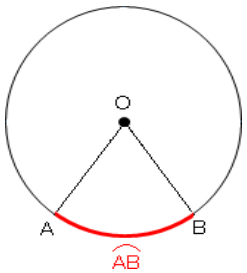
MATHEMATICS

Chapter 12: Areas Related to Circles

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
4. 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 he 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 = $\frac{1}{4}\text{Circumference} + 2\text{r} = \frac{\pi r}{2} + 2\text{r}$
9. Distance moved by a wheel in 1 revolution = Circumference of the wheel.
   Number of revolutions in one minute $= \frac{Distance\ moved\ in\ 1\ minute}{Circumference}$
10. The region enclosed inside a circle is called its **area**.
11. Area of a circle = πr^2
12. Area of a semi circle= $\frac{1}{2}\pi r^2$
13. Area of a quadrant = $\frac{1}{4}$ Area of circle= $\frac{1}{4}\pi r^2$
14. Circles having the same centre but different radii are called **concentric circles**.
    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.

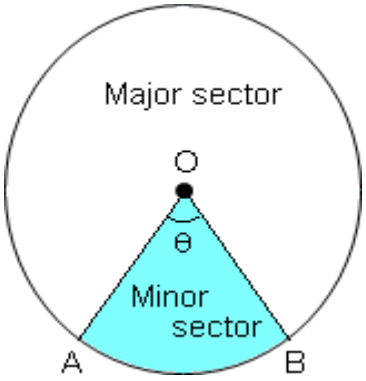


16. A diameter of circle divides a circle into two equal arcs, each known as a **semi-circle**.
17. An arc of a circle whose length is less than that of a semicircle of the same circle is called a **minor arc**.
18. An arc of a circle whose length is greater than that of a semicircle of the same circle is

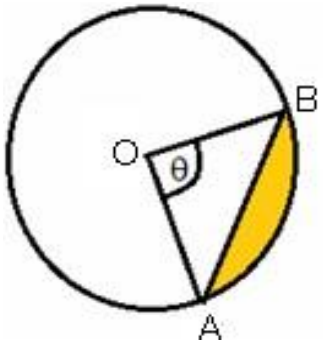
called a **major arc**.

19. Length of an arc $= \frac{\pi r^2}{180°}$
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**.

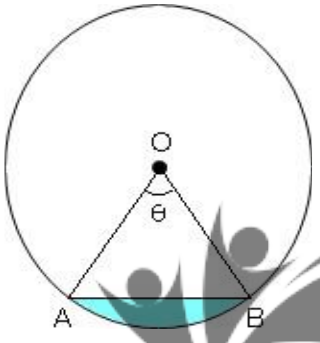


21. Perimeter of sector of angle $\theta = \frac{\pi r\theta}{180°} + 2r$
22. Area of a sector of angle $= \frac{\pi r^2\theta}{360°}$
23. Area of major sector $= \pi r^2 -$ Area of minor sector
24. A chord divides the interior of a circle into two parts, each called a segment.



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.

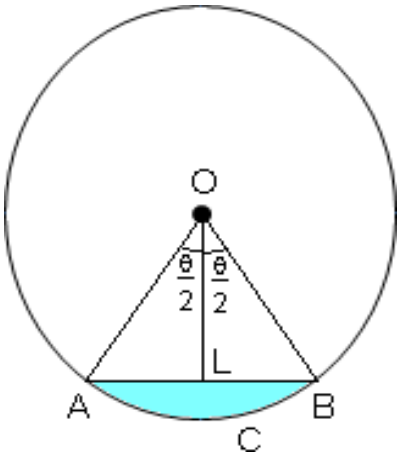
25. Perimeter of segment of angle $\theta = \frac{2\pi r\theta}{360°} + 2r \sin\frac{\theta}{2}$
26. Area of minor segment = Area of sector - Area of Δ ABC



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

Area of the segment ACB = Area of sector OABC – Area of Δ OAB

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



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

29. Area of a Circle

Area of a circle is πr^2, where π=22/7 or ≈3.14 (can be used interchangeably for problem-solving purposes) and r is the radius of the circle.

π is the ratio of the circumference of a circle to its diameter.

Circumference of a Circle

The perimeter of a circle is the distance covered by going around its boundary once. The perimeter of a circle has a special name: Circumference, which is π times the diameter which is given by the formula 2πr

Segment of a Circle

A circular segment is a region of a circle that is "cut off" from the rest of the circle by a secant or a chord.

Sector of a Circle

A circle sector/ sector of a circle is defined as the region of a circle enclosed by an arc and two radii. The smaller area is called the minor sector and the larger area is called the major sector.

Angle of a Sector

The angle of a sector is the angle that is enclosed between the two radii of the sector.

Length of an arc of a sector

The length of the arc of a sector can be found by using the expression for the circumference of a circle and the angle of the sector, using the following formula:

L= (θ/360°)×2πr

Length of an arc of a sector