Short Answer Type Questions – I

[2 marks]

Que 1. State whether the equation $(x + 1)(x – 2) + x = 0$ has two distinct real roots or not. Justify your answer.

Sol. $(x + 1)(x – 2) + x = 0 \Rightarrow x^2 – x – 2 + x = 0 \Rightarrow x^2 – 2 = 0$

$D = b^2 - 4ac = 0 – 4 (1) (-2) = 8 > 0$

$\therefore$ Given equation has two distinct real roots.

Que 2. Is 0.3 a root of the equation $x^2 - 0.9 = 0$? Justify.

Sol. $\therefore$ 0.3 is a root of the equation $x^2 - 0.9 = 0$

$\therefore x^2 - 0.9 = (0.3)^2 - 0.9 = 0.09 – 0.9 \neq 0$

Hence, 0.3 is not a root of given equation.

Que 3. For what value of k, is 3 a root of the equation $2x^2 + x + k = 0$?

Sol. 3 is a root of $2x^2 + x + k = 0$, when

$2(3)^2 + 3 + k = 0$

$\Rightarrow 18 + 3 + k = 0 \Rightarrow k = - 21$

Que 4. Find the values of k for which the quadratic equation $9x^2 - 3kx + k = 0$ has equal roots.

Sol. For equal roots:

$D = 0 \Rightarrow b^2 – 4ac = 0$

$(-3k)^2 – 4 \times 9 \times k = 0 \Rightarrow 9k^2 = 36k \Rightarrow k = 4$

Que 5. If – 5 is a root of the quadratic equation $2x^2 + px – 15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots, then find the value of k.

Sol. Since – 5 is a root of the equation $2x^2 + px – 15 = 0$

$\therefore 2(-5)^2 + p(-5) – 15 = 0$

$\Rightarrow 50 - 5p – 15 = 0$ or $5p = 35$ or $p = 7$

Again $p(x^2 + x) + k = 0$ or $7x^2 + 7x + k = 0$ has equal roots

$\therefore D = 0$

$i.e., \quad b^2 – 4ac = 0$ or $49 – 4 \times 7 k = 0 \Rightarrow k = \frac{49}{28} = \frac{7}{4}$

Que 6. Does there exist a quadratic equation whose co-efficients are rational but both of its roots are irrational? Justify your answer.

Sol. Yes, $x^2 – 4x + 1 = 0$ is a quadratic equation with rational co-efficients.

Its roots are $\frac{4 \pm \sqrt{(-4)^2 - 4 \times 1 \times 1}}{2} = \frac{4 \pm \sqrt{12}}{2} = 2 \pm \sqrt{3}$, which are irrational.

Que 7. Write the set of values of k for which the quadratic equation $2x^2 + kx + 8 = 0$ has real roots.

Sol. For real roots, D ≥ 0

⇒ $b^2 - 4ac \geq 0$ ⇒ $k^2 - 4(2)(8) \geq 0$

⇒ $k^2 - 64 \geq 0$ ⇒ $k^2 \geq 64$ ⇒ $k \geq -8$ and $k \geq 8$

Que 8. Solve the quadratic equation $2x^2 + ax - a^2 = 0$ for x.

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

Here, a = 2, b = a and c = $-a^2$.

Using the formula,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ we get,

$$x = \frac{-a \pm \sqrt{a^2 - 4 \times 2 \times -a^2}}{2 \times 2} = \frac{-a \pm \sqrt{9a^2}}{4} = \frac{-a \pm 3a}{4}$$

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

Que 9. Find the values of p for which the quadratic equation $4x^2 + px + 3 = 0$ has equal roots.

Sol. For equal roots; D = 0

$b^2 - 4ac = 0$

i.e., $p^2 - 4 \times 4 \times 3 = 0$ ⇒ $p^2 - 48 = 0$

$p^2 = 48$ ⇒ $p = \pm\sqrt{48}$

$p = 4\sqrt{3}$ or $-4\sqrt{3}$

Que 10. Solve for x: $\sqrt{3}x^2 - 2\sqrt{2x} - 2\sqrt{3} = 0$

Sol. $\sqrt{3}x^2 - 2\sqrt{2x} - 2\sqrt{3} = 0$ ⇒ $\sqrt{3}x^2 - 3\sqrt{2x} + \sqrt{2x} - 2\sqrt{3} = 0$

$\sqrt{3x}(x - \sqrt{6}) + \sqrt{2}(x - \sqrt{6}) = 0$ ⇒ $(\sqrt{3x} + \sqrt{2})(x - \sqrt{6}) = 0$

⇒ $\sqrt{3x} + \sqrt{2} = 0$ or $x - \sqrt{6} = 0$

⇒ $x = \frac{-\sqrt{2}}{\sqrt{3}}$ or $x = \sqrt{6}$

Que 11. If $x = \frac{2}{3}$ and $x = -3$ are roots of the quadratic equation $ax^2 + 7x + b = 0$, find the values of a and b.

Sol. Let us assume the quadratic equation be Ax^2 + Bx + C = 0.

Sum of the roots = - $\frac{B}{A}$

⇒ $\frac{-7}{a} = \frac{2}{3} - 3$ ⇒ $a = 3$

Product of the roots = $\frac{C}{A}$

⇒ $\frac{b}{a} = \frac{2}{3}$ x (-3) ⇒ b = - 6

Que 12. A two digit number is four times the sum of the digit. It is also equal to 3 times the product of digit. Find the number.

Sol. Let the ten's digit be x and unit's digit = y

Number = 10x + y

∴ 10x + y = 4(x + y) ⇒ 6x = 3y ⇒ 2x = y

Again 10x + y =3xy

10x + 2x = 3x (2x) ⇒ 12x = 6x^2 ⇒ x = 2 (rejecting x = 0)

2x = y ⇒ y = 4

∴ The required number is 24