PRACTICE PAPER (SESSION 2023 – 24)
ANNUAL EXAMINATION
CLASS XI
MATHEMATICS (CODE: 041)

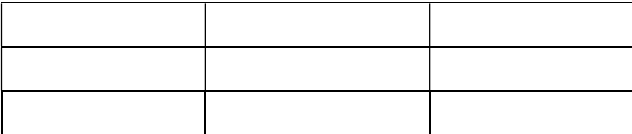**Time Allowed: 3 HOURS**   **Maximum Marks: 80**

General Instructions:

1. This question paper contains **FIVE sections – A, B, C, D & E**. Each part 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.**
3. **Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.**
4. **Section C has 6 Short Answer (SA)-type questions of 3 marks each.**
5. **Section D has 4 Long Answer (LA)-type questions of 5 marks each.**
6. **Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.**

	SECTION – A (Multiple Choice Questions) Each question carries 1 mark Each MCQ has four options with only one correct option, choose the correct option.	
1.	For all sets A & B, $A \cap (A \cup B) =$ $(a)\ A \qquad (b)\ B \qquad (c)\ A \cup B \qquad (d)\ A \cap B$	1
2.	The value of the expression $\dfrac{4\cos^3 10^0 - 3\cos 10^0}{3\sin 20^0 - 4\sin^3 20^0}$ is $(a)\ 1 \qquad (b)\ 0 \qquad (c)\ -1 \qquad (d)\ 2$	1
3.	Range of function $f(x) = \dfrac{x - 2024}{|x - 2024|}$ is $(a)\ R \qquad (b)\ R - \{2024\} \qquad (c)\ \{1\} \qquad (d)\ \{1, -1\}$	1
4.	If $A = \{2023,\ 2024\}$ & $B = \{x : x^2 - |x| = 0, x \in R\}$, then $n(A \times B) =$ $(a)\ 4 \qquad (b)\ 6 \qquad (c)\ 8 \qquad (d)\ 16$	1

5.	If $n(A) = 2$ and $n(B \times B \times B) = 8,$ then $n(A \times B) =$ (a) 2 $\qquad$ (b) 4 $\qquad$ (c) 8 $\qquad$ (d) 16	1
6.	Value of $\dfrac{\cos 3\pi + \sin 2\pi + \tan \pi}{\sec 2\pi}$ is (a) 0 $\qquad$ (b) 1 $\qquad$ (c) -1 $\qquad$ (d) *not* defined	1
7.	If $i + i^2 + i^3 + \ldots\ldots + i^{2024} = a + ib,$ then $a + 2b =$ (a) 1 $\qquad$ (b) 0 $\qquad$ (c) 3 $\qquad$ (d) 2	1
8.	If $-3x + 2 \geq 2 + 3x,$ then $x \in$ (a) $(-\infty, 0)$ $\qquad$ (b) $(0, \infty)$ $\qquad$ (c) $[0, \infty)$ $\qquad$ (d) $(-\infty, 0]$	1
9.	Value of $(^4C_0 + {}^4C_1 + {}^4C_2 + {}^4C_3 + {}^4C_4)$ is (a) 5 $\qquad$ (b) 8 $\qquad$ (c) 16 $\qquad$ (d) 32	1
10.	Number of terms in the expansion of $(2x^2 + 3 + 2\sqrt{6}x)^{10}$ is (a) 10 $\qquad$ (b) 11 $\qquad$ (c) 20 $\qquad$ (d) 21	1
11.	If $L = \lim\limits_{x \to 1} \dfrac{1 - x^2}{x - 1},$ then $L^L =$ (a) -4 $\qquad$ (b) $-\dfrac{1}{4}$ $\qquad$ (c) 4 $\qquad$ (d) $\dfrac{1}{4}$	1
12.	The distance of the point $P\ (1, -1)$ from the line $3x + 4y = 4$ *is* (a) 2 units $\qquad$ (b) 4 units $\qquad$ (c) 1 unit $\qquad$ (d) 3 units	1
13.	Distance (in units) of the point $P(-3, -4, -6)$ from z-axis is (a) 5 $\qquad$ (b) 4 $\qquad$ (c) -6 $\qquad$ (d) 6	1
14.	Value of $\lim\limits_{x \to 0} \dfrac{\sin 2024}{\tan 1012}$ is (a) 1 $\qquad$ (b) 2 $\qquad$ (c) 0 $\qquad$ (d) $\dfrac{1}{2}$	1
15.	Derivative of $(1 - x)(1 + x)(1 + x^2)$ with respect to x is (a) $4x$ $\qquad$ (b) $1 - 8x$ $\qquad$ (c) $1 - 4x^3$ $\qquad$ (d) $-4x^3$	1

16.	Mean deviation of $1, 3, 2, 5, 4$ about mean is	1
	(a) 1 $\quad\quad\quad$ (b) 0.8 $\quad\quad\quad$ (c) 1.2 $\quad\quad\quad$ (d) 1.1	
17.	In a leap year, the probability of having 53 Sundays or 53 Wednesdays is	1
	$(a)\ \dfrac{4}{7}$ $\quad\quad$ $(b)\dfrac{1}{7}$ $\quad\quad$ $(c)\dfrac{2}{7}$ $\quad\quad$ $(d)\dfrac{3}{7}$	
18.	If $P(A \cup B) = P(A \cap B)$ for any two events $A\ and\ B,\ then$	1
	$(a)\ P(A) = P(B)$ $\quad\quad\quad\quad$ $(b)\ P(A) < P(B)$	
	$(c)\ P(A) > P(B)$ $\quad\quad\quad\quad$ $(d)\ P(A) + P(B) = 0$	

ASSERTION-REASON BASED QUESTIONS (Q.19 & Q.20)

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.	$ASSERTION(A)$: If $a < b,\ c < 0$, then $ac > bc$.	1
	$REASONING(R)$: If both sides are multiplied by same negative quantity then inequality is reversed.	
20.		1

Figure (A)

$ASSERTION(A)$: Number of rectangles in figure (A) is 36.

$REASONING(R)$: In order to form a Rectangle we have to select any two of the horizontal line and any two of the vertical lines.

SECTION B
This section comprises of very short answer type-questions (VSA) of 2 marks each

21.	Draw the graph of f(x) = $\begin{cases} \dfrac{x}{|x|}, \text{ when } x \neq 0 \\ 0, \text{ when } x = 0 \end{cases}$. $$OR$$ Find the value of $\tan\left(\dfrac{13\pi}{12}\right)$.	2
22.	Solve for x: $-2 < |4-x| \leq 1$	2
23.	In a class, there are 27 boys and 14 girls. The teacher wants to select 1 boy and 1 girl to represent the class for a function. In how many ways can the teacher make this selection? $$OR$$ In how many ways can 5 children be arranged in a line such that two particular children of them are always together.	2
24.	If the third term of G.P. is 4,then find product of its first 5 terms.	2
25.	If $y = \dfrac{x-1}{x-2}$, then find the value of $\dfrac{dy}{dx}$.	2

SECTION C
(This section comprises of short answer type questions (SA) of 3 marks each)

26.	If $x - iy = \dfrac{2023 + i2024}{2024 - i2023}$, then find the value of $x^2 + y^2$. $$OR$$ Find the Modulus, Conjugate & multiplicative inverse of the complex number $Z = -5 + 12i$.	3

27.	If $A = \{x : x^4 - x = 0, x \in R\}$ & $B = \{x : x^2 + x = 0, x \in R\}$, then verify (a) $(A \cup B)' = A' \cap B'$ (b) $(A \cap B)' = A' \cup B'$	3
28.	Prove that : $\tan 2024x - \tan 2023x - \tan x = \tan 2024x . \tan 2023x . \tan x$ OR If $\tan\left(\dfrac{x}{2}\right) = \dfrac{-3}{4}$, where $x \in (\pi, \dfrac{3\pi}{2})$, then find the value of $\sin 2x$.	3
29.	$Evaluate : L = \lim\limits_{x \to \frac{\pi}{6}} \dfrac{\sqrt{3}\sin x - \cos x}{x - \dfrac{\pi}{6}}$ OR Prove that $\dfrac{d}{dx}[\cos^4\left(\dfrac{x}{2}\right) - \sin^4\left(\dfrac{x}{2}\right)] = -\sin x$	3
30.	Find the equation of the lines which passes through the point $(3, 4)$ and cuts off intercepts from the coordinate axes such that their sum is 14.	3
31.	Find the equation of a circle passing through the point $(7, 3)$ having radius 3 units and whose centre lies on the line $y = x - 1$.	3

<div align="center">

SECTION D
(This section comprises of long answer-type questions (LA) of 5 marks each)

</div>

32.	Find the Mean and Variance for the following Distribution:	5

Class interval	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20
Frequency	4	6	8	5	2

|		
33.	Find the Domain & Range of the following functions: (a) $f(x) = \dfrac{x-1}{x-2}$ (b) $f(x) = \sqrt{25 - x^2}$ OR Prove that: $4\sin x . \sin\left(\dfrac{\pi}{3} - x\right). \sin\left(\dfrac{\pi}{3} + x\right) = \sin 3x$ Hence, find the value of $\sin 20^0 . \sin 40^0 . \sin 80^0$.	5
34.	(a) What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these (i) four cards are of the same suit, (ii) four cards belong to four different suits, (iii) two are red cards and two are black cards, (iv) cards are of the same colour? OR (b) Using Binomial Theorem, Find the Expansion of $(a+b)^4 - (a-b)^4$. Use it to find the value of $(\sqrt{3} + \sqrt{2})^4 - (\sqrt{2} - \sqrt{3})^4$.	5
35.	If a and b are the roots of $x^2 - 3x + p = 0$ and $c,\ d$ are roots of $x^2 - 12x + q = 0$, where $a,\ b,\ c,\ d$ form a G.P. Prove that $(q + p):(q - p) = 17:15$.	1

This section comprises of 3 case-study/passage-based questions of 4 marks each with two sub-parts.

First two case study questions have three sub parts (A), (B) & (C) of marks 1, 1, 2 respectively.
The third case study question has two sub-parts of 2 marks each.

36.	For an EMC Project A team of class XI students Prepared Cubical Boxes for Diwali Mela. One of such box is placed in First Quadrant as shown in the figure below with O is the origin.	4
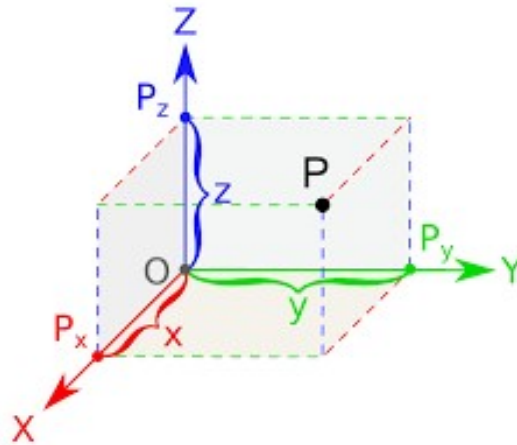
Based on the above information answer the following:

(A) If coordinates of the Point P are (3, 4, 5) then find the distance of Point P From y-axis.   1

(B) If coordinates of the Point P are (5, 12, 13) then find the distance of Point P From xy-plane.   1

(C) Let the coordinates of the Point P & Q are (10, 12, 7) & (7, 8, 12) then find the distance PQ.   2

OR

Let the Point P be (1, 2, 4), then find the coordinate of R which is the Image of point P in x-axis and also find in which octant R do lies.

37.	Manya, a student of class 11, On her Winter vacation, visits four Places (COORG, KERALA, OOTY & SHILLONG) in a random order.	4

Based on the above information answer the following:

(a) What is the probability that she visits COORG before OOTY?   1

(b) What is the probability that she visits KERALA First and OOTY last?   1

(c) What is the probability that she visits SHILLONG before OOTY and   2

OOTY before COORG?

OR

What is the probability that she visits KERALA just before COORG?

38.

4

Students of a Delhi government school are very happy with their newly constructed school Building. One of the students of class 11, Surender is looking at the window of his classroom (B) on ground Floor and window of his Maths Lab (A) on first floor.

Surender observe that angle of elevation from the Ground (D) to B and A are 15^0 & 75^0 respectively. If he is standing at a distance of $10(2+\sqrt{3})$m from the building (CD), then answer the following on the basis of this information:

(a) Find the height of top of the window (from the ground) of his classroom.

(b) Find the height of top of the window (from the ground) of his math-lab.