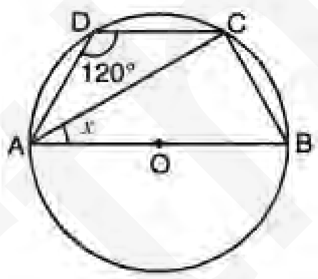
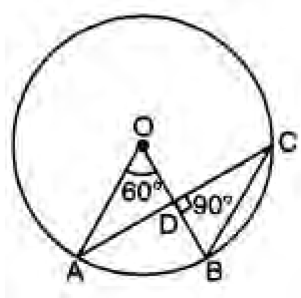
# Chapter 9 Circles Class 9 Maths important questions

**Question 1.**
**In the figure, O is the centre of a circle passing through points A, B, C and D and ∠ADC = 120°. Find the value of x.**




Solution:
Since ABCD is a cyclic quadrilateral
∠ADC + ∠ABC = 180°
[∴ opp. ∠s of a cyclic quad. are supplementary]
120° + ∠ABC = 180°
∠ABC = 180° – 120° = 60°
Now, ∠ACB = 90° [angle in a semicircle]
In rt. ∠ed ΔCB, ∠ACB = 90°
∠CAB + ∠ABC = 90°
x + 60° = 90°
x = 90° -60°
x = 30°

**Question 2.**
**In the given figure, O is the centre of the circle, ∠AOB = 60° and CDB = 90°. Find ∠OBC.**

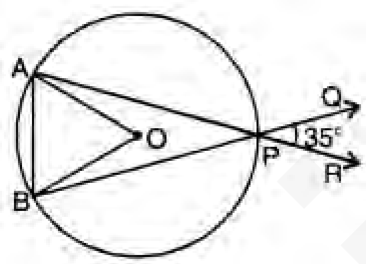



Solution:
Since angle subtended at the centre by an arc is double the angle subtended at the remaining part of the circle.
∴ ∠ACB = 13 ∠AOB = 13 x 60° = 30°
Now, in ACBD, by using angle sum property, we have
∠CBD + ∠BDC + ∠DCB = 180°
∠CBO + 90° + ∠ACB = 180°
[∵ ∠CBO = ∠CBD and ∠ACB = ∠DCB are the same ∠s]
∠CBO + 90° + 30° = 180°
∠CBO = 1800 – 90° – 30° = 60°
or ∠OBC = 60°

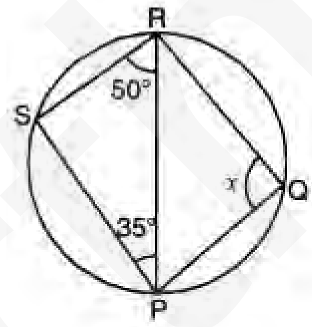
**Question 3.**
**In the given figure, O is the centre of the circle with chords AP and BP being produced to R and Q respectively. If ∠QPR = 35°, find the measure of ∠AOB.**

Solution:
∠APB = ∠RPQ = 35° [vert. opp. ∠s]

Now, $\angle AOB$ and $\angle APB$ are angles subtended by an arc AB at centre and at the remaining part of the circle.
$\therefore \angle AOB = 2\angle APB = 2 \times 35^\circ = 70^\circ$

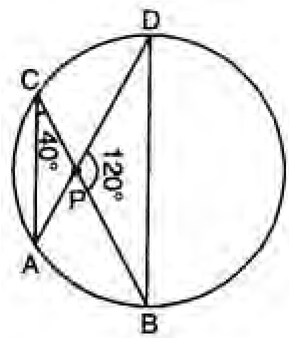



**Question 4.**
**In the figure, PQRS is a cyclic quadrilateral. Find the value of x.**



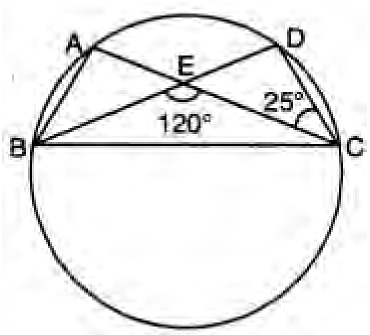

Solution:
In $\Delta PRS$, by using angle sum property, we have
$\angle PSR + \angle SRP + \angle RPS = 180^\circ$
$\angle PSR + 50^\circ + 350 = 180^\circ$
$\angle PSR = 180^\circ - 850 = 95^\circ$
Since PQRS is a cyclic quadrilateral
$\therefore \angle PSR + \angle PQR = 180^\circ$
[$\because$ opp. $\angle$s of a cyclic quad. are supplementary]
$95^\circ + x = 180^\circ$
$x = 180^\circ - 95^\circ$
$x = 85^\circ$

**Question 5.**
**In the given figure, $\angle ACP = 40^\circ$ and BPD = $120^\circ$, then find $\angle CBD$.**




Solution:
$\angle BDP = \angle ACP = 40^\circ$ [angle in same segment]
Now, in $\Delta BPD$, we have
$\angle PBD + \angle BPD + \angle BDP = 180^\circ$
$\Rightarrow \angle PBD + 120^\circ + 40^\circ = 180^\circ$
$\Rightarrow \angle PBD = 180^\circ - 1600 = 20^\circ$
or $\angle CBD = 20^\circ$

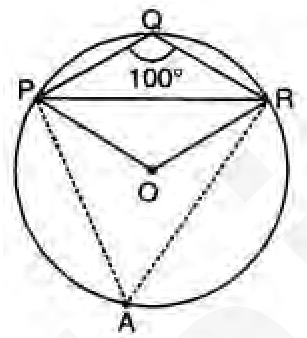
**Question 6.**
**In the given figure, if $\angle BEC = 120^\circ$, $\angle DCE = 25^\circ$, then find $\angle BAC$.**




Solution:
$\angle BEC$ is exterior angle of $\Delta CDE$.
$\therefore \angle CDE + \angle DCE = \angle BEC$
$\Rightarrow \angle CDE + 25^\circ = 120^\circ$
$\Rightarrow \angle CDE = 95^\circ$
Now, $\angle BAC = \angle CDE$ [$\because$ angle in same segment are equal]
$\Rightarrow \angle BAC = 95^\circ$

**Question 7.**
**In the given figure, PQR = $100^\circ$, where P, Q and R are points on a circle with centre O. Find LOPR.**

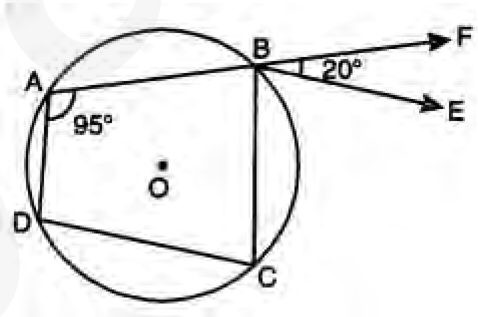
Solution:
Take any point A on the circumcircle of the circle.
Join AP and AR.




∵ APQR is a cyclic quadrilateral.
∴ ∠PAR + ∠PQR = 180° [sum of opposite angles of a cyclic quad. is 180°]
∠PAR + 100° = 180°
⇒ Since ∠POR and ∠PAR are the angles subtended by an arc PR at the centre of the circle and circumcircle of the circle.
∠POR = 2∠PAR = 2 x 80° = 160°
∴ In APOR, we have OP = OR [radii of same circle]
∠OPR = ∠ORP [angles opposite to equal sides]
Now, ∠POR + ∠OPR + ∠ORP = 180°
⇒ 160° + ∠OPR + ∠OPR = 180°
⇒ 2∠OPR = 20°
⇒ ∠OPR = 10°

**Question 8.**
**In figure, ABCD is a cyclic quadrilateral in which AB is extended to F and BE || DC. If ∠FBE = 20° and DAB = 95°, then find ∠ADC.**

Solution:

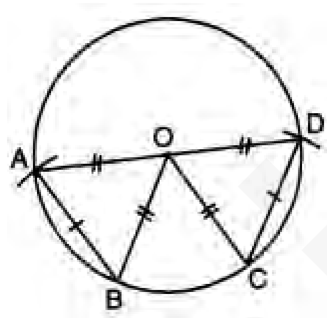



Sum of opposite angles of a cyclic quadrilateral is 180°
∴ ∠DAB + ∠BCD = 180°
⇒ 95° + ∠BCD = 180°
⇒ ∠BCD = 180° – 95° = 85°
∵ BE || DC
∴ ∠CBE = ∠BCD = 85°[alternate interior angles]
∴ ∠CBF = CBE + ∠FBE = 85° + 20° = 105°
Now, ∠ABC + 2CBF = 180° [linear pair]
and ∠ABC + ∠ADC = 180° [opposite angles of cyclic quad.]
Thus, ∠ABC + ∠ADC = ∠ABC + 2CBF
⇒ ∠ADC = CBF
⇒ ∠ADC = 105° [∵ CBF = 105°]

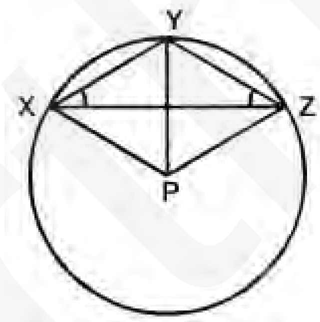
**Question 9**
**Equal chords of a circle subtends equal angles at the centre.**

Solution:
Given : In a circle C(O, r), chord AB = chord CD
To Prove : ∠AOB = ∠COD.
Proof : In ΔAOB and ΔCOD
AO = CO (radii of same circle]
BO = DO [radii of same circle]

Chord AB = Chord CD (given]
$\Rightarrow$ $\Delta$AOB = ACOD [by SSS congruence axiom]
$\Rightarrow$ $\angle$AOB = COD (c.p.c.t.]




**Question 10.**
**In the given figure, P is the centre of the circle. Prove that : $\angle$XPZ = 2($\angle$X$\angle$Y + $\angle$YXZ).**




Solution:
Arc XY subtends $\angle$XPY at the centre P and $\angle$XZY in the remaining part of the circle.
$\therefore$ $\angle$XPY = 2 ($\angle$X$\angle$Y)
Similarly, arc YZ subtends $\angle$YPZ at the centre P and $\angle$YXZ in the remaining part of the circle.
$\therefore$ $\angle$YPZ = 2($\angle$YXZ) ....(ii)
Adding (i) and (ii), we have
$\angle$XPY + $\angle$YPZ = 2 ($\angle$XZY + $\angle$YXZ)
$\angle$XP2 = 2 ($\angle$XZY + $\angle$YXZ)