

**Vikas Bharati Public School**  
**Final Terminal Examination**  
**Class: XI (Sample Paper)**  
**Subject: Mathematics**

**Time : 3 Hrs.**

**M.M:100**

**Note: 1. This question paper contains 4 printed pages**

**2. General Instructions**

- i) All questions are compulsory.
- ii) The question paper consists of 29 questions divided into four sections A, B, C and D. Section A comprises of 4 questions of 1 mark each, Section B comprises of 8 questions of 2 marks each, Section C comprises of 11 questions of 4 marks each and section D comprises of 6 questions of 6 marks each.
- iii) Use of calculator is not permitted.

**Section A**

1.		Find the principal and general solution of $\cot x = -\sqrt{3}$	1
2.		Find the angle in radian through which a pendulum swings and its length is 75cm and tip describes an arc of length 21 cm.	1
3.		Find the domain of $f(x) = \sqrt{16 - x^2}$ .	1
4.		A single letter is selected at random from the word 'PROBABILITY', then find the probability that it is a vowel.	1

**Section B**

5.		Find the Foci, vertices and eccentricity of the given ellipse $16x^2 + y^2 = 16$ .	2
6.		Define greatest integer function. Draw its graph and write domain and range.	2
7.		In any $\Delta ABC$ , prove that $a \sin(B - C) + b \sin(C - A) + c \sin(A - B) = 0$ .	2
8.		Find the equation of the line passing through (-3, 5) and perpendicular to the line through the points (2, 5) and (-3, 6).	2
9.		Write contrapositive and converse of the following statement. Something is cold implies that it has low temperature	2
10.		If $\frac{a+bx}{a-bx} = \frac{b+cx}{b-cx} = \frac{c+dx}{c-dx}$ ( $x \neq 0$ ), then show that a, b, c, d are in G.P.	2
11.		Prove that $\tan 3A - \tan 2A - \tan A = \tan 3A \tan 2A \tan A$ .	2
12.	a)	How many 6 digit numbers can be formed from the digits 0, 1, 3, 5, 7 and 9 which are divisible by 10 and no digit is repeated?	1
	b)	Find the no. of permutations of the letters of the word 'Allahabad'?	1

**Section C**

13.		Prove that $\cos 5A = 16\cos^5 A - 20\cos^3 A + 5\cos A$ .	4
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14.		Find the value of $(a^2 + \sqrt{a^2 - 1})^4 + (a^2 - \sqrt{a^2 - 1})^4$	4
15.		Prove the following statement by using the principle of mathematical induction for all $n \in N, p(n): a + ar + ar^2 + \dots + ar^{n-1} = \frac{a(r^n - 1)}{r - 1}$ .	4
16.	a)	Express $(\sqrt{6} + 5i)(\sqrt{6} - \frac{1}{5}i)$ in the form of $a + ib$ .	2
	b)	Convert the complex number $-\sqrt{3} - i$ into polar form.	2
17.		Find the sum to n terms of the series: $5 + 11 + 19 + 29 + 41 + \dots$	4
18.		Find the equation of the straight line which passes through the point (1, -4) and the point of intersection of the lines. $x + y - 3 = 0$ and $2x - y - 7 = 0$	4
19.		The cable of uniformly loaded suspension bridge hangs in the form of a parabola. The roadway which is horizontal and 100m long is supported by vertical wires attached to the cable, the longest wire being 30m and the shortest being 6m. Find the length of a supporting wire attached to the roadway 18m from the middle.	4
20.	a)	Find the ratio in which YZ - plane divides the line segment formed by joining the points (-2, 4, 7) and (3, -5, 8). Also find the coordinates of that point in YZ plane.	2
	b)	If A(3, 2, 0), B(5, 3, 2) and C(-9, 6, -3) are three points forming a triangle. AD the bisector of $\angle BAC$ meets BC at D. Find the co-ordinates of D.	2
21.		If $f(x) = \begin{cases}  x  + 1, & x < 0 \\ 0, & x = 0 \\  x  - 1 & x > 0 \end{cases}$ , for what value(s) of a does $\lim_{x \rightarrow a} f(x)$ exist?	4
22.	a)	The probability that atleast one of the events A and B occurs is 0.6. if A and B occur simultaneously with probability 0.2, then find $P(\overline{A}) + P(\overline{B})$ .	1
	b)	Out of 100 students two sections of 40 and 60 are formed. If you and your friend are among the 100 students. What is the probability that	3
	i)	You both enter the same section.	
	ii)	You both enter the different section.	
23.	a)	Two students Ravi and Sonu appeared in an examination. The probability that Ravi will qualify the examination is 0.05 and that sonu will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that	4
	i)	Both Ravi and Sonu will not qualify the examination.	

ii) Atleast one of them will not qualify the examination and

iii) Only one of them will qualify the examination.

**Section D**

24. In a survey twice as many people said they read both the sport and TV pages but not the headlines, as read the TV page only. Four more people read the headline only as the sport only. 12 people read the TV pages only. 2 more people read the headlines only as read both the headlines and TV pages but not the sports. One more person reads both the headlines and the sport as read all 3, 66 people do not reads the headlines, and 112 do not read the TV pages. 34 people read the headlines only. How many people read all three sections? What is importance of reading newspaper. **6**

25. a) Solve the given inequality and represent the solution on number line  $\frac{2x-3}{4} + 9 \geq 3 + \frac{4x}{3}$  **2**

b) A manufacturer has 600 L of a 12% solution of acid. How many liters of a 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%. **4**

26. a) The mean and S.D of 100 observations were calculated as 40 and 5.1, respectively by a student who took by mistake 50 instead of 40 for one observation. What are the correct mean and standard deviation? **4**

b) Find the mean deviation about the mean for the given data **2**

$x_i$	5	10	15	20	25
$f_i$	7	4	6	3	5

27. a) Find the derivative of  $f(x) = x \sin x$  from the first principle. **3**

b) Find the derivative of following funtions: **3**

i) 
$$f(x) = \frac{x^2 + \cot x}{\sin^n x}$$

ii) 
$$f(x) = 2^x \cdot e^x$$

28. a) Find the number of words with or without meaning which can be made using all the letters of word AGAIN. If these words are written as in a dictionary. What will be the 50<sup>th</sup> word. **3**

b) Find the image of the point (3, 8) w.r.t the line  $x + 3y = 7$ , assuming the line to be a plane mirror. **3**

29. a) A tree stands vertically on a hill side which makes an angle of  $15^\circ$  with the horizontal. From a point on the ground 35m down the hill from the base of the tree, **3**

the angle of elevation of the top of the tree is  $60^\circ$ . Find the height of the tree.

b)

Prove that

$$\cos \frac{2\pi}{15} \cdot \cos \frac{4\pi}{15} \cdot \cos \frac{8\pi}{15} \cdot \cos \frac{16\pi}{15} = \frac{1}{16}$$

OR

Prove that  $\sqrt{2 + \sqrt{2 + \sqrt{2 + 2\cos 8\phi}}} = 2 \cos \phi$ .

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