



**ST. MARGARET SR. SEC. SCHOOL
MID TERM EXAMINATION 2024-25
MATHEMATICS (041)**

**CLASS XI
SAMPLE PAPER.**

Time: 3Hr

M.M: 80

GENERAL INSTRUCTIONS:

Read the following instructions very carefully and follow them:

- i) Question paper is divided into 5 sections-Section A, B,C,D and E.
- ii) In Section A- Question Number 1 to 18 are Multiple Choice Questions(MCQ) type and Question Number 19 to 20 are Assertion-Reason based questions of 1 mark each.
- iii) In Section B-Question Number 21 to 25 are Very Short Answer(VSA) type questions of 2 marks.
- iv) In Section C- Question Number 26 to 31 are Short Answer(SA) type questions carrying 3 marks each.
- v) In Section D-Question Number 32 to 35 are Long Answer(LA) type questions carrying 5 marks each.
- vi) In Section E-Question Number 36 to 38 are case study based questions carrying 4 marks each.
- vii) There is an internal choice in 2 questions in Section B, 3 questions in Section C, 2 questions in Section D and 2 questions in Section E.

SECTION- A

1. If $A \cap B = B$ then
(a) $A \subseteq B$ (b) $B \subseteq A$ (c) $A = \varnothing$ (d) $B = \varnothing$
2. $f(x) = \frac{x}{|x|}$
(a) $R - \{0\}$ (b) $R - \{-1, 1\}$ (c) $[-1, 1]$ (d) None of these.
3. $\frac{\sin 2x}{1 - \cos 2x} =$
(a) $\tan 2x$ (b) $\cot 2x$ (c) $\tan x$ (d) $\cot x$
4. $i^9 + i^{19} =$
(a) 0 (b) i (c) $-i$ (d) 1
5. The multiplicative inverse of $3 + 2i =$
(a) $-\frac{3}{13} - \frac{2i}{13}$ (b) $\frac{3}{13} - \frac{2i}{13}$ (c) $\frac{3}{13} + \frac{2i}{13}$ (d) $-\frac{3}{13} + \frac{2i}{13}$
6. Which of the following is not a function ?
(a) $\{(x, y) : x, y \in R, x^2 = y\}$ (b) $\{x, y : x, y \in R, y^2 = x\}$
(c) $\{(x, y) : x, y \in R, x = x^3\}$ (d) $\{(x, y) : x, y \in R, y = x^3\}$
7. For any two sets A and B $A \cap (A \cup B) =$
(a) A (b) $A \cup B$ (c) \varnothing (d) $A \cap B$
8. The value of x so that the line passing through (3,4) and (x,5) makes 135° angle with the positive direction of x axis.
(a) 1 (b) 2 (c) -1 (d) -2
9. The distance between $5x + 3y - 7 = 0$ and $15x + 9y + 14 = 0$ is
(a) $\frac{35}{\sqrt{14}}$ (b) $\frac{35}{3\sqrt{34}}$ (c) $\frac{35}{2\sqrt{34}}$ (d) $\frac{1}{3\sqrt{34}}$
10. The value of $(1+i)(1+i^2)(1+i^3)(1+i^4)$ is
(a) 2 (b) 0 (c) 1 (d) i
11. If $\frac{1-ix}{1+ix} = a+ib$ then $a^2 + b^2 =$

- (a) 1 (b) -1 (c) 0 (d) None of these.
12. Two finite sets have m and n elements. The number of elements in the power set of first set is 48 more than the total number of elements in power set of second set. Then values of m and n are
 (a) 7,6 (b) 6,3 (c) 6,4 (d) 7,4
13. If R is a relation on a finite set having n elements, then the number of relation on A
 (a) 2^n (b) 2^{n^2} (c) n^2 (d) n^n
14. The LCM of $4!$, $5!$ and $6!$ is
 (a) 720 (b) 360 (c) 120 (d) 20
15. The equation of a line which is parallel to x axis and passes through $(3, -5)$ is
 (a) $X = -5$ (b) $y = -5$ (c) $x = 3$ (d) $y = -3$
16. The value of $\sin(-1125^\circ)$ is
 (a) $\frac{-1}{\sqrt{2}}$ (b) $\frac{1}{\sqrt{2}}$ (c) $\frac{1}{2}$ (d) $-\frac{1}{2}$
17. Total number of words formed by 2 vowels and 3 consonants taken from 4 vowels and 5 consonants is equal to
 (a) 60 (b) 120 (c) 7200 (d) 240
18. The value of $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ$ is equal to
 (a) 1 (b) 0 (c) $\frac{1}{2}$ (d) 2

Assertion-Reason Based Questions

In the following questions 19 and 20, a statement of Assertion(A) is followed by a statement of a 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 and (R) is not the correct explanation of (A).
 (c) (A) is true and (R) is false.
 (d) (A) is false and (R) is true.
19. Assertion: $2 \sin 5A \cos A = \sin 6A + \sin 4A$
 Reason: $2 \sin A \cos B = \sin(A+B) + \sin(A-B)$.
20. Assertion: The slope of the line passing through the points $(1, -2)$ and $(-4, 3)$ is 135° .
 Reason: Slope of a line is given by $m = \tan \theta$.

SECTION- B

21. Show that if $A \subset B$ then $C - B \subset C - A$.
22. Find the value of $\sin(-690^\circ)\cos(-300^\circ) + \cos(-750^\circ)\sin(-240^\circ)$
 OR

Find the value of $\sin 75^\circ$

23. Find the value of $(-\frac{1}{3} - 3i)^3$.

24. If the lines $2x + 3y - 3 = 0$, $5x + ky - 3 = 0$ and $3x - y - 2 = 0$ are coplanar. Find k .

OR

Find the distance of the point $(-1, 1)$ from the line $12(x+6) = 5(y-2)$.

25. Let $A = \{a, b, c\}$. Find $A \times A$. Find number of relations on $A \times A$.

SECTION - C

26. Let A and B are two sets then prove that $(A \cap B)' = A' \cup B'$ using venn diagram.
27. It is required to seat 5 men and 4 women in a row so that the women occupy even places. How many such arrangements are available.
28. Show that a real value of x will satisfy the equation $\frac{1-ix}{1+ix} = a-ib$ if $a^2 + b^2 = 1$ where a and b are real.

OR

If $z = x + iy$ and $w = \frac{1-iz}{z-i}$ show that $|w| = 1 \Rightarrow z$ is purely real.

29. ${}^{2n+1}P_{n-1} : {}^{2n-1}P_n = 3:5$.

30. Prove that: $\sqrt{3} \operatorname{cosec} 20^\circ - \sec 20^\circ = 4$

31. If f is a real function defined by $f(x) = \frac{x-1}{x+1}$ then prove that $f(2x) = \frac{3f(x)+1}{f(x)+3}$.

OR

Find the domain and range of $f(x) = \frac{3}{2-x^2}$.

SECTION- D

32. Prove that. $\tan 40^\circ \cdot \tan 20^\circ \cdot \tan 80^\circ = \sqrt{3}$.

OR

Prove that $\sin^3 A + \sin^3\left(\frac{2\pi}{3} + A\right) + \sin^3\left(\frac{4\pi}{3} + A\right) = -\frac{3}{4} \sin 3A$

33. Find the number of words which can be made using all letters of the word 'MOTHER'. If the words are arranged as in dictionary then find its Rank.

34. Find the equation of the lines through the point (3,2) which make an angle of 45° with the line $x-2y=3$.

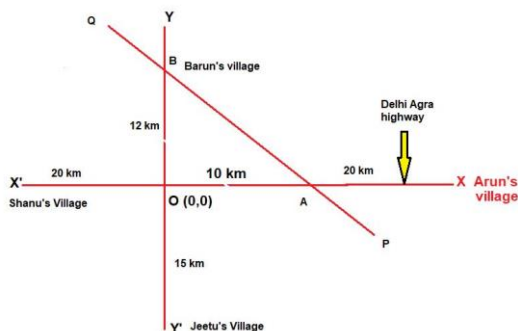
35. Find the coefficient of a^4 in the product $(1+2a)^4 (2-a)^5$ using binomial theorem.

OR

Expand : $(3x^2 - 2ax + 3a^2)^3$.

SECTION- E

36. Villages of Shanu and Arun's are 50km apart and are situated on Delhi Agra highway as shown in the following picture. Another highway YY' crosses Agra Delhi highway at O(0,0). A small local road PQ crosses both the highways at points A and B such that OA=10 km and OB =12 km. Also, the villages of Barun and Jeetu are on the smaller high way YY'. Barun's village B is 12km from O and that of Jeetu is 15 km from O.



Now answer the following questions:

(i) What are the coordinates of A? (1)

(ii) What is the equation of AB? (1)

(iii) What is the slope of AB?

OR

Find the distance from AB from origin? (2)

37. The ordered pair of two elements a and b is denoted by (a,b) : a is first element and b is second element. Two ordered pairs are equal if their corresponding elements are equal, i.e. $(a, b) = (c,d) \Rightarrow a=c$ and $b=d$. For two non-empty sets A and B , the cartesian product $A \times B$ is the set of all ordered pairs of elements from sets A and B . In symbolic form we say it as $A \times B = \{(a, b); a \in A, b \in B\}$.

Answer the following:

(i) If $(a-3, b+7) = (3, 7)$, then find the value of a and b . (1)

(ii) Let A and B be two sets such that $A \times B$ consists 6 elements three of them are $(1,4), (2,6)$ and $(3,6)$ then find $A \times B$. (2)

(iii) If $n(A \times B) = 45$, then find $n(A)$ if $n(B) = 5$ (1)

38. In how many ways can the letters of the word **INTERMEDIATE** be arranged so that

(i) The vowels always occupy even places ? (2)

(ii) The relative order of vowels and consonants do not alter ? (2)