



Delhi Public School, Howrah

PERIODIC TEST- II (2024 - 2025)

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

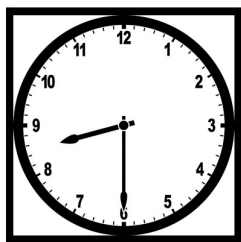
General Instructions:

1. This Question paper contains - five sections A,B,C,D and E. Each section is compulsory. However, there is some internal choice in some questions.
2. Section A has 18 MCQ's and 2 Assertion Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer(VSA) questions of 2 marks each.
4. Section C has 6 Short Answer(SA) questions of 3 marks each.
5. Section D has 4 Long Answer(LA) questions of 5 marks each.
6. Section E has 3 sources based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.
7. Internal Choice is provided in 2 questions in Section-B, 2 questions in Section-C, 2 Questions in Section-D. You have to attempt only one alternative in all such questions.

SECTION A

(All Questions are compulsory. No internal choice is provided in this section)

- 1) If $a = b^{2x}$, $b = c^{2y}$, $c = a^{2z}$, then find the value of xyz . 1
- (a) $\frac{1}{2}$ (b) $\frac{1}{8}$ (c) $\frac{1}{4}$ (d) $(-\frac{1}{8})$
- 2) If $\log 325.6 = 2.5127$, then $\log 0.03256$ is 1
- (a) -2.5127 (b) $\bar{2}.5127$ (c) -1.5127 (d) $\bar{1}.5127$
- 3) The angle between two hands of a clock at 8:30 a.m. is 1



- (a) 75° (b) 80° (c) 85° (d) 45°
- 4) If the perimeter of one face of a cube is 40 cm, then the sum of the lengths of its edge is 1
- (a) 80 cm (b) 120 cm (c) 160 cm (d) 240 cm
- 5) The distance between two parallel lines $2x - 3y + 5 = 0$ and $4x - 6y + 15 = 0$ is 1
- (a) $\frac{10}{\sqrt{13}}$ (b) $\frac{5}{\sqrt{13}}$ (c) $\frac{15}{\sqrt{13}}$ (d) $\frac{20}{\sqrt{13}}$
- 6) If a line has the equation $y = mx + c$ and it is perpendicular to the line $3x + 4y = 7$, then the value of m is 1
- (a) $-\frac{3}{4}$ (b) $\frac{3}{4}$ (c) $\frac{4}{3}$ (d) $\frac{2}{7}$
- 7) A line passes through the point $(2, -3)$ and makes equal intercepts on the positive coordinate axes. What is the equation of the line? 1
- (a) $x + y = 6$ (b) $x + y = 61$ (c) $x - y = 5$ (d) $x + y = 5$

8) A satellite is moving along a path given by the equation, $4x - 3y = 12$. If a meteor is detected at $(2,5)$, then what is the minimum distance between the satellite's path and the meteor? 1

- (a) 5 units (b) $\frac{6}{5}$ units (c) 4 units (d) $\frac{19}{5}$ units

9) In a certain code language, "COLD" is written as "XPMG" and "WARM" is written as "DZIN". How will "HEAT" be written in that language? 1

- (a) SRZX (b) SVVY (c) SRVY (d) SVZX



10) If A is the daughter of B and C, and D is the son of E and F, and B and E are sisters, how is A related to D? 1

- (a) Cousin (b) Sister (c) Aunt (d) Niece

11) If "COIN" is coded as "3145", "NEAT" is coded as "5462", and "TONE" is coded as "2546", how is "CONE" coded in that language? 1

- (a) 3456 (b) 3546 (c) 3645 (d) 3154

12) Identify the correct conclusion based on the following premises:

Statement I: All fruits are sweet.

Statement II: All sweet things are healthy. 1

- (a) Some healthy things are fruits. (b) Some fruits are not healthy
(c) All fruits are healthy. (d) No fruits are healthy

13) If A and B are sets such that $A \cup B = A \cap B$, what can be concluded about A and B? 1

- (a) $A = B$ (b) $A \cap B = \emptyset$ (c) $A \subseteq B$ (d) $A \cup B = \emptyset$

14) If the sum of the first n terms of an arithmetic progression is $2n^2 + n$, what is the common difference of the AP? 1

- (a) 2 (b) 3 (c) 4 (d) 5

15) If the sum of the infinite geometric series is 15 and the common ratio r is $\frac{1}{3}$, what is the first term? 1

- (a) 10 (b) 12 (c) 15 (d) 20

16) Let $A = \{a, b\}$ and $B = \{1, 2\}$. How many distinct relations can be defined from A to B? 1

- (a) 4 (b) 8 (c) 16 (d) 14

17) Given the data set: 5, 7, 9, 12, 15, 18, 22, what is the first quartile? 1

- (a) 12 (b) 15 (c) 5 (d) 0

18) If the 5th term of an arithmetic progression is 20 and the 12th term is 50, what is the common difference of the AP? 1

- (a) 10 (b) 5 (c) 4 (d) 6

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

- (i) Both A and R are true and R is the correct explanation of A.
(ii) Both A and R are true and R is not the correct explanation of A.
(iii) A is true but R is false.
(iv) A is false but R is true.

19) Assertion(A): If the Arithmetic Mean (AM) of two distinct positive numbers is equal to their Geometric Mean (GM), then the two numbers must be equal. 1

Reason(R): For any two positive numbers, equality in the AM-GM inequality $AM \geq GM$ holds if and only if the numbers are equal.

- (a) (i) (b) (ii) (c) (iii) (d) (iv)

20) Assertion(A): The mean of a data set is always greater than the median.

Reason(R) : The mean is affected by extreme values, while the median is not. 1
 (a) (i) (b) (ii) (c) (iii) (d) (iv)

SECTION B

(All Questions are compulsory. In case of internal Choice, attempt any one question only)

- 21) The marks of 9 students in a test are 13, 17, 20, 5, 3, 3, 18, 15 and 20. Calculate the quartile deviation. 2
 22) (a) Out of 500 cars owners investigated, 400 owned car A and 200 owned car B, 50 owned both A and B cars. Is the data correct? 2

OR

- (b) If $R = \{(x, y) : x, y \in W, x^2 + y^2 = 100\}$, then find the domain and range of R. Also write R in roster form. 2
 23) The test scores of 10 students are given below: 13, 52, 42, 22, 44, 105, 45, 88, 88, 76. Find the percentile rank of score 88. 2
 24) (a) Ramdin can reap a field in 30 days. What part of the field would he have reaped in 25 days? 2

OR

- (b) The average mark of 15 students is 45. If average marks of first 8 students are 48 and that of last 8 students is 42, find the marks obtained by 8th student. 2
 25) Find the minimum value of $4^x + 4^{1-x}$. 2

SECTION C

(All Questions are compulsory. In case of internal Choice, attempt any one question only)

- 26) (a) If $x^4 y^2 z^3 = 49392$, find the values of x, y, z where x, y, z are different positive primes. 3

OR

- (b) Solve for x : $\log_3 x + \log_9 x + \log_{81} x = \frac{7}{4}$ 3

- 27) (a) Convert the decimal number 450 to the binary number. 2
 (b) Dimensions of the cuboidal hall are 10 m x 12m x 15 m. Find the length of the longest rod that can be fitted into the hall. 1

- 28) Find the equation of a line which passes through (2,2) and the sum of its intercepts on the axes is 9. 3

- 29) (a) Coding is a method of converting information in the form of letters, words or phrases into same or other form for the purpose of secrecy. Decoding is a method of converting the message sent by a source into the original form. Some basic methods of coding – decoding are
 (i) Letter coding (ii) Number coding (iii) Group coding (iv) Letter for digits

Based on the above information, answer the following questions:

- (i) In a certain language if 'AMITABH' is coded as 3 -15 -11 -22 -3 - 4 - 10. How is 'DHERMENDRA' coded? 1
 (ii) CIRCLE: HNWHQJ :: PARABOLA: _____ 1
 (iii) Find the digits P and Q. 1

	Q	P
×	Q	5
1	8	0 P

OR

- (b) In an extended Indian family, the following relationships are given:
 1. Arjun is the father of Karan, Lata, and Maya.
 2. Karan is married to Rita, and they have two children: Ravi and Aditi.
 3. Lata is married to Vikram, and they have one child: Sneha.
 4. Maya is the mother of Suresh and Anita. Suresh is married to Simran, and they have one daughter: Neha.

5. Ravi and Neha are in the same class at school.

Based on the information provided, answer the following questions:

- a) Determine the relationship between Neha and Sneha. 1
- b) How is Simran related to Karan? 1
- c) What is the relationship between Aditi and Suresh? 1

30) In a frequency distribution, the co-efficient of skewness based on quartiles is 0.5. If the sum of upper quartile and lower quartile is 100 and the median is 40, find the values of upper and lower quartiles. 3

31) Find the equation of a line which is perpendicular to $3x + 2y = 8$ and passes through the mid-point of the line segment joining the points $(5, -2)$ and $(2, 2)$. 3

SECTION D

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

32) (a) During the annual school debate competition at Sunshine High, 8 students—Aman, Bina, Charan, Divya, Esha, Farhan, Gita, and Hari—are to be seated in a single row facing the audience. The seating arrangement is crucial as it reflects the school's diverse group dynamics. The students must follow certain rules and preferences for seating, which are detailed below:

- 1. Aman does not want to sit next to Farhan.
- 2. Bina must sit at either end of the row.
- 3. Charan prefers to sit immediately to the right of Esha.
- 4. Divya and Gita should not sit next to each other.
- 5. Hari must sit exactly in the middle of the row.
- 6. Esha must sit somewhere to the left of Farhan.

Based on the above information, answer the following questions:

- (a) Write the seating arrangement. 1
- (b) Who is seated at the extreme left and extreme right ends of the row? 1
- (c) If Esha is seated in the 3rd position from the left, who must be seated to the immediate right of her? 1
- (d) If Hari is in the middle position (4th from either end), which two students could possibly be seated next to him? 1
- (e) If Aman is seated to the left of Hari, and Bina is seated at the extreme right, where could Divya be seated? 1

OR

(b) What was the day on 9th December 1969? 5

33) Calculate the mean, variance and standard deviation for the following data: 5

Classes	30 -40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

34) (a) The sum of two numbers is 6 times their geometric mean, show that the numbers are in the ratio $(3 + 2\sqrt{2}) : (3 - 2\sqrt{2})$. 5

OR

(b) Metro City, a bustling hub with a population of 5,120,000 people, is facing a public health crisis. A new virus, highly contagious and spreading rapidly, has begun to take hold of the city. Initial reports indicate that 5,000 people have already been infected. Health experts have warned that the virus spreads exponentially, with the number of infected individuals doubling every 12 days. The city's administration is working against the clock to contain the virus, but time is running out. The crucial question they need to answer is: how long before half of the city's population is infected? 5

35) Calculate the moment co-efficient of Kurtosis for the following data: 5

x_i	5	10	15	20	25	30	35
f_i	8	15	18	29	23	17	5

SECTION E

(This section comprises of 3 source based questions (Case Studies) of 4 marks each)

36) Case Study – 1 :

The city of Greenfield is undergoing a major urban development project, and the local government has decided to redesign its road network. One of the key tasks is to determine the placement and alignment of new roads to ensure efficient traffic flow and connectivity between important locations such as the City Hall, Central Park, and the Shopping District.

The locations are represented on a coordinate plane as follows:

- City Hall is located at (2, 3).
- Central Park is located at (8, 7).
- Shopping District is located at (5, -2).

The urban planners want to construct two straight roads: Road A and Road B.

- Road A will connect the City Hall to the Central Park.
- Road B will be designed in such a way that it is perpendicular to Road A and passes through the Shopping District.

The planners also need to identify the point where Road A and Road B intersect to install a traffic signal.

Based on the above information, answer the following questions:

- (i) Find the equation of Road A connecting City Hall to Central Park. 1
- (ii) Determine the slope of Road B, which is perpendicular to Road A. 1
- (iii) Find the equation of Road B, given that it is perpendicular to Road A and passes through the Shopping District. 2

OR

- (iv) Calculate the coordinates of the intersection point of Road A and Road B where the traffic signal will be installed. 2

37) Case Study – 2:

To celebrate Independence Day, Delhi Public School has decided to organize a series of events, including a flag-hoisting ceremony, cultural performances, and a quiz competition. To fund these activities, the school plans to raise money through voluntary contributions from students, teachers, and alumni.

The principal, Ms. Arora, suggested a unique fundraising method: each student in the school will contribute a certain amount of money in an increasing sequence over a period of 10 days. The contribution pattern follows an arithmetic progression (AP).

On the first day, each student contributes ₹10. On the second day, the contribution increases by ₹5 (making it ₹15), and this pattern continues for 10 days, with the contribution amount increasing by ₹5 each day. The school has 1500 students, and all students contribute according to this pattern every day.

Based on the above information, answer the following questions:

- (i) Calculate the total contribution made by a single student over the 10-day period. 2
- (ii) Determine the total amount of money raised by the entire school over the 10 days. 1
- (iii) If the contribution pattern continued for 15 days instead of 10, what would be the total contribution of a single student? 1



OR

(iv) If the school plans to achieve a fundraising goal of ₹5000000, how many additional days (after the 10 days) would be needed to reach this goal? Assume the pattern of increasing contributions by ₹5 each day continues.

1

38) Case Study – 3 :

The Sharma family is a large, close-knit household living in Delhi. They are preparing for a grand family reunion, where all nine members of the family will gather to celebrate the upcoming festival season. The family spans three generations, with members excelling in various professions. Each person in the family has a distinct role, contributing to the household's dynamic. The family members are as follows: A, B, C, D, E, F, G, H, and I. Here are some interesting facts about them:



1. A is the head of the family and is enjoying retirement after a successful career. He is married to B, who is a respected doctor.
2. C is the daughter of A and B. She is a homemaker and the loving mother of D and H.
3. D is the eldest daughter of C and is known for her sharp intellect. She is the elder sister of H.
4. F is C's daughter-in-law, married to G. She is a talented engineer.
5. G is a dedicated teacher and the father of H. He takes great pride in shaping young minds.
6. H is the first cousin of E and I. He is a student and aspires to follow in his father's footsteps as an educator.
7. E is the daughter of F and G. She is a student and the younger cousin of H.
8. I is the grandson of A and is also a student. He is known for his enthusiasm and curiosity.
9. Among the family members, there is a male lawyer and a female politician. These roles are filled by two unmarried adults in the family.

The reunion is an opportunity to bring together the diverse talents of the Sharma family, each member contributing uniquely to the celebration. However, to ensure the event runs smoothly, it is essential to clarify the family dynamics, relationships, and professions. Based on the above information, answer the following question:

- | | |
|----------------------------------|---|
| (a) Who is the politician? | 1 |
| (b) Who is the lawyer? | 1 |
| (c) What is the profession of C? | 1 |
| (d) How is A related to H? | 1 |
