Chapter - 4

Quadratic Equations

(Assertion and Reasoning Questions)

In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark 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.

Q.1. Assertion (A) : $4x^2 - 12x + 9 = 0$ has repeated roots.

Reason (R) : The quadratic equation $ax^2 + bx + c = 0$ have repeated roots if discriminant $D > 0$.

Q.2. Assertion (A) : The equation $x^2 + 3x + 1 = (x - 2)^2$ is a quadratic equation.

Reason (R) : Any equation of the form $ax^2 + bx + c = 0$ where $a \neq 0$ is called a quadratic equation.

Q.3. Assertion (A) : $(2x - 1)^2 - 4x^2 + 5 = 0$ is not a quadratic equation.

Reason (R) : x = 0, 3 are the roots of the equation $2x^2 - 6x = 0$.

Q.4. Assertion (A) : The values of x are $-\frac{a}{2}$, a for a quadratic equation $2x^2 + ax - a^2 = 0$.

Reason (R) : For quadratic equation $ax^2 + bx + c = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Q.5. Assertion (A) : The equation $8x^2 + 3kx + 2 = 0$ has equal roots then the value of k is $\pm \frac{8}{3}$.

Reason (R) : The equation $ax^2 + bx + c = 0$ has equal roots if $D = b^2 - 4ac = 0$

Q.6. Assertion (A) : The value of k = 2, if one root of the quadratic equation $6x^2 - x - k = 0$ is $\frac{2}{3}$

Reason (R) : The quadratic equation $ax^2 - bx + c = 0$, $a \neq 0$ has two roots.

Q.7. Assertion (A) : The roots of the quadratic equation $x^2 - 2x + 2 = 0$ are imaginary.

Reason (R) : If discriminant $D = b^2 - 4ac < 0$ then the roots of quadratic equation $ax^2 + bx + c = 0$ are imaginary.

Q.8. Assertion (A) : If roots of the equation $x^2 - bx + c = 0$ are two consecutive integers, then $b^2 - 4c = 1$

Reason (R) : If a, b, c are odd integer then the roots of the equation $4abc\,x^2 + (b^2 - 4ac)x - b = 0$ are real and distinct.

Q.9. Assertion (A) : The equation $9x^2 + 3kx + 4 = 0$ has equal roots for k = ± 4.

Reason (R) : If discriminant 'D' of a quadratic equation is equal to zero then the roots of equation are real and equal.

Q.10. Assertion (A) : A quadratic equation $ax^2 + bx + c = 0$, has two distinct real roots, if $b^2 - 4ac > 0$.

Reason (R) : A quadratic equation can never be solved by using method of completing the squares.

Q.11. Assertion (A) : Sum and product of roots of $2x^2 - 3x + 5 = 0$ are $\frac{3}{2}$ and $\frac{5}{2}$ respectively.

Reason (R) : If α and β are the roots of $ax^2 + bx + c = 0$, a ≠ 0 , then sum of roots = α + β = $-\frac{b}{a}$ and product of roots = αβ = $\frac{c}{a}$.

-x-x-x-

ANSWER KEY

Q.1 : (c)

$$\begin{aligned} 4x^2 - 12x + 9 &= 0 \\ D &= b^2 - 4ac \\ &= (-12)^2 - 4(4)(9) \\ &= 144 - 144 = 0 \end{aligned}$$

Roots are repeated.

Q.2 : (d)

$$\begin{aligned} &\text{We have, } x^2 + 3x + 1 = (x-2)^2 = x^2 - 4x + 4 \\ &\Rightarrow \quad x^2 + 3x + 1 = x^2 - 4x + 4 \\ &\Rightarrow \quad 7x - 3 = 0, \\ &\text{it is not of the form } ax^2 + 6x + c = 0 \end{aligned}$$

So, A is incorrect but R is correct.

Q.3 : (b)

Assertion and Reason both are true statements. But Reason is not the correct explanation.

Assertion $(2x-1)^2-4x^2+5=0$

$$-4x+6=0$$

Reason $$2x^2-6x=0$$

$$2x(x-3)=0$$

$$x=0$$

and $$x=3$$

Q.4 : (d)

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

$$2x^2+ax-a^2=0$$

$$x=\frac{-a\pm\sqrt{a^2+8a^2}}{4}$$

$$=\frac{-a+3a}{4}=\frac{2a}{4},\frac{-4a}{4}$$

$$x=\frac{a}{2},-a$$

So, A is incorrect but R is correct.

Q.5 : (a)

$$8x^2+3kx+2=0$$

Discriminant, $D=b^2-4ac$

$$D=(3k)^2-4\times8\times2=9k^2-64$$

$$\begin{aligned}
\text{For equal roots,} \quad D &= 0 \\
9k^2 - 64 &= 0 \\
9k^2 &= 64 \\
k^2 &= \frac{64}{9} \\
k &= \pm\frac{8}{3}
\end{aligned}$$

So, A and R both are correct and R explains A.

Q.6 : (b)

$$\begin{aligned}
\text{As one root is } \frac{2}{3} \quad x &= \frac{2}{3} \\
6 \times \left(\frac{2}{3}\right)^2 - \frac{2}{3} - k &= 0 \\
6 \times \frac{4}{9} - \frac{2}{3} &= k \\
k &= \frac{8}{3} - \frac{2}{3} = \frac{6}{3} = 2 \\
k &= 2
\end{aligned}$$

So, both A and R are correct but R does not explain A.

Q.7 : (a)

$$\begin{aligned}
x^2 + 2x + 2 &= 0 \\
\text{Discriminant,} \quad D &= b^2 - 4ac \\
&= (2)^2 - 4 \times 1 \times 2 \\
&= 4 - 8 = -< 04
\end{aligned}$$

Roots are imaginary. So, both A and R are correct and R explains A.

Q.8 : (b)

Assertion : Given equation

$$x^2 - bx + c = 0$$

Let α, β be two roots such that

$$|\alpha - \beta| = 1$$
$$(\alpha + \beta)^2 - 4\alpha\beta = 1$$
$$b^2 - 4c = 1$$

Reason : Given equation

$$4abc\,x^2 + (b^2 - 4ac)x - b = 0$$
$$D = (b^2 - 4ac)^2 + 16ab^2c$$
$$D = (b^2 - 4ac)^2 > 0$$

Hence roots are real and unequal.

Q.9 : (a)

Assertion

$$9x^2 + 3kx + 4 = 0$$
$$D = b^2 - 4ac$$
$$= (3k)^2 - 4(9)(4)$$
$$= 9k^2 - 144$$

For equal roots $D = 0$

$$9k^2 = 144$$
$$k = \pm\frac{12}{3}$$
$$k = \pm 4$$

Q.10 : (c)

Q.11 : (a)

Assertion and Reason both are correct and Reason is correct explanation.

Assertion $2x^2 - 3x + 5 = 0$

$$\alpha + \beta = \frac{-b}{a}$$

$$= \frac{-(-3)}{2} = \frac{3}{2}$$

and $$\alpha\beta = \frac{c}{a} = \frac{5}{2}$$