Akshay Bhardwaj
X-A

HALF YEARLY EXAMINATION—2025-26

CLASS–X

SUBJECT–MATHEMATICS

Time : 3 Hrs. **M.M. : 80**

No. of Pages 11 **No. of Qs. 38**

General Instructions :

1. *This question paper contains 38 questions. All questions are compulsory.*
2. *This question paper is divided into 5 Sections A, B, C, D and E.*
3. *In Section A, Questions numbers 1-18 are multiple choice questions (MCQs) and question numbers 19 and 20 are Assertion-Reason based questions of 1 mark each.*
4. *In Section B, Question numbers 21-25 are very short answer (VSA) type questions, carrying 2 marks each.*
5. *In Section C, Question numbers 26-31 are short answer (SA) type questions, carrying 3 marks each.*
6. *In Section D, Question numbers 32-35 are long answer (LA) type questions, carrying 5 marks each.*
7. *In Section E, Question numbers 36-38 are case study based questions carrying 4 marks each with sub parts of the values of 1, 1 and 2 marks each respectively.*
8. *There is no overall choice. However, an internal choice in 2 Questions of Section B, 2 questions of Section C and 2 questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E.*
9. *Draw neat and clean figures wherever required. Take* $\pi = \frac{22}{7}$ *wherever required if not stated.*
10. *Use of calculators is not allowed.*

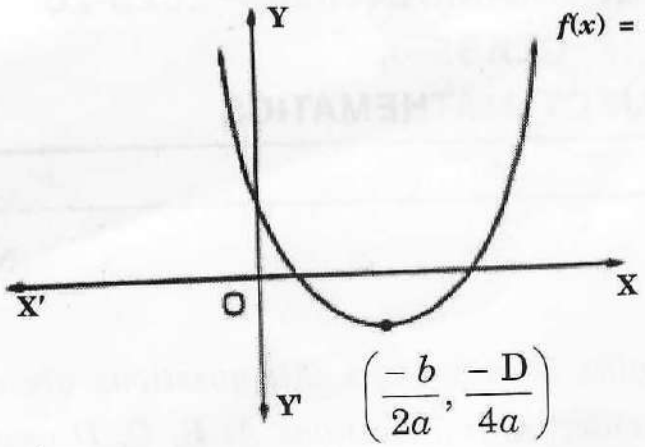
SECTION–A

(Section A consists of 20 questions of 1 mark each).

Q1. If $3825 = 3^x \times 5^y \times 17^z$, then the value of $x + y - 2z$ is : (1)

(A) 0 (B) 1 (C) 2 (D) 3

Q2.



The above figure shows the graph of the polynomial $f(x) = ax^2 + bx + c$ for which :

(A) $a > 0$, $b < 0$ and $c > 0$ (B) $a < 0$, $b < 0$ and $c > 0$

(C) $a < 0$, $b > 0$ and $c > 0$ (D) $a > 0$, $b > 0$ and $c < 0$

Alternative Question for Visually Challenged Students in lieu of Q. 2

Q2. The zeroes of the polynomial $p(x) = x^2 - 3\sqrt{2}x + 4$ are :

(A) $2, \sqrt{2}$ (B) $2\sqrt{2}, \sqrt{2}$ (C) $4\sqrt{2}, -\sqrt{2}$ (D) $\sqrt{2}, 2$ (1)

Q3. 20 tickets on which numbers 1 to 20 are written, are mixed thoroughly and then a ticket is drawn at random out of them. The probability that the number on the drawn ticket is a multiple of 3 or 7 is : (1)

(A) $\frac{3}{5}$ (B) $\frac{2}{5}$ (C) $\frac{8}{19}$ (D) $\frac{6}{19}$

Q4. The equation $2x^2 + 2(p + 1)x + p = 0$, where p is real, always has roots that are : (1)

(A) equal

(B) equal in magnitude but opposite in sign

(C) no real

(D) real

Q5. If a letter of English alphabet is chosen at random, then the probability of this letter to be a consonant is : (1)

(A) $\frac{11}{13}$ (B) $\frac{10}{13}$

(C) $\frac{21}{26}$ (D) $\frac{5}{26}$

Q6. The vertices of a triangle are A (– 1, 0), B (5, – 2) and C (8, 2). The coordinates of the centroid of this triangle are : (1)

(A) (– 4, 0) (B) (4, 0)

(C) (6, 0) (D) (4, – 4)

Q7. The statement which is true for all values of θ ($0° \leq \theta < 90°$) is : (1)

(A) $\text{cosec}^2\theta - \sec^2\theta = 1$ (B) $\cos^2\theta - \sin^2\theta = 1$

(C) $\cot^2\theta - \tan^2\theta = 1$ (D) $\sec^2\theta - \tan^2\theta = 1$

Q8. The vertices of a parallelogram EFGH are E (2, 7), F (6, 7),G (6, 3) and H (a, 3). The value of a is : (1)

(A) – 2 (B) 2

(C) 6 (D) 4

Q9. If $\sin\theta = \cos\theta$, ($0° < \theta < 90°$), then value of ($\sin\theta.\cos\theta$) is : (1)

(A) $\frac{1}{2}$ (B) $\sqrt{2}$

(C) 1 (D) 0

Q10. If $\Delta PQR \sim \Delta ABC$; PQ = 8 cm, AB = 6 cm and perimeter of ΔABC is 36 cm, then the perimeter of ΔPQR is : (1)

(A) 20.5 cm (B) 25 cm

(C) 48 cm (D) 64 cm

Q11. The number $3^{13} - 3^{10}$ is divisible by : (1)

(A) 2 and 10 (B) 3 and 10

(C) 2, 3 and 10 (D) 2, 3 and 13

Q12. If α and β are the zeroes of polynomial $3x^2 + 6x + k$ such that $\alpha + \beta + \alpha\beta = \frac{-2}{3}$, then the value of k is : (1)

(A) -8 (B) 4

(C) -4 (D) 8

Q13. If (sec A – tan A) = m, then the value of sec A + tan A is : (1)

(A) $1 - \frac{1}{m}$ (B) $m^2 - 1$

(C) $\frac{1}{m}$ (D) $-m$

Q14. A line intersects the y-axis and x-axis at the points P and Q respectively. If (2, – 5) is the mid-point of PQ, then the coordinates of P and Q are, respectively: (1)

(A) (0, – 5) and (2, 0) (B) (0, 10) and (– 4, 0)

(C) (0, 4) and (– 10, 0) (D) (0, – 10) and (4, 0)

Q15. A bag contains 5 red balls and n green balls. If the probability of drawing a green ball is three times that of a red ball, then the value of n is : (1)

(A) 20 (B) 18

(C) 15 (D) 10

Q16. $\Delta ABC \sim \Delta PQR$. If AM and PN are altitudes of ΔABC and ΔPQR respectively and $AB^2 : PQ^2 = 4 : 9$ then, AM : PN : (1)

(A) 16 : 81 (B) 4 : 9

(C) 3 : 2 (D) 2 : 3

Q17. If (k, 3) is the point of intersection of the lines represented by $x + py = 6$ and $x = 15$, then (k, p) will be : (1)

(A) (15, 3) (B) (15, – 3)

(C) (3, 15) (D) (– 15, 3)

Q18. In ΔABC, D and E are points on AC and BC respectively such that DE || AB. If AB = a, DE = x, BE = b and EC = c. Then x can be expressed in terms of a, b and c as : (1)

(A) $\frac{ac}{b}$ (B) $\frac{ac}{b+c}$

(C) $\frac{ab}{c}$ (D) $\frac{ab}{b+c}$

Q19. **Assertion (A) :** In ΔPQR, DE || QR such that PD = $(7x - 4)$ cm, PE = $(5x - 2)$ cm, DQ = $(3x + 4)$ cm and ER = $3x$ cm, then $x = 5$. (1)

Reason (R) : If a line is drawn parallel to one side of a triangle intersecting other two sides, then the other two sides are divided in the same ratio.

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

(B) Both A and R are true and R is not the correct explanation of Assertion A.

(C) A is true but R false.

(D) A is false but R is true.

Q20. **Assertion (A) :** If the system of linear equations $3x + 6y = 10$ and $2x - ky + 5 = 0$ is inconsistent, then $k = -4$. (1)

Reason (R) : The system of equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is inconsistent if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$.

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

(B) Both A and R are true and R is not the correct explanation of Assertion A.

(C) A is true but R false.

(D) A is false but R is true.

SECTION–B

(Section B consists of 5 Very Short Answer type questions of 2 marks each).

Q21. (A) If the sum of the zeroes of a quadratic polynomial $p(x) = kx^2 + 2x + 3k$ is equal to the product of its zeroes, then find the value of k.

OR

Q21. (B) If one zero of the polynomial $p(x) = 6x^2 + 37x - (k - 2)$ is reciprocal of the other, then find the value of k. (2)

Q22. Solve : (2)

$$152x - 378y = -74$$
$$-378x + 152y = -604$$

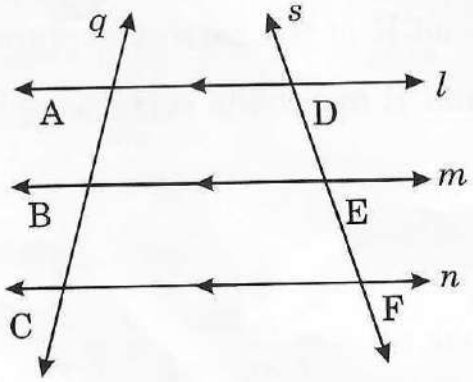
Q23. Find the ratio in which y-axis divides the line segment joining the points $(5, -6)$ and $(-1, -4)$. (2)

Q24. (A) If $\tan(\alpha + \beta) = \sqrt{3}$ and $\tan(\alpha - \beta) = \frac{1}{\sqrt{3}}$, $0° < \alpha + \beta \leq 90°$ and $\alpha > \beta$, find the angles α, β.

OR

Q24. (B) If $A = 45°$ and $B = 30°$, verify that $\frac{\sin A}{\cos A + \sin A \cdot \sin B} = \frac{2}{3}$ (2)

Q25. If three parallel lines l, m, n are intersected by a transversals q and s as shown in the adjoining figure, then $\frac{AB}{BC} = \frac{DE}{EF}$. (2)



Alternative Question for Visually Challenged Students in lieu of Q. 25

Q25. Prove that the line drawn through the mid-point of one side of a triangle parallel to another side bisects the third side. (2)

SECTION–C

(Section C consists of 6 Short Answer type questions of 3 marks each).

Q26. (A) Given that $\sqrt{3}$ is irrational number, prove that $5 - 2\sqrt{3}$ is irrational.

OR

(B) Find the largest number which divides 245 and 1029 leaving remainder 5 in each case. (3)

Q27. Find 'c' if the system of equations $cx + 3y + (3 - c) = 0$; $12x + cy - c = 0$ has infinitely many solutions ? (3)

Q28. If the roots of the equation $(a - b)x^2 + (b - c)\,x + c - a = 0$ are equal, prove that $2a = b + c$. (3)

Q29. If α and β are the zeroes of the quadratic polynomial $p(x) = x^2 - 3x + 2$, find a quadratic polynomial whose zeroes are $2\alpha + \beta$ and $2\beta + \alpha$. (3)

Q30. If AM and PF are medians of triangles ABC and PQR respectively, where $\Delta ABC \sim \Delta PQR$, prove that $\frac{AB}{PQ} = \frac{AM}{PF}$. (3)

Q31. (A) Find the ratio in which the line $2x + 3y - 5 = 0$ divides the line segment joining the points $(8, -9)$ and $(2, 1)$. Also find the coordinates of the point of division.

OR

(B) Find the coordinates of the point of R on the line segment joining the points P $(-1, 3)$ and Q $(2, 5)$ such that $PR = \frac{3}{5}PQ$. (3)

SECTION–D

(Section D consists of 4 Long Answer questions of 5 marks each).

Q32. Solve graphically the pair of linear equations :

$$4x - 3y - 6 = 0$$

$$7x + 3y - 27 = 0$$

Shade the triangular region formed by these lines and y-axis. Write the coordinates of this triangle. Also, calculate the area of this triangle.

Alternative Question for Visually Challenged Studnts in lieu of Q. 32.

Q32. The area of a rectangle remains the same if the length is increased by 7 m and the breadth is decreased by 3 m. The area remains unaffected if the length is decreased by 7 m and breadth is increased by 5 m. Find the dimensions of the rectangle. (5)

Q33. (A) In a flight of 600 km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 km/hr from its usual speed and the time of the flight increased by 30 mins. Find the scheduled duration of the flight.

OR

(B) Solve the following quadratic equations :

$$9x^2 - 9(a + b)x + [2a^2 + 5ab + 2b^2] = 0 \quad (5)$$

Q34. Prove that if a line drawn parallel to one side of a triangle, to intersect other two sides in two distinct points then the other two sides are divided in the same ratio.

Using the above result, prove that ΔXYZ is an isosceles triangle if DE || YZ and YD = ZE where D and E are two points on XY and XZ respectively. (5)

Q35. (A) If $x = r\sin\theta.\cos\phi$, $y = r\sin\theta.\sin\phi$ and $z = r\cos\theta$,
Prove that $r^2 = x^2 + y^2 + z^2$.

OR

(B) Prove the identity :

$$\frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A} = 1 + \sec A \,.\, \text{cosec}\, A \quad (5)$$

SECTION–E

(Section E consists of 3 case study based questions of 4 marks each).

Q36. A book bank in school is a valuable resource that provides textbooks and study materials to students who need them. It helps promote equal learning opportunities by supporting those who may not afford to buy books. Students can borrow books for the academic year and return them after use. This initiative encourages reuse, reduces waste, and supports education for all.

The school has a book bank for the help of the students from economically weaker sections. Students of class X donated the following number of books to the book bank :

English books = 100

Hindi books = 250

Mathematics books = 325

These books have to be stacked in such a way that all the books are kept subject wise and the number of copies in each stack are the same.

I. How many books are arranged in each stack ? (1)

II. How many stacks are used to arrange all the Hindi books ? (1)

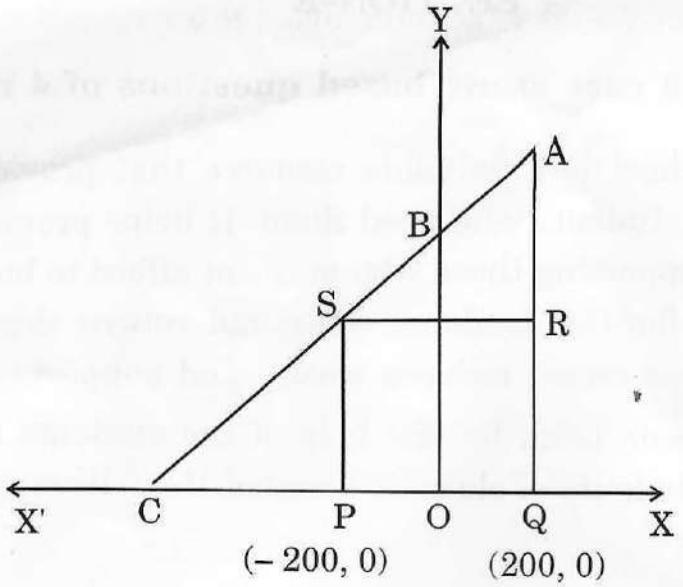
III. Determine the total number of stacks that will be used for arranging all the books.

OR

If the thickness of each book of English, Hindi and Mathematics is 2.2 cm, 1.6 cm and 1.8 cm respectively, then find the height of each stack of English, Hindi and Mathematics. (2)

Q37. Growing vegetables and wheat together on the same piece of land is known as mixed farming. This method helps in better use of land and increases overall crop productivity. It also improves soil health and reduces the risk of total crop failure. Such practices support sustainable and efficient agriculture.

Jagdhish has a field which is in the shape of a right-angled triangle AQC. He wants to leave a space in the form of square PQRS inside the field to grow wheat and remaining to grow vegetables (as shown in the figure). In the field, there is a pole marked as O.



I. Taking O as the origin, the coordinates of P are (– 200, 0) and of Q are (200, 0). PQRS being a square, what are the coordinates of R and S ? (1)

II. If S divides CA in ratio K : 1, what is the value of K, where point A is (200, 800) and C is (– 600, 0) ? (1)

III. (A) What is the area of square PQRS ? (2)

OR

(B) What is the length of diagonal PR in square PQRS ?

Alternative Question for Visually Challenged Studnts in lieu of Q. 37

Q37. Riya is creating a small garden in the shape of a quadrilateral in her backyard. She uses a coordinate system to map out the four corners of her garden. The coordinates of the corners are :

Point A : (2, 3)

Point B : (6, 3)

Point C (6, 7)

Point D : (2, 7)

She marks these points and plans to plant different types of flowers along the boundary lines of the garden.

Answer the following questions based on above information :

I. What is the length of side AB of the garden ? (1)

II. There is a well on the side AB of the garden which divides the side in the 2 : 3 ratio. Find the coordinates of the well. (1)

III. (A) Prove that the garden has a square shape.

OR

(B) Find the coordinates of the center of the square-shaped garden. (2)

Q38. Van Mahotsav, also known as the "Festival of Trees," is celebrated every year in the first week of July across India. It was started in 1950 to create awareness about the importance of trees and encourage people to plant more of them. During this week, million of trees are planted across the country by schools, government bodies and communities. Trees play a vital role in maintaining ecological balance and fighting climate change. Van Mahotsav reminds us of our responsibility to protect nature and preserve forests for future generations. It promotes a greener, healthier and more sustainable environment.

During Van Mahotsav, a group of students planted a certain number of plants in 20 houses of a locality.

Number of plants	0-2	2-4	4-6	6-8	8-10	10-12	12-14
Number of houses	x	$2x$	x	$2x + 3$	$6x$	$2x$	$2x + 1$

Based on the given information, answer the following questions :

I. Calculate the value of x. (1)

II. Find the probability that a particular house selected at random has number of plants greater than or equal to 4 and less than 8. (1)

III. (A) Find the probability of houses having plants less than 8.

OR

(B) Find the probability of selecting a house having plants greater than or equal to 6. (2)

□□□