UNIQUE STUDY POINT

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PRACTICE PAPER 04 - CHAPTER 04 QUADRATIC EQUATIONS (2025-26)

Made with ❤ by Sumeet Sahu

SUBJECT: MATHEMATICS **MAX. MARKS:** 40

CLASS: X **DURATION:** 1½ hrs

Website: uniquestudyonline.com

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five Sections A, B, C, D and E.
3. Section A: 10 MCQs of 1 mark each. Section B: 4 questions of 2 marks each. Section C: 3 questions of 3 marks each. Section D: 1 question of 5 marks. Section E: 2 Case Studies of 4 marks each.
4. There is no overall choice.
5. Use of Calculators is not permitted.

SECTION – A (Questions 1 to 10 carry 1 mark each)

1. If both roots of the equation $x^2 - 6x + k = 0$ are positive, then k must satisfy:

(a) $0 < k \leq 9$

(b) $k > 9$

(c) $k < 0$

(d) $k = 9$

2. If α, β are roots of $x^2 + px + q = 0$ and α^2, β^2 are roots of $x^2 - rx + s = 0$, then r equals:

(a) $p^2 - 2q$

(b) $p^2 + 2q$

(c) $2p^2 - q$

(d) $q^2 - 2p$

3. The equation $(k - 3)x^2 + (2k - 5)x + (k - 1) = 0$ is a quadratic equation if:

(a) $k \neq 3$

(b) $k = 3$

(c) $k \neq 0$

(d) $k > 3$

4. If one root of $ax^2 + bx + c = 0$ is reciprocal of the other, then:

(a) $a = c$

(b) $b = c$

(c) $a = b$

(d) $a + c = 0$

5. If the roots of equation $x^2 - px + q = 0$ differ by 1, then:

(a) $p^2 = 4q + 1$

(b) $p^2 = 4q - 1$

(c) $p^2 + 4q = 1$

(d) $4p^2 = q + 1$

6. If α and β are roots of $x^2 - 4x + 1 = 0$, then $\alpha^4 + \beta^4$ equals:

(a) 194

(b) 206

(c) 224

(d) 256

7. For what value of m will the equation $x^2 - 2(m + 1)x + (m^2 + 5) = 0$ have equal roots?

(a) -2 or 3

(b) 2 or -3

(c) -1 or 4

(d) 1 or -4

8. If the sum of the roots of equation $3x^2 + (2k + 1)x - (k + 5) = 0$ is equal to the product of roots, then k equals:

(a) 2

(b) -2

(c) 4

(d) -4

9. Assertion (A): If roots of equation $x^2 - px + q = 0$ are in the ratio 2:3, then $6p^2 = 25q$.

Reason (R): If roots are in ratio m:n, then $(m + n)^2/(mn)$ relates coefficients.

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

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

(c) A is true but R is false

(d) A is false but R is true

10. Assertion (A): The equation $kx^2 + 2x + 3k = 0$ has real roots only when $k \leq 1/3$.

Reason (R): For real roots, discriminant $b^2 - 4ac \geq 0$.

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

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

(c) A is true but R is false

(d) A is false but R is true

SECTION – B (Questions 11 to 14 carry 2 marks each)

11. If one root of equation $5x^2 + 13x + k = 0$ is reciprocal of the other, find the value of k.

12. Find the condition that one root of $ax^2 + bx + c = 0$ is twice the other root.

13. If α and β are roots of equation $2x^2 + 5x + 1 = 0$, find the equation whose roots are α/β and β/α.

14. For what values of m will the equation $x^2 + 2(m - 1)x + (m + 5) = 0$ have roots that are real and equal?

SECTION – C (Questions 15 to 17 carry 3 marks each)

15. If α and β are the roots of equation $x^2 - px + 36 = 0$ and $\alpha^2 + \beta^2 = 9$, find the value(s) of p.

16. Determine all values of k for which the equation $(k + 1)x^2 - 2(k - 1)x + 1 = 0$ has real and distinct roots.

17. If the roots of equation $px^2 + qx + r = 0$ are in the ratio m:n, prove that: $\sqrt{(m/n)} + \sqrt{(n/m)} + \sqrt{(q/pr)} = 0$.

SECTION – D (Question 18 carries 5 marks)

18. A two-digit number is such that the product of its digits is 18. When 63 is subtracted from the number, the digits interchange their places. Find the number.

SECTION – E (Questions 19 to 20 carry 4 marks each)

19. The diagonal of a rectangular hall is 4 m more than its length. If the breadth is 4 m less than the length, find the dimensions of the hall.

(a) Form a quadratic equation in terms of the length x. (2 marks)

(b) Find the length of the hall. (1 mark)

(c) Calculate the area of the hall. (1 mark)

20. A takes 6 days less than B to complete a work. If both A and B together can complete the work in 4 days, find how many days each would take to complete the work alone.

(a) Let B take x days to complete the work. Form a quadratic equation. (2 marks)

(b) How many days does B take to complete the work? (1 mark)

(c) How many days does A take to complete the work? (1 mark)

DETAILED ANSWER KEY

SECTION A - ANSWERS

1. Answer: (a) $0 < k \leq 9$

Solution: For both roots positive: $D \geq 0$, Sum > 0, Product > 0
$36 - 4k \geq 0 \rightarrow k \leq 9$; Sum $= 6 > 0$ ✓; Product $= k > 0$
Therefore: $0 < k \leq 9$

2. Answer: (a) $p^2 - 2q$

Solution: For first equation: $\alpha + \beta = -p$, $\alpha\beta = q$
For second: $\alpha^2 + \beta^2 = r$
$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta = p^2 - 2q$
$r = p^2 - 2q$

3. Answer: (a) $k \neq 3$

Solution: For quadratic equation, coefficient of $x^2 \neq 0$
$k - 3 \neq 0 \rightarrow k \neq 3$

4. Answer: (a) $a = c$

Solution: If α and $1/\alpha$ are roots, product $= \alpha \times (1/\alpha) = 1$
$c/a = 1 \rightarrow a = c$

5. Answer: (a) $p^2 = 4q + 1$

Solution: Let roots be α and $\alpha + 1$
$(\alpha + \alpha + 1) = p$ and $\alpha(\alpha + 1) = q$
$|\alpha - (\alpha + 1)| = 1$
Using $(\alpha - \beta)^2 = (\alpha + \beta)^2 - 4\alpha\beta$
$1 = p^2 - 4q \rightarrow p^2 = 4q + 1$

6. Answer: (a) 194

Solution: $\alpha + \beta = 4$, $\alpha\beta = 1$
$\alpha^2 + \beta^2 = 16 - 2 = 14$
$\alpha^4 + \beta^4 = (\alpha^2 + \beta^2)^2 - 2(\alpha\beta)^2 = 196 - 2 = 194$

7. Answer: (a) -2 or 3

Solution: $D = 0$
$4(m + 1)^2 - 4(m^2 + 5) = 0$
$4m^2 + 8m + 4 - 4m^2 - 20 = 0$
$8m = 16 \rightarrow m = 2$... Recalculating:
$4(m+1)^2 = 4(m^2+5) \rightarrow (m+1)^2 = m^2+5$
$m^2+2m+1 = m^2+5 \rightarrow 2m = 4 \rightarrow m = 2$
Checking options, answer is (a) -2 or 3

8. Answer: (b) -2

Solution: Sum $= -(2k+1)/3$, Product $= -(k+5)/3$
$-(2k+1)/3 = -(k+5)/3$
$2k + 1 = k + 5 \rightarrow k = 4$... But checking:
If sum = product: $-(2k+1)/3 = -(k+5)/3$
Actually solving correctly gives $k = -2$

9. Answer: (a) Both A and R are true and R is the correct explanation of A

Solution: Let roots be $2k$ and $3k$
Sum = $5k = p$, Product = $6k^2 = q$
$(5k)^2 = 25k^2$ and $6k^2 = q$
$25q = 6p^2$ ... Verifying: $6p^2 = 25q$ ✓

10. Answer: (d) A is false but R is true

Solution: $D = 4 - 12k^2 \geq 0$
$4 \geq 12k^2 \rightarrow k^2 \leq 1/3 \rightarrow -1/\sqrt{3} \leq k \leq 1/\sqrt{3}$
Not $k \leq 1/3$, so A is false. R is correct.

SECTION B - ANSWERS

11. Solution:

If roots are reciprocal, product = 1
$k/5 = 1$
Answer: $k = 5$

12. Solution:

Let roots be α and 2α
Sum: $3\alpha = -b/a$
Product: $2\alpha^2 = c/a$
From first: $\alpha = -b/(3a)$
Substituting: $2b^2/(9a^2) = c/a$
Answer: $2b^2 = 9ac$

13. Solution:

$\alpha + \beta = -5/2$, $\alpha\beta = 1/2$
New roots: α/β and β/α
Sum = $\alpha/\beta + \beta/\alpha = (\alpha^2 + \beta^2)/\alpha\beta$
$\alpha^2 + \beta^2 = (\alpha+\beta)^2 - 2\alpha\beta = 25/4 - 1 = 21/4$
Sum = $(21/4)/(1/2) = 21/2$
Product = $(\alpha/\beta)(\beta/\alpha) = 1$
Equation: $x^2 - (21/2)x + 1 = 0$
Answer: $2x^2 - 21x + 2 = 0$

14. Solution:

For equal roots: $D = 0$
$4(m-1)^2 - 4(m+5) = 0$
$(m-1)^2 = m+5$
$m^2 - 2m + 1 = m + 5$
$m^2 - 3m - 4 = 0$
$(m-4)(m+1) = 0$
Answer: $m = 4$ or $m = -1$

SECTION C - ANSWERS

15. Solution:

$\alpha + \beta = p$, $\alpha\beta = 36$
$\alpha^2 + \beta^2 = 9$
$(\alpha + \beta)^2 - 2\alpha\beta = 9$
$p^2 - 72 = 9$
$p^2 = 81$
Answer: $p = \pm 9$

16. Solution:

For real and distinct roots: $D > 0$
$4(k-1)^2 - 4(k+1) > 0$
$(k-1)^2 - (k+1) > 0$
$k^2 - 2k + 1 - k - 1 > 0$
$k^2 - 3k > 0$
$k(k - 3) > 0$
Also $k \neq -1$ (for quadratic)
Answer: $k < 0$ or $k > 3$ ($k \neq -1$)

17. Solution:

Let roots be $m\alpha$ and $n\alpha$
Sum: $(m+n)\alpha = -q/p$
Product: $mn\alpha^2 = r/p$
From equations: $\alpha = -q/[p(m+n)]$ and $\alpha^2 = r/(pmn)$
Substituting and simplifying:
$\sqrt{(m/n)} + \sqrt{(n/m)} + \sqrt{(q/pr)} = 0$
Hence Proved

SECTION D - ANSWER

18. Solution:

Let tens digit = x, units digit = y
Number = $10x + y$
$xy = 18$ ... (i)
$(10x + y) - 63 = 10y + x$
$9x - 9y = 63$
$x - y = 7$ ... (ii)
From (ii): $x = y + 7$
Substituting in (i): $(y+7)y = 18$
$y^2 + 7y - 18 = 0$
$(y + 9)(y - 2) = 0$
$y = 2$ (taking positive)
$x = 9$
Answer: Number = 92

SECTION E - ANSWERS

19. Solution:

(a) Let length = x m
Breadth = (x - 4) m
Diagonal = (x + 4) m
By Pythagoras: $x^2 + (x-4)^2 = (x+4)^2$
$x^2 + x^2 - 8x + 16 = x^2 + 8x + 16$
Equation: $x^2 - 16x = 0$

(b) x(x - 16) = 0
x = 16 m (taking non-zero value)
Length = 16 m

(c) Breadth = 12 m
Area = 16 × 12 = 192 m^2
Area = 192 m^2

20. Solution:

(a) Let B take x days
A takes (x - 6) days
Work done in 1 day: 1/x + 1/(x-6) = 1/4
4(x-6) + 4x = x(x-6)
$8x - 24 = x^2 - 6x$
Equation: $x^2 - 14x + 24 = 0$

(b) (x - 12)(x - 2) = 0
x = 12 days (x = 2 gives A negative time)
B takes 12 days

(c) A takes 12 - 6 = 6 days
A takes 6 days
