CLASS 10 MATHS EXTRA QUESTIONS

Extra Questions: Class 10 Maths Chapter 4 Quadratic Equations

These go beyond the standard Exercise 4.1–4.3 questions into genuine HOTS (Higher Order Thinking Skills) territory — parameter-based equal-roots problems, an assertion-reason question, a reverse-engineered equation from irrational roots, a digit-based word problem, and two abstract/general reasoning questions. S...

Contents

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Extra Questions (HOTS Level): Quadratic Equations (Class 10 Maths Chapter 4)

Q1. Find the value(s) of p for which the equation $(p - 2)x^2 + 8x + (p + 4) = 0$, $p \neq 2$, has real and equal roots.
Here a = (p−2), b = 8, c = (p+4). For equal roots, D = 0:
$D = 8^2 - 4(p-2)(p+4) = 64 - 4(p^2 + 2p - 8) = 64 - 4p^2 - 8p + 32 = 96 - 8p - 4p^2$.
Setting D = 0: $4p^2 + 8p - 96 = 0 \Rightarrow p^2 + 2p - 24 = 0 \Rightarrow (p+6)(p-4) = 0$.
Both values satisfy $p \neq 2$.
p = −6 or p = 4.

Q2. Assertion (A): The quadratic equation $x^2 + 6x + 9 = 0$ has real and equal roots. Reason (R): A quadratic equation $ax^2 + bx + c = 0$ ($a \neq 0$) has real roots whenever $b^2 \geq 4ac$. Which is correct: (a) both A and R true, R correctly explains A; (b) both A and R true, but R does NOT correctly explain A; (c) A true, R false; (d) A false, R true?
Checking A: for $x^2+6x+9=0$, D = 36−36 = 0, so the roots are real and equal — A is true.
Checking R: the general statement "$b^2 \geq 4ac \Rightarrow$ real roots" is itself true — it covers both the D>0 (distinct) and D=0 (equal) cases, so R is also true.
However, R only explains why the roots are real; it does not by itself explain why they are specifically equal (that needs the stricter condition $b^2 = 4ac$). So R does not correctly explain A.
Answer: (b) — both A and R are true, but R is not the correct explanation of A.

Q3. Form a quadratic equation with rational (integer) coefficients, given that one of its roots is $3 + \sqrt{7}$.
Since the coefficients must be rational, irrational roots of a quadratic always occur in conjugate pairs. So the other root must be $3 - \sqrt{7}$.
Sum of roots = $(3+\sqrt{7}) + (3-\sqrt{7}) = 6$. Product of roots = $(3+\sqrt{7})(3-\sqrt{7}) = 9 - 7 = 2$.
Using $x^2 - (\text{sum})x + (\text{product}) = 0$:
$x^2 - 6x + 2 = 0$.

Q4. A two-digit number is such that the product of its digits is 18. When 27 is added to the number, its digits interchange their places. Find the number.
Let the ten's digit = x and the unit's digit = y, so the number = 10x+y and the digit product xy = 18.
Adding 27 reverses the digits: $10x + y + 27 = 10y + x \Rightarrow 9x - 9y = -27 \Rightarrow y = x + 3$.
Substituting into xy = 18: $x(x+3) = 18 \Rightarrow x^2 + 3x - 18 = 0 \Rightarrow (x+6)(x-3) = 0$. Rejecting the negative root, x = 3, so y = 6.
Check: number = 36, reversed = 63, and 36 + 27 = 63. ✓
The number is 36.

Q5. If α and β are the roots of $x^2 - px + q = 0$, find, in terms of p and q, the quadratic equation whose roots are (α+1) and (β+1).
For the given equation, sum of roots $\alpha+\beta = p$ and product $\alpha\beta = q$.
New sum = $(\alpha+1)+(\beta+1) = (\alpha+\beta) + 2 = p + 2$.
New product = $(\alpha+1)(\beta+1) = \alpha\beta + (\alpha+\beta) + 1 = q + p + 1$.
Using $x^2 - (\text{new sum})x + (\text{new product}) = 0$:
$x^2 - (p+2)x + (p+q+1) = 0$.

Q6. If the roots of $ax^2 + bx + c = 0$ ($a\neq0$) are in the ratio 3 : 4, prove that $12b^2 = 49ac$.
Let the roots be 3k and 4k for some $k\neq0$.
Sum of roots: $3k + 4k = 7k = -b/a \Rightarrow k = -b/(7a)$.
Product of roots: $(3k)(4k) = 12k^2 = c/a$.
Substituting k: $12 \times b^2/(49a^2) = c/a \Rightarrow 12b^2/(49a^2) = c/a \Rightarrow 12b^2 = 49a^2 \times (c/a) = 49ac$.
Hence $12b^2 = 49ac$, proved.

How These Differ From the Textbook Exercises

Exercises 4.1–4.3 focus on recognising quadratic equations, solving them directly by factorisation, and applying the discriminant to a given numeric equation. These HOTS questions instead ask you to work backwards from conditions (build an equation from given roots, as in Q3 and Q6), reason abstractly in terms of p, q, a, b, c rather than specific numbers (Q5, Q6), and carefully distinguish between related-but-different concepts, such as “real” versus “equal” roots in the assertion-reason format (Q2) — exactly the kind of multi-step, concept-linking reasoning the CBSE board favours in its higher-mark and competency-based questions.

More Extra Questions (HOTS Level)

A further set of higher-order-thinking questions for this chapter: a general root-relationship proof, a reverse-engineering root problem, a fresh-numbers speed word problem, an assertion-reason question, and two further word problems.

Q1. (General proof) If α and β are the roots of the general quadratic equation $ax^2+bx+c = 0$ ($a\neq0$), prove that $\alpha+\beta = -b/a$ and $\alpha\beta = c/a$.
By the quadratic formula, the two roots are $\alpha = (-b+\sqrt{D})/2a$ and $\beta = (-b-\sqrt{D})/2a$, where $D = b^2-4ac$.
Sum: $\alpha+\beta = -2b/2a =$ **$-b/a$.** Product: $\alpha\beta = 4ac/4a^2 =$ **c/a.**

Q2. (Reverse-engineering) One root of the equation $3x^2-10x+k = 0$ is the reciprocal of the other. Find k.
Let the roots be α and 1/α. Product of roots = 1 = c/a = k/3 → **k = 3.**

Q3. (Word problem) A car covers a distance of 300 km at a uniform speed. Had the speed been 5 km/h more, it would have taken 2 hours less for the same journey. Find the original speed of the car.
$300/x - 300/(x+5) = 2 \rightarrow x^2+5x-750 = 0$. $D = 3025 = 55^2$. $x = 25$.
Original speed = 25 km/h.

Q4. (Assertion-Reason) Assertion (A): The equation $x^2+4x+4 = 0$ has two equal real roots. Reason (R): A quadratic equation $ax^2+bx+c=0$ has equal roots iff $b^2-4ac = 0$.
D = 16−16 = 0, so the equation does have two equal real roots. **Assertion is true, Reason is true and correctly explains the Assertion.**

Q5. (Word problem) The sum of the squares of two consecutive even positive integers is 340. Find the integers.
$x^2+(x+2)^2 = 340 \rightarrow x^2+2x-168 = 0$. $D = 676 = 26^2$. $x = 12$.
The integers are 12 and 14.

Q6. (Word problem) A shopkeeper buys a certain number of books for ₹80. If he had bought 4 more books for the same total amount, each book would have cost him ₹1 less. Find the number

of books he bought.
$80/x - 80/(x+4) = 1 \rightarrow x^2+4x-320 = 0$. $D = 1296 = 36^2$. $x = 16$.
He bought 16 books.