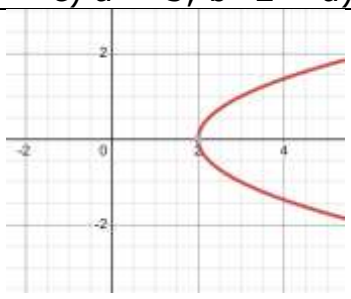
THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

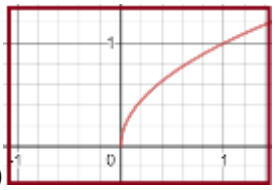
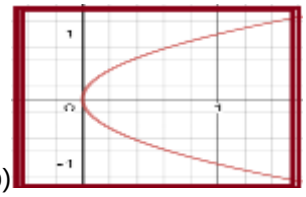
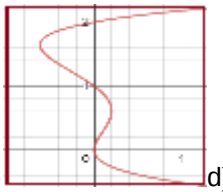
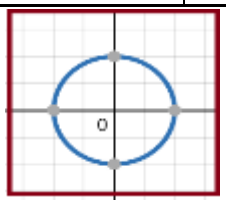
Date: 9/12/23	**SECOND TERM EXAMINATION-2024**	**Max marks: 80**
GRADE: XI	**MATHEMATICS (041)**	**Time: 3 Hours**

General Instructions:

1.This question paper consists of **five sections A, B, C, D and E**. Each section is compulsory.
2.**Section A** comprises of 18 MCQs of one mark each(from Q01-Q18) and Assertion-Reasoning based questions (from Q 19- Q20)
3.**Section B** comprises of 05 Very Short Answer(VSA)-type questions of 2 marks each(from Q21-Q25).
4.**Section C** comprises of 06 Short Answer (SA)-type questions of 3 marks each (from Q26-Q31) .
5.**Section D** comprises of 04 Long Answer (LA)-type questions of 5 marks each (from Q32-Q35)
6.**Section E** comprises of 03 Case-study based questions of 4 marks each (fromQ36- Q38)
7. There is no overall choice. However, internal choice has been provided in some of the questions. You must attempt only one of the alternatives in all such questions.

	SECTION A	
1	If A = {1 , 2 , 3, 4, 5, 6 }, then the number of proper subsets of A is a)12 b) 63 c) 64 d) 120	
2	The values of a and b, if ordered pair (2a-5 , 4) = (5 , b+6) a) a=5, b=-2 b) a=0 , b =2 c) a= -5, b=2 d) a=0 , b = -2	
3	 From the following expressions, choose the correct expression for the above graph. a) $Y = x^2-2$ b) $y^2= x + 2$ c) $y^1= (x + 2)^2$ d) $y^2 = x - 2$	

4	From the following graphs ,choose the graph of a function.	

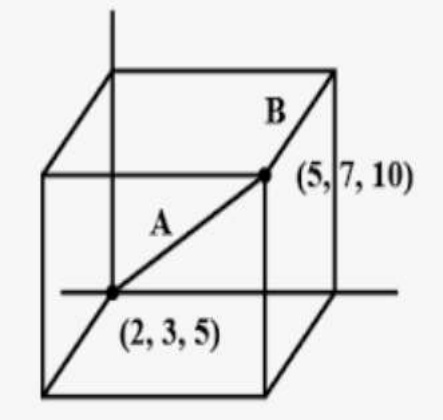
a)  b)  c)  d) 

5	If the distance between the (-1,0,1) and the point (2, y, 5) is $\sqrt{50}$ unit, find y. a) 5 b) -5 c) ± 5 d)± 4	
6	If ${}^{9}P_{5} + 5{}^{9}P_{4} = {}^{10}P_{r}$, find 'r' a) 5! b) 5 c) 9 d) 10	
7	Convert 40° into radian measure. a) $\frac{9\pi}{20}$ b) $\frac{5\pi}{27}$ c) $\frac{4\pi}{9}$ d) $\frac{2\pi}{9}$	
8	Find the value of $i^{2020} + i^{2021} + i^{2022} + i^{2023}$ (a) 0 (b) 1 (c) 2 (d) 3	
9	Find the coordinates of the midpoint of the line segment joining P (4, 2, -6) and Q (10, -16, 6). a) (7,-7,0) b) (14,-14,0) c) (0,0,0) d)(3,-5,6)	
10	Find the number of terms in the expansion in $(1 + 2x + x^2)^{20}$ (a) 20 (b) 40 (c)21 (d) 41	
11	If a is the G.M between 2 and 1/8 , then the value of a is a) 4 b) ½ c) 2 d) 1/4	
12	The slope of line, whose inclination is 60° with the positive direction of x-axis. a) $\frac{1}{\sqrt{3}}$ b) 1 c)$\sqrt{3}$ d) 0	
13	The perpendicular distance of the point P(6, 7, 8) from XY plane is …….. a) 6 b) 7 c) 8. d)$\sqrt{149}$	
14	Probability of solving a specific problem independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If both try to solve the problem independently, find the probability of the problem is solved. a) 1/3 b) 2/3 c) 1/6 d) 5/6	
15	What is the value of $\sec(1410^0)$. a) $\frac{2}{\sqrt{3}}$ b) $\frac{\sqrt{3}}{2}$ c)$-\frac{\sqrt{3}}{2}$ d)$\sqrt{2}$	

16	A box contains 10 red marbles, 20 blue marbles and 30 green marbles.5 marbles are randomly drawn from the box, what is the probability that all will be blue? a) $\frac{^{30}C_5}{^{60}C_5}$ b) $\frac{^{20}C_5}{^{60}C_5}$ c) $\frac{^{10}C_5}{^{60}C_5}$ d) 1 - $\frac{^{20}C_5}{^{60}C_5}$	
17	Write the additive inverse of 2 - 3i a) -2 + 3i b) 2 + 3i c) 2 - 3i d) $\frac{1}{-2+3i}$	
18	If a complex number lies in the third quadrant, then its conjugate lies in the ----------quadrant. a) 1st quadrant b) 2nd quadrant c) 3rd quadrant d) 4th quadrant	
	Following are Assertion-Reasoning based questions (from Q19-Q20): Read the following statements carefully to mark the correct option out of the options given below. (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):** Slope of a straight line is 5, and slope of its perpendicular line is - $\frac{1}{5}$. **Reason (R) :** Product of slopes of a line and its perpendicular line is -1.	
20	**Assertion (A):** Solution set for inequality 5x – 3 < 3x + 1, x ∈ N is {1} **Reason (R) :** In the above expression , x is an integer	
	SECTION B	
21	Let A= {1,2,3,4,5,6,7,8,9}, B= {3,4,5,6,7}, C={4,5,6} and D= {1,3,5,7} and U = {1,2,3,4……..10} Find A ∩ $(B \cup C)'$ - D	2
22	How many words, with or without meaning, each of 3 vowels and 2 consonants can be formed from the letters of the word" INVOLUTE"? OR In how many of the distinct permutations of the letters in MISSISSIPPI do the four I's not come together?	2

23	Let A= {1,2,3….14}. Define a relation R from A to A by R= {(x, y) : 3x-2y =28,where x ,y ∈ A }.Write its domain, codomain and Range *OR* Let f = $\left\{\left(x, \frac{x^2}{1+x^2}\right) : x \in R\right\}$ be a function from R into R. Determine the range of f.	2
24	Solve the system of inequalities: 5(2x-7) – 3(2x+3) ≤ 0 , 2x +19 ≤6x + 47, and represent the solutions on the number line.	2
25	A man wants to cut three lengths from a single tree of length 91 feet. The second length is to be 3 feet longer than the shortest and third length is to be twice as long as the shortest. What are the possible lengths for the shortest piece if third piece is to be at least 5 feet longer than the second?	2
	SECTION C	
26	Prove that $\frac{\sin 3x+\sin 5x+\sin 7x+\sin 9x}{\cos 3x+\cos 5x+\cos 7x+\cos 9x} = \tan 6x$ OR Prove that $Cos^2x + Cos^2\left(x+\pi/3\right)+Cos^2\left(x-\pi/3\right)=\frac{3}{2}$	3
27	If $x+iy=\sqrt{\frac{a+ib}{c+id}}$ prove that $(x^2+y^2)^2=\frac{a^2+b^2}{c^2+d^2}$ OR If $(x + iy)^{1/3} = a + ib$, prove that $\frac{x}{a}+\frac{y}{b}=4(a^2-b^2)$	3
28	How many words can be formed from the letters of the word 'DAUGHTER' so that, 1) The vowels always come together 2) The vowels never come together.	3
29	Expand $\left(\frac{x}{3}+9y\right)^5$ by using binomial theorem.	3
30	The sum of first three terms of a G.P is 39/10 and their product is 1. Find the common ratio and the terms. OR Find the sum of the following series up to n terms: $5 + 55 + 555 + \cdots$	3

31	The sum of the second and third terms of a G.P. is 280 and the sum of the 5^{th} and 6^{th} terms is 4375. Find the 4^{th} term of G.P.	3
	SECTION D	
32	Find the 13^{th} term in the expansion of $\left(9x-\frac{1}{3\sqrt{x}}\right)^{18}$, $where\, x \neq 0.$	5
33	A school awarded 42 medals in hockey,18 in basket ball and 23 in cricket.If these medals were bagged by a total of 65 students and only 4 students got medals in all the three sports, a) How many students received medals in exactly two of the three sports? b) How many students received medals in exactly one of the three sports? OR The following information was observed during a survey of 100 television viewers:- 18 watch programme P only,23 watch programme P but not Q, 8 watch programme P and R, 26 watch programme P,48 watch programme R.8 watch programme Q and R ,14 watch none of these programmes .Find the number of people who watch a) exactly two programmes b) Only one programme c) only Q d) At least one programme.	2 1 1 1
34	Find the image of the point (3, 8) with respect to the line x + 3y = 7, assuming the line to be a plane mirror.	5
35	Prove that $\frac{cos2x\, sinx+cos6xsin3x}{sin2xsinx+sin6xsin3x}$ = cot5x OR 1f tanx = ¾ and $\pi < x < \frac{3\pi}{2}$, find the values of $\sin\frac{x}{2}$, $\cos\frac{x}{2}$ and $\tan\frac{x}{2}$	5

	SECTION E	
36.	An urn contain twenty white slips of paper numbered from 1 through 20, ten red slips of paper numbered from 1 through 10, forty yellow slips of paper numbered from 1 through 40 and ten blue slips of paper numbered from 1 through 10. These 80 slips of paper are thoroughly shuffled so that each slip has the equal chance of begin drawn. A slip is drawn random from the urn. Based on the above information , answer the following questions: (i) What is the probability that slip drawn is blue or white? (ii) What is the probability that slip drawn is numbered 1,2,3,4 or 5? (iii) What is the probability that slip drawn is red or yellow and numbered 1,2,3 or 4? (iv) What is the probability that slip drawn is numbered 5,15,25 or 35?	4
37	Two friends Swati and KOMAL are playing cards. Swati asks Komal to choose any four cards from a pack of 52 cards. Based on it answer the following: (i) In how many ways can Komal select 4 cards from same suite and she select all 4 cards from different suites? (ii) In how many ways can she select all face cards?	 2 2
38.	If a cuboid is formed by planes drawn through the points A(2, 3, 5) and B(5, 7, 10) parallel to the coordinate planes.  a) Find the length of the diagonal AB b) Find the length of sides of the cuboid	 1 3

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