



Delhi Public School, Howrah

Periodic Test - I Examination (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: - Applied Mathematics (Code No- 241)

Time: 3 Hours

F.M. 80

General Instructions:

Read the following instructions very carefully and strictly follow them:

- This question paper contains 38 questions. All questions are compulsory.
- This question paper is divided into 5 Sections – Section A, B, C, D and E.
- In Section – A, Questions Number 1 to 18 are Multiple Choice Questions (MCQs) and Questions Number 19 and 20 are Assertion – Reason based questions of 1 mark each.
- In Section – B, Questions Number 21 to 25 are Very Short Answer (VSA) type Questions, carrying 2 marks each.
- In Section – C, Questions Number 26 to 31 are Short Answer (SA) type Questions, carrying 3 marks each.
- In Section – D, Questions Number 32 to 35 are Long Answer (LA) type Questions, carrying 5 marks each.
- In Section – E, Questions Number 36 to 38 are case study-based questions, carrying 4 marks each.
- There is no overall choice. However, an internal choice has been provided in 2 questions in Section – B, 2 questions in Section – C, 2 questions in Section D and 3 questions in Section – E.
- Use of calculators is NOT allowed.

SECTION - A

This section comprises of Multiple Choice Questions (MCQs) of 1 mark each. Select the correct option (Question 1 to Question 18):

- The binary equivalent of the decimal number 569 is
(A) 100110011 (B) 1000111001 (C) 1110001001 (D) 1010111001
- The product of $\sqrt[3]{2}$, $\sqrt[4]{2}$, $\sqrt[12]{32}$ is equal to
(A) $\sqrt{2}$ (B) 2 (C) $\sqrt[12]{2}$ (D) $\sqrt[12]{32}$
- If $\log_5(0.04) = x$, then the value of x is
(A) 2 (B) 4 (C) -4 (D) -2
- If it was Friday on 4th May 1956, then what was the day on 6th July 1957 ?
(A) Wednesday (B) Monday (C) Saturday (D) Tuesday
- A train covered first 120 km at a speed of 20 km/h and then covered 180 km at a speed of 30 km/hr. Its average speed is
(A) 25 km/h (B) 27 km/h (C) 28 km/h (D) 26 km/h
- Ramu is twice efficient as Komal. They together can finish a piece of work in 50 days. In how many day Komal can finish the same work alone?
(A) 75 days (B) 150 days (C) 160 days (D) 180 days
- A and B take a contract to finish a piece of work for ₹ 450. A can alone do the work in 10 days and B can alone do it in 20 days. With the help of C, they finish the work in 4 days. What amount should be paid to C for his contribution?
(A) ₹ 90 (B) ₹ 60 (C) ₹ 180 (D) ₹ 120
- Two trains running in opposite directions at the speed of 36 km/h and 54 km/h cross each other in 8 sec. If the length of first train is 80 m, then the length of second train is
(A) 90 m (B) 100 m (C) 110 m (D) 120 m
- Two finite sets have m and n number of elements respectively. The total number of subsets of the first set is 192 more than the total number of subsets of the second set. The values of m and n respectively are
(A) 7, 6 (B) 8, 6 (C) 8, 5 (D) 9, 7
- Two finite sets A and B are such that $A \subset B$, then which of the following is not correct?

- (A) $A \cup B = B$ (B) $A \cap B = A$ (C) $A - B = \emptyset$ (D) $B - A = \emptyset$
- 11) Let $A = \{3, 5\}$ and $B = \{7, 11\}$ and R be the relation from A to B defined as $R = \{(a, b) : a \in A, b \in B, a - b \text{ is odd}\}$, then
 (A) $R = A \times B$ (B) $R = \emptyset$ (C) $R \subset A \times B$ (D) $R \subset B \times A$
- 12) If the sum of n terms of an A.P. is given by $S_n = 3n + 2n^2$, then the common difference of the A.P. is
 (A) 3 (B) 2 (C) 6 (D) 4
- 13) The sum of all odd numbers between 1 and 1000 which are divisible by 3, is
 (A) 90000 (B) 83367 (C) 93660 (D) none of these
- 14) The value of $2 \times 2^{\frac{1}{2}} \times 2^{\frac{1}{4}} \times 2^{\frac{1}{8}} \times \dots \times \infty$ is
 (A) 4 (B) $\sqrt{2}$ (C) $2\sqrt{2}$ (D) 8
- 15) If 3^{rd} , 8^{th} and 13^{th} terms of a G.P. are p, q and r respectively, then which of the following is correct?
 (A) $q^2 = pr$ (B) $r^2 = pq$ (C) $pqr = 1$ (D) $2q = p + r$
- 16) Let a, b, c are in A.P. and $k \neq 0$ be a real number. Which of the following is /are correct?
 (i) ka, kb, kc are in A.P.
 (ii) $k - a, k - b, k - c$ are in A.P.
 (iii) $\frac{a}{k}, \frac{b}{k}, \frac{c}{k}$ are in A.P.
 (A) (i) and (ii) only (B) (ii) and (iii) only (C) (i) and (iii) only (D) (i), (ii) and (iii)
- 17) If a person walks at 12 km/h instead of 10 km/h, he would have walked 10 km more in the same time period. What is the actual distance travelled by him?
 (A) 60 km (B) 50 km (C) 40 km (D) 30 km
- 18) The value of $\frac{\log 8 - \log 2}{\log 32}$ is
 (A) $\frac{2}{5}$ (B) $\frac{1}{4}$ (C) $-\frac{2}{5}$ (D) $\frac{1}{3}$

Questions number 19 and 20 are Assertion – Reason based questions of 1 mark each. Two statements are given – one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below:

- (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):** If $A \subseteq B$, then $A \cup B = B$.

Reason(R): Union of a set with itself is the universal set.

20) **Assertion(A):** In a non-leap year, the 1st of March is the same day of the week as the 1st of November.

Reason(R): There are exactly 244 days between the 1st of March and the 1st of November in a non-leap year.

SECTION – B

Questions Number 21 to 25 are Very Short Answer (VSA) type questions of 2 marks each.

21) (a) If $a^x = b$, $b^y = c$ and $c^z = a$, prove that $xyz = 1$.

OR

(b) If $2^x = 3^y = 6^{-z}$, prove that $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$.

22) If $\log_3 y = x$ and $\log_2 z = x$, express 72^x in terms of y and z .

23) Let R be the relation on the set N of natural numbers defined by $R = \{(a, b) : a + 3b = 12, a \in N, b \in N\}$.

Find domain and range of R .

24) If A and B are two sets and ξ is the universal set such that $n(\xi) = 40$, $n(A) = 25$ and $n(B) = 20$, then find the least value of $n(A \cap B)$.

25) (a) If $\frac{b+c-a}{a}, \frac{c+a-b}{b}, \frac{a+b-c}{c}$ are in A.P., prove that $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are also in A.P.

OR

(b) If a, b, c are in G.P. and $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}}$, prove that x, y, z are in A.P.

SECTION - C

Questions Number 26 to 31 are Short Answer (SA) type questions of 3 marks each.

- 26) If 2 men or 3 boys take 40 hours to do a certain piece of work, how long will 4 men and 9 boys working together take to complete the work?
- 27) Read the following information carefully and answer the questions given below it:
Eight friends **P, Q, R, S, T, U, V** and **W** are sitting around a circular table facing the centre. **V** is third to the right of **Q**, and second to the left of **R**. **Q** is second to the left of **T** and immediate right of **S**. **U** is between **Q** and **T**. **P** is not at the left of **R**.
- Who is exactly at left of **S**?
 - Who is second to right of **T**?
 - What is exact position of **W**?

28) (a) If $abc = 1$, show that $\frac{1}{1+a+b^{-1}} + \frac{1}{1+b+c^{-1}} + \frac{1}{1+c+a^{-1}} = 1$.

OR

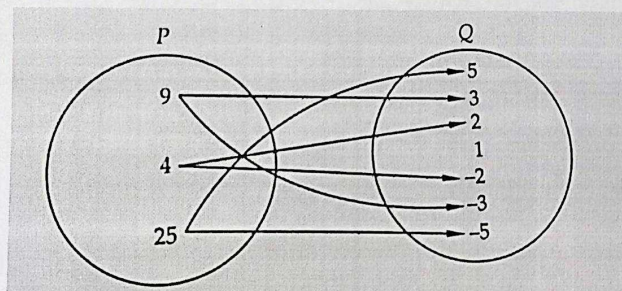
(b) If $x^2 + y^2 = 23xy$, prove that $\log \frac{x+y}{5} = \frac{1}{2}(\log x + \log y)$

- 29) (a) The interior angles of a polygon are in A.P. The smallest angle is 120° and the common difference is 5° . Find the number of sides of the polygon.

OR

- (b) The product of first three terms of a G.P. is 1000. If 6 is added to its second term and 7 added to its third term, the terms become in A.P. Find the G.P.

- 30) A relation **R** between the sets **P** and **Q** is shown in the given figure. Study the figure and answer the following questions:



- Write the relation **R** in roster form
 - Write relation **R** in set builder form
 - Find the domain and range of **R**
- 31) Let $\xi = \{x: x \in N \text{ and } x \leq 8\}$, $A = \{x: 5 < x^2 < 50\}$ and $B = \{x: x \text{ is prime}\}$. Draw a Venn diagram to show the relationship between the given sets. Hence list the elements of the set $(A-B)$.

SECTION - D

Questions Number 32 to 35 are Long Answer (LA) type questions of 5 marks each.

- 32) (a) Find the sum of n terms of the sequence: $\left(x + \frac{1}{x}\right)^2, \left(x^2 + \frac{1}{x^2}\right)^2, \left(x^3 + \frac{1}{x^3}\right)^2, \dots$

OR

- (b) If **S** be the sum, **P** the product and **R** the sum of the reciprocals of n terms of a G.P., prove that $\left(\frac{S}{R}\right)^n = P^2$.

33) (a) If $\frac{9^n \times 3^{2n} \times 3^{2n} - 27^n}{3^{3n} \times 2^3} = \frac{1}{27}$, prove that $m - n = 1$.

OR

(b) (i) Solve for x : $\log_2 x + \log_4 x + \log_{16} x = \frac{21}{4}$

3

(ii) If $\frac{1}{\log_a n} + \frac{1}{\log_c n} = \frac{2}{\log_b n}$, prove that $b^2 = ac$.

2

- 34) Using the concept of odd days, determine what was the day of the week on 15th August, 1947?

- 35) (a) The sums of n terms of two arithmetic progression are in the ratio $(3n+8):(7n+15)$. Find the ratio of their 12th terms. 3
- (b) If A is the A.M. between a and b , prove that $(A - a)^2 + (A - b)^2 = \frac{1}{2}(a - b)^2$ 2

SECTION – E

Questions Number 36 to 38 are case – study based questions of 4 marks each.

- 36) **Case Study 1:** A survey was conducted among 100 students about their preferences for online courses. They were asked whether they were enrolled in Science Courses (S) or Coding Courses (C) on an e-learning platform.

The findings were:

60 students were enrolled in Science

55 students were enrolled in Coding

30 students were enrolled in both Science and Coding

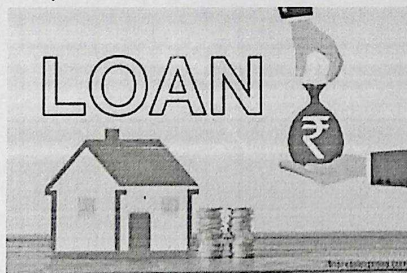
Based on the above information, answer the following questions:

- (a) How many students were enrolled **only in Science courses**? 1
- (b) How many students were enrolled **only in Coding courses**? 1
- (c) How many students were enrolled in **at least one** of the two courses? 2

OR

- (d) How many students did not enrol for either of the courses? 2

- 37) **Case Study 2:** Your younger sister wants to buy an electric car and plans to take loan from a bank for her electric car. She repays her total loan of Rs 321600 by paying every month starting with the first instalment of Rs 2000 and it increases the instalment by Rs 200 every month.



Based on the above information, answer the following questions:

- (a) Find the amount paid by her in 25th instalment. 1
- (b) Find the difference of the amount in 4th and 6th instalment paid by her. 1
- (c) In how many instalments, she clear her total bank loan? 2

OR

- (d) Find the sum of the first seven instalments. 2

- 38) **Case Study 3:** Riya starts investing ₹1,000 in a new cryptocurrency. The coin is volatile but promising—it doubles in value every month for a limited time due to a tech boom. Riya decides to hold her investment for a few months, planning to reinvest the total value at the end of each month. But she is aware of the risks of exponential rise and market crash, and caps her investment period to avoid a bubble.

Based on the above information, answer the following questions:

- (a) What type of sequence models the growth of Riya's crypto investment? 1
- (b) What will be the value of Riya's investment at the end of the 3rd month? 1
- (c) What will be the total value of her cumulative investments over 6 months if the money is not withdrawn? 2

OR

- (d) If Riya wants to stop investing once her investment crosses ₹1,00,000, after how many full months should she exit? (Use $\log_2 101 \approx 7$). 2