

ISC Class 11 MATHEMATICS Mock Paper 1

(Three hours)

(Candidates are allowed an additional 15 minutes for **only** reading the paper.
They must NOT start writing during this time.)

The Question Paper consists of **three** sections A, B, and C.

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 three questions of four marks each and two questions of six marks each.

Section B: Internal choice has been provided in two questions of four marks each.

Section C: Internal choice has been provided in two questions of four marks each.

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 (80 Marks)

Question 1

[10x2]

(i) If $U = \{2, 3, 5, 7, 9\}$ is the universal set and $A = \{3, 7\}$, $B = \{2, 5, 7, 9\}$, then prove that:

(a) $(A \cup B)' = A' \cap B'$

(b) $(A \cap B)' = A' \cup B'$

(ii) If $A = \{x \in \mathbb{N} : x \leq 3\}$ and $B = \{x \in \mathbb{W} : x < 2\}$, find $(A \times B)$ and $(B \times A)$. Check whether $(A \times B) = (B \times A)$?

(iii) Find the domain and range of the function $y = (x - 1)/(x + 2)$.

(iv)

If $f(x) = \begin{cases} x + 1; & x > 0 \\ x - 1; & x < 0 \end{cases}$ prove that $\lim_{x \rightarrow 0} f(x)$ does not exist.

(v) Using the principle of mathematical induction, prove the following for all $n \in \mathbb{N}$.

$$2 + 6 + 18 + \dots + 2 \times 3^{n-1} = (3)^n - 1$$

(vi) Find the sum of the following series to infinity $8 + 4\sqrt{2} + 4 + \dots \infty$

(vii) Solve the equation $\cos \theta + \cos 3\theta - 2 \cos 2\theta = 0$

(viii) If two dice are thrown simultaneously, find the probability of getting a sum less than 7 or a doublet.

(ix) Find the number of different signals that can be generated by arranging at least 2 flags in order (on below the

other) on a vertical staff, if five different flags are available.

(x) Find the real values of x and y , if $(x + iy)(2 - 3i) = 4 + i$.

Question 2

[4]

Draw the graph of the function $y = |x - 4| + |x - 7|$.

Question 3

[4]

Solve the following equation:

$$\tan x + \tan 2x + \tan 3x = 0$$

OR

In a triangle, ABC, prove that $\sin A + \sin B + \sin C = 4 \cos A/2 \cos B/2 \cos C/2$

Question 4

[4]

Prove that: $5^{2n} - 1$ is divisible by 24 for all $n \in \mathbb{N}$.

Question 5

[4]

Find the locus of the point z satisfying $|z| + |z - i| = 3$ where $z = x + iy$ and represent it in the argand diagram.

Question 6

[4]

A committee of 5 persons has to be chosen from 8 boys and 6 girls consisting of:

- (i) at least 4 girls
- (ii) more boys than girls.

OR

How many words each of 3 vowels and 2 consonants can be formed from the letters of the word INVOLUTE?

Question 7

[4]

Find the term independent of x in the expansion of $[(4x/5) + (5/2x)]^{10}$.

Question 8

[4]

Differentiate from first principle: $f(x) = \sqrt{5x - 7}$

Question 9

[4]

Find the equation of acute angled bisector of lines:

$$12x - 5y + 11 = 0 \text{ and } 4x - 3y - 8 = 0$$

Question 10

[4]

Find the equation of the circle which passes through the intersection of $x^2 + y^2 - 4 = 0$ and $x^2 + y^2 - 2x - 4y + 4 = 0$ and touches the line $x + 2y = 0$.

OR

If the equations of two diameters of a circle are $3x + 2y - 4 = 0$ and $2x + y - 6 = 0$. Find the equation of the circle with radius 10 units.

Question 11
[6]

In any triangle ABC, prove that $a^2(\cos^2 B - \cos^2 C) + b^2(\cos^2 C - \cos^2 A) + c^2(\cos^2 A - \cos^2 B) = 0$.

Question 12
[6]

Find the sum of the below series for n terms:

$$2 + 5 + 10 + 17 + 26 + \dots$$

OR

If the sum of n terms of a progression is $(2^n - 1)$, then show that it is a GP. Hence, find the common ratio of that GP.

Question 13
[6]

Show that for all real values of x, the expression $(x^2 - 2x + 4)/(x^2 + 2x + 4)$ has maximum value 3 and minimum value $1/3$.

OR

Does the expansion of $(2x^2 - 1/x)^{20}$ contain any term involving x^9 ?

Question 14
[6]

Calculate the mean and standard deviation for the following data:

Class	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30
Frequency	8	11	15	12	9	5

SECTION B (20 Marks)

Question 15
[3x2]

(a) Find the eccentricity and the coordinates of foci of the hyperbola $25x^2 - 9y^2 = 225$.

(b) Construct the truth table for $(\sim p \Rightarrow q) \wedge (p \vee \sim q)$.

(c) Write the converse, contradiction, and contrapositive of a statement.

“A positive integer is prime only if it has no divisors other than 1 and itself”.

Question 16
[4]

Find the equation of the parabola whose focus is the point (2, 3) and directrix is the line $x - 4y + 3 = 0$. Also, find the length of its latus rectum.

OR

Find the equation of tangents to the ellipse $5x^2 + 4y^2 = 20$ which are parallel to the line $3x + 2y - 5 = 0$.

Question 17
[4]

Find the coordinates of the point where the line through the points A(3, 4, 1) and B(5, 1, 6) crosses the ZX plane.

OR

A point C with z-coordinate 8 lies on the line segment joining the points A(2, -3, 4) and B(8, 0, 10). Find the coordinates.

Question 18

[6]

Find the equation of the circle passing through the points (0, 0), (5, 0) and (3, 3). Also, find its radius and centre of that circle.

SECTION C (20 Marks)

Question 19

(a) The average salary of male employees in an organization was Rs.420 and that of females was Rs.520. The mean salary of all the employees was Rs.500. Find the percentage of male and female employees.

[2]

(b) Calculate D_4 and D_6 for the following distribution:

[4]

C.I	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
Frequency	7	11	12	23	4	3

OR

Calculate the mode for the following data:

CI	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
Frequency	2	4	1	6	7	17	10	3

Question 20

(a) Find the correlation coefficient of x and y when $\sum x = 15$, $\sum y = 25$, $\sum xy = 83$, $\sum x^2 = 55$, $\sum y^2 = 135$ and $n = 5$.

[2]

(b) Find Karl Pearson's Correlation Coefficient from the given data:

[4]

X	15	19	25	35	35	40	42	45
Y	30	35	36	40	42	48	55	80

OR

Calculate the Spearman's rank correlation coefficient for the following data:

X	35	54	80	95	73	73	35	91	83	81
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Y	70	75	95	38	75	70	90	75	60	40
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Question 21**[4]**

Find the consumer price index for 2014 on the basis of 2010 from the following data using a weighted average of price relative method:

Commodity	2010	2014	Weight
A	20	40	8
B	50	60	10
C	40	50	14
D	20	20	19

Question 22**[4]**

Construct a 3 yearly moving average from the following data and represent it using a graph.

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Sales	18	22	20	26	30	22	24	28	32	35