Circles

Assertion & Reason Type Questions

Directions: In the following questions, a statement of Assertion (A) is followed by a statement of a Reason (R). Choose the correct choice as:

a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

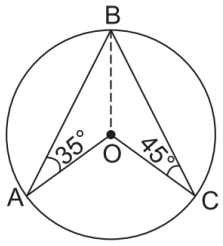
b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

c. Assertion (A) is true but Reason (R) is false.

d. Assertion (A) is false but Reason (R) is true.

Q1.

Assertion (A): If O is the centre of a circle and A, B and C are three points on a circle such that $\angle OAB = 35°$ and $\angle OCB = 45°$, then $\angle AOC = 160°$.



Reason (R): Angle subtended by an arc of a circle at the centre of the circle is double the angle subtended by an arc on the circumference.

Answer :

(a) **Assertion (A):** Given, $\angle OAB = 35°$ and $\angle OCB = 45°$

In ΔOAB,

$OA = OB$ [Radii of a circle]

$\Rightarrow \angle ABO = \angle BAO$ (angles opposite to equal sides of a triangle are equal)

$= 35°$

Similarly, $\angle OBC = \angle BCO = 45°$

$\therefore \angle ABC = \angle ABO + \angle OBC$

$= 35° + 45° = 80°$

$\therefore \angle AOC = 2 \times \angle ABC$

= 2 × 80° = 160°

So, Assertion (A) is true.

Reason (R): It is also true that angle subtended by an arc of a circle at the centre of circle is double the angle subtended by an arc on the circumference.

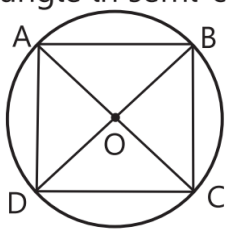
Hence, both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q2. Assertion (A): Two diameters of a circle intersect each other at right angles. Then the quadrilateral formed by joining their end-points is a square.

Reason (R): Equal chords subtend equal angles at the centre.

Answer :

(b) **Assertion (A):** Let AC and BD be two perpendicular diameters of a circle with centre O.
Here, $\angle ABC = 90°$ and $\angle ADC = 90°$
[angle in semi-circle is a right-angle]



Also, $\angle BAD = 90°$ and $\angle BCD = 90°$

In ΔAOB and ΔAOD,

	$AO = AO$	[Common]
	$\angle AOB = \angle AOD$	[Given $AO \perp BD$]
	$BO = OD$	[Radii of a circle]
$\therefore$	$\Delta AOB \cong \Delta AOD$	[By SAS congruence rule)
$\Rightarrow$	$AB = AD$	[By CPCT]

Similarly, $AD = DC$, $DC = BC$, $BC = AB$
$\therefore AB = BC = CD = DA$

Also, each angle of a quadrilateral is 90°.

Hence, ABCD is a square.

So, Assertion (A) is true.

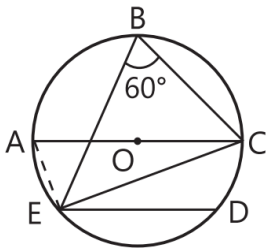
Reason (R): It is also true that equal chords subtend equal angles at the centre.

Hence, both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

Q3.

Assertion (A): Chord ED is parallel to the diameter AC of the circle. If $\angle$ CBE = 60°, then $\angle$ ACE is 30°.

Reason (R): Same segment of a circle do not make equal angles at the circumference.



Answer :

(c) **Assertion (A):** In a given figure EC is a chord of a circle.
Since, $\angle$ EBC and $\angle$ EAC are the same segments of a circle.
$\therefore$ $\angle$ EAC = $\angle$ EBC = 60°
Since, AC is the diameter of the circle and the angle in semi-circle is a right angle *i.e.*,
$\angle$ AEC = 90°.
Now in Δ ACE, use angles sum property of a triangle.

$$\angle EAC + \angle AEC + \angle ACE = 180°$$
$$\Rightarrow 60° + 90° + \angle ACE = 180°$$
$$\Rightarrow \angle ACE = 30°$$

So, Assertion (A) is true.

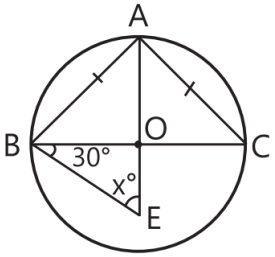
Reason (R): It is false, because same segment of a circle makes equal angles at the circumference.

Hence, Assertion (A) is true but Reason (R) is false.

Q4.

Assertion (A): In the figure, E is any point in the interior of the circle with centre O. Chord AB is equal to chord AC. If $\angle$ OBE = 30°, the value of x is 60°.

Reason (R): Equal chords subtend equal angles at the centre.



Answer : (a) Assertion (A): Given, AB = AC

$\Rightarrow \quad \angle AOB = \angle AOC$

In ΔAOB and ΔAOC,

$AB = AC$ [Given]

$OB = OC$ [Radii]

$OA = OA$ [Common]

$\therefore \Delta AOB \cong \Delta AOC$ [By SSS congruence criterion]

$\Rightarrow \quad \angle AOB = \angle AOC = 90°$

$\Rightarrow \quad OA \perp BC$

In ΔOBE,

$\angle OBE + \angle BOE + \angle BEO = 180°$

$\Rightarrow \quad 30° + 90° + x = 180°$

$\therefore \quad x = 60°$

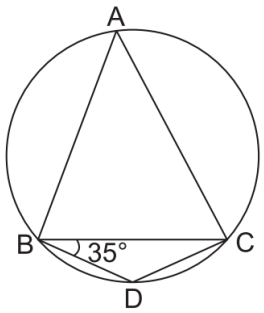
So, Assertion (A) is true.

Reason (R): It is true that equal chords subtend equal angles at the centre.

Hence, both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q5.

Assertion (A): In the adjoining figure, BD = DC and $\angle DBC = 35°$, then the measure of $\angle BAC$ is 70°.



Reason (R): The sum of opposite angles of a cyclic quadrilateral is 180°.

Answer : (a) Assertion (A):

In ΔBDC,

$BD = DC$ [Given]

$\Rightarrow \angle BCD = \angle DBC$

[Angles opposite to equal sides of a triangle are equal]

$= 35°$

Using angle sum property of a triangle,

$$\angle CBD + \angle BCD + \angle BDC = 180°$$
$$\Rightarrow \quad 35° + 35° + \angle BDC = 180°$$
$$\Rightarrow \quad 70° + \angle BDC = 180°$$
$$\Rightarrow \quad \angle BDC = 110°$$

Since, ABCD is a cyclic quadrilateral

Here $\angle BAC + \angle BDC = 180°$

$$\therefore \quad \angle BAC + 110° = 180°$$
$$\Rightarrow \quad \angle BAC = 70°$$

So, Assertion (A) is true.

Reason (R): It is true to say that the sum of opposite angles of a cyclic quadrilateral is 180°.

Hence, both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).