



Delhi Public School, Howrah

PERIODIC TEST-II (2025 -2026)

Class-XI

Care must be taken not to write anything on the question paper. All the questions must be attempted in the correct sequence.

Subject:- Mathematics (Code 041)

Time: 3 Hours

F.M. 80

General Instructions:

Read the following instructions very carefully and strictly follow them:

1. This Question paper contains 38 questions. All questions are compulsory.
2. This Question paper is divided into five Sections - A, B, C, D and E.
3. In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) with only one correct option and Questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In Section B, Questions no. 21 to 25 are Very Short Answer (VSA)-type questions, carrying 2 marks each.
5. In Section C, Questions no. 26 to 31 are Short Answer (SA)-type questions, carrying 3 marks each.
6. In Section D, Questions no. 32 to 35 are Long Answer (LA)-type questions, carrying 5 marks each.
7. In Section E, Questions no. 36 to 38 are Case study-based questions, carrying 4 marks each.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 3 questions in Section C, 2 questions in Section D and one subpart each in 2 questions of Section E.
9. Use of calculator is not allowed.

Section – A

(Multiple Choice Questions)

Each question carries 1 mark

1. If $n(A) = 20$, $n(B) = 28$ and $n(A \cup B) = 40$, then the number of subsets of $A \cap B$ is
A) 2^8 B) 2^{16} C) 2^{48} D) 2^{60}
2. Let $A = \{1, 2, 3, 4, 5\}$ and $B = \{1, 3, 5, 7, 9\}$. Which of the following relation is a function from A to B?
A) $R_1 = \{(x, y) : y = 2 + x, x \in A, y \in B\}$ B) $R_2 = \{(1, 1), (2, 1), (3, 3), (4, 3), (5, 5)\}$
C) $R_3 = \{(x, y) : y = 5 - x, x \in A, y \in B\}$ D) $R_4 = \{(1, 3), (2, 5), (2, 4), (7, 9)\}$
3. If $\tan A = \frac{b}{a}$, then value of $a \cos 2A + b \sin 2A =$
A) $(-b)$ B) a C) $(-a)$ D) b
4. If in two circles, arcs of the same length subtend angles 45° and 60° at centre, find the ratio of their radii.
A) 2:3 B) 2:5 C) 3:4 D) 4:3
5. If $z(2 - i) = (3 + i)$, then z^{20} is equal to
A) 2^{10} B) -2^{10} C) 2^{20} D) -2^{20}
6. If $4x + i(3x - y) = 3 + i(-6)$, where x and y are real numbers, then the values of x and y are:
A) $x = 3, y = 4$ B) $x = \frac{3}{4}, y = \frac{33}{4}$ C) $x = 33, y = 4$ D) $x = 4i, y = 3$
7. If $|2x - 3| \geq 7$ and x is a real number, then x belongs to
A) (4, 10) B) (-10, 4) C) (4, -10) D) None of these
8. There are 10 true-false questions in an examination. Then in how many ways these questions can be answered?
A) 100 B) 20 C) 512 D) 1024
9. 10 people are sitting around a circular table. Two persons, A and B, insist on sitting together. In how many ways can the group be seated?
A) $9!$ B) $2 \times 8!$ C) $2 \times 9!$ D) $2 \times 8! \times 8$
10. In the expansion of $(1 + x)^{15}$, the coefficient of middle term is:
A) 308 B) 462 C) 6435 D) 1848

11. The Geometric Mean between 0.15 and 0.0015 is:
 A) 1.5 B) 0.015 C) 0.15 D) None of these
12. In a G.P. of even number of terms, the sum of all terms is 5 times the sum of the odd terms. The common ratio of the G.P. is
 A) $\frac{4}{5}$ B) $\frac{1}{5}$ C) 4 D) $\frac{5}{4}$
13. Find the number of different 8 – letter arrangements that can be made from the letters of the word DAUGHTER so that all vowels occur together.
 A) 4320 B) 4230 C) 4520 D) None of these
14. How many numbers greater than 1000000 can be formed by using the digits 1,2,0,2,4,2,4?
 A) 360 B) 367 C) 350 D) 250
15. L is the foot of the perpendicular drawn from a point (6, 7, 8) on x-axis. The coordinates of L are
 A) (6, 0, 0) B) (0, 7, 0) C) (0, 0, 8) D) (0, 7, 8)
16. The coefficient of x^3 in the expansion of $(2x - 3)^5$ is
 A) (-720) B) 720 C) (-1020) D) 1020
17. If the distance between the points (a, 0, 1) and (0, 1, 2) is $\sqrt{27}$, then the value of a is
 A) 5 B) ± 5 C) -5 D) none of these
18. If $3 \tan (\theta - 15^\circ) = \tan (\theta + 15^\circ)$, $0^\circ < \theta < 90^\circ$, then θ is
 A) π B) $\frac{\pi}{4}$ C) $\frac{\pi}{3}$ D) $\frac{\pi}{2}$

ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R).

Choose the correct answer out of the following choices.

- 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.

19. Assertion(A): cosec x is negative in third and fourth quadrants.

Reason(R): cot x decreases from 0 to $-\infty$ in first quadrant and increases from 0 to ∞ in third quadrant

20. Assertion (A): if $A = \{1,2\}$ then $A \times A = \{(1,1), (2,2)\}$.

Reason (R): A and B to be two non-empty sets and the Cartesian Product is given by $A \times B$ is the set of all ordered pairs (a, b) where $a \in A$ and $b \in B$.

Section – B

[This section comprises of very short answer type questions (VSA) of 2 marks each]

21. a) For all sets A, B, and C, is $(A \cap B) \cup C = A \cap (B \cup C)$? Justify your statement.

OR

b) Given $L = \{1, 2, 3, 4\}$, $M = \{3, 4, 5, 6\}$, and $N = \{1, 3, 5\}$. Verify that $L - (M \cup N) = (L - M) \cap (L - N)$.

22. If $z_1 = 2 - i$, $z_2 = 1 + i$, find $\left| \frac{z_1 + z_2 + 1}{z_1 - z_2 + 1} \right|$.

23. Draw the graph of the greatest integer function and write its domain and range.

24. a) Find the general solution of the equation $5\cos^2 \theta + 7\sin^2 \theta - 6 = 0$.

OR

b) Prove that $\cos \theta \cos \frac{\theta}{2} - \cos 3\theta \cos \frac{9\theta}{2} = \sin 7\theta \sin 8\theta$.

25. Let $f = \{(1,1), (2,3), (0,-1), (-1,-3)\}$ be a function from Z to Z defined by $f(x) = ax + b$, for some integers a, b. Determine the values of a and b.

Section – C

[This section comprises of short answer type questions (SA) of 3 marks each]

26. a) The mid-point of the sides of a triangle are (1, 5, -1), (0, 4, -2) and (2, 3, 4). Find its vertices.

OR

b) Prove that the points (0, -1, -7), (2, 1, -9) and (6, 5, -13) are collinear. Find the ratio in which the first point divides the join of the other two.

27. If θ lies in the first quadrant and $\cos \theta = \frac{8}{17}$, then find the value of the following:

$$\cos (30^\circ + \theta) + \cos (45^\circ - \theta) + \cos (120^\circ - \theta).$$

28. There are 200 individuals with skin disorder. Out of them, 100 have been exposed to chemical C_1 , 50 to chemical C_2 , and 30 to both C_1 and C_2 . Find the number of individuals exposed to

- i) C_1 but not C_2 ii) C_2 but not C_1 iii) C_1 or C_2

29. a) A student has to answer 10 questions, choosing at least 4 from each of Part's A and B. If there are 6 questions in Part A and 7 in Part B, in how many ways can the student choose 10 questions?

OR

b) Out of 18 points in a plane, no three are in the same line except five points which are collinear. Find the number of lines that can be formed joining the point.

30. If $x \cos \theta = y \cos \left(\theta + \frac{2\pi}{3} \right) = z \cos \left(\theta + \frac{4\pi}{3} \right)$, then find the value of $xy + yz + zx$.

31.a) If A is the arithmetic mean and G_1, G_2 be two geometric means between any two numbers, then prove that $2A = \frac{G_1^2}{G_2} + \frac{G_2^2}{G_1}$.

OR

b) Find the sum to n terms of the series: $3 \times 8 + 6 \times 11 + 9 \times 14 + \dots$

Section – D

[This section comprises of long answer type questions (LA) of 5 marks each]

32) If the A.M. and G.M. between two numbers are in the ratio $m:n$, then prove that the numbers are in the ratio $(m + \sqrt{m^2 - n^2}) : (m - \sqrt{m^2 - n^2})$

33)a) Solve the following system of linear inequalities: $x + 2y \leq 10, x + y \geq 1, x - y \leq 0, x \geq 0, y \geq 0$.

OR

b) A solution of 9% acid is to be diluted by adding 3% acid solution to it. The resulting mixture is to be more than 5% but less than 7% acid. If there is 460 litres of the 9% solution, how many litres of 3% solution will have to be added?

34) By the Principle of Mathematical Induction, prove that $2 \cdot 7^n + 3 \cdot 5^n - 5$ is divisible by 24 for all $n \in N$.

35) a) Find n in the binomial $(\sqrt[3]{2} + \frac{1}{\sqrt[3]{3}})^n$ if the ratio of 7th term from the beginning to the 7th term from the end is $\frac{1}{6}$.

OR

b) The second, third and fourth terms in the binomial expansion $(x + a)^n$ are 240, 720 and 1080, respectively. Find x, a & n .

Section – E

[This section comprises of 3 case- study/passage based questions of 4 marks each with sub parts.

The first two case study questions have three sub parts (i), (ii), (iii) of marks 1,1,2 respectively.

The third case study question has two sub parts of 2 marks each.]

36. Case Study I:

A group of 100 students in a college were surveyed about their subscriptions to three online streaming platforms: Netflix (N), Amazon Prime (A), and Disney+ Hotstar (H). The following data was collected:

- 40 students subscribed to Netflix.
- 45 students subscribed to Amazon Prime.
- 50 students subscribed to Disney+ Hotstar.
- 20 students subscribed to both Netflix and Amazon Prime.
- 25 students subscribed to both Amazon Prime and Hotstar.
- 15 students subscribed to both Netflix and Hotstar.
- 10 students subscribed to all three platforms.



Based on the above information, answer the following questions:

- (i) Find the number of students who subscribed to none of the platforms. 1
 (ii) Find the number of students who subscribed to exactly one platform. 1
 (iii) a) Find the number of students who subscribed to exactly two platforms. 2

OR

- (iii) b) Find the number of students who subscribed to only Netflix, only Amazon Prime, and only Hotstar. 2

37. Case Study II:

In wireless communication, signal waves are often represented as complex numbers. The real part represents the in-phase component, while the imaginary part represents the quadrature component.

- To maintain signal stability, engineers use the conjugate of a complex number.
- The multiplicative inverse is used in normalization of signals.
- Multiplication of complex numbers is used to combine or modulate signals, and the result must be expressed in the form $a + ib$.

Based on the above information, answer the following questions:

- (i) A signal is represented by the complex number $z = 7 - 24i$. Find the value of $\sqrt{7 - 24i}$. 1
 (ii) A drone receiver moves such that its position z satisfies $|z|=5$. Describe the locus of the drone in the Argand plane. 1
 (iii) a) Suppose the receiver moves in a path such that $|z - (3 + 4i)| = |z - (3 - 4i)|$. Find the equation of its path. 2

OR

- (iii) b) Two signals are combined as $S = (2 + 3i)(4 - i)$. Express S in the form $a + ib$. 2

38. Case Study III:

A school library has 10 different books, of which 4 are Mathematics, 3 are Science, and 3 are Literature. A student has to select 5 books to issue, but with the following conditions:

- At least 1 book of each subject must be chosen.
- No two Literature books can be chosen together unless at least 2 Mathematics books are also included.



Based on the above information, answer the following questions.

- (i) Find the number of ways in which the student can select 5 books satisfying the given conditions. 2
 (ii) If the student additionally decides to arrange the selected 5 books in a row on a shelf, find the total number of such arrangements when books of the same subjects are kept together. 2
