

GUIDELINES

(By Sunny Sir & group of ICSE and CBSE school teachers)

MATHAMETICES, Class - XI

MOCK PAPER – 1 (2024)

Time: 3 hours

Total Marks: 80

General Instructions:

1. Candidates are allowed **additional 15 minutes** for only reading the paper. They must **NOT** start writing during this time.
2. This Question Paper consists of three sections A, B and C.
3. Candidates are required to attempt all questions from Section A and all questions **EITHER** from Section B OR Section C. **Section A:** Internal choice has been provided in two questions of two marks each, two questions of four marks each and two questions of six marks each.
4. **Section B:** Internal choice has been provided in one question of two marks and one question of four marks.
5. **Section C:** Internal choice has been provided in one question of two marks and one question of four marks.
6. All working, including rough work, should be done on the same sheet as, and adjacent to the rest of the answer. The intended marks for questions or parts of questions are given in brackets []. **Mathematical tables and graph papers are provided.**

Section A

[20 Marks]

(Attempt **all** questions from this Section)

Question 1

- (a) Range of $f(x) = \frac{1}{1-2\cos x}$ is
- (i) $\left[\frac{1}{3}, 1\right]$ (ii) $\left[-1, \frac{1}{3}\right]$ (iii) $(-\infty, -1] \cup \left[\frac{1}{3}, \infty\right)$ (iv) $\left[-\frac{1}{3}, 1\right]$
- (b) If x is a positive integer, then the solution set of the equation $x + 2$
- (i) $\{-2\}$ (ii) $\{2\}$ (iii) ϕ (iv) $\{\phi\}$
- (c) The solution of $\cos \theta = 0$ is
- (i) $n\pi$ (ii) $2n\pi$ (iii) $(2n-1)\frac{\pi}{2}$ (iv) $(2n+1)\frac{\pi}{2}$
- (d) For any positive integer m _____ is divisible by 4.
- (i) $5m^2 + 2$ (ii) $3m + 1$ (iii) $m^2 + 3$ (iv) $m^3 + 3m$
- (e) If $z_1 = 4 + 7i$ and $z_2 = 3 - 5i$ then find $z_1 - z_2$.
- (i) $1 + 12i$ (ii) $12 + i$ (iii) $1 - 12i$ (iv) $1 + 2i$
- (f) The roots of the quadratic equation are said to be imaginary if the discriminant is
- (i) < 0 (ii) ≤ 0 (iii) > 0 (iv) ≥ 0
- (g) If $\frac{|x-7|}{(x-7)} \geq 0$, then
- (i) $x \in [7, \infty)$ (ii) $x \in (7, \infty)$ (iii) $x \in (-\infty, 7)$ (iv) $x \in (-\infty, 7]$
- (h) If ${}^nP_4 : {}^nP_5 = 1 : 5$, then find the value of n .
- (i) 4 (ii) 5 (iii) 1 (iv) 9

- (i) If n is even in the expansion of $(a+b)^n$, the middle term is
 (i) n^{th} term (ii) $(n/2)^{\text{th}}$ term (iii) $[(n/2)-1]^{\text{th}}$ term (iv) $[(n/2)+1]^{\text{th}}$ term
- (j) Find the 7th term from the end of the A.P. $5 + 10 + 15 + \dots + 95$
 (i) 5 (ii) 55 (iii) 65 (iv) 75
- (k) Find the number of ways in which 'PERMUTATIONS' be arranged such that P comes just before S.
- (l) Find the derivative of the function $(\sin x + \cos x)^2$.
- (m) Two real numbers x, y are chosen from the interval $x \in [0, 3], y \in [0, 3]$. What is the probability that $x^2 + y^2 \leq 2$?
- (n) Find the slope of the line, which takes an angle of 30° with the positive direction of y -axis measured anticlockwise.
- (o) Which term is independent of x in the expansion of $\left(3x^3 - \frac{1}{2x^3}\right)^{10}$?

Question 2

[2]

If A and B are two sets such that $n(A) = 17, n(B) = 23$ and $n(A \cup B) = 38$, find $n(A \cap B)$.

A1

OR

Evaluate: $\sin(\pi + x) \sin(\pi - x) \operatorname{cosec}^2 x$

A1

Question 3

[2]

Write the sets in the roster form.

(i) $A = \{x : x \in W \text{ and } 5 < x \leq 9\}$

(ii) $B = \{x : x \in N \text{ and } 4 < x^2 < 60\}$

Question 4

[2]

Prove that :

$$\frac{\cos 2A}{1 + \sin 2A} = \tan\left(\frac{\pi}{4} - A\right)$$

Question 5

[2]

Find the general solution of the equation $\sin x = \frac{\sqrt{3}}{2}$.

OR

Find the general solution of $\tan 2x = -\cot\left(x + \frac{\pi}{3}\right)$.

A1

Question 6

[2]

Evaluate : $(i^{77} + i^{70} + i^{87} + i^{414})^3$

A1

Question 7

[4]

$$f(x) = \sqrt{x^2 + 4}$$

Question 8

[4]

Using mathematical induction prove that

$3^{2n+2} - 8n - 9$ is divisible by 64, for all $n \in N$

A1

Question 9

[4]

Find the number of terms of a geometric sequence (a_n) if $a_1 = 3, a_n = 96$ and $S_n = 189$.

OR

If the continued product of three numbers in G.P. is 216 and the sum of their products in pair is 156, find numbers.

Question 10

[4]

Find the derivative of $\frac{\cos x}{1 + \sin x}$

OR

Find the derivative of $\frac{\sin x + \cos x}{\sin x - \cos x}$

Question 11

If a and b are the roots of $x^2 - 3x + p = 0$ and c and d are roots of $x^2 - 12x + q = 0$, where a, b, c, d forms a G.P. prove that $(q + p) : (q - p) = 17 : 15$. [6]

Question 12

Find the value of p , such that the difference of the roots of the equation $x^2 - px + 10 = 0$ is 3. If the roots of $x^2 - px + 10 = 0$ are α, β find the quadratic equation whose roots are $(\alpha + \beta)^2$ and $\alpha^2\beta - \alpha\beta^2$. [6]

Question 13

Find the equation of the circle having radius 5 and touching the line $3x - 4y + 5 = 0$ at the point $(1, 2)$. [6]

OR

Find the equation of a circle passing through the point $(7, 3)$ having radius 3 units and whose centre lies on the line $y = x - 1$. [6]

Question 14

Find the mean, standard deviation for the following data

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	2	3	5	10	3	5	2

Section-B

[15 Marks]

(Attempt all questions from this Section)

Question 15

In sub-parts (i) and (ii) choose the correct option and in sub-parts (iii) to (v), answer the questions as instructed.

(i) The distance between the directrices of the ellipse $\frac{x^2}{36} + \frac{y^2}{20} = 1$ is [4]

- (a) 16 units (b) 17 units
(c) 18 units (d) 19 units

(ii) The ratio in which the line segment joining the points $(2, 4, -3)$ and $(-3, 5, 4)$ divided by XY-plane is

- (a) 3 : 4 internally (b) 4 : 5 externally
(c) 2 : 6 internally (d) 6 : 7 externally

(iii) Find the equation of the parabola with vertex at $(0, 0)$ and focus at $(0, 3)$.

(iv) Find the equation of the hyperbola whose foci are $(\pm 3, 0)$ and vertices $(\pm 2, 0)$.

(v) Write the negation of the statement "New Delhi is in India and Colombo is in Sri Lanka".

Question 16

(a) Check the validity of the following statement. If x and y are odd integers, then xy is an odd integer. [2]

OR

(b) Write the negation of the following statement. If I become a doctor then I will open a hospital. [4]

Question 17

(a) Show that the equation $3x^2 + 4y^2 - 12x - 8y + 4 = 0$ represents an ellipse. Find the centre, lengths and the equations of axes, eccentricity, foci and directrices. [4]

OR

(b) Find the equation of the hyperbola with centre at the origin, the length of transverse axis 6 and one focus at $(0, 4)$. [4]

Question 18

Find the coordinates of the point which divides the line segment joining the point, $(-2, 3, 5)$ and $(1, -4, 6)$ in the ratio

- (i) 2 : 3 internally, (ii) 2 : 3 externally

August	50
September	52
October	56

Calculate the four monthly moving averages.

Question 22

(a) If $\sum(x_i - 2) = 10$, $\sum(y_i - 5) = 20$, $\sum x_i y_i = 148$ and $n = 5$, find $\text{cov}(x, y)$.

OR

(b) The marks of ten intelligent students in two subjects as given below:

Students	English	Physics
A	88	74
B	74	66
C	80	72
D	76	90
E	40	54
F	65	50
G	68	54
H	80	43
I	40	30
J	43	38

Calculate the rank correlation coefficient and interpret your result.