Circles

Assertion & Reason Type Questions

In the following questions, a statement of assertion (A) is followed by a statement of a reason (R). Choose the correct option:

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): A tangent to a circle is perpendicular to the radius through the point of contact.

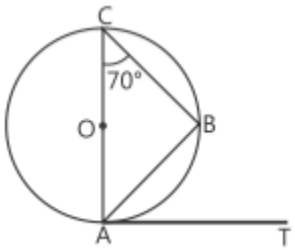
Reason (R): The lengths of tangents drawn from the external point to a circle are equal.

Answer : (b) **Assertion (A):** It is true that a tangent to a circle is perpendicular to the radius through the point of contact.

Reason (R): It is also true that the lengths of tangents drawn from the external point to a circle are equal. Thus, both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

Q 2. Assertion (A): In the given figure, O is the centre of a circle and AT is a tangent at point A, then <BAT = 70°.

Reason (R): A straight line can intersect a circle at one point only.



Answer : Here. <BAT = <ACB

(by alternate segment theorem)

:- <BAT 70° (<ACB=70°, given)

So, Assertion (A) is true.

Reason (R): Any straight line can intersect a circle at two points.
So, Reason (R) is false.

Q 3. Assertion (A): Suppose the distance between two parallel tangents of a circle is 16 cm, then radius of a circle is 10 cm.

Reason (R): The distance between two parallel tangents of a circle is equal to the diameter of a circle.

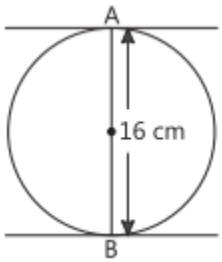
Answer : (d) **Assertion (A):** The distance between two parallel tangents is equal to the diameter of a circle.

$\therefore \quad d = AB = 16$ cm

Now, radius of a circle, $r = \frac{d}{2} = \frac{16}{2}$

$= 8$ cm

So, Assertion (A) is false.

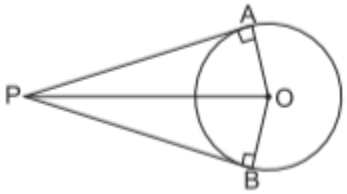


Reason (R): It is also true that the distance between two parallel tangents is equal to the diameter of a circle.
So, Reason (R) is true.
Hence, Assertion (A) is false but Reason (R) is true.

Q 4. Assertion (A): If PA and PB are tangents drawn from an external point P to a circle with centre O, then the quadrilateral AOBP is cyclic.

Reason (R): The angle between two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre.

Answer : (a) **Assertion (A):** We know that, the angle between two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre.
i.e., <APB + <AOB = 180° ...(1)



Also, the tangent at any point of a circle is perpendicular to the radius through the point of contact.

i.e., $PA \perp OA \Rightarrow \angle OAP = 90°$

and $PB \perp OB \Rightarrow \angle OBP = 90°$

$\therefore \angle OAP + \angle OBP = 90° + 90° = 180°$ ...(2)

If the sum of a pair of opposite angles of a quadrilateral is 180° then quadrilateral is cyclic.

From eqs. (1) and (2), we get

Quadrilateral AOBP is cyclic.

So, Assertion (A) is true.

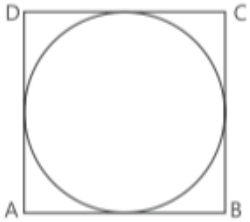
Reason (R): It is a true statement also.

Hence, both Assertion (A) and Reason (R) are true and

Reason (R) is the correct explanation of Assertion (A).

Q 5. Assertion (A): In the given figure, a quadrilateral ABCD is drawn to circumscribe a given circle, as shown. Then

AB + BC = AD + DC.



Reason (R): In two concentric circles, the chord of the larger circle, which touches the smaller circle, is bisected at the point of contact.

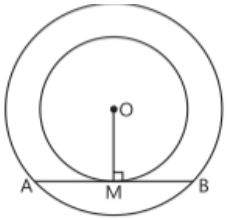
Answer :

(d) Assertion (A): If a quadrilateral ABCD is drawn to circumscribe a circle, then

AB + CD = AD + BC

So, Assertion (A) is false.

Reason (R): We have two concentric circles with O is the centre of concentric circles and AB is the tangent.



Since, $OM \perp AB$

$\therefore$ $AM = MB$

($\because$ perpendicular drawn from centre

So, Reason (R) is true.

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

Q 6. Assertion (A): PA and PB are two tangents to a circle with centre O. Such that <AOB = 110°, then <APB = 90°.

Reason (R): The length of two tangents drawn from an external point are equal.

Answer :

(d) **Assertion (A):** We have,

$OA \perp AP$

and $OB \perp PB$

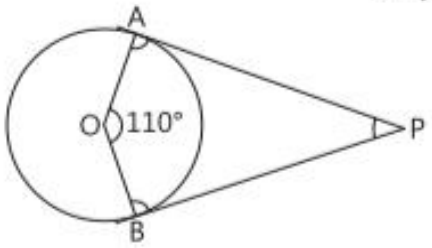
In quadrilateral OAPB, we have

$\angle OAP + \angle APB + \angle PBO + \angle AOB = 360°$

$\Rightarrow \quad 90° + \angle APB + 90° + 110° = 360°$

$\Rightarrow \quad \angle APB = 70°$

(∵ radius is perpendicular to the tangent at point of contact)



So, Assertion (A) is false.

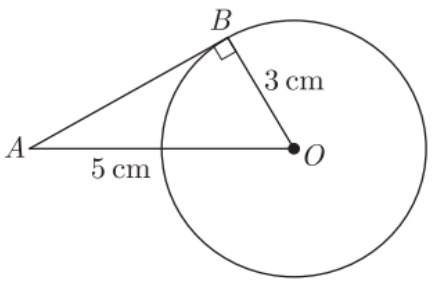
Reason (R): It is true that the length of two tangents drawn from an external point are equal.

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

Q.7. Assertion (A) : If in a circle, the radius of the circle is 3 cm and distance of a point from the centre of a circle is 5 cm, then length of the tangent will be 4 cm.

Reason (R) : (hypotenuse) ^{2} = (base) ^{2} + (height) ^{2}

Answer : (a)



$$(OA)^2 = (AB)^2 + (OB)^2$$
$$(AB) = \sqrt{25 - 9} = 4 \text{ cm}$$

Q.8. Assertion (A) : The two tangents are drown to a circle from an external point, than they subtend equal angles at the centre.

Reason (R) : A parallelogram circumscribing a circle is a rhombus.

Answer : (b) From an external point the two tangents drawn subtend equal angles at the centre. So A is true. Also, a parallelogram circumscribing a circle is a rhombus, so R is also true but R is not correct explanation of A.

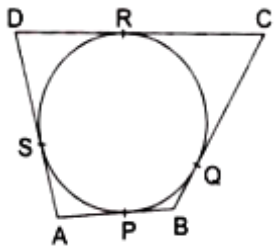
Q.9. Assertion (A) : If in a cyclic quadrilateral, one angel is 40^0 , then the opposite angle is 140^0.

Reason (R) : Sum of opposite angles in a cyclic quadrilateral is equal to 360^0.

Answer : (c) Angle + $40^0 = 180^0$

Angle = $180^0 - 40^0 = 140^0$

Q.10. Assertion (A) : In the given figure, a quadrilateral ABCD is drawn to circumscribe a given circle, as shown. Then AB + BC = AD + DC .



Reason (R) : In two concentric circles, the chord of the larger circle, which touches the smaller circle, is bisected at the point of contact.

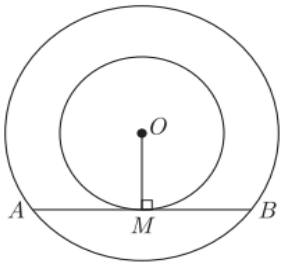
Answer : (d) We have two concentric circles O is the centre of concentric circles and AB is the tangent

$$OM \perp AB$$

$$AM = MB$$

(Perpendicular from centre O to the chord AB bisect the chord AB)

So, A is incorrect but R is correct. Hence, (d) is the correct option.

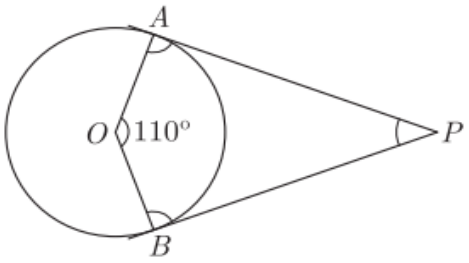


Q.11. Assertion (A) : PA and PB are two tangents to a circle with centre O. Such that $\angle AOB = 110^0$, then $+APB = 90^0$.

Reason (R) : The length of two tangents drawn from an external point are equal.

Answer : (d) We have, $OA \perp AP$
and $OB \perp PB$

In quadrilateral, OAPB , we have
$\angle OAP + \angle APB + \angle PBO + \angle AOB = 360^0$
$90^0 + \angle APB + 90^0 + 110^0 = 360^0$
$\angle APB = 70^0$
(Radius is perpendicular to the tangent at point of tangency)

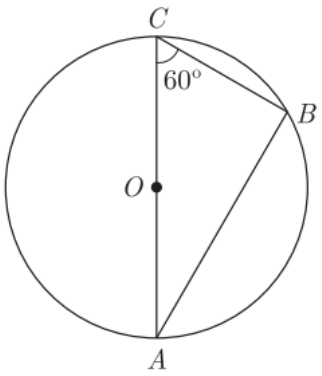


Q.12. Assertion (A) : If length of a tangent from an external point to a circle is 8 cm, then length of the other tangent from the same point is 8 cm.

Reason (R) : Length of the tangents drawn from an external point to a circle are equal.

Answer : (a)

Q.13. Assertion (A) : In the given figure, O is the centre of a circle and AT is a tangents at point A, then $\angle BAT = 60^0$.



Reason (R) : A straight line can meet a circle at one point only.

Answer : (c)

We have, $\angle ABC = 90^\circ$

(Angle in the semi-circle)

in $\triangle ABC$

$\angle ABC + \angle ACB + \angle CAB = 180^\circ$

(Angle sum property of $\triangle ABC$)

$\Rightarrow \quad 90^\circ + 60^\circ + \angle CAB = 180^\circ$

$\Rightarrow \quad \angle CAB = 30^\circ$

Now, $OA \perp AT$

$\angle BAT = 90^\circ - 30^\circ = 60^\circ$

So, A is correct but R is incorrect.

Q.14. Assertion (A) : Centre and radius of the circle $x^2 + y^2 - 6x + 4y - 36 = 0$ is (3, -2) and 7 respectively.

Reason (R) : Centre and radius of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ is given as (-g, -f) and $\sqrt{g^2 + f^2 - c}$ respectively.

Answer : (a)

$2g = -6$

$g = -3$

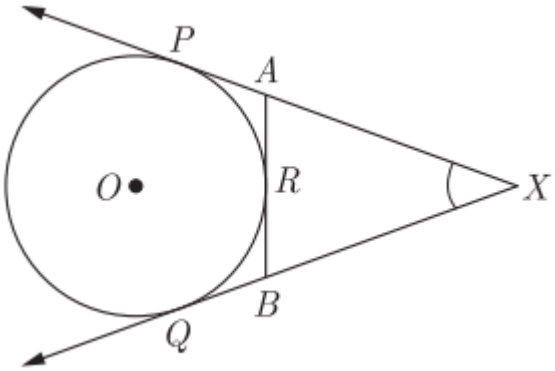
$2f = 4$

$f = 2$

Centre $= (3, -2)$

and $r = \sqrt{9 + 4 + 36} = \sqrt{49} = 7$

Q.15**. Assertion (A) :** In the given figure, XA + AR = XB + BR , where XP, XQ and AB are tangents.



Reason (R) : A tangent to the circle can be drawn from a point inside the circle.

Answer : (c) We have, XP = XQ

XA + AP = XB + BQ

XA + AR = XB + BR

[PA = AR and BQ = BR]

(The length of tangents drawn from in external point are equal)

So, A is correct but R is incorrect.

Q.16**. Assertion (A) :** Centre and radius of the circle

$x^2 + y^2 - x + 2y - 3 = 0$ is $\left(\frac{1}{2}, -1\right)$ and $\frac{\sqrt{17}}{2}$

respectively.

Reason (R) : The equation of a circle with radius r having centre (h,k) is given by $(x - h^2) + (y - k)^2 = r^2$.

Answer : (b)

$$2g = -1$$

$$g = -\frac{1}{2}$$

and

$$2f = 2$$

$$f = 1$$

Q.17. Assertion (A) : The circle $x^2+y^2+2ax+c=0$, $x^2+y^2+2by+c=0$ touch if $\frac{1}{a^2}+\frac{1}{b^2}=\frac{1}{c}$

Reason (R) : The circles with centre C_1, C_2 and radii r_1, r_2 touch each other if $r_1 \pm r_2 = c_1c_2$.

Answer : (a) Two circles touch each other,

$$\begin{aligned} C_1C_2 &= r_1 \pm r_2 \\ \sqrt{a^2+b^2} &= \sqrt{a^2+c} = \sqrt{b^2-c} \\ a^2+b^2 &= a^2-c+b^2-c+2\sqrt{(a^2-c)(b^2-c)} \\ c^2 &= (a^2-1)(b^2-c) \\ a^2b^2 &= (a^2+b)^2c \\ \frac{1}{c} &= \frac{1}{a^2}+\frac{1}{b^2} \end{aligned}$$