



ANANDALAYA
ANNUAL EXAMINATION
Class: XI

Subject : Mathematics (041)
Date : 03- 03 – 2025

M.M : 80
Time : 3 Hours

General Instructions:

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) 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 calculators is not allowed.

SECTION - A

1. Find the values of a and b , when $(a - 2, 2b + 1) = (b - 1, a + 2)$. (1)
(A) $a = 3, b = 2$ (B) $a = \frac{1}{3}, b = \frac{1}{2}$ (C) $a = -3, b = 2$ (D) $a = 3, b = -2$
2. If $f: R \rightarrow R$, defined by $f(x) = \begin{cases} 3x - 2, & x < 0 \\ 1, & x = 0 \\ 4x + 1, & x > 0 \end{cases}$, find $f(-2) + f(3.5)$. (1)
(A) 15 (B) 7 (C) 8 (D) -7
3. Evaluate : $i^{10} + i^{20} + i^{30} + 1$ (1)
(A) 2 (B) i (C) 1 (D) 0
4. Modulus of the complex number $4 + \sqrt{-3}$ is _____. (1)
(A) $\sqrt{7}$ (B) 19 (C) $\sqrt{19}$ (D) 7
5. How many 4 digit numbers can be formed using the digits 0, 1, 2, 3, 4, 5, if no digit being repeated? (1)
(A) 1800 (B) 300 (C) 2400 (D) 6^4
6. The 10^{th} term of the GP $\frac{1}{4}, -\frac{1}{2}, 1, -2, 4 \dots$ is _____. (1)
(A) -512 (B) -128 (C) -81 (D) 512
7. The value of $\frac{\cos 9^\circ + \sin 9^\circ}{\cos 9^\circ - \sin 9^\circ} =$ _____. (1)
(A) $\cot 54^\circ$ (B) $\sin 54^\circ$ (C) $\tan 54^\circ$ (D) $\tan 37^\circ$
8. The value of $\frac{\sin 3x - \sin x}{\cos 2x} =$ _____. (1)
(A) $2\sin x$ (B) $4\sin x$ (C) $-2\sin x$ (D) $\tan x$
9. If the slope of the line passing through the points $(2, 5)$ and $(x, 3)$ is 2, then the value of $x =$ _____. (1)
(A) 2 (B) 3 (C) 1 (D) -1

10. Find the angle made by the line $x + \sqrt{3}y - 6 = 0$ with the positive direction of x - axis. (1)
 (A) 30° (B) 150° (C) 135° (D) 120°
11. The length of the latus rectum of the parabola $x^2 = 6y$ is _____. (1)
 (A) $\frac{3}{2}$ (B) 3 (C) 6 (D) 12
12. In which octant does the point $(2, 3, -4)$ lies? (1)
 (A) III (B) IV (C) V (D) VII
13. Evaluate : $\lim_{x \rightarrow 1} \frac{x^{15}-1}{x^{10}-1}$. (1)
 (A) 15 (B) $\frac{2}{3}$ (C) 10 (D) $\frac{3}{2}$
14. If $y = \sin x + \tan x$, find $\frac{dy}{dx}$ at $x = \frac{\pi}{3}$. (1)
 (A) $\frac{2}{9}$ (B) 4 (C) $\frac{9}{2}$ (D) $\frac{5}{2}$
15. From a well shuffled pack of cards, a card is drawn at random. Find the probability that the card drawn is either red or a king. (1)
 (A) $\frac{7}{13}$ (B) $\frac{1}{2}$ (C) $\frac{8}{13}$ (D) $\frac{1}{3}$
16. If E_1 and E_2 are two events associated with a random experiment such that $P(E_2) = 0.35$, $P(E_1 \text{ or } E_2) = 0.85$, $P(E_1 \text{ and } E_2) = 0.15$, find $P(E_1)$. (1)
 (A) 0.75 (B) 0.45 (C) 0.65 (D) 0.55
17. The set builder form of the set $\{8, 27, 64, 125, 216\}$ is _____. (1)
 (A) $\{x: x = n^3, n \in N\}$ (B) $\{x: x = n^3, n \in N, 2 \leq n \leq 6\}$
 (C) $\{x: x = n^3, n \in N, 2 < n \leq 6\}$ (D) $\{x: x = n^3, n \in N, 2 \leq n < 6\}$
18. The domain of the function given by $f(x) = \frac{x^3-x+3}{x^2-1}$ is _____. (1)
 (A) R (B) $R - \{1\}$ (C) $R - \{-1, 1\}$ (D) $R - \{0\}$

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. **A:** A room has 9 doors. A man enters the room through one door and comes out through a different door. Then total number of ways equal to 72. (1)
R: Fundamental principle of counting says "If an event can occur in m different ways and another event can occur in n different ways, then the total number of occurrences of the events is $m \times n$ ".
20. **A:** If P is a point on the ellipse $\frac{x^2}{16} + \frac{y^2}{25} = 1$ whose foci are S and S', then $PS + PS' = 1$. (1)
R: P is a point on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, S and S' are foci, then $PS + PS' = 2a$

SECTION - B

21. (A) Find the domain and range of the function $f(x) = \sqrt{3x - 5}$. (2)

OR

- (B) Let $A = \{1, 2, 3, \dots, 20\}$. Define a relation R from A to A by $R = \{(a, b) : a - 2b = 0, a, b \in A\}$. Write the relation using roster form. Write down domain and range of the relation.

22. Solve the linear inequality: $2x - 3 < x + 2 \leq 3x + 5$. (2)

23. (A) In how many ways can the letters of the word 'PARALLEL' be arranged so that all L's do not come together? (2)

OR

- (B) In how many ways 3 boys and 5 girls can be arranged in a row so that: (i) no boys sit together (ii) all the girls are together?

24. Let $f(x) = \begin{cases} a + bx, & x < 1 \\ 4, & x = 1 \\ b - ax, & x > 1 \end{cases}$. If $\lim_{x \rightarrow 1} f(x) = f(1)$, find the values of a and b . (2)

25. Two cards are drawn at random from a pack of 52 cards. What is the probability that both the drawn cards are aces? (2)

SECTION- C

26. If $A = \{2x : x \in N \text{ and } 1 \leq x < 4\}$, $B = \{x + 2 : x \in N \text{ and } 2 \leq x < 5\}$ and $C = \{x : x \in N \text{ and } 4 < x < 8\}$. Find the value of (i) $A \cup B$ (ii) $A \cap B$ (iii) $(B - A) \cap C$. (3)

27. Prove that: $\frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \operatorname{cosec} 2x - \cot 2x$. (3)

28. (A) Find the real values of x and y for which $(x - iy)(3 + 5i)$ is the conjugate of $(-6 - 24i)$. (3)

OR

- (B) Show that: $(x + 1 + i)(x + 1 - i)(x - 1 + i)(x - 1 - i) = x^4 + 4$.

29. (A) The angle between two lines is $\frac{\pi}{4}$ and slope of one of the lines is $\frac{1}{2}$. Find the slope of other line. (3)

OR

- (B) Find the equation of the line passing through the point (1, 3) such that the intercept on the y -axis exceeds the intercept on the x -axis by 4.

30. Find $(a + b)^4 - (a - b)^4$. Hence, evaluate $(\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4$. (3)

31. A number is chosen from the numbers 1 to 100. Find the probability that the number so chosen is divisible by 4 or 6. (3)

OR

In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both NCC and NSS. If one of these students is selected at random, find the probability that (i) The student opted for NCC or NSS. (ii) The student has opted neither NCC nor NSS (iii) The student has opted NSS but not NCC.

SECTION- D

32. (A) If $\tan x = \frac{1}{7}$ and $\tan y = \frac{1}{3}$, show that $\cos 2x = \sin 4y$. (5)

OR

- (B) Prove that: $\sin 5A = 5\sin A - 20\sin^3 A + 16\sin^5 A$.

33. (A) Find the sum the given series up to n terms: $0.3 + 0.33 + 0.333 + \dots$ (5)

OR

- (B) If $x = 1 + a + a^2 + \dots \infty$, $|a| < 1$ and $y = 1 + b + b^2 + \dots \infty$, $|b| < 1$, show that:

$$1 + ab + a^2b^2 + a^3b^3 + \dots = \frac{xy}{x+y-1}.$$

34. Find the derivative of $\cot x$, by using first principle method. (5)

35. Find mean, variance and standard deviation using short cut method. (5)

Height (in cm)	70–75	75–80	80–85	85–90	90–95	95–100	100–105	105–110	110–115
Number of children	3	4	7	7	15	9	6	6	3

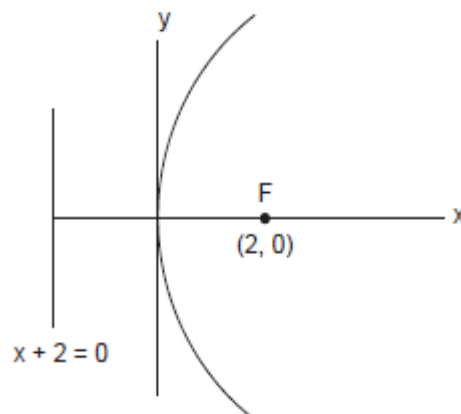
SECTION- E

36. A man is moving on curved road and notes as that his distance from a flag post F and from a straight wall always remain same. If flag post is at the point (2, 0) and wall is represented by $x + 2 = 0$, then

- (i) The equation of the road is _____.
- (ii) The length of latus rectum of the curve is _____.
- (iii) If man is standing at point (2, 5) then his distance from focus of the path is _____.

OR

- (iii) Equation of directrix is _____.



37. Out of 7 boys and 5 girls, a team of 7 students is to be made. Find the number of ways, (1)
- (i) If team contain at most 3 girls. (1)
 - (ii) If team contain exactly 3 girls. (2)
 - (iii) If exactly 3 girls and remaining 4 boys are selected and are arranged in a row for photograph. Find number of ways if all 3 girls and all 4 boys stand together.

OR

- (iii) The number of ways to arrange 3 girls and 4 boys if no two boys and girls will stand together.

38. Three friends were having get together. Suddenly they decided to play with their names using sets. Name of friends were AARTI, CHARVI and AYSHA. They asked each other the following questions.

- (i) What is the difference of set of letters of CHARVI and AYSHA? (2)
- (ii) Form a union of sets taking the letters of names of all friends. (2)