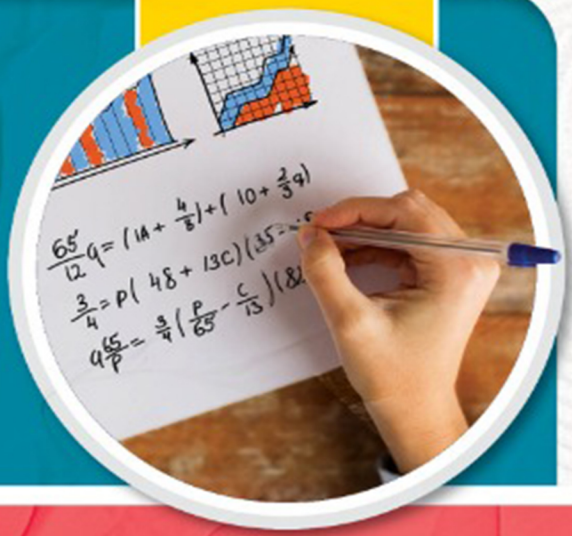
SAMPLE CONTENT

Academic ace

10 PAPERS WITH SOLUTIONS



MATHEMATICS AND STATISTICS

CREATED AS PER THE LATEST BOARD PAPER PATTERN

Std. XII (Commerce)

Features

- Summary Notes for Last Minute Revision
- 5 Latest Board Papers
- 5 Model Papers

Target Publications® Pvt. Ltd.

Based on Latest Paper Pattern prescribed by the Maharashtra State Board of Secondary and Higher Secondary Education, Pune - 04

HSC

10 Papers With Solutions

MATHEMATICS & STATISTICS

Part – I & II

Salient Features

- Includes 10 Question Papers (5 Board Question Papers and 5 Model Papers)
- Summary Notes for efficient revision for Final Board Examination
- Replicates the format of Board Question Paper
- Created as per the latest paper pattern
- Comprehensive answers provided for every question with relevant marks
- **Special Inclusions:**
  - *Graphs and diagrams included where applicable*
  - *Score card / Performance tracker to help students stay updated on their progress*
  - *Features Board Question Paper with Solution of March 2024*

Scan the adjacent QR Code to access solutions of previous years' Board Question Papers.

Printed at: **Print to Print,** Mumbai

Balbharati Registration No.: 2018MH0022

TEID: 4206

P.O. No. 14604

PREFACE

It is rightly said, "Practice makes a man perfect". With this philosophy at heart, we proudly present **HSC 10 Papers with Solutions**. This comprehensive set of resources has been meticulously designed to aid students in their preparation for the final examinations. The book comprises a total of 5 Board Question Papers and 5 Model Question Papers. Each Model Question Paper offers an accurate representation of the HSC Board Exam paper, allowing students to experience the real exam format.

Summary Notes

We have provided concise summary notes designed for quick revision before final exams. These notes offer key concepts and essential points, allowing students to to help students efficiently review and reinforce their understanding for effective last-minute preparation.

Board Answers with Marks Allocations

We have provided Board Answers accompanied by marks allocations. This feature is intended to underscore the significance of each question and guide students in understanding expected responses.

Examination Papers

Students can access solutions to Board Examination Papers of July 2023 and 2022, March 2023 and 2022 via QR Code. This inclusion offers invaluable insights into the types of questions typically asked in Board examinations, thereby enhancing preparedness.

We believe that this compilation will not only enhance students' confidence but also equip them with the necessary skills to excel in their examinations.

We wish all students the very best in their academic endeavors.

Publisher

Edition: First

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.

Please write to us on: mail@targetpublications.org

A book affects eternity; one can never tell where its influence stops.

Best of luck to all the aspirants!

INDEX

Score Card / Performance Tracker

Dear Aspirants,
Consistent practice with Target Publications model papers will significantly boost your preparation.
Track your progress with the scorecard provided below.
Wishing you all the best!

Mathematics & Statistics Part I & II			
Board Question Papers	**Start Time**	**End Time**	**Marks obtained out of 80**
Board Question Paper: July 2023			
Board Question Paper: March 2023			
Board Question Paper: July 2022			
Board Question Paper: March 2022			

MATHEMATICS & STATISTICS : PAPER PATTERN

- There will be a single paper of 80 Marks in Mathematics & Statistics.
- Duration of the paper will be 3 hours.

Format of Question Paper (From Year 2021)
Annual Examination

Section 1 (Based on Mathematics & Statistics Part 1 Syllabus)

Question No.	Types of Questions	Marks (Without Option)
Q.1 (A)	6 Multiple Choice Questions (1 mark each)	06
Q.1 (B)	3 True or False Type Questions (1 mark each)	03
Q.1 (C)	3 Fill in the blanks Type Questions (1 mark each)	03
Q.2 (A)	Attempt any 2 of the 3 questions. (3 marks each)	06
Q.2 (B)	Attempt any 2 of the 3 questions. (4 marks each)	08
Q.3 (A)	Attempt any 2 of the 3 questions. (3 marks each)	06
Q.3 (B)	Attempt any 1 of the 2 questions. (4 marks each)	04
Q.3 (C)	Attempt any 1 of the 2 Activities. (4 marks each)	04
Total		**40 Marks**

Section 2 (Based on Mathematics & Statistics Part 2 Syllabus)

Question No.	Types of Questions	Marks (Without Option)
Q.4 (A)	6 Multiple Choice Questions (1 mark each)	06
Q.4 (B)	3 True or False Type Questions (1 mark each)	03
Q.4 (C)	3 Fill in the blanks Type Questions (1 mark each)	03
Q.5 (A)	Attempt any 2 of the 3 questions. (3 marks each)	06
Q.5 (B)	Attempt any 2 of the 3 questions. (4 marks each)	08
Q.6 (A)	Attempt any 2 of the 3 questions. (3 marks each)	06
Q.6 (B)	Attempt any 1 of the 2 questions. (4 marks each)	04
Q.6 (C)	Attempt any 1 of the 2 Activities. (4 marks each)	04
Total		**40 Marks**

Distribution of Marks According to the Type of Questions

Type of Questions	Total Marks (with option)
MCQ	12 Marks
Objective	12 Marks
Short Answer	36 Marks
Long Answer	40 Marks
Activity Based	16 Marks
Total	**116 Marks**

Part I

No.	Topic Name	Marks
1	Mathematical Logic	08
2	Matrices	08
3	Differentiation	07
4	Application of Derivatives	09
5	Integration	07
6	Definite Integration	05
7	Application of definite integration	04
8	Differential Equations and its Applications	10
	Total	**58**

Part II

No.	Topic Name	Marks
1	Commission , Brokerage and Discount	06
2	Insurance and Annuity	04
3	Linear regression	08
4	Time Series	07
5	Index Numbers	07
6	Linear Programming	06
7	Assignment Problems and Sequencing	09
8	Probability Distributions	11
	Total	**58**

Note: The weightage to theory questions in question paper is up to 15% (i.e. up to 17 marks)

SUMMARY NOTES

MATHEMATICS & STATISTICS Part - I

01 Mathematical Logic

- **STATEMENTS**

Definition:
A statement is a declarative sentence which is either true or false but not both simultaneously. Statements are denoted by the letters p, q, r….

Truth Value of a Statement:
A statement is either True or False. The Truth value of a 'true' statement is defined to be T (TRUE) and that of a 'false' statement is defined to be F (FALSE).

- **LOGICAL CONNECTIVES**

Definition:
The words or group of words such as "and, or, if …. then, if and only if, not" are used to join or connect two or more simple sentences. These connecting words are called logical connectives.

Compound Statement:
The new statement that is formed by combining two or more simple statements by using logical connectives is called compound statement.

Truth Table:
A table that shows the relationship between truth values of simple statements and the truth values of compound statements formed by using these simple statements is called truth table.

A. AND [$\wedge$] (Conjunction)

p	q	$p \wedge q$
T	**T**	**T**
T	F	F
F	T	F
F	F	F

B. OR [$\vee$] (Disjunction)

p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	**F**	**F**

C. Not [~] (Negation)

p	~p
T	F
F	T

D. If….then (Implication, $\rightarrow$) (Conditional)

p	q	$p \rightarrow q$
T	T	T
T	**F**	**F**
F	T	T
F	F	T

Converse, Inverse and Contrapositive statements:

If $p \to q$ is given, then its

converse is $q \to p$

inverse is $\sim p \to \sim q$

contrapositive is $\sim q \to \sim p$

E. If and only if (Double Implication, $\leftrightarrow$) (Biconditional)

p	q	$p \leftrightarrow q$
T	**T**	**T**
T	F	F
F	T	F
F	**F**	**T**

- **QUANTIFIERS**

Quantifiers are the symbols used to denote a group of words or a phrase. There are two types of quantifiers.

Universal Quantifier:

The symbol '$\forall$' stands for "all values of" and is known as universal quantifier.

Existential Quantifier:

The symbol '$\exists$' stands for 'there exists' and is known as existential quantifier.

- **QUANTIFIED STATEMENT**

The statement containing quantifiers is known as quantified statement.

- **STATEMENT PATTERN AND LOGICAL EQUIVALENCE**

A. Statement Pattern

A compound statement obtained from simple statements and by using one or more connectives $\wedge, \vee, \sim, \to, \leftrightarrow$ is called a statement pattern.

B. Tautology, Contradiction, Contingency

Tautology:

A statement pattern having truth value always T, irrespective of the truth values of its component statement is called Tautology.

Contradiction:

A statement pattern having truth value always F, irrespective of the truth values of its component statement is called a Contradiction.

Contingency:

A statement pattern which is neither a tautology nor a contradiction is called Contingency.

C. Logical equivalence

Two logical statements are said to be equivalent if and only if the truth values in their respective columns in the joint truth table are identical.

If S_1 and S_2 are logically equivalent statement patterns, we write

$S_1 \equiv S_2$.

D. Duality

Two compound statements S_1 and S_2 are said to be duals of each other, if one can be obtained from the other by interchanging '$\wedge$' and '$\vee$' and vice-versa. The connectives '$\wedge$' and '$\vee$' are duals of each other. Also, a dual is obtained by replacing t by c and c by t, where 't' denotes tautology and 'c' denotes contradiction.

E. Negation of compound statement

i. Negation of conjunction:

Negation of the conjunction of two simple statements is the disjunction of their negations.

i.e. $\sim(p \wedge q) \equiv \sim p \vee \sim q$

ii. Negation of disjunction:

Negation of the disjunction of two simple statements is the conjunction of their negations.

i.e. $\sim(p \vee q) \equiv \sim p \wedge \sim q$

iii. Negation of negation:
The negation of negation of a simple statement is the statement itself.
i.e. If p is a simple statement then $\sim(\sim p) \equiv p$

iv. Negation of conditional (implication) statement:
The negation of a conditional statement $p \rightarrow q$ is p but not q.
i.e. $\sim(p \rightarrow q) \equiv p \wedge \sim q$

v. Negation of biconditional (double implication):
The negation of a biconditional statement $p \leftrightarrow q$ is the negation of $p \rightarrow q$ or $q \rightarrow p$.
i.e. $\sim(p \leftrightarrow q) \equiv (p \wedge \sim q) \vee (q \wedge \sim p)$

vi. Negation of a quantified statement:
While finding the negations of quantified statements, the word 'all' is replaced by 'some' and 'for every' is replaced by 'there exists' and vice-versa.

- **ALGEBRA OF STATEMENTS**

Some standard equivalent statements:

i. Idempotent Law:
a. $p \vee p \equiv p$ b. $p \wedge p \equiv p$

ii. Commutative Law:
a. $p \vee q \equiv q \vee p$ b. $p \wedge q \equiv q \wedge p$

iii. Associative Law:
a. $(p \vee q) \vee r \equiv p \vee (q \vee r) \equiv p \vee q \vee r$ b. $(p \wedge q) \wedge r \equiv p \wedge (q \wedge r) \equiv p \wedge q \wedge r$

iv. Distributive Law:
a. $p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$ b. $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$

v. Identity Law:
a. $p \vee F \equiv p$ b. $p \wedge F \equiv F$ c. $p \vee T \equiv T$ d. $p \wedge T \equiv p$

vi. Complement Law:
a. $p \vee \sim p \equiv T$ b. $p \wedge \sim p \equiv F$

vii. Involution Law (Law of double negation):
a. $\sim T \equiv F$ b. $\sim F \equiv T$ c. $\sim(\sim p) \equiv p$

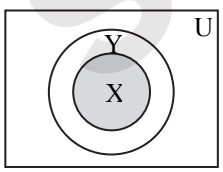
viii. DeMorgan's Law:
a. $\sim(p \vee q) \equiv \sim p \wedge \sim q$ b. $\sim(p \wedge q) \equiv \sim p \vee \sim q$

ix. Absorption Law:
a. $p \vee (p \wedge q) \equiv p$ b. $p \wedge (p \vee q) \equiv p$

x. Conditional Law:
a. $p \rightarrow q \equiv \sim p \vee q$ b. $p \leftrightarrow q \equiv (\sim p \vee q) \wedge (\sim q \vee p)$

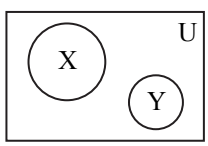
- **VENN DIAGRAMS**

i. All x's are y's



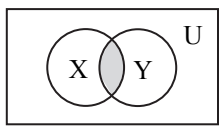
$X \cap Y = X \neq \phi$

ii. "No x's are y's"

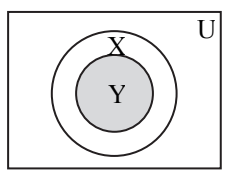


$X \cap Y = \phi$

iii. "Some x's are y's"

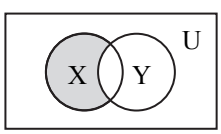


$X \cap Y \neq \phi$ or

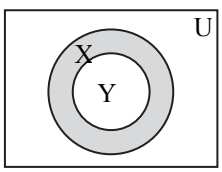


$X \cap Y = Y \neq \phi$

iv. "Some x's are not y's"



$X - Y \neq \phi$ or



$X - Y \neq \phi$

Page no. **6** to **35** are purposely left blank.

To see complete chapter buy **Target Notes** or **Target E-Notes**

SEAT NUMBER | | | | | | |

2024	III	02	1100	J-866	(E)

MATHEMATICS & STATISTICS (88)

BOARD QUESTION PAPER - 2024

Time : 3 Hrs. **6 Pages** **Max. Marks : 80**

General Instructions:

(i) *All questions are compulsory.*

(ii) *There are 6 questions divided into two sections.*

(iii) *Write answers of Section-I and Section-II in the same answer book.*

(iv) *Use of logarithmic tables is allowed. Use of calculator is not allowed.*

(v) *For L.P.P. graph paper is not necessary. Only rough sketch of graph is expected.*

(vi) *Start answer to each question on a new page.*

(vii) *For each multiple choice type of question, it is mandatory to write the correct answer along with its alphabetical letter eg. (a) ……../(b)……../(c)……../ (d)……. No mark(s) shall be given if "ONLY" the correct answer or the alphabet of the correct answer is written. Only the first attempt will be considered for evaluation.*

Section – I

Q.1. (A) Select and write the correct answer of the following multiple choice type of questions (1 mark each): **(6)[12 Marks]**

i. Which of the following is not a statement?

(A) Smoking is injurious to health (B) $2 + 2 = 4$

(C) 2 is the only even prime number (D) Come here

ii. If $x + y + z = 3$, $x + 2y + 3z = 4$, $x + 4y + 9z = 6$ then (y, z) = _____.

(A) $(-1, 0)$ (B) $(1, 0)$

(C) $(1, -1)$ (D) $(-1, 1)$

iii. If $y = \log\left(\frac{e^x}{x^2}\right)$, then $\frac{dy}{dx}$ = ?

(A) $\frac{2-x}{x}$ (B) $\frac{x-2}{x}$

(C) $\frac{e-x}{ex}$ (D) $\frac{x-e}{ex}$

iv. The value of $\int \frac{dx}{\sqrt{1-x}}$ is _____.

(A) $2\sqrt{1-x}+c$ (B) $-2\sqrt{1-x}+c$

(C) $\sqrt{x}+c$ (D) $x + c$

v. $\int \frac{dx}{(x-8)(x+7)} =$ _____.

(A) $\frac{1}{15}\log\left|\frac{x+2}{x+1}\right| + c$ (B) $\frac{1}{15}\log\left|\frac{x+8}{x+7}\right| + c$

(C) $\frac{1}{15}\log\left|\frac{x-8}{x+7}\right| + c$ (D) $(x-8)(x+7) + c$

vi. The differential equation of $y = k_1e^x + k_2e^{-x}$ is :

(A) $\frac{d^2y}{dx^2} - y = 0$ (B) $\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$

(C) $\frac{d^2y}{dx^2} + y\frac{dy}{dx} = 0$ (D) $\frac{d^2y}{dx^2} + y = 0$

(B) State whether the following statements are true or false (1 mark each): **(3)**

i. $\int_a^b f(x)dx = \int_a^b f(t)dt$

ii. For $\int \frac{x-1}{(x+1)^3} e^x dx = e^x f(x) + c$, $f(x) = (x+1)^2$

iii. Order and degree of a differential equation are always positive integers.

(C) Fill in the following blanks (1 mark each): **(3)**

i. The slope of tangent at any point (a, b) is called as _____.

ii. If $f'(x) = \frac{1}{x} + x$ and $f(1) = \frac{5}{2}$ then $f(x) = \log x + \frac{x^2}{2} +$ _____.

iii. A solution of differential equation which can be obtained from the general solution by giving particular values to the arbitrary constants is called _____ solution.

Q.2. (A) Attempt any TWO of the following questions (3 marks each): **(6)[14 Marks]**

i. Examine whether the following statement pattern is tautology, a contradiction or contingency
$\sim p \rightarrow (p \rightarrow \sim q)$

ii. Find $\frac{dy}{dx}$ if, $x = e^{3t}$, $y = e^{(4t+5)}$

iii. If $A = \begin{bmatrix} 7 & 3 & 0 \\ 0 & 4 & -2 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -2 & 3 \\ 2 & 1 & -4 \end{bmatrix}$ then find $A^T + 4B^T$.

(B) Attempt any TWO of the following questions (4 marks each): **(8)**

i. Consider the following statements.
a. If D is dog, then D is very good.
b. If D is very good, then D is dog.
c. If D is not very good, then D is not a dog.
d. If D is not a dog, then D is not very good.
Identify the pairs of statements having the same meaning. Justify.

ii. Determine the minimum value of the function:
$f(x) = 2x^3 - 21x^2 + 36x - 20$.

iii. Find the area of the regions bounded by the line $y = -2x$, the X - axis and the lines $x = -1$ and $x = 2$.

Q.3. (A) Attempt any TWO of the following questions (3 marks each): **(6)[14 Marks]**

i. Find $\frac{dy}{dx}$ if, $y = x^{e^x}$

ii. If $f'(x) = 4x^3 - 3x^2 + 2x + k$, $f(0) = 1$ and $f(1) = 4$, find $f(x)$.

iii. Obtain the differential equation whose general solution is $x^3 + y^3 = 35ax$.

(B) Attempt any ONE of the following questions (4 marks each): **(4)**

i. Find the inverse of $\begin{bmatrix} 3 & 1 & 5 \\ 2 & 7 & 8 \\ 1 & 2 & 5 \end{bmatrix}$ by adjoint method.

ii. The consumption expenditure E_c of a person with income x, is given by $E_c = 0.0006x^2 + 0.003x$. Find average propensity to consume (APC), marginal propensity to consume (MPC) when his income is ₹ 200. Also find his marginal propensity to save (MPS).

(C) Attempt any ONE of the following questions (Activity) (4 marks each): **(4)**

i. Complete the following activity :

$$\int_0^2 \frac{dx}{4+x-x^2} = \int_0^2 \frac{dx}{-x^2+\square+\square}$$

$$= \int_0^2 \frac{dx}{-x^2+x+\frac{1}{4}-\square+4}$$

$$= \int_0^2 \frac{dx}{\left(x-\frac{1}{2}\right)^2-\left(\square\right)^2}$$

$$= \frac{1}{\sqrt{17}}\log\left(\frac{20+4\sqrt{17}}{20-4\sqrt{17}}\right)$$

ii. The rate of growth of population is proportional to the number of inhabitants. If the population doubles in 25 years and the present population is 1,00,000, when will the city have population 4,00,000?

Solution:

Let 'P' be the population at time 't'.

Since rate of growth of population is proportional to the no. of inhabitants :

$\frac{dP}{dt} \propto P$

$\therefore$ Differential equation can be written as $\frac{dP}{dt} = kP$.

where k is constant of proportionality.

$\therefore$ $\frac{dP}{P} = k \cdot dt$.

On integrating we get

$\square = kt + c$ ....(i)

a. When $t = 0$, $P = 1,00,000$

$\therefore$ from (i)

$\log 1,00,000 = k(0) + c$

$\therefore$ $c = \square$

$\therefore$ $\log\left(\frac{P}{1,00,000}\right) = kt$ .... (ii)

b. When $t = 25$, $P = 2,00,000$

as population doubles in 25 years.

$\therefore$ from (ii) $\log 2 = 25\,k$

$\therefore$ $k = \square$

$\therefore$ $\log\left(\frac{P}{1,00,000}\right) = \left(\frac{1}{25}\log 2\right) t$

c.

$\therefore$ when P = 4,00,000

$\therefore$ $\log\left(\frac{4,00,000}{1,00,000}\right)=\left(\frac{1}{25}\log 2\right)$ t

$\therefore$ $\log 4 = \left(\frac{1}{25}\log 2\right)$ t

$\therefore$ t = $\square$ years

Section – II

Q.4. (A) Select and write the correct answer of the following multiple choice type of questions (1 mark each): **(6)[12 Marks]**

i. The difference between face value and present worth is called _____.
(A) Banker's discount (B) True discount
(C) Banker's gain (D) Cash value

ii. In an ordinary annuity, payments or receipts occur at _____.
(A) beginning of each period (B) end of each period
(C) mid of each period (D) quarterly basis

iii. b_{xy} and b_{yx} are _____.
(A) Independent of change of origin and scale.
(B) Independent of change of origin but not of scale.
(C) Independent of change of scale but not of origin.
(D) Affected by change of origin and scale.

iv. Dorbish-Bowley's Price Index Number is given by _____.
(A) $\frac{\frac{\sum p_1q_0}{\sum p_0q_1}+\frac{\sum p_0q_1}{\sum p_1q_0}}{2}\times 100$ (B) $\frac{\frac{\sum p_1q_1}{\sum p_0q_0}+\frac{\sum p_0q_0}{\sum p_1q_1}}{2}\times 100$
(C) $\frac{\frac{\sum p_1q_0}{\sum p_0q_0}+\frac{\sum p_1q_1}{\sum p_0q_1}}{2}\times 100$ (D) $\frac{\frac{\sum p_0q_0}{\sum p_1q_0}+\frac{\sum p_0q_1}{\sum p_1q_1}}{2}\times 100$

v. Objective function of L.P.P. is _____.
(A) a constraint (B) a function to be maximised or minimised.
(C) a relation between the decision variables (D) a feasible region

vi. To use the Hungarian method, a profit maximization assignment problem requires _____.
(A) Converting all profits to opportunity losses.
(B) A dummy person or job
(C) Matrix expansion
(D) Finding the maximum number of lines to cover all the zeros in the reduced matrix.

(B) State whether the following statements are true or false (1 mark each) : **(3)**

i. Broker is an agent who gives a guarantee to seller that the buyers will pay the selling price of goods.

ii. $\sum\frac{p_0q_0}{p_1q_1}\times 100$ is the Value Index Number by simple aggregate method.

iii. The optimum value of the objective function of L.P.P. occurs at the center of the feasible region.

(C) Fill in the blanks (1 mark each): **(3)**

i. The banker's discount is always _____ than the true discount.

ii. The cost of living index number using Weighted Relative Method is given by _____.

iii. The time interval between starting the first job and completing the last job including the idle time (if any) in a particular order by the given set of machines is called _____.

Q.5. (A) Attempt any TWO of the following questions (3 marks each): (6)[14 Marks]

i. Deepak's salary was increased from ₹ 4,000 to ₹ 5,000. The sales being the same, due to reduction in the rate of commission from 3% to 2%, his income remains unchanged. Find his sales.

ii. For a bivariate data, the regression co-efficient of Y on X is 0.4 and the regression co-efficient of X on Y is 0.9. Find the value of variance of Y if variance of X is 9.

iii. The following table shows the index of industrial production for the period from 1976 to 1985, using the year 1976 as the base year. Obtain the trend values for the following data using 4 yearly centered moving averages:

Year	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Index	0	2	3	3	2	4	5	6	7	10

(B) Attempt any TWO of the following questions (4 marks each) : (8)

i. If for the following data, Walsh's Price Index Number is 150, find 'x':

Commodity	Base Year		Current Year	
	Price p_0	Quantity q_0	Price p_1	Quantity q_1
A	5	3	10	3
B	x	4	16	9
C	15	5	23	5
D	10	2	26	8

ii. A toy manufacturing company produces five types of toys. Each toy has to go through three machines A, B and C in the order ABC. The time required in hours for each process is given in the following table:

Type	1	2	3	4	5
Machine A	16	20	12	14	22
Machine B	10	12	4	6	8
Machine C	8	18	16	12	10

Find the total elapsed time and also find idle time for machine B.

iii. A random variable X has the following probability distribution:

x	1	2	3	4	5	6	7
P (x)	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$

Find: (a) k (b) P (X < 3) (c) P (X > 6)

Q.6. (A) Attempt any TWO of the following questions (3 marks each) : (6)[14 Marks]

i. The building is insured for 75% of its value. The annual premium at 0.70 percent amounts to ₹ 2,625. If the building is damaged to the extent of 60% due to fire, how much can be claimed under the policy?

ii. Three new machines M_1, M_2, M_3 are to be installed in a machine shop. There are four vacant places A, B, C, D. Due to limited space, machine M_2 can not be placed at B. The cost matrix (in hundred ₹) is as follows::

Machine	Places			
	A	B	C	D
M_1	13	10	12	11
M_2	15	-	13	20
M_3	5	7	10	6

Determine the optimum assignment schedule and find the minimum cost.

iii. The eggs are drawn successively with replacement from a lot containing 10% defective eggs. Find the probability that there is at least one defective egg in the lot of 10 eggs.

(B) Attempt any ONE of the following questions (4 marks each) : **(4)**

i. Following table shows the all India infant mortality rates (per '000) for years 1980 to 2010:

Year	1980	1985	1990	1995	2000	2005	2010
IMR	10	7	5	4	3	1	0

Fit the trend line to the above data by the method of least squares.

ii. Minimize : $z = 6x + 2y$
Subject to : $x + 2y \geq 3$,
$x + 4y \geq 4$,
$3x + y \geq 3$,
$x \geq 0, y \geq 0$

(C) Attempt any ONE of the following questions (Activity) (4 marks each) : **(4)**

i. For a bivariate data $\bar{x} = 10$, $\bar{y} = 12$, V(X) = 9, $\sigma_y = 4$ and r = 0.6
Estimate y when $x = 5$
Solution:
Line of regression of Y on X is
$Y - \bar{y} =$ ☐ $(X - \bar{x})$

$\therefore$ $Y - 12 = r \cdot \frac{\sigma_y}{\sigma_x}(X - 10)$

$\therefore$ $Y - 12 = 0.6 \times \frac{4}{\square}(X - 10)$

$\therefore$ When $x = 5$
$Y - 12 =$ ☐ $(5 - 10)$

$\therefore$ $Y - 12 = -4$

$\therefore$ $Y =$ ☐

ii. If $X \sim P(m)$ with $P(X = 1) = P(X = 2)$ then find the mean and $P(X = 2)$.
Given $e^{-2} = 0.1353$
Solution:
Since $P(X = 1) = P(X = 2)$

$\therefore$ $\frac{e^{\square} m^1}{1!} = \frac{e^{-m} m^2}{\square}$

$\therefore$ $m =$ ☐

$\therefore$ $P(X = 2) = \frac{e^{-2} \cdot 2^2}{2!} =$ ☐

MATHEMATICS & STATISTICS

Note: *Answer to every question must be written on a new page.*

Section – I

Q.1. (A)

i. **(D)** Come here **[1 Mark]**

ii. **(B)** (1, 0) **[1 Mark]**

iii. **(B)** $\frac{x-2}{x}$ **[1 Mark]**

iv. **(B)** $-2\sqrt{1-x}+c$ **[1 Mark]**

v. **(C)** $\frac{1}{15}\log\left|\frac{x-8}{x+7}\right|+c$ **[1 Mark]**

vi. **(A)** $\frac{d^2y}{dx^2} - y = 0$ **[1 Mark]**

Explanation:

iii. $y = \log\left(\frac{e^x}{x^2}\right) = \log(e^x) - \log(x^2)$

$= x \log e - 2 \log x$

$= x(1) - 2 \log x$

$\therefore$ $y = x - 2 \log x$

Differentiating both sides w.r.t.x, we get

$\frac{dy}{dx} = 1 - 2\left(\frac{1}{x}\right) = \frac{x-2}{x}$

v. Let $I = \int \frac{dx}{(x-8)(x+7)}$

$= \frac{1}{15}\int \frac{15.dx}{(x-8)(x+7)}$

$= \frac{1}{15}\int \frac{(x+7)-(x-8)}{(x-8)(x+7)}dx$

$= \frac{1}{15}\left(\int \frac{1}{x-8} - \int \frac{1}{x+7}\right)dx = \frac{1}{15}\left[\log|x-8| - \log|x+7|\right]+c = \frac{1}{15}\log\left|\frac{x-8}{x+7}\right|+c$

vi. $y = k_1 e^x + k_2 e^{-x}$

Differentiating w.r.t. x, we get

$\frac{dy}{dx} = k_1 e^x - k_2 e^{-x}$

Again, differentiating w.r.t. x, we get

$\frac{d^2y}{dx^2} = k_1 e^x + k_2 e^{-x}$

$\therefore \quad \frac{d^2y}{dx^2} = y$

$\therefore \quad \frac{d^2y}{dx^2} - y = 0$

(B)

i. True ***[1 Mark]***

ii. False ***[1 Mark]***

Justification:

Let $I = \int \frac{x-1}{(x+1)^3} . e^x dx$

$= \int e^x \left[\frac{(x+1)-2}{(x+1)^3} \right] dx$

$= \int e^x \left[\frac{1}{(x+1)^2} - \frac{2}{(x+1)^3} \right] dx$

$= \int e^x \left[(x+1)^{-2} - 2(x+1)^{-3} \right] dx$

Put $f(x) = (x + 1)^{-2}$

$\therefore \quad f'(x) = -2 (x + 1)^{-3}$

$\therefore \quad I = e^x [f(x) + f'(x)] dx$

$= e^x . f(x) + c$

$= e^x . (x + 1)^{-2}$

$\therefore \quad f(x) = (x + 1)^{-2}$

iii. True ***[1 Mark]***

(C)

i. gradient ***[1 Mark]***

ii. 2 ***[1 Mark]***

iii. particular ***[1 Mark]***

Explanation:

ii. $f'(x) = \frac{1}{x} + x$

$f(x) = \int f'(x) \, dx$

$= \int \left(\frac{1}{x} + x \right) dx = \log x + \frac{x^2}{2} + c$

$\therefore$ $f(x) = \log x + \frac{x^2}{2} + c$ ...(i)

Now, $f(1) = \frac{5}{2}$

$\therefore$ $\frac{5}{2} = \log 1 + \frac{1}{2} + c$

$\Rightarrow c = 2$ ...(ii)

Substituting (ii) in (i), we get

$f(x) = \log x + \frac{x^2}{2} + 2$

Page no. **45** to **86** are purposely left blank.

To see complete chapter buy **Target Notes** or **Target E-Notes**

SEAT NUMBER | | | | | | |

2025	III	00	1100	J-000	(E)

MATHEMATICS & STATISTICS (88)

MODEL QUESTION PAPER - 1

Time : 3 Hrs. **6 Pages** **Max. Marks : 80**

General Instructions:

(i) *All questions are compulsory.*

(ii) *There are 6 questions divided into two sections.*

(iii) *Write answers of Section-I and Section-II in the same answer book.*

(iv) *Use of logarithmic tables is allowed. Use of calculator is not allowed.*

(v) *For L.P.P. graph paper is not necessary. Only rough sketch of graph is expected.*

(vi) *Start answer to each question on a new page.*

(vii) *For each multiple choice type of question, it is mandatory to write the correct answer along with its alphabetical letter eg. (a) ……../(b)……../(c)……../ (d)……. No mark(s) shall be given if "ONLY" the correct answer or the alphabet of the correct answer is written. Only the first attempt will be considered for evaluation.*

SECTION - I

Q.1. (A) Select and write the correct answer of the following multiple choice type of questions (1 mark each): **(6)[12 Marks]**

i. Which of the following is not a statement?

(A) Roses are red (B) New Delhi is in India

(C) Every square is a rectangle (D) Alas ! I have failed

ii. The differential equation of $y = k_1 e^{x} + k_2 e^{-x}$ is

(A) $\frac{d^2y}{dx^2} - y = 0$ (B) $\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$

(C) $\frac{d^2y}{dx^2} + y\frac{dy}{dx} = 0$ (D) $\frac{d^2y}{dx^2} + y = 0$

iii. If $y = 2x^2 + 2^2 + a^2$ then $\frac{dy}{dx}$ = _____.

(A) $4x + 2a$ (B) $4x$ (C) $2x$ (D) $-2x$

iv $\int \frac{dx}{(x - x^2)} =$

(A) $\log x - \log (1 - x) + c$ (B) $\log (1 - x^2) + c$

(C) $-\log x + \log (1 - x) + c$ (D) $\log (x - x^2) + c$

v. $\int (1-x)^{-2}\,dx =$

(A) $(1+x)^{-1} + c$ (B) $(1-x)^{-1} + c$

(C) $(1-x)^{-1} - 1 + c$ (D) $(1-x)^{-1} + 1 + c$

vi. If $\int_0^a 3x^2\,dx = 8$, then a = ?

(A) 2 (B) 0 (C) $\frac{8}{3}$ (D) a

(B) State whether the following statements are true or false (1 mark each): **(3)**

i. The demand function is $p = 40 + 3D - 5D^2$. The average revenue function is $R_A = 40 + 3D - 5D^2$.

ii. If $\int x\,e^{2x}dx$ is equal to $e^{2x}f(x) + c$,where c is constant of integration, then $f(x)$ is $\frac{(2x-1)}{2}$.

iii. The equation of the curve which passes through the point (1, 1) and whose slope is given by $\frac{2y}{x}$, is $2x = y^2$

(C) Fill in the following blanks (1 mark each): **(3)**

i. To find the value of $\int \frac{(1+\log x)dx}{x}$, the proper substitution is _____

ii. The supply function for a commodity is $S = p^3 + 1000$. The rate of change in supply with respect to price at price 4 is _____.

iii. If $p \wedge q$ is true, then truth value of $\sim p \vee \sim q$ is _____.

Q.2. (A) Attempt any TWO of the following questions (3 marks each): **(6)[14 Marks]**

i. Find the values of x, such that $f(x)$ is increasing function.
$f(x) = 2x^3 - 15x^2 - 144x - 7$

ii. Find $\frac{dy}{dx}$, if $x = e^{3t}, y = e^{\sqrt{t}}$.

iii. Write negation of each of the following statements.
a. All the stars are shining if it is night.
b. $\exists\, n \in N$, $(n^2 + 2)$ is odd number.
c. Some continuous functions are differentiable.

(B) Attempt any TWO of the following questions (4 marks each): **(8)**

i. Solve: $\int_0^1 \log\left(\frac{1}{x} - 1\right) dx$

ii. Solve the differential equation: $x^2\frac{dy}{dx} = x^2 + xy - y^2$

iii. The sum of the cost of one Economic book, one Co-operation book and one account book is ₹ 420. The total cost of an Economic book, 2 Co-operation books and an Account book is ₹ 480. Also the total cost of an Economic book, 3 Co-operation books and 2 Account books is ₹ 600. Find the cost of each book.

Q.3. (A) Attempt any TWO of the following questions (3 marks each): **(6)[14 Marks]**

i. Write the truth values of following statements.
a. Earth is a planet and Moon is a star.
b. A quadratic equation has two distinct roots or 6 has three prime factors.
c. The Himalayas are the highest mountains but they are part of India in the North East.

ii. Find the equations of tangent and normal to the curve $x^2 + y^2 + xy = 3$ at (1, 1)

iii. If $y = [\log(\log(\log x))]^2$, find $\frac{dy}{dx}$.

Page no. **89** to **92** are purposely left blank.

To see complete chapter buy **Target Notes** or **Target E-Notes**

Model Answer Paper - 1

MATHEMATICS & STATISTICS

Note: *Answer to every section must be written on a new page.*

SECTION I

Q.1. (A)

i. (D) Alas ! I have failed ***[1 Mark]***

ii. (A) $\frac{d^2y}{dx^2} - y = 0$ ***[1 Mark]***

iii. (B) $4x$ ***[1 Mark]***

iv. (A) $\log x - \log (1 - x) + c$ ***[1 Mark]***

v. (B) $(1 - x)^{-1} + c$ ***[1 Mark]***

vi. (A) 2 ***[1 Mark]***

Explanation:

ii. $y = k_1 e^x + k_2 e^{-x}$

Differentiating w.r.t. x, we get

$\frac{dy}{dx} = k_1 e^x - k_2 e^{-x}$

Again, differentiating w.r.t. x, we get

$\frac{d^2y}{dx^2} = k_1 e^x + k_2 e^{-x}$

$\therefore \quad \frac{d^2y}{dx^2} = y$

$\therefore \quad \frac{d^2y}{dx^2} - y = 0$

iv. Let $I = \int \frac{dx}{x - x^2}$

$= \int \frac{1}{x(1-x)} dx$

$= \int \frac{(1-x)+x}{x(1-x)} dx$

$= \int \left(\frac{1}{x} + \frac{1}{1-x}\right) dx$

$= \log |x| + \frac{\log|1-x|}{-1} + c$

$= \log |x| - \log |1 - x| + c$

v. $\int (1-x)^{-2} dx = \frac{(1-x)^{-1}}{-1 \times -1} + c$

$= (1 - x)^{-1} + c$

vi. $\int_0^a 3x^2\,dx = 8$

$\therefore\ 3\left[\frac{x^3}{3}\right]_0^a = 8$

$\therefore\ a^3 = 2^3$

$\therefore\ a = 2$

Q.1. (B)

i. True *[1 Mark]*

ii. False *[1 Mark]*

iii. False *[1 Mark]*

Justification:

ii. Let $I = \int x.e^{2x}.dx$

$= x\int e^{2x}.dx - \int\left[\frac{d}{dx}(x)\int e^{2x}.dx\right]dx$

$= x.\frac{e^{2x}}{2} - \int 1.\frac{e^{2x}}{2}.dx$

$= \frac{x}{2}e^{2x} - \frac{1}{2}\int e^{2x}.\,dx$

$= \frac{x}{2}e^{2x} - \frac{1}{2}.\frac{e^{2x}}{2} + c$

$= e^{2x}\left(\frac{x}{2} - \frac{1}{4}\right) + c$

$= e^{2x}\left(\frac{2x-1}{4}\right) + c$

$\therefore\ f(x) = \frac{2x-1}{4}$

iii. Here, $\frac{dy}{dx} = \frac{2y}{x}$

$\therefore\ \frac{dy}{y} = 2\frac{dx}{x}$

Integrating both sides, we get

$\log y = \log x^2$

$\therefore\ y = x^2 + c$

At (1, 1), c = 0

$\therefore$ Required equation is $y = x^2$

Q.1. (C)

i. $1 + \log x = t$ *[1 Mark]*

ii. 48 *[1 Mark]*

iii. F *[1 Mark]*

HSC Super Scorers Ka Start Kit

SAMPLE CHAPTER

30 Question Papers & Activity Sheets with Solutions

Perform faster, better and confidently in the HSC exam with this expert-curated collection of model papers

- All subjects
- 24 Practice papers
- 6 Solved past papers

Book Keeping and Accountancy Practice

The ultimate practice book to master BK and Accountancy

- 200+ Sums
- Answer key
- Detailed solutions

SAMPLE CHAPTER

SAMPLE CHAPTER

10 Papers with Solutions

Enjoy result-driven preparation for the HSC exam with subject-wise model and board papers

- Summary notes
- 5 Model papers
- 5 Board past papers
- Solutions

CUET-UG Practice Paper Set

#GetSetForCUET with practice papers created according to the latest exam pattern

- Practice papers
- Solved past papers
- Solutions

SAMPLE CHAPTER

Visit Our Website

Target Publications® Pvt. Ltd.
Transforming lives through learning

Address:
B2, 9th Floor, Ashar, Road No. 16/Z,
Wagle Industrial Estate, Thane (W)- 400604

Tel: 88799 39712 / 13 / 14 / 15
Website: www.targetpublications.org
Email: mail@targetpublications.org

VISIT OUR STORE

TARGET AMAZON STORE

TARGET FLIPKART STORE