

Directorate of Education, GNCT of Delhi

PRACTICE PAPER (MID TERM)

(2022-23)

Class - XI
Mathematics (Code: 041)

Time: 3 hours

Maximum Marks: 80

General Instructions :

1. This Question paper contains - **five sections A,B,C,D,E**. Each section is compulsory. However, there are internal choices in some questions.
2. **Section A** has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.(20 Marks)
3. **Section B** has 5 **Very Short Answer (VSA)-type** questions of 2 marks each.(10 Marks)
4. **Section C** has 6 **Short Answer (SA)-type** questions of 3 marks each.(18 Marks)
5. **Section D** has 4 **Long Answer (LA)-type** questions of 5 marks each.(20 Marks)
6. **Section E** has 3 **Source based/Case based/passage based/integrated units of assessment (4 marks each) with sub parts.(12 Marks)**

Section - A						
Question Number 1-18 are of MCQ type question one mark each.						
Q. No.		Marks				
1.	Let two finite sets have m & n elements . The number of subsets of the first set is 112 more than that of second set. The values of m and n are respectively : <table border="1" data-bbox="210 1554 1398 1727"><tr><td>(a) 4 , 7</td><td>(b) 7 , 4</td></tr><tr><td>(c) 4 , 4</td><td>(d) 7 , 7</td></tr></table>	(a) 4 , 7	(b) 7 , 4	(c) 4 , 4	(d) 7 , 7	1
(a) 4 , 7	(b) 7 , 4					
(c) 4 , 4	(d) 7 , 7					
2	If $X = \{8^n - 7n - 1 n \in N\}$ and $Y = \{49n - 49 n \in N\}$ then <table border="1" data-bbox="210 1912 1398 2134"><tr><td>(a) $X \subset Y$</td><td>(b) $Y \subset X$</td></tr><tr><td>(c) $X = Y$</td><td>(d) $X \cap Y = \phi$</td></tr></table>	(a) $X \subset Y$	(b) $Y \subset X$	(c) $X = Y$	(d) $X \cap Y = \phi$	1
(a) $X \subset Y$	(b) $Y \subset X$					
(c) $X = Y$	(d) $X \cap Y = \phi$					

3

Let $S = \{x \mid x \text{ is a positive multiple of 3 less than 100}\}$

$P = \{x \mid x \text{ is a prime number less than 20}\}$.

Then $n(S) + n(P)$ is :

(a) 34

(b) 41

(c) 33

(d) 30

1**4**

Let R be the set of points inside a rectangle of sides a and b ($a, b > 1$) with two sides along the positive direction of x -axis and y -axis. Then

(a) $R = \{(x, y) : 0 \leq x \leq a, 0 \leq y \leq b\}$ (b) $R = \{(x, y) : 0 \leq x < a, 0 \leq y \leq b\}$ (c) $R = \{(x, y) : 0 \leq x \leq a, 0 < y < b\}$ (d) $R = \{(x, y) : 0 < x < a, 0 < y < b\}$ **1****5**

Let $n(A) = m$ and $n(B) = n$ then number of non empty relations that can be defined from A to B is :

(a) m^n (b) $n^m - 1$ (c) $mn - 1$ (d) $2^{mn} - 1$ **1****6**

Let F_1 be a set of parallelograms F_2 the set of rectangles, F_3 set of rhombuses, F_4 set of squares and F_5 the set of trapeziums in a plane. Then F_1 may be equal to :

(a) $F_2 \cap F_3$ (b) $F_3 \cap F_4$ (c) $F_2 \cup F_5$ (d) $F_2 \cup F_3 \cup F_4 \cup F_5$ **1****7**

Domain of $\sqrt{a^2 - x^2}$ ($a > 0$) is :

(a) $(-a, a)$ (b) $[-a, a]$ (c) $[0, a]$ (d) $(-a, 0]$ **1**

8	<p>If $f(x) = \frac{9}{5}x + 32$, the value of $f(-10)$ is :</p> <table border="1" data-bbox="212 129 1396 297"> <tbody> <tr> <td data-bbox="212 129 805 212">(a) 15</td> <td data-bbox="805 129 1396 212">(b) 14</td> </tr> <tr> <td data-bbox="212 212 805 297">(c) -15</td> <td data-bbox="805 212 1396 297">(d) -14</td> </tr> </tbody> </table>	(a) 15	(b) 14	(c) -15	(d) -14	1
(a) 15	(b) 14					
(c) -15	(d) -14					
9	<p>If A and B are finite sets such that $n(A) = 5$ and $n(B) = 7$, then the number of functions from A to B:</p> <table border="1" data-bbox="212 454 1396 633"> <tbody> <tr> <td data-bbox="212 454 805 537">(a) 7^5</td> <td data-bbox="805 454 1396 537">(b) 5^7</td> </tr> <tr> <td data-bbox="212 537 805 633">(c) 7^7</td> <td data-bbox="805 537 1396 633">(d) 5^5</td> </tr> </tbody> </table>	(a) 7^5	(b) 5^7	(c) 7^7	(d) 5^5	1
(a) 7^5	(b) 5^7					
(c) 7^7	(d) 5^5					
10	<p>The value of $i + i^{10} + i^{20} + i^{30}$ is:</p> <table border="1" data-bbox="212 784 1396 981"> <tbody> <tr> <td data-bbox="212 784 805 866">(a) 1</td> <td data-bbox="805 784 1396 866">(b) $-i$</td> </tr> <tr> <td data-bbox="212 866 805 981">(c) 0</td> <td data-bbox="805 866 1396 981">(d) $i - 1$</td> </tr> </tbody> </table>	(a) 1	(b) $-i$	(c) 0	(d) $i - 1$	1
(a) 1	(b) $-i$					
(c) 0	(d) $i - 1$					
11	<p>If z is a complex number, then</p> <table border="1" data-bbox="212 1120 1396 1350"> <tbody> <tr> <td data-bbox="212 1120 805 1232">(a) $z^2 > z ^2$</td> <td data-bbox="805 1120 1396 1232">(b) $z^2 = z ^2$</td> </tr> <tr> <td data-bbox="212 1232 805 1350">(c) $z^2 < z ^2$</td> <td data-bbox="805 1232 1396 1350">(d) $z^2 \geq z ^2$</td> </tr> </tbody> </table>	(a) $ z^2 > z ^2$	(b) $ z^2 = z ^2$	(c) $ z^2 < z ^2$	(d) $ z^2 \geq z ^2$	1
(a) $ z^2 > z ^2$	(b) $ z^2 = z ^2$					
(c) $ z^2 < z ^2$	(d) $ z^2 \geq z ^2$					
12	<p>If $f(z) = \frac{7-z}{1-z^2}$, where $z = 1 + 2i$, then $f(z)$ is :</p> <table border="1" data-bbox="212 1509 1396 1742"> <tbody> <tr> <td data-bbox="212 1509 805 1632">(a) $\frac{ z }{2}$</td> <td data-bbox="805 1509 1396 1632">(b) z</td> </tr> <tr> <td data-bbox="212 1632 805 1742">(c) $2 z$</td> <td data-bbox="805 1632 1396 1742">(d) None of these</td> </tr> </tbody> </table>	(a) $\frac{ z }{2}$	(b) $ z $	(c) $2 z $	(d) None of these	1
(a) $\frac{ z }{2}$	(b) $ z $					
(c) $2 z $	(d) None of these					
13	<p>The solution of equation $x^2 + 6xi - 9 = 0$ is :</p> <table border="1" data-bbox="212 1877 1396 2085"> <tbody> <tr> <td data-bbox="212 1877 805 1989">(a) $x = \pm 3i$</td> <td data-bbox="805 1877 1396 1989">(b) $x = -3i, -3i$</td> </tr> <tr> <td data-bbox="212 1989 805 2085">(c) $x = -i, i$</td> <td data-bbox="805 1989 1396 2085">(d) None of these</td> </tr> </tbody> </table>	(a) $x = \pm 3i$	(b) $x = -3i, -3i$	(c) $x = -i, i$	(d) None of these	1
(a) $x = \pm 3i$	(b) $x = -3i, -3i$					
(c) $x = -i, i$	(d) None of these					

14	<p>If $\tan \theta = \frac{1}{2}$ and $\tan \phi = \frac{1}{3}$ then $\theta + \phi$ equals to :</p> <table border="1" data-bbox="212 246 1396 459"> <tbody> <tr> <td data-bbox="212 246 805 353">(a) $\frac{\pi}{6}$</td> <td data-bbox="805 246 1396 353">(b) π</td> </tr> <tr> <td data-bbox="212 353 805 459">(c) 0</td> <td data-bbox="805 353 1396 459">(d) $\frac{\pi}{4}$</td> </tr> </tbody> </table>	(a) $\frac{\pi}{6}$	(b) π	(c) 0	(d) $\frac{\pi}{4}$	1
(a) $\frac{\pi}{6}$	(b) π					
(c) 0	(d) $\frac{\pi}{4}$					
15	<p>The maximum value of $\sin x \cdot \cos x$ is :</p> <table border="1" data-bbox="212 571 1396 784"> <tbody> <tr> <td data-bbox="212 571 805 654">(a) 1</td> <td data-bbox="805 571 1396 654">(b) 2</td> </tr> <tr> <td data-bbox="212 654 805 784">(c) $\sqrt{2}$</td> <td data-bbox="805 654 1396 784">(d) $\frac{1}{2}$</td> </tr> </tbody> </table>	(a) 1	(b) 2	(c) $\sqrt{2}$	(d) $\frac{1}{2}$	1
(a) 1	(b) 2					
(c) $\sqrt{2}$	(d) $\frac{1}{2}$					
16	<p>If for all values of x, $\cos \theta = x + \frac{1}{x}$ then</p> <table border="1" data-bbox="212 996 1396 1176"> <tbody> <tr> <td data-bbox="212 996 805 1079">(a) θ is an acute angle</td> <td data-bbox="805 996 1396 1079">(b) θ is right angle</td> </tr> <tr> <td data-bbox="212 1079 805 1176">(c) θ is obtuse angle</td> <td data-bbox="805 1079 1396 1176">(d) No value of θ is possible</td> </tr> </tbody> </table>	(a) θ is an acute angle	(b) θ is right angle	(c) θ is obtuse angle	(d) No value of θ is possible	1
(a) θ is an acute angle	(b) θ is right angle					
(c) θ is obtuse angle	(d) No value of θ is possible					
17	<p>The value of $\cos^2 48^\circ - \sin^2 12^\circ$ is :</p> <table border="1" data-bbox="212 1377 1396 1691"> <tbody> <tr> <td data-bbox="212 1377 805 1500">(a) $\sqrt{5} + \frac{1}{8}$</td> <td data-bbox="805 1377 1396 1500">(b) $\sqrt{5} - \frac{1}{8}$</td> </tr> <tr> <td data-bbox="212 1500 805 1691">(c) $\sqrt{5} + \frac{1}{5}$</td> <td data-bbox="805 1500 1396 1691">(d) $\sqrt{5} + \frac{1}{\sqrt{2}}$</td> </tr> </tbody> </table>	(a) $\sqrt{5} + \frac{1}{8}$	(b) $\sqrt{5} - \frac{1}{8}$	(c) $\sqrt{5} + \frac{1}{5}$	(d) $\sqrt{5} + \frac{1}{\sqrt{2}}$	1
(a) $\sqrt{5} + \frac{1}{8}$	(b) $\sqrt{5} - \frac{1}{8}$					
(c) $\sqrt{5} + \frac{1}{5}$	(d) $\sqrt{5} + \frac{1}{\sqrt{2}}$					
18	<p>If $f(x) = p(x) + q$, where p and q are integers ,</p> <p>$f(-1) = 5$, and $f(3) = 3$ then p and q are equal to :</p> <table border="1" data-bbox="212 1960 1396 2116"> <tbody> <tr> <td data-bbox="212 1960 805 2027">(a) $p = -3, q = -1$</td> <td data-bbox="805 1960 1396 2027">(b) $p = 2, q = -3$</td> </tr> <tr> <td data-bbox="212 2027 805 2116">(c) $p = 0, q = -2$</td> <td data-bbox="805 2027 1396 2116">(d) $p = 2, q = 3$</td> </tr> </tbody> </table>	(a) $p = -3, q = -1$	(b) $p = 2, q = -3$	(c) $p = 0, q = -2$	(d) $p = 2, q = 3$	1
(a) $p = -3, q = -1$	(b) $p = 2, q = -3$					
(c) $p = 0, q = -2$	(d) $p = 2, q = 3$					

(ASSERTION-REASONING BASED QUESTIONS)

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.**
- (b) Both A and R are true but R is not the correct explanation of A.**
- (c) A is true but R is false.**
- (d) A is false but R is true.**

19 Given $A = \{a, b, c\}$, $B = \{a, e, i, o, u\}$ and $C = \{x, y, z\}$
Assertion (A) : $(A \cup B) \cap C = \phi$

Reason (R) : $(A \cup B) = \{a, b, c\} \cup \{a, e, i, o, u\} = \{a, b, c, e, i, o, u\}$
 $(A \cup B) \cap C = \{a, b, c, e, i, o, u\} \cap \{x, y, z\} = \phi$

20 **Assertion (A) :** Domain of $f(x) = x|x|$ is \mathbb{R}
Reason (R) : Domain of $f(x) = x|x|$ is \mathbb{N}

Section B

This Section contains 5 Very Short Answer (VSA)-type questions of 2 marks each.

21 If $A = \{1, 2, 3, 4, 5\}$, $B = \{1, 3, 5, 8\}$, $C = \{2, 5, 7, 8\}$ verify that
 $A - (B \cup C) = (A - B) \cap (A - C)$

OR

If $A = \{x : x \in \mathbb{N}\}$, $B = \{x : x = 2n, n \in \mathbb{N}\}$, $C = \{x : x = 2n - 1, n \in \mathbb{N}\}$
 $D = \{x : x \text{ is a prime natural number}\}$
Find (a) $(A \cap B)$ (b) $(B \cap C)$

22 Determine the domain and range of relation R, Where
 $R = (x, x^3) : x \text{ is prime number less than } 10$

OR

Function $f : \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = x^2$ Determine
(a) Range of f
(b) $\{x : f(x) = 4\}$

23 Prove that $\tan(60^\circ + \theta) \cdot \tan(60^\circ - \theta) = \frac{2 \cos(2\theta + 1)}{2 \cos(2\theta - 1)}$

24 Prove that $\sin(n+1)x \cdot \sin(n+2)x + \cos(n+1)x \cdot \cos(n+2)x = \cos x$

25 Find n if $(n+2)! = 2550 \times n!$

OR

How many 3-digit even numbers can be made using the digits 1, 2, 3, 4, 5, 6, if no digit is repeated.

Section C		
This section contains Six Short Answer (SA)-type questions of 3 marks each.		
26	If $A = \{3, 6, 12, 15, 18, 21\}$, $B = \{4, 8, 12, 16, 20\}$, $C = \{2, 4, 6, 8, 10, 12, 14, 16\}$ and $D = \{5, 10, 15, 20\}$ Find (a) $A - B$ (b) $B - C$ (c) $B - D$	3
27	Let $A = \{1, 2, 3, 4, 5, \dots, 20\}$. Define a relation R from A to A by $R = \{(a, b) : a - 2b = 0, a, b \in A\}$. Depict the relation using roster form. Write domain and range of the relation.	3
28	If $\cot x = \frac{5}{12}$, x lies in the second quadrant. Find the values of other five trigonometric functions OR Show that $\left(\frac{1 + \sin \theta}{1 - \sin \theta}\right) = \tan\left(\frac{\pi}{4} + \frac{\theta}{2}\right)$	3
29	If $a + ib = \frac{x^2 + 1}{2x^2 + 1}$ prove that $a^2 + b^2 = \frac{(x^2 + 1)^2}{(2x^2 + 1)^2}$ OR If $z_1 = 3 + i$ and $z_2 = 1 + 4i$ verify that $ z_1 - z_2 \geq z_2 - z_1 $	3
30	Solve the following system of inequality graphically: $2x + y \geq 6$, $3x + 4y \leq 12$ OR IQ of a person is given by the formula, $IQ = \frac{MA}{CA} \times 100$ where MA is the mental age and CA is Chronological age. If $80 \leq IQ \leq 140$ for a group of 12 year old children, find the range of their mental age.	3
31	In how many ways 7 positive and 5 negative signs can be arranged in a row so that no two negative signs occur together?	3
SECTION D		
This section contains four Long Answer (LA)-type questions of 5 marks each.		
32	Find domain and range of real function $f(x) = \sqrt{x^2 - 16}$ OR Let $f = \left\{ \left[x, \frac{x^2}{1+x^2} \right] : x \in \mathbb{R} \right\}$ be function from \mathbb{R} to \mathbb{R} . Determine range of f .	5
33	Prove that $\sin^4 \frac{\pi}{8} + \sin^4 \frac{3\pi}{8} + \sin^4 \frac{5\pi}{8} + \sin^4 \frac{7\pi}{8} = 32$ OR If $\frac{\cos(A - B)}{\cos(A + B)} + \frac{\cos(C + D)}{\cos(C - D)} = 0$, then prove that $\tan A \cdot \tan B \cdot \tan C \cdot \tan D = -1$	5
34	Three balls are drawn from a bag containing 5 red, 4 white, and 3 black balls. Find the number of ways in which this can be done if at least 2 balls are red.	5
35	Solve the inequality $3x + 2y \geq -6$ graphically.	5

SECTION E

Source based/Case based/passage based/integrated units of assessment Questions

36

Myiesha is a class XI th student of a reputed school . She had been anxiously waiting for having a get together with her classmates as she could not be with them for a stretch of year due to Covid 19 and Board Exam of class X th. She invited four of her best friends Koyal ,Ayushi ,Prisha ,and Sanchi to her birthday party on 26th March. After cutting cake , her elder sister Khushali wants to take group photograph of all of them standing in a single row.

4



Based on the information given above answer any four questions

(i) How many distinct photographs can be clicked?

(a) 120

(b) 240

(c) 60

(d) 30

(ii) In how many photographs Myiesha will be standing in the middle?

(a) 12

(b) 24

(c) 36

(d) 60

(iii) In how many of these photographs Myiesha and Sanchi will be standing next to each other?

(a) 120

(b) 24

(c) 48

(d) 60

(iv) In how many photographs Myiesha and Ayushi will not be standing together?

(a) 48

(b) 96

(c) 120

(d) 72

(v) In how many photograph Prisha would not be in the middle?

(a) 24

(b) 48

(c) 96

(d) 120

37

4

Two friends Rahul and Nihal were discussing 'Set' based problems . Nihal asked one question from Rahul .If $A = \{x : x \text{ is a set of letters need to spell 'CATARACT'}\}$ and $B = \{x : x \text{ is a set of letters need to spell 'TRACT'}\}$. Based on information given above answer any four questions asked by Nihal



(I) Which of the following is true?

(a) $A=B$	(b) $A \subset B$
(c) $B \subset A$	(d) None of these

(ii) $A \cup B$ equals to:

(a) None of these	(b) B
(c) $A \cap B$	(d) ϕ

(iii) $A \cap B$ equals to:

(a) A	(b) None of these
(c) $A \cup B$	(d) ϕ

(iv) $B-A$ equals to :

(a) A	(b) B
(c) ϕ	(d) None of these

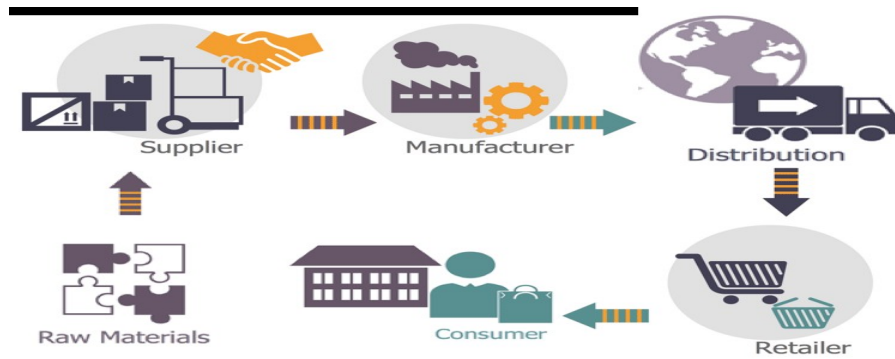
(v) No of proper subset of B are

(a) 13	(b) 14
(c) 15	(d) 16

A company produces certain items : Manager in the company used to make a data record on daily basis about the cost and revenue of those items separately . The cost and revenue function of the product

are given by $C(x)=20X+4000$ and

$R(x) =60x +2000$ respectively where X is the number of Items produced and sold . The company manager has few questions in mind , help him to solve them.



(i) How many items must be sold to realize some profit?

(ii) If the cost and revenue functions of the product are given by

$C(X)=2x+400$, $R(X)=6x+20$ respectively , Where X is the number of items produced by the manufacturer. Calculate the Minimum number of items that the manufacturer must sell to realize some profit .