

ISC Class 11 MATHEMATICS Mock Paper 2

(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) Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined as $f(x) = x^2 + 1$, find $f^{-1}(-7) = x$.

(ii) If $a \in \{2, 4, 6, 9\}$ and $b \in \{4, 6, 18, 27\}$, then form the set of all ordered pairs (a, b) such that a divides b and $a < b$.

(iii) Prove that $\cos x + \cos (120^\circ - x) + \cos (120^\circ + x) = 0$.

(iv) Express $(1 + i)^3 - (1 - i)^3$ in the form of $a + ib$, find the value of a and b .

(v) Prove that $b \sin B - c \sin C = a \sin (B - C)$.

(vi) If α and β are the roots of the equation $px^2 - qx + r = 0$, find $\alpha^3 + \beta^3$.

(vii) In how many ways can 11 members of a committee sit around a round table so that the secretary and the joint secretary are always as the neighbors of the president?

(viii) In a single throw of three dice, find the probability of getting a total of 17 or 18.

(ix) Evaluate:

$$\lim_{x \rightarrow 0} \frac{x \cos x + \sin x}{x^2 + \tan x}$$

(x) Differentiate: $f(x) = (x^2 + 1)/(x + 1)$

Question 2

[4]

Find the domain and range of the function $f(x) = 1/\sqrt{2x - 3}$.

Question 3

[4]

(a) Solve for x : $\cos x + \sin x = \cos 2x + \sin 2x$

OR

(b) If $A + B + C = \pi$, prove that $\tan 2A + \tan 2B + \tan 2C = \tan 2A \tan 2B \tan 2C$.

Question 4

[4]

Prove that $3^{2n+2} - 8n - 9$ is divisible by 8 for all $n \in \mathbb{N}$.

Question 5

[4]

Find the locus of z satisfying the inequality $|(z + 2i)/(2z + 1)| < 1$, where $z = x + iy$. Represent it in the argand plane.

Question 6

[4]

(a) In how many ways can a football team of 11 players be selected from 16 players? How many of these will:
(i) Include 2 particular players
(ii) Exclude 2 particular players?

OR

(b) How many permutations can be formed by the letters of the word "VOWELS", when
(i) there is no restriction on letters
(ii) each word begins with E
(iii) each word begins with O and ends with L
(iv) all vowels come together?

Question 7

[4]

Find the term independent of x in the expansion of the following:
 $[2x^2 - (3/x^3)]^{25}$

Question 8

[4]

Find the equation of obtuse angle bisector of lines:
 $6x - 8y + 5 = 0$ and $7x + 24y - 8 = 0$

Question 9

[4]

(a) Prove that the line $2x - 3y - 27 = 0$ is a tangent to the circle $x^2 + y^2 - 8x + 4y + 7 = 0$.

OR

(b) Show that the points A(1, 0), B(2, -7), C(8, 1) and D(9, -6) all lie on the same circle. Find the equation of this circle, its centre, and radius.

Question 10

[4]

Differentiate the function $\cos(3x - 2)$ by the first principle of differentiation.

Question 11
[6]

In triangle ABC, if $\cos A/a = \cos B/b$, show that the triangle is isosceles.

Question 12
[6]

(a) If x is real, then find the maximum and minimum values of $y = (x^2 - 3x + 4)/(x^2 + 3x + 4)$.

OR

(b) If α, β are the roots $kx^2 + lx + m = 0$, then form an equation whose roots are $\alpha + (1/\beta)$ and $\beta + (1/\alpha)$.

Question 13
[6]

(a) The sum of three numbers which are consecutive terms of an A.P. is 21. If the second number is reduced by 1 and the third is increased by 1, we obtain three consecutive terms of a G.P. Find the numbers.

OR

(b) Find the sum of the series:

$$\frac{1}{1 \times 6} + \frac{1}{6 \times 11} + \frac{1}{11 \times 16} + \dots + \frac{1}{(5n - 4) \times (5n + 1)}$$

Question 14
[6]

Find the standard deviation for the following data:

Class	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90
Frequency	8	10	15	25	20	18	9	5

SECTION B (20 Marks)

Question 15
[3x2]

(a) At what point of the parabola $x^2 = 9y$ is the abscissa three times that of ordinate?

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

(c) Write Converse and inverse of the given conditional statement:

I go to the beach whenever it is a sunny day.

Question 16
[4]

(a) The length of the major axis of an ellipse is 20 units and its foci are $(\pm 5\sqrt{3}, 0)$ Find the equation of the ellipse.

OR

(b) Find the eccentricity, coordinates of the foci, equations of directrices, and length of the latus-rectum of the hyperbola $4x^2 - 3y^2 = 36$.

Question 17
[4]

(a) Find the ratio in which the line joining (2, 4, 5) and (3, 5, 4) is divided by the yz-plane.

OR

(b) If the origin is the centroid of a triangle with vertices (2a, 2, 6), (-4, 3b, -10) and (8, 14, 2c), then find the values of a, b, and c.

Question 18
[6]

Find the equation of the parabola whose focus is (-1, 1) and directrix is $4x + 3y - 24 = 0$.

SECTION C (20 Marks)
Question 19

(a) The mean weight of 100 students in a class is 46 kg. The mean weight of girls is 50 and of the boys is 40 kg. Find the number of girls and boys in the class. **[2]**

(b) Calculate P65 for the following distribution. **[4]**

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

OR

Find mode from the following distribution.

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
Frequency	11	29	18	4	5	3

Question 20

(a) In a sample of 'n' observations given that $\sum d^2 = 22$ and rank correlation $r = 31/42$ then find the value of n. **[2]**

(b) Find the correlation coefficient $r(x, y)$ if:

$n = 7, \sum x = 19, \sum y = 565, \sum x^2 = 75, \sum y^2 = 46775, \sum xy = 1380$

[4]

OR

Find Spearman's rank correlation coefficient for the below data.

X	50	175	270	375	425	580	710	790	890	980
Y	180	120	200	100	100	120	80	60	100	85

Question 21
[4]

Calculate the Index Number for the following data using the Weighted average of price relatives Method for the

year 1995 with respect to 1990 as the base.

Commodity	Price in 1995 (in Rs.)	Price in 1990 (in Rs.)	Weight
A	5.20	4.25	30
B	3.75	2.95	40
C	1.95	2.15	15
D	8.10	8.85	15

Question 22

[4]

Calculate the 5-year moving average for the following data.

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
No. of students	332	317	357	392	402	405	410	427	405	438