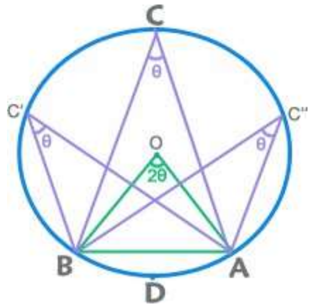
CIRCLES

Diameter = 2r;

Circumference = 2πr;

Area = πr^2



⇒ Chords equidistant from the centre of a circle are equal.

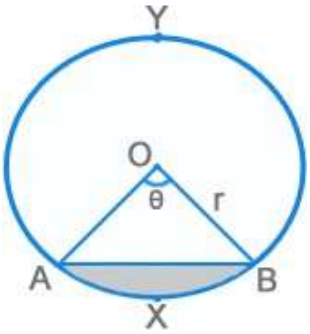
⇒ A line from the centre, perpendicular to a chord, bisects the chord.

⇒ Equal chords subtend equal angles at the centre.

⇒ The diameter is the longest chord of a circle.

⇒ A chord /arc subtends equal angle at any point on the circumference and double of that at the centre.

Chords / Arcs of equal lengths subtend equal angles.



Chord AB divides the circle into two parts: Minor Arc AXB and Major Arc AYB

Measure of arc AXB = m   AOB= θ

Length (arc AXB) = $\frac{\theta}{360^0} \times 2\pi r$

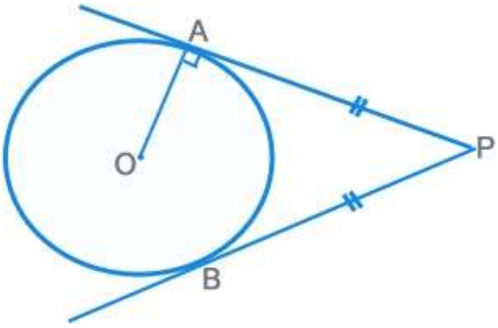
Area (sector OAXB) = $\frac{\theta}{360^0} \times \pi r^2$

Area of Minor Segment = Shaded Area in above figure

⇒Area of Sector OAXB - Area of OAB

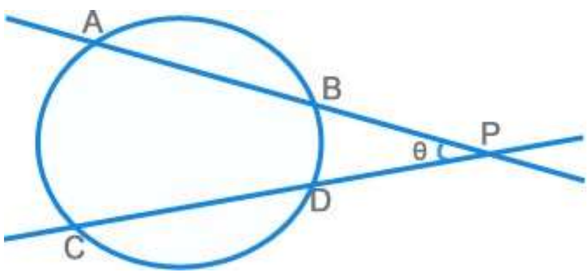
$\Rightarrow r^2\left[\frac{\pi\theta}{360^0} - \frac{\sin\theta}{2}\right]$

Properties of Tangents, Secants and Chords



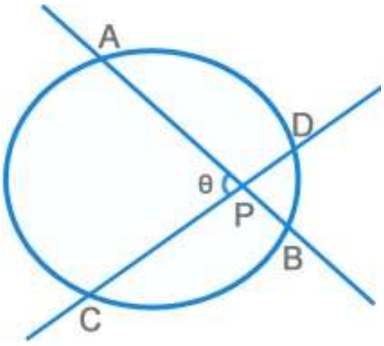
⇒ The radius and tangent are perpendicular to each other.

⇒ There can only be two tangents from an external point, which are equal in length **PA=PB**



⇒ PA × PB = PC × PD

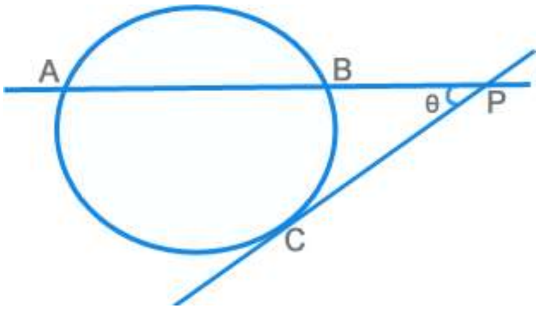
⇒ θ = ½ [m(Arc AC) – m(Arc BD)]



⇒ PA × PB = PC × PD

⇒ Θ = ½ [m(Arc AC) + m(Arc BD)]

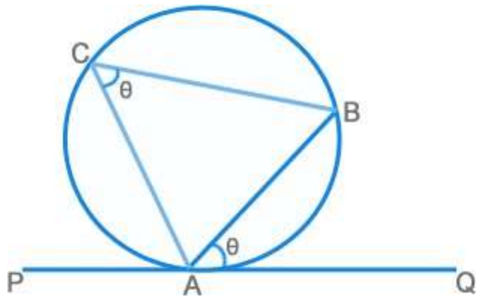
Properties



PA × PB = PC2

θ = ½ [m(Arc AC) - m(Arc BC)]

Alternate Segment Theorem

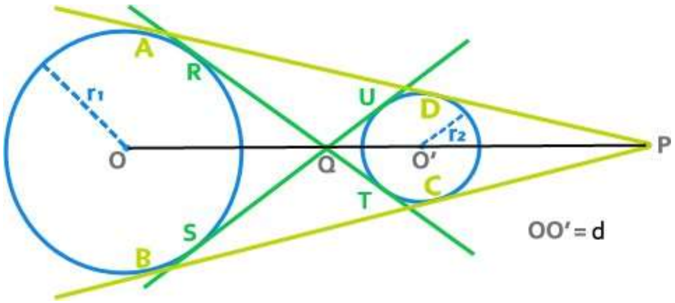


The angle made by the chord AB with the tangent at A (PQ) is equal to the angle that it subtends on the opposite side of the circumference.

⇒ ∠BAQ = ∠ACB

Common Tangents

Two Circles	No. of Common Tangents	Distance Between Centers (d)
One is completely inside other	0	$< r_1 - r_2$
Touch internally	1	$= r_1 - r_2$
Intersect	2	$r_1 - r_2 < d < r_1 + r_2$
Touch externally	3	$= r_1 + r_2$
One is completely outside other	4	$> r_1 + r_2$



Length of the Direct Common Tangent (DCT)
⇒ AD = BC = $\sqrt{d^2 - (r_1 - r_2)^2}$

Length of the Transverse Common Tangent (TCT)
⇒ RT = SU = $\sqrt{d^2 - (r_1 + r_2)^2}$

Concept: The two centers (O and O'), point of intersection of DCTs (P) and point of intersection of TCTs (Q) are collinear. Q divides OO' in the ratio r_1:r_2 internally whereas P divides OO' in the ratio r_1:r_2 externally.