - Area of $\triangle ABC$



27. Area of minor segment can also be written as:

$$\text{Area of segment } ACB = \left\{ \frac{\pi}{360^\circ} \times \theta - \sin \frac{\theta}{2} \cos \frac{\theta}{2} \right\} r^2$$



28. Area of major segment = Area of the circle – Area of minor segment