

Half Yearly Maths **MIND CURVE** Practice Paper Series 2023-24

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Practice Paper 02

S no	Syllabus Covered	Chapters(In Half Yearly)	Marking Scheme
1.	Unit 1 Sets & Functions	Sets Relations and Functions Trigonometric Function	26
2.	Unit 2 Algebra	Complex Numbers Linear Inequalities Binomial Theorem Permutation and Combination	30
3.	Unit 4 Calculus	Limits and Derivatives	16
4.	Unit 5 Statistics and Probability	Statistics	8

Note: Students/Teachers can refer to this Sample Paper for practice purpose. However, students may find or experience different exam pattern as syllabus or marking scheme may vary school to school.

MM:80

GENERAL INSTRUCTIONS

TIME:3 Hrs

READ CAREFULLY ALL INSTRUCTIONS

1. This Question Paper has 5 Sections A, B, C, D and E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.
9. This paper consists of 38 questions.
 - a. Write your answers neatly and legibly.
 - b. Ensure you have not left any question unanswered

Section A (1 Marker)

1. If A and B are two sets such that $A \subset B$ then $A \cap B'$ is
 a) A b) B' c) ϕ d) $A - B$
2. If $\sin\theta + \cos\theta = 1$, then the value of $\sin 2\theta$ is equal to
 a) 1 b) $\frac{1}{2}$ c) 0 d) 2
3. What will be the domain for which the functions $f(x) = 2x^2 - 1$ and $g(x) = 1 - 3x$ are equal?
 a) $\{-2, 1\}$ b) $[2, 12]$ c) $\{1/2, -2\}$ d) $(-1, 2)$
4. The domain and range of the function f given by $f(x) = 2 - |x - 5|$ is
 a) Domain = \mathbb{R}^+ , Range = $(-\infty, 1]$ b) Domain = \mathbb{R} , Range = $(-\infty, 2]$
 c) Domain = \mathbb{R} , Range = $(-\infty, 2)$ d) Domain = \mathbb{R} , Range = $(-\infty, 2)$
5. If $\tan\theta = \frac{1}{2}$ and $\tan\phi = \frac{1}{3}$ then the value of $\theta + \phi$.
 a) $\pi/6$ b) π c) 0 d) $\pi/4$
6. If $|z| = 9$, then $(z)\overline{(z)} = ?$
 a) 3 b) 81 c) 0 d) none of these
7. If $n(A \cup B) = 18$, $n(A - B) = 5$, $n(B - A) = 3$ then find $n(A \cap B)$
 a) 10 b) 12 c) 15 d) 9
8. The value of i^{-999} is
 a) 1 b) -1 c) i d) -i
9. The solution of the inequality $|x - 1| < 2$
 a) $(1, \infty)$ b) $(-1, 3)$ c) $(1, -3)$ d) $(\infty, 1)$
10. If ${}^nP_5 = 60{}^{n-1}P_3$, the value of n
 a) 6 b) 10 c) 12 d) 16
11. The fourth term in the expansion $(x - 2y)^{12}$ is
 a) $-1670 x^9 \times y^3$ b) $-7160 x^9 \times y^3$ c) $-1760 x^9 \times y^3$ d) $-1607 x^9 \times y^3$
12. In how many ways can a bowler take four wickets in a single 6 balls over
 a) 6 b) 15 c) 20 d) 30
13. The coefficient of the middle term in the expansion of $(2+3x)^4$ is:
 a) $5!$ b) 6 c) 216 d) $8!$
14. The derivative of $x^2 \cos x$ is
 a) $2x \sin x - x^2 \sin x$ (b) $2x \cos x - x^2 \sin x$

c) $2x \sin x - x^2 \cos x$

d) $\cos x - x^2 \sin x \cos x$

15. The interval in which $f(x) = (x - 1) \times (x - 2) \times (x - 3)$ is negative is

a) $x > 2$

b) $2 < x$ and $x < 1$

c) $2 < x < 1$ and $x < 3$

d) $2 < x < 1$ and $x < 3$

16. $\lim_{x \rightarrow \pi} \frac{\sin x}{x - \pi}$

a) 1

b) 2

c) -1

d) -2

17. 6 men and 4 women are to be seated in a row so that no two women sit together. The number of ways they can be seated is

a) 604800

b) 17280

c) 120960

d) 518400

18. The value of $[3 \cdot 8] + [-3.8]$ is

a) 8

b) 0

c) 7

d) -1

19. Assertion : The range of the function $f(x) = 2 - 3x$, $x \in \mathbb{R}$, $x > 0$ is \mathbb{R}

Reason : The range of the function $f(x) = x^2 + 2$, is $[2, \infty)$

a) both Assertion and reason are correct and reason is correct explanation for Assertion

b) both Assertion and reason are correct but reason is not correct explanation for Assertion

c) Assertion is true but reason is false.

d) both Assertion and reason are false.

20. Assertion (A): $\frac{\sin 3x - \sin x}{\cos 2x} = 2 \cos x$

Reason (R): $\sin C - \sin D = 2 \cos \left(\frac{C+D}{2} \right) \sin \left(\frac{C-D}{2} \right)$

a) both Assertion and reason are correct and reason is correct explanation for Assertion

b) both Assertion and reason are correct but reason is not correct explanation for Assertion

c) Assertion is true but reason is false.

d) Assertion is false but reason is true.

Section B (2 Marker)

21. Expand the expression $(2x-3)^6$ using the binomial theorem.

22. Prove that $\frac{\tan A + \sec A - 1}{\tan A - \sec A + 1} = \frac{1 + \sin A}{\cos A}$.

OR

Prove that : $\frac{\cos 7x + \cos 5x}{\sin 7x - \sin 5x} = \cot x$

23. Convert Solve for real x,

$(x - 1)(x^2 - 5x + 7) < (x - 1)$

24. Reduce $\left\{ \frac{\sqrt{5+12i} + \sqrt{5-12i}}{\sqrt{5+12i} - \sqrt{5-12i}} \right\}$ to the form $(a+ib)$ and hence find its conjugate

25. Find the Limits

$\lim_{x \rightarrow 0} \frac{x}{3 - \sqrt{x+9}}$

OR $\lim_{x \rightarrow 1} \frac{x^9 - 1}{x^{10} - 1}$

Section C(3 Marker)

26. Find the domain and range of $f(x) = \sqrt{x - [x]}$
27. Prove that $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{16}$
Hence find the value of $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ$
28. Find the derivative by First Principal for $f(x) = \frac{1}{x^2}$.
29. If $R_1 = \{(x, y) | y = 2x + 7, \text{ where } x \in \mathbb{R} \text{ and } -5 \leq x \leq 5\}$ is a relation. Then find the domain and range of R_1 .
30. Find the modulus of the complex number $(1 - i)^{-2} + (1 + i)^{-2}$?
31. Expand $\left(X^2 + \frac{3}{x}\right)^5$, (x need not be zero) using Binomial theorem

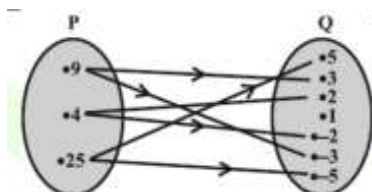
Section D (5 Marker)

32. If $\tan x = \frac{3}{4}$, $\pi < x < \frac{3\pi}{4}$, find $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$
OR
Prove that: $\cos 2x + \cos 2\left(x + \frac{\pi}{3}\right) + \cos 2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$
33. Calculate the mean, variance and standard deviation of the following data:
- | Classes | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 |
|-----------|-------|-------|-------|-------|-------|-------|--------|
| Frequency | 3 | 7 | 12 | 15 | 8 | 3 | 2 |
34. Define the following function and find range of each and draw the graph also
(a) Modulus function (b) Signum function
35. Find $(x + y)^4 - (x - y)^4$. Hence evaluate: $(\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4$.

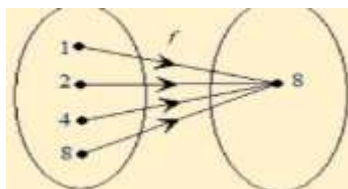
Section E (4 Marker)

36. A Relation R from A to B can be depicted pictorially using arrow diagram . In arrow diagram, we write down the elements of two set A and B in two disjoint circle, Then we draw arrow from set A to set B whenever $(a,b) \in R$. Answer the questions given below:

i. For relation defined in the below arrow diagram from set P to Q ,find set builder form?



ii. For relation defined in the below arrow diagram ,find set builder form?



- iii. For a Relation $R = \{ (x,y): x^2 < y, x \in \{1,2,3,4,5,6\} \text{ and } y \in \{1,2,3,4,5,6,7,8,9,10\} \}$
Find the domain and range.
Or
iv. For a Relation $R = \{ (x,y): \text{mod}(x-y) < 5, x \in \{1,2,3,4,5,6\} \text{ and } y \in \{1,2,3,4,5,6,7,8,9,10\} \}$
Find the domain and range.

37. The number lock has three wheels each labelled with 10 digits 0 to 9. The lock can be opened with the digits are set in a particular specific order. In mathematics, a permutation of a set is an arrangement of its members into a sequence or linear order, or if the set is already ordered, a rearrangement of its elements. The word "Permutation" also refers to the act or process of changing the linear order of an ordered set. Now answer the questions given below:



- i. The arrangements (with or without meaning) of letters or alphabets is called?
ii. If an event can occur in 'm' different ways following which another event can occur in 'n' different ways followed by another event in 'p' different ways and so on, then find the total number of ways in which the event occurs?
iii. Find the number lock in a suitcase has three wheels each labelled with ten digits 0 to 9, the number of possible attempts if repetition of numbers is not allowed.

Or

Find the number of unsuccessful attempts if repetition of digit allowed

38. In class XI, teacher explained binomial theorem. Two students Shivani and Vishwani trying to solve the exercise. Shivani expanded $(1+x)^6$ by using Binomial theorem, Vishwani expanded $(2x+1)^6$. Based on this above information answer the following questions.

- i. According to Shivani find 4th term. (1M)
ii. Find the value of $C_1^6 + C_2^6 + C_3^6 + C_4^6 + C_5^6 + C_6^6$ (1M)
iii. Find the positive value of x if 3rd terms of Shivani and 4th term of Vishwani are equal. (2M)



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