

Class XI Session 2024-25
Subject - Mathematics
Sample Question Paper - 2

Time Allowed: 3 hours

Maximum Marks: 80

General Instructions:

1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.
4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.
5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.
6. Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.

Section A

1. $\cos 40^\circ + \cos 80^\circ + \cos 160^\circ + \cos 240^\circ =$ [1]
a) $\frac{1}{2}$ b) $\frac{-1}{2}$
c) 1 d) 0
2. if $f\left(x + \frac{1}{x}\right) = x^2 + \frac{1}{x^2}$ then $f(x) = ?$ [1]
a) $(x^2 - 2)$ b) $(x^2 + 1)$
c) $(x^2 - 1)$ d) x^2
3. The mean and S.D. of 1, 2, 3, 4, 5, 6 is [1]
a) 3, $\frac{35}{12}$ b) 3, 3
c) $\frac{7}{2}, \sqrt{\frac{35}{12}}$ d) $\frac{7}{2}, \sqrt{3}$
4. $\lim_{x \rightarrow 0} \frac{\sin x^n}{(\sin x)^m}$, $n > m > 0$ is equal to [1]
a) $\frac{m}{n}$ b) 0
c) 1 d) $\frac{n}{m}$
5. The lines $8x + 4y = 1$, $8x + 4y = 5$, $4x + 8y = 3$, $4x + 8y = 7$ form a [1]
a) Trapezium b) Rhombus
c) Rectangle d) Square
6. The reflection of the point (α, β, γ) in the xy - plane is [1]
a) $(\alpha, \beta, -\gamma)$ b) $(0, 0, \gamma)$

- c) $(\alpha, \beta, 0)$ d) $(-\alpha, -\beta, \gamma)$
7. If $z = (3 + \sqrt{2}i)$ then $z \times z = ?$ [1]
 a) 11 b) 7
 c) $\sqrt{11}$ d) 5
8. The number of ways in which 5 + and 5 – signs can be arranged in a line such that no two – signs occur together is [1]
 a) P(5, 5) b) C(5, 5)
 c) P(6, 5) d) C(6, 5)
9. $\lim_{x \rightarrow \pi} \frac{\sin x}{x - \pi}$ is equal to [1]
 a) 1 b) -1
 c) 2 d) -2
10. If $A - B = \frac{\pi}{4}$, then $(1 + \tan A)(1 - \tan B)$ is equal to [1]
 a) 2 b) 0
 c) 1 d) 3
11. Let $S = \{x \mid x \text{ is a positive multiple of 3 less than 100}\}$ [1]
 $P = \{x \mid x \text{ is a prime number less than 20}\}$. Then $n(S) + n(P)$ is
 a) 41 b) 30
 c) 34 d) 33
12. $(\sqrt{5} + 1)^4 + (\sqrt{5} - 1)^4$ is [1]
 a) an irrational number b) a negative real number
 c) a rational number d) a negative integer
13. If $x = 99^{50} + 100^{50}$ and $y = (101)^{50}$ then [1]
 a) $x < y$ b) $x > y$
 c) $x = y$ d) $x \geq y$
14. Solve the system of inequalities $(x + 5) - 7(x - 2) \geq 4x + 9$, $2(x - 3) - 7(x + 5) \leq 3x - 9$ [1]
 a) $\frac{-9}{4} \leq x \leq 1$ b) $-4 \leq x \leq 1$
 c) $-1 \leq x \leq 1$ d) $-4 \leq x \leq 4$
15. Which of the following is a null set? [1]
 a) $C = \phi$ b) $B = \{x : x + 3 = 3\}$
 c) $D = \{0\}$ d) $A = \{x : x > 1 \text{ and } x < 3\}$
16. $\sin 18^\circ = ?$ [1]
 a) $\frac{(\sqrt{3}+1)}{2}$ b) $\frac{(\sqrt{3}-1)}{2}$
 c) $\frac{(\sqrt{5}+1)}{4}$ d) $\frac{(\sqrt{5}-1)}{4}$
17. $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$ is equal to: [1]

a) na^{n-1} b) 1

c) na^n d) na

18. In an examination, a candidate has to pass in each of the five subjects. In how many ways can he fail? [1]

a) 31 b) 10

c) 21 d) 5

19. **Assertion (A):** Let $A = \{1, 2, 3\}$ and $B = \{1, 2, 3, 4\}$. Then, $A \subset B$. [1]

Reason (R): If every element of X is also an element of Y , then X is a subset of Y .

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.

20. **Assertion (A):** The sum of infinite terms of a geometric progression is given by $S_\infty = \frac{a}{1-r}$, provided $|r| < 1$. [1]

Reason (R): The sum of n terms of Geometric progression is $S_n = \frac{a(r^n - 1)}{r - 1}$.

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.

Section B

21. f , g and h are three functions defined from R to R as follows: [2]

i. $f(x) = x^2$

ii. $g(x) = x^2 + 1$

iii. $h(x) = \sin x$

Then, find the range of each function.

OR

Find the domain and range of the function $f(x) = 1 - |x - 2|$

22. Differentiate the function with respect to x : $(3x^2 - x + 1)^4$. [2]

23. One card is drawn from a well shuffled deck of 52 cards. If each outcome is equally likely, calculate the probability that the card will be a black card (i.e., a club or, a spade). [2]

OR

An integer is chosen at random from the numbers ranging from 1 to 50. What is the probability that the integer chosen is a multiple of 2 or 3 or 10?

24. If $A = \{a, b, c, d, e\}$, $B = \{a, c, e, g\}$ and $C = \{b, e, f, g\}$, verify that: $(A \cap B) \cap C = A \cap (B \cap C)$ [2]

25. In what ratio is the line joining the points $(2, 3)$ and $(4, -5)$ divided by the line passing through the points $(6, 8)$ and $(-3, -2)$. [2]

Section C

26. The letters of the word **SURITI** are written in all possible orders and these words are written out as in a dictionary. Find the rank of the word **SURITI**. [3]

27. If the origin is the centroid of the triangle PQR with vertices $P(2a, 2, 6)$, $Q(-4, 3b, -10)$ and $R(8, 14, 2c)$, then find the values of a , b and c . [3]

28. Show that the coefficient of the middle term in the expansion of $(1 + x)^{2n}$ is equal to the sum of the coefficients [3]

of middle terms in the expansion of $(1 + x)^{2n-1}$.

OR

Find a, b and n in the expansion of $(a + b)^n$ if the first three terms of the expansion are 729, 7290 and 30375 respectively.

29. Differentiate $\frac{x^2-1}{x}$ from first principle. [3]

OR

Find the derivative of function $\frac{ax+b}{cx+d}$ (it is to be understood that a, b, c, d, p, q, r and s are fixed non-zero constants and m and n are integers).

30. If the p^{th} and q^{th} terms of a GP are q and p respectively, then show that $(p + q)^{\text{th}}$ term is $\left(\frac{q^p}{p^q}\right)^{\frac{1}{p-q}}$. [3]

OR

Find a G.P. for which sum of the first two term is -4 and the fifth term is 4 times the third term.

31. Out of 100 students; 15 passed in English, 12 passed in Mathematics, 8 in Science, 6 in English and Mathematics, 7 in Mathematics and Science, 4 in English and Science, 4 in all the three. Find how many passed
- in English and Mathematics but not in Science
 - in Mathematics and Science but not in English
 - in Mathematics only
 - in more than one subject only
- [3]

Section D

32. Calculate the mean, median and standard deviation of the following distribution: [5]

Class-interval:	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70
Frequency:	2	3	8	12	16	5	2	3

33. Draw the shape of the ellipse $4x^2 + 9y^2 = 36$ and find its major axis, minor axis, value of c, vertices, directrices, foci, eccentricity and length of latusrectum. [5]

OR

Find the equation of the parabola whose focus is (1, -1) and whose vertex is (2, 1). Also find its axis and latus - rectum.

34. Solve the following system of linear inequalities [5]

$$-2 - \frac{x}{4} \geq \frac{1+x}{3} \text{ and } 3 - x < 4(x-3)$$

35. Prove that: $\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ = \frac{3}{16}$. [5]

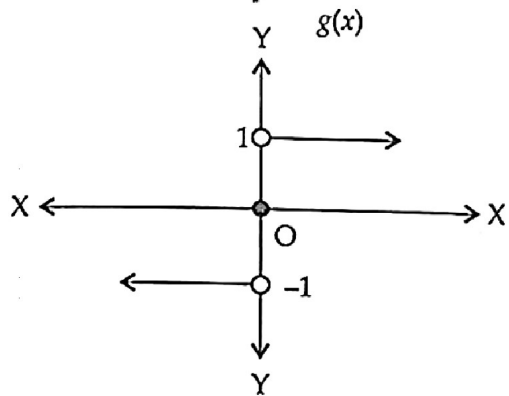
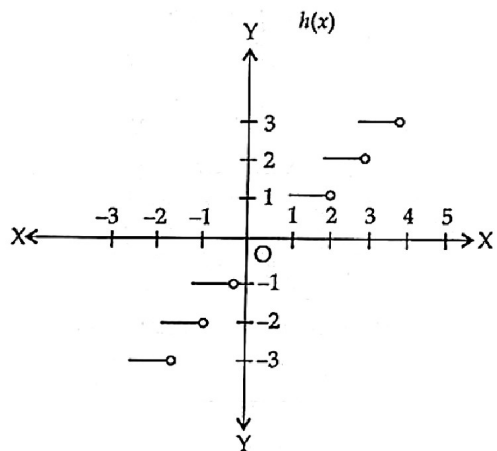
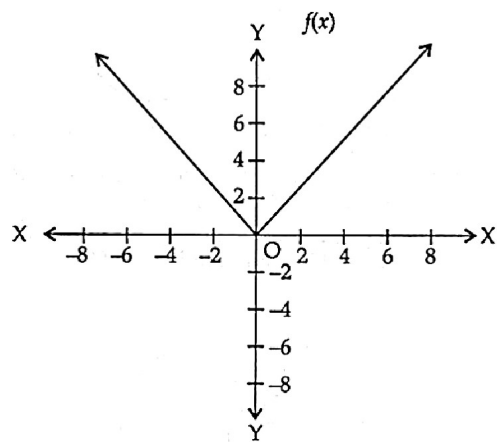
OR

$$\text{Prove that: } \cos^3 x \sin 3x + \sin^3 x \cos 3x = \frac{3}{4} \sin 4x.$$

Section E

36. Read the following text carefully and answer the questions that follow: [4]

Consider the graphs of the functions $f(x)$, $h(x)$ and $g(x)$.



- i. Find the range of $h(x)$. (1)
- ii. Find the domain of $f(x)$. (1)
- iii. Find the value of $f(10)$. (2)

OR

Find the range of $g(x)$. (2)

37. **Read the following text carefully and answer the questions that follow:**

[4]

Four friends Dinesh, Yuvraj, Sonu, and Rajeev are playing cards. Dinesh, shuffling a cards and told to Rajeev choose any four cards.



- i. What is the probability that Rajeev getting all face card. (1)

ii. What is the probability that Rajeev getting two red cards and two black card. (1)

iii. What is the probability that Rajeev getting one card from each suit. (2)

OR

What is the probability that Rajeev getting two king and two Jack cards. (2)

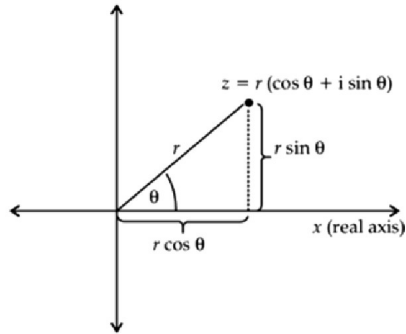
38. **Read the following text carefully and answer the questions that follow:**

[4]

Consider the complex number $Z = 2 - 2i$.

Complex Number in Polar Form

Complex Numbers in Polar Form
 i (imaginary axis)



i. Find the principal argument of Z . (1)

ii. Find the value of $z\bar{z}$? (1)

iii. Find the value of $|Z|$. (2)

OR

Find the real part of Z . (2)