Time Allowed: 3 Hours **Maximum Marks: 80**

CBSE Class 10 Mathematics Practice Examination Paper

CBSE Class 10 Mathematics - Practice Examination Paper (Polynomials & Coordinate Geometry)

Q1. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is [1 Mark]
(a) 10
(b) -10
(c) -7
(d) -2

Q2. The distance of the point P(-6, 8) from the origin is [1 Mark]
(a) 8 units
(b) $2\sqrt{7}$ units
(c) 10 units
(d) 6 units

Q3. If α and β are the zeroes of the polynomial $f(x) = p x^2 - 2x + 3p$ and $\alpha + \beta = \alpha\beta$, then the value of p is [1 Mark]
(a) 2/3
(b) -2/3
(c) 1/3
(d) -1/3

Q4. The point which divides the line segment joining the points (7, -6) and (3, 4) in the ratio 1 : 2 internally lies in which quadrant? [1 Mark]
(a) I quadrant
(b) II quadrant
(c) III quadrant
(d) IV quadrant

Q5. A quadratic polynomial, whose zeroes are -3 and 4, is [1 Mark]
(a) $x^2 - x + 12$
(b) $x^2 + x + 12$
(c) $(x^2/2) - (x/2) - 6$
(d) $2x^2 + 2x - 24$

Q6. If A(m/3, 5) is the mid-point of the line segment joining the points Q(-6, 7) and R(-2, 3), then the value of m is [1 Mark]
(a) -12
(b) -4
(c) 12
(d) -6

Q7. Find the zeroes of the quadratic polynomial $6x^2 - 3 - 7x$ and verify the relationship between the zeroes and the coefficients. [2 Marks]

Q8. Find the point on the x-axis which is equidistant from (2, -5) and (-2, 9). [2 Marks]

Q9. If α and β are the zeroes of the polynomial $x^2 - 5x + k$ such that $\alpha - \beta = 1$, find the value of k. [2

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Marks]

Q10. Find the ratio in which the y-axis divides the line segment joining the points (5, -6) and (-1, -4). Also find the point of intersection. [3 Marks]

Q11. Find a quadratic polynomial whose zeroes are the reciprocals of the zeroes of the polynomial $f(x) = ax^2 + bx + c$, where $a \neq 0$, $c \neq 0$. [3 Marks]

Q12. If A(-2, -1), B(a, 0), C(4, b) and D(1, 2) are the vertices of a parallelogram ABCD, find the values of a and b. [3 Marks]

Q13. Read the conditions carefully and answer:
(i) If the distance between the points (4, p) and (1, 0) is 5 units, find the values of p. [2.5 Marks]
(ii) If α and β are the zeroes of $2x^2 + 5x + k$ such that $\alpha^2 + \beta^2 + \alpha\beta = 21/4$, find k. [2.5 Marks]

Q14. Prove that the points A(1, 7), B(4, 2), C(-1, -1) and D(-4, 4) are the vertices of a square ABCD. [5 Marks]

Q15. Read the following passage and answer the questions:
To conduct Sports Day activities in a rectangular shaped school ground ABCD, lines have been drawn with chalk powder at a distance of 1 m each. 100 flower pots have been placed at a distance of 1 m from each other along AD. Niharika runs 1/4th the distance AD on the 2nd line and posts a green flag. Preet runs 1/5th the distance AD on the 8th line and posts a red flag.
(i) Write the coordinates of the green flag (G) and the red flag (R). [1 Mark]
(ii) Find the distance between both the flags. [1 Mark]
(iii) If Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags, at what distance and on which line should she post her flag? [2 Marks]

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Detailed Solutions & Marking Scheme

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Q1. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is [1 Mark]
(a) 10
(b) -10
(c) -7
(d) -2

Correct Option / Answer: (b) -10
Detailed Solution: Since 2 is a zero of the polynomial $p(x) = x^2 + 3x + k$, we have $p(2) = 0$.
Substituting x = 2:
$(2)^2 + 3(2) + k = 0$
$4 + 6 + k = 0$
$10 + k = 0$
$k = -10$
Marking Scheme: 1 mark for the correct option and calculation.

Q2. The distance of the point P(-6, 8) from the origin is [1 Mark]
(a) 8 units
(b) $2\sqrt{7}$ units
(c) 10 units
(d) 6 units

Correct Option / Answer: (c) 10 units
Detailed Solution: Distance of a point P(x, y) from origin O(0, 0) is given by $OP = \sqrt{(x^2 + y^2)}$.
$OP = \sqrt{((-6)^2 + 8^2)}$
$OP = \sqrt{(36 + 64)}$
$OP = \sqrt{100} = 10$ units.
Marking Scheme: 1 mark for selecting the correct option with calculation.

Q3. If α and β are the zeroes of the polynomial $f(x) = p x^2 - 2x + 3p$ and $\alpha + \beta = \alpha\beta$, then the value of p is [1 Mark]
(a) 2/3
(b) -2/3
(c) 1/3
(d) -1/3

Correct Option / Answer: (a) 2/3
Detailed Solution: For polynomial $f(x) = px^2 - 2x + 3p$:
Sum of zeroes $(\alpha + \beta) = -(-2)/p = 2/p$
Product of zeroes $(\alpha\beta) = 3p/p = 3$
Given $\alpha + \beta = \alpha\beta$:
$2/p = 3 \Rightarrow 3p = 2 \Rightarrow p = 2/3$.
Marking Scheme: 1 mark for obtaining the correct value of p.

Q4. The point which divides the line segment joining the points (7, -6) and (3, 4) in the ratio 1 : 2 internally lies in which quadrant? [1 Mark]

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(a) I quadrant
(b) II quadrant
(c) III quadrant
(d) IV quadrant

Correct Option / Answer: (d) IV quadrant
Detailed Solution: By section formula:
x = (1(3) + 2(7)) / (1 + 2) = (3 + 14) / 3 = 17/3 (> 0)
y = (1(4) + 2(-6)) / (1 + 2) = (4 - 12) / 3 = -8/3 (< 0)
Since the x-coordinate is positive and the y-coordinate is negative, the point lies in the IV quadrant.
Marking Scheme: 1 mark for identifying the correct quadrant.

Q5. A quadratic polynomial, whose zeroes are -3 and 4, is [1 Mark]
(a) $x^2 - x + 12$
(b) $x^2 + x + 12$
(c) $(x^2/2) - (x/2) - 6$
(d) $2x^2 + 2x - 24$

Correct Option / Answer: (c) $(x^2/2) - (x/2) - 6$
Detailed Solution: Sum of zeroes (S) = -3 + 4 = 1
Product of zeroes (P) = (-3)(4) = -12
Quadratic polynomial is given by $k(x^2 - Sx + P) = k(x^2 - x - 12)$.
Taking k = 1/2, the polynomial becomes $(x^2/2) - (x/2) - 6$.
Marking Scheme: 1 mark for correctly matching the polynomial form.

Q6. If A(m/3, 5) is the mid-point of the line segment joining the points Q(-6, 7) and R(-2, 3), then the value of m is [1 Mark]
(a) -12
(b) -4
(c) 12
(d) -6

Correct Option / Answer: (a) -12
Detailed Solution: Mid-point coordinates of QR are:
x = (-6 + (-2)) / 2 = -8/2 = -4
It is given that x-coordinate of A is m/3.
So, m/3 = -4 => m = -12.
Marking Scheme: 1 mark for correct valuation of m.

Q7. Find the zeroes of the quadratic polynomial $6x^2 - 3 - 7x$ and verify the relationship between the zeroes and the coefficients. [2 Marks]

Correct Option / Answer: Zeroes are 3/2 and -1/3.
Detailed Solution: Rearranging the polynomial in standard form: $p(x) = 6x^2 - 7x - 3$
Factoring: $6x^2 - 9x + 2x - 3 = 0$
$3x(2x - 3) + 1(2x - 3) = 0$
$(2x - 3)(3x + 1) = 0$
x = 3/2 or x = -1/3

Verification:
Sum of zeroes = 3/2 + (-1/3) = 7/6

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From coefficients: -b/a = -(-7)/6 = 7/6 (Verified)

Product of zeroes = (3/2)(-1/3) = -1/2
From coefficients: c/a = -3/6 = -1/2 (Verified)
Marking Scheme: 1 mark for finding the correct zeroes, 1 mark for verification of relationship.

Q8. Find the point on the x-axis which is equidistant from (2, -5) and (-2, 9). [2 Marks]

Correct Option / Answer: (-7, 0)
Detailed Solution: Let the point on the x-axis be P(x, 0). Given points are A(2, -5) and B(-2, 9).
Since P is equidistant from A and B, PA = PB => $PA^2 = PB^2$
Using distance formula:
$(x - 2)^2 + (0 - (-5))^2 = (x - (-2))^2 + (0 - 9)^2$
$x^2 - 4x + 4 + 25 = x^2 + 4x + 4 + 81$
$-4x + 29 = 4x + 85$
$-8x = 56 \Rightarrow x = -7$
So, the required point is (-7, 0).
Marking Scheme: 1 mark for setting up distance equation, 1 mark for finding the coordinates.

Q9. If α and β are the zeroes of the polynomial $x^2 - 5x + k$ such that α - β = 1, find the value of k. [2 Marks]

Correct Option / Answer: k = 6
Detailed Solution: For polynomial $x^2 - 5x + k$:
α + β = 5 --- (1)
αβ = k --- (2)
Given: α - β = 1 --- (3)

Adding equations (1) and (3):
2α = 6 => α = 3
Substituting α = 3 in (1):
3 + β = 5 => β = 2

Now using (2):
k = αβ = 3 × 2 = 6.
Marking Scheme: 1 mark for solving for α and β, 1 mark for getting k = 6.

Q10. Find the ratio in which the y-axis divides the line segment joining the points (5, -6) and (-1, -4). Also find the point of intersection. [3 Marks]

Correct Option / Answer: Ratio is 5 : 1; Point of intersection is (0, -13/3)
Detailed Solution: Let the y-axis divide the segment joining A(5, -6) and B(-1, -4) in ratio k : 1 at point P(0, y).
By section formula for x-coordinate:
0 = (k(-1) + 1(5)) / (k + 1)
-k + 5 = 0 => k = 5
So, the ratio is 5 : 1.

Now finding the y-coordinate using k = 5:
y = (5(-4) + 1(-6)) / (5 + 1)
y = (-20 - 6) / 6 = -26/6 = -13/3
Therefore, the point of intersection is (0, -13/3).

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Marking Scheme: 1.5 marks for finding the ratio 5:1, 1.5 marks for finding the point of intersection.

Q11. Find a quadratic polynomial whose zeroes are the reciprocals of the zeroes of the polynomial f(x) = ax² + bx + c, where a ≠ 0, c ≠ 0. [3 Marks]

Correct Option / Answer: cx² + bx + a (or any non-zero constant multiple)
Detailed Solution: Let α and β be the zeroes of f(x) = ax² + bx + c.
Then, α + β = -b/a and αβ = c/a.

The zeroes of the required polynomial are 1/α and 1/β.
Sum of new zeroes (S') = 1/α + 1/β = (α + β) / (αβ) = (-b/a) / (c/a) = -b/c
Product of new zeroes (P') = (1/α)(1/β) = 1/(αβ) = 1 / (c/a) = a/c

Required polynomial is g(x) = k(x² - S'x + P') = k(x² - (-b/c)x + a/c)
Taking k = c, we get g(x) = cx² + bx + a.
Marking Scheme: 1 mark for sum and product of original zeroes, 1 mark for sum and product of new zeroes, 1 mark for final polynomial expression.

Q12. If A(-2, -1), B(a, 0), C(4, b) and D(1, 2) are the vertices of a parallelogram ABCD, find the values of a and b. [3 Marks]

Correct Option / Answer: a = 1, b = 3
Detailed Solution: We know that diagonals of a parallelogram bisect each other.
Mid-point of diagonal AC = Mid-point of diagonal BD

Mid-point of AC = ((-2 + 4)/2, (-1 + b)/2) = (1, (b - 1)/2)
Mid-point of BD = ((a + 1)/2, (0 + 2)/2) = ((a + 1)/2, 1)

Equating corresponding coordinates:
(a + 1)/2 = 1 => a + 1 = 2 => a = 1
(b - 1)/2 = 1 => b - 1 = 2 => b = 3

Thus, a = 1 and b = 3.
Marking Scheme: 1 mark for mid-point concept, 1 mark for calculating a, 1 mark for calculating b.

Q13. Read the conditions carefully and answer:
(i) If the distance between the points (4, p) and (1, 0) is 5 units, find the values of p. [2.5 Marks]
(ii) If α and β are the zeroes of 2x² + 5x + k such that α² + β² + αβ = 21/4, find k. [2.5 Marks]

Correct Option / Answer: (i) p = ±4; (ii) k = 2
Detailed Solution: Part (i):
Distance = √((4 - 1)² + (p - 0)²) = 5
√(3² + p²) = 5
Squaring both sides: 9 + p² = 25
p² = 16 => p = ±4.

Part (ii):
For p(x) = 2x² + 5x + k, α + β = -5/2 and αβ = k/2.
Given: α² + β² + αβ = 21/4
(α + β)² - αβ = 21/4
(-5/2)² - (k/2) = 21/4

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25/4 - k/2 = 21/4
k/2 = 25/4 - 21/4 = 4/4 = 1
k = 2.
Marking Scheme: 2.5 marks for Part (i) step-by-step solution, 2.5 marks for Part (ii) step-by-step solution.

Q14. Prove that the points A(1, 7), B(4, 2), C(-1, -1) and D(-4, 4) are the vertices of a square ABCD. [5 Marks]

Correct Option / Answer: Proof complete - ABCD has equal side lengths and equal diagonals.
Detailed Solution: To prove ABCD is a square, we need to show that all 4 sides are equal and both diagonals are equal.

Using Distance Formula:
AB = $\sqrt{((4 - 1)^2 + (2 - 7)^2)} = \sqrt{(9 + 25)} = \sqrt{34}$
BC = $\sqrt{((-1 - 4)^2 + (-1 - 2)^2)} = \sqrt{(25 + 9)} = \sqrt{34}$
CD = $\sqrt{((-4 - (-1))^2 + (4 - (-1))^2)} = \sqrt{(9 + 25)} = \sqrt{34}$
DA = $\sqrt{((1 - (-4))^2 + (7 - 4)^2)} = \sqrt{(25 + 9)} = \sqrt{34}$
Since AB = BC = CD = DA = $\sqrt{34}$, all four sides are equal.

Diagonals:
AC = $\sqrt{((-1 - 1)^2 + (-1 - 7)^2)} = \sqrt{(4 + 64)} = \sqrt{68}$
BD = $\sqrt{((-4 - 4)^2 + (4 - 2)^2)} = \sqrt{(64 + 4)} = \sqrt{68}$
Since diagonals AC = BD = $\sqrt{68}$.

Therefore, quadrilateral ABCD is a square.
Marking Scheme: 2 marks for calculating 4 side lengths, 2 marks for calculating 2 diagonal lengths, 1 mark for final conclusion.

Q15. Read the following passage and answer the questions:
To conduct Sports Day activities in a rectangular shaped school ground ABCD, lines have been drawn with chalk powder at a distance of 1 m each. 100 flower pots have been placed at a distance of 1 m from each other along AD. Niharika runs 1/4th the distance AD on the 2nd line and posts a green flag. Preet runs 1/5th the distance AD on the 8th line and posts a red flag.
(i) Write the coordinates of the green flag (G) and the red flag (R). [1 Mark]
(ii) Find the distance between both the flags. [1 Mark]
(iii) If Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags, at what distance and on which line should she post her flag? [2 Marks]

Correct Option / Answer: (i) G(2, 25) and R(8, 20); (ii) $\sqrt{61}$ m; (iii) 5th line at a distance of 22.5 m
Detailed Solution: Total distance along AD = 100 m.
(i) Green flag (G): x = 2, y = (1/4) × 100 = 25. Thus, G(2, 25).
Red flag (R): x = 8, y = (1/5) × 100 = 20. Thus, R(8, 20).

(ii) Distance GR = $\sqrt{((8 - 2)^2 + (20 - 25)^2)}$
GR = $\sqrt{(6^2 + (-5)^2)}$
GR = $\sqrt{(36 + 25)} = \sqrt{61}$ m.

(iii) Blue flag position is the midpoint M(x, y) of GR:
x = (2 + 8) / 2 = 5
y = (25 + 20) / 2 = 45/2 = 22.5
Hence, Rashmi should post her blue flag on the 5th line at a distance of 22.5 m.
Marking Scheme: 1 mark for part (i), 1 mark for part (ii), 2 marks for part (iii).

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