



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 $A \times B = \{(a, x), (a, y), (b, x), (b, y)\}$. Find A and B.
2. Express $(5 - 3i)^3$ in the form $a + ib$.
3. Find the centre and the radius of the circle $x^2 + y^2 + 8x + 10y - 8 = 0$.
4. Write the negation of the statement : All triangles are not equilateral triangle.

SECTION – B

5. Draw appropriate Venn diagram for (i) $A' \cap B'$, (ii) $(A \cap B)'$.
6. Prove that : $3 \sin \frac{\pi}{6} \sec \frac{\pi}{3} - 4 \sin \frac{5\pi}{6} \cot \frac{\pi}{4} = 1$.
7. 7 candidates are to be examined, 2 in Mathematics and the remaining in different subjects. In how many ways can they be seated in a row so that the two examinees in Mathematics may not sit together?
8. Find the 12th term of a G.P. whose 8th term is 192 and the common ratio is 2.
9. Write the contrapositive and converse of the statement : x is an even number implies that x is divisible by 4.

10. Coefficient of variation of two distributions are 60 and 70, and their standard deviations are 21 and 16, respectively. What are their arithmetic means.
11. What is the chance that a leap year selected at random will contain 53 Mondays?
12. A bag contains 4 red, 6 blue and 8 green balls. Two balls are drawn at random. Find the probability that the balls drawn are blue.

SECTION – C

13. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$ and $C = \{3, 4, 5, 6\}$. Find
 (i) $(A \cap C)'$ (ii) $(A \cup B)'$ (iii) $(A')'$ (iv) $(B - C)'$.
14. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find : (i) the number of people who read at least one of the newspapers.
 (ii) the number of people who read exactly one newspaper.
15. If f and g are two functions defined by $f(x) = \sqrt{x+1}$, $g(x) = \frac{1}{x}$, describe the following functions:
 (i) $f + g$ (ii) $\frac{g}{f}$ (iii) $2f - 3g$ (iv) $2f^2 + \sqrt{2}g$.
16. By PMI prove that for all natural numbers n , $a^{2n-1} - 1$ is divisible by $a - 1$.
17. Convert the complex number $\frac{-16}{1+i\sqrt{3}}$ into polar form.
18. Eighteen guests have to be seated, half on each side of a long table. Four particular guests desire to sit on one particular side and three others on the other side. Determine the number of ways in which sitting arrangement can be made.
19. The sum of the coefficients of the first three terms in the expansion of $\left(x - \frac{3}{x^2}\right)^m$, $x \neq 0$, m being a natural number, is 559. Find the term of the expansion containing x^3 .

OR

The second, third and fourth terms in the binomial expansion $(x + a)^n$ are 240, 720 and 1080 respectively. Find a , x and n .

20. The sums of n terms of two arithmetic progressions are in the ratio $5n + 4 : 9n + 6$. Find the ratio of their 18th terms.
21. Find the image of the point (3, 8) with respect to the line $x + 3y = 7$ assuming the line to be a plane mirror.

OR

Two lines passing through the point (2, 3) intersects each other at an angle of 60° . If slope of one line is 2, find equation of the other line.

22. A beam is supported at its ends by supports which are 12 metres apart. Since the load is concentrated at its centre, there is a deflection of 3 cm at the centre and the deflected beam is in the shape of a parabola. How far from the centre is the deflection 1 cm?

OR

Find the equation of the hyperbola satisfying the given conditions:

Foci $(\pm 4, 0)$, the latus rectum is of length 12.

23. (i) Find the equation of set of points P such that $PA^2 + PB^2 = 2k^2$, where A and B are the points (3, 4, 5) and (-1, 3, -7), respectively.
 (ii) Find the ratio in which the line segment joining the points (4, 8, 10) and (6, 10, -8) is divided by the YZ-plane.

SECTION – D

24. Solve the equation $2(\cos x + \cos 2x) + \sin 2x (1 + 2 \cos x) = 2 \sin x$.

OR

Prove that $\left(1 + \cos \frac{\pi}{8}\right) \left(1 + \cos \frac{3\pi}{8}\right) \left(1 + \cos \frac{5\pi}{8}\right) \left(1 + \cos \frac{7\pi}{8}\right) = \frac{1}{8}$.

25. (i) Prove that $\cot 4x (\sin 5x + \sin 3x) = \cot x (\sin 5x - \sin 3x)$
 (ii) If $\sin x = 3/5$, $\cos y = (-12/13)$, where x and y both lie in second quadrant, find the value of $\sin (x + y)$.

26. Find graphically the solution set of the linear inequations:

$$x + y \leq 8, x + y \geq 4, x \leq 5, y \leq 5, x \geq 0, y \geq 0.$$

27. (i) Find the sum to n terms of the series : $.6 + .66 + .666 + \dots$
 (ii) The sum of the first four terms of an A.P. is 56. The sum of the last four terms is 112. If the first term is 11, then find the number of terms.

28. (i) Evaluate : $\lim_{x \rightarrow 0} \frac{x^3 \cot x}{1 - \cos x}$.

(ii) Find the derivative of $\frac{x^5 - \cos x}{\sin x}$

OR

(i) Find the derivative of $\tan x$ from first principle.

(ii) Find $\lim_{x \rightarrow 1} f(x)$ and $\lim_{x \rightarrow 0} f(x)$, where $f(x) = \begin{cases} 2x + 3 & x \leq 0 \\ 3(x + 1) & x > 0 \end{cases}$.

29. The mean and standard deviation of 20 observations are found to be 10 and 2, respectively. On rechecking, it was found that an observation 8 was incorrect. Calculate the correct mean and standard deviation in each of the following cases :

- (i) If wrong item is omitted. (ii) If it is replaced by 12.

OR

Classes	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Frequency	3	7	12	15	8	3	2

Calculate
mean,
Variance

and Standard Deviation for the following distribution by short-cut method (or step deviation method taking assumed mean as 65):

END OF EXAMINATION