



## DELHI PUBLIC SCHOOL SURAT

## MATHEMATICS

Roll No: 

Class: XI

Marks: 100

Time Allowed: 3Hrs

**Instructions:**

- (i) All questions are compulsory.
- (ii) This question paper contains **29** questions.
- (iii) Question **1- 4** in **Section A** are very short-answer type questions carrying **1** mark each.
- (iv) Question **5-12** in **Section B** are short-answer type questions carrying **2** marks each.
- (v) Question **13-23** in **Section C** are long-answer-I type questions carrying **4** marks each.
- (vi) Question **24-29** in **Section D** are long-answer-II type questions carrying **6** marks each.
- (vii) This question paper contains 4 pages .

**SECTION – A**

1. If  $\left(\frac{x}{3} + 1, y - \frac{2}{3}\right) = \left(\frac{5}{3}, \frac{1}{3}\right)$ , find the values of x and y.
2. Express the following in the form a+ib :  
 $3(7 + 7i) + i(7 + 7i)$ .
3. Find the coordinates of the focus and length of the latus rectum of the parabola  $x^2 = - 16y$
4. Write the converse of the statement : If a number is divisible by 10 , it is divisible by 5 .

**SECTION – B**

5. Let  $U = \{1,2,3,4,5,6\}$  ,  $A = \{2,3\}$  and  $B = \{3,4,5\}$  . Show that  $(A \cup B)' = A' \cap B'$  .
6. Prove that :  $\frac{\cos(\pi+x)\cos(-x)}{\sin(\pi-x)\cos\left(\frac{\pi}{2}+x\right)} = \cot^2 x$  .
7. Find r , if  $5^4 P_r = 6^5 P_{r-1}$  .

8. Which term of the G.P.  $2, 1, \frac{1}{2}, \frac{1}{4}, \dots$  is  $\frac{1}{128}$  ?

9. Find the mean deviation about median for the following data:

3, 9, 5, 3, 12, 10, 18, 4, 7, 19, 21

10. A fair coin with 1 marked on one face and 6 on the other and a fair die are both tossed, find the probability that the sum of numbers that turn up is

- i) 3
- ii) 12.

11. Three dice are thrown simultaneously. Find the probability that:

- i) all of them show the same face
- ii) all show distinct faces.

12. i) Find the component statements of the following compound statement.

All rational numbers are real and all real numbers are complex.

- ii) Write the negation of statement : The sum of 4 and 7 is 11.

### SECTION – C

13. There are 40 students in a chemistry class and 60 students in a physics class. Find the number of students which are either in physics class or chemistry class in the following cases :

- i) the two classes meet at the same hour.
- ii) the two classes meet at the same hours and 20 students are enrolled in both the subjects.

14. i) A market research group conducted a survey of 1000 consumers and reported that 720 consumers like product A and 450 consumers like product B, what is the least number that must have liked both products ?

- ii) If  $A = \{x: x = 2n, n \in Z\}$  and  $B = \{x: x = 3n, n \in Z\}$  then find  $A \cap B$

15. i) Find the domain and the range of the real function  $f$  defined by :  $f(x) = \sqrt{x-1}$ .

- ii) If  $f(x) = x^2$ , find  $\frac{f(1.1)-f(1)}{(1.1-1)}$

16. Using the principle of mathematical induction prove that

$$1 \cdot 3 + 2 \cdot 3^2 + 3 \cdot 3^3 + \dots + n \cdot 3^n = \frac{(2n-1)3^{n+1} + 3}{4} \text{ for all } n \in \mathbb{N}.$$

**OR**

Using the principle of mathematical induction prove that

$(10^{2n-1} + 1)$  is divisible by 11 for all  $n \in \mathbb{N}$ .

17. Solve the following quadratic equation :

$$x^2 - (3\sqrt{2} - 2i)x - 6\sqrt{2}i = 0.$$

18. Find the number of arrangements of the letters of the word INDEPENDENCE . In how many of these arrangements,

- i) do all words start with P
- ii) do all the vowels always occur together
- iii) do all the vowels never occur together

**OR**

There are 10 points in a plane , no three of which are in the same straight line , excepting 4 points , which are collinear . Find the (i) number of straight lines obtained from the pairs of these points (ii) number of triangles that can be formed with the vertices as these points.

19. Find the middle terms in the expansion of  $\left(3x - \frac{x^3}{6}\right)^7$  .

20. The sum of the first four terms of an A. P. is 56 . The sum of the last four terms is 112 . If its first term is 11 , then find the number of terms .

21. Prove that A(4, 3) , B(6, 4) , C (5, 6) and D (3, 5) are the vertices of a square .

**OR**

A line passing through the point A(3,0) makes  $30^\circ$  angle with the positive direction of x – axis . If this line is rotated through an angle of  $15^\circ$  in clockwise direction , find its equation in new position .

22. Find the equation of the circle whose radius is 5 and touches the circle  $x^2 + y^2 - 2x - 4y - 20 = 0$  externally at the point ( 5, 5) .

23. Find the coordinates of the points which trisect the line segment joining the points P (4, 2, -6) and Q (10, -16, 6) .

### **SECTION – D**

24. If  $\sin A = \frac{3}{5}$  , where  $0^\circ < A < 90^\circ$  , find the values of  $\sin 2A$  ,  $\cos 2A$  ,  $\tan 2A$  and  $\sin 4A$  .

25. i) Prove that :  $(\cos A + \cos B)^2 + (\sin A - \sin B)^2 = 4 \cos^2 \left(\frac{A+B}{2}\right)$  .

ii) Solve :  $\sec^2 2x = 1 - \tan 2x$  .

26. Exhibit graphically the solution set of the linear inequations

$$x + y \leq 5, 4x + y \geq 4, x + 5y \geq 5, x \leq 4, y \leq 3 .$$

27. Show that  $\frac{1 \times 2^2 + 2 \times 3^2 + \dots + n \times (n+1)^2}{1^2 \times 2 + 2^2 \times 3 + \dots + n^2 \times (n+1)} = \frac{3n+5}{3n+1}$

28. i) Compute the derivate of  $\tan x$  using first principle of derivative .

ii) Differentiate the following w.r.t  $x$  :  $y = \frac{x+\sin x}{x+\cos x}$  .

**OR**

i) Evaluate the following limits:

$$\lim_{x \rightarrow 0} \frac{\sec 4x - \sec 2x}{\sec 3x - \sec x}$$

ii) Differentiate the following w.r.t  $x$  :  $y = \frac{\sec x + 1}{\sec x - 1}$

29. The mean of 5 observations is 4.4 and their variance is 8.24 . If three of the observations are 1, 2 and 6 , find the other two observations .

**OR**

Calculate the mean , variance and standard deviation using step – deviation method ( taking assumed mean as 55 ) for the following distribution :

Marks :	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of students :	3	6	13	15	14	5	4

**END OF EXAMINATION**