UNIQUE STUDY POINT

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PRACTICE PAPER 02 - CHAPTER 04 QUADRATIC EQUATIONS (2025-26)

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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. The discriminant of the quadratic equation $2x^2 - 7x + 3 = 0$ is:

(a) 25

(b) 49

(c) 73

(d) 37

2. For what value of k does the equation $x^2 + 4x + k = 0$ have real and equal roots?

(a) 2

(b) 4

(c) 8

(d) 16

3. The roots of the equation $x^2 - 6x + 9 = 0$ are:

(a) 3, 3

(b) 3, -3

(c) 6, 9

(d) -3, -3

4. The equation $x^2 + 2x + 3 = 0$ has:

(a) Two distinct real roots

(b) Equal real roots

(c) No real roots

(d) One real root

5. Using the quadratic formula, the roots of $x^2 + 3x - 4 = 0$ are:

(a) 1, -4

(b) -1, 4

(c) 2, -2

(d) 3, -4

6. The equation $x^2 - 4x + 13 = 0$ can be written in the form $(x - 2)^2 + k = 0$. What is the value of k?

(a) 5

(b) 9

(c) 13

(d) 17

7. If the quadratic equation $px^2 - 2\sqrt{5}px + 15 = 0$ has two equal roots, then the value of p is:

(a) ±3

(b) 3

(c) -3

(d) 0, 3

8. The nature of roots of the equation $2x^2 - 3x + 5 = 0$ is:

(a) Real and distinct

(b) Real and equal

(c) Not real

(d) Cannot be determined

9. Assertion (A): The equation $x^2 + x + 1 = 0$ has no real roots.

Reason (R): For a quadratic equation to have no real roots, its discriminant must be negative.

(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 quadratic formula is $x = [-b \pm \sqrt{(b^2 - 4ac)}] / 2a$.

Reason (R): This formula can be used to solve any quadratic equation.

(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. Find the discriminant of the equation $3x^2 - 5x + 2 = 0$ and determine the nature of its roots.

12. For what value of k will the equation $kx^2 + 6x + 1 = 0$ have equal roots?

13. Solve the equation $x^2 + 5x + 6 = 0$ using the quadratic formula.

14. Express $x^2 + 8x + 10 = 0$ in the form $(x + a)^2 = b$ and hence solve it.

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

15. Solve the quadratic equation $x^2 - 4x - 5 = 0$ by completing the square method.

16. Find the values of k for which the quadratic equation $(k + 1)x^2 - 6(k + 1)x + 3(k + 9) = 0$ has equal roots.

17. A quadratic equation has roots that are reciprocals of the roots of $2x^2 - 5x + 3 = 0$. Form the new quadratic equation.

SECTION – D (Question 18 carries 5 marks)

18. A rectangular park is 50 m long and 40 m wide. A path of uniform width is constructed around the outside of the park. If the area of the path is 1056 m^2, find the width of the path.

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

19. A shopkeeper buys a number of books for ₹1800. If he had bought 15 more books for the same amount, each book would have cost him ₹20 less.

(a) Taking the original number of books as x, form a quadratic equation. (2 marks)

(b) Find the original number of books bought. (1 mark)

(c) What was the original price per book? (1 mark)

20. A motor boat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream than to return downstream to the same spot.

(a) Let the speed of the stream be x km/h. Form a quadratic equation in x. (2 marks)

(b) Find the speed of the stream. (1 mark)

(c) Find the time taken to go upstream. (1 mark)

DETAILED ANSWER KEY

SECTION A - ANSWERS

1. Answer: (a) 25

Solution: $D = b^2 - 4ac = (-7)^2 - 4(2)(3) = 49 - 24 = 25$

2. Answer: (b) 4

Solution: For equal roots: $D = 0$
$16 - 4(1)(k) = 0 \rightarrow 16 = 4k \rightarrow k = 4$

3. Answer: (a) 3, 3

Solution: $x^2 - 6x + 9 = (x - 3)^2 = 0 \rightarrow x = 3$ (repeated root)

4. Answer: (c) No real roots

Solution: $D = 4 - 4(1)(3) = 4 - 12 = -8 < 0$ (No real roots)

5. Answer: (a) 1, -4

Solution: $x = [-3 \pm \sqrt{(9 + 16)}]/2 = [-3 \pm 5]/2$
$x = 1$ or $x = -4$

6. Answer: (b) 9

Solution: $x^2 - 4x + 13 = (x - 2)^2 - 4 + 13 = (x - 2)^2 + 9$
So $k = 9$

7. Answer: (b) 3

Solution: For equal roots: $D = 0$
$(-2\sqrt{5}p)^2 - 4(p)(15) = 0$
$20p^2 - 60p = 0 \rightarrow 20p(p - 3) = 0$
$p = 3$ ($p \neq 0$ for quadratic)

8. Answer: (c) Not real

Solution: $D = 9 - 4(2)(5) = 9 - 40 = -31 < 0$

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

Solution: $D = 1 - 4(1)(1) = -3 < 0$ ✓ (No real roots)
R correctly explains why A is true

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

Solution: The quadratic formula is correct and can solve any quadratic equation

SECTION B - ANSWERS

11. Solution:

$D = b^2 - 4ac = 25 - 4(3)(2) = 25 - 24 = 1$
Since $D > 0$, the equation has two distinct real roots.
Answer: Discriminant = 1, Nature: Two distinct real roots

12. Solution:

For equal roots: $D = 0$
$36 - 4(k)(1) = 0$
$36 = 4k$
Answer: k = 9

13. Solution:

$x = [-5 \pm \sqrt{(25 - 24)}]/2 = [-5 \pm 1]/2$

$x = -2$ or $x = -3$

Answer: x = -2, -3

14. Solution:

$x^2 + 8x + 10 = 0$

$x^2 + 8x = -10$

$x^2 + 8x + 16 = -10 + 16$

$(x + 4)^2 = 6$

$x + 4 = \pm\sqrt{6}$

Answer: $x = -4 \pm \sqrt{6}$

SECTION C - ANSWERS

15. Solution:

$x^2 - 4x - 5 = 0$

$x^2 - 4x = 5$

$x^2 - 4x + 4 = 5 + 4$

$(x - 2)^2 = 9$

$x - 2 = \pm 3$

Answer: x = 5 or x = -1

16. Solution:

For equal roots: $D = 0$

$36(k + 1)^2 - 4(k + 1) \times 3(k + 9) = 0$

$36(k + 1)^2 = 12(k + 1)(k + 9)$

$3(k + 1) = k + 9$

$3k + 3 = k + 9$

$2k = 6$

Answer: k = 3

17. Solution:

$2x^2 - 5x + 3 = 0$ has roots α, β

New equation has roots $1/\alpha, 1/\beta$

Sum $= 1/\alpha + 1/\beta = (\alpha + \beta)/\alpha\beta = (5/2)/(3/2) = 5/3$

Product $= (1/\alpha)(1/\beta) = 1/\alpha\beta = 1/(3/2) = 2/3$

New equation: $x^2 - (5/3)x + 2/3 = 0$

Answer: $3x^2 - 5x + 2 = 0$

SECTION D - ANSWER

18. Solution:

Let width of path = x m
New dimensions: (50 + 2x) × (40 + 2x)
Area of path = New area - Original area
(50 + 2x)(40 + 2x) - 50 × 40 = 1056
2000 + 100x + 80x + 4x² - 2000 = 1056
4x² + 180x = 1056
x² + 45x - 264 = 0
(x + 57)(x - 4.64) ≈ 0 or using formula:
x = [-45 ± √(2025 + 1056)]/2 = [-45 ± √3081]/2
x ≈ 4.64 m (taking positive value)
Answer: Width of path ≈ 4.64 m or 33/7 m

SECTION E - ANSWERS

19. Solution:

(a) Original price per book = 1800/x
New price per book = 1800/(x + 15)
1800/x - 1800/(x + 15) = 20
1800(x + 15) - 1800x = 20x(x + 15)
27000 = 20x² + 300x
Equation: x² + 15x - 1350 = 0

(b) (x + 45)(x - 30) = 0
x = 30 (taking positive value)
Number of books = 30

(c) Original price = 1800/30 = ₹60
Price per book = ₹60

20. Solution:

(a) Upstream speed = (18 - x) km/h
Downstream speed = (18 + x) km/h
Time upstream - Time downstream = 1
24/(18 - x) - 24/(18 + x) = 1
24(18 + x) - 24(18 - x) = (18 - x)(18 + x)
48x = 324 - x²
Equation: x² + 48x - 324 = 0

(b) Using formula: x = [-48 ± √(2304 + 1296)]/2
x = [-48 ± 60]/2 = 6 km/h (taking positive)
Speed of stream = 6 km/h

(c) Time upstream = 24/12 = 2 hours
Time = 2 hours
