CBSE Board
Class XI Mathematics
Sample Paper – 8

Time: 3 hrs   **Total Marks: 100**

General Instructions:
1. All questions are compulsory.
2. The question paper consist of 29 questions.
3. Questions 1 – 4 in Section A are very short answer type questions carrying 1 mark each.
4. Questions 5 – 12 in Section B are short-answer type questions carrying 2 mark each.
5. Questions 13 – 23 in Section C are long-answer I type questions carrying 4 mark each.
6. Questions 24 – 29 in Section D are long-answer type II questions carrying 6 mark each.

SECTION – A

1. Find $\lim\limits_{x \to \frac{1}{2}} \dfrac{4x^2 - 1}{2x - 1}$.

2. Write the negation of the statement: The number 2 is greater than 7.

3. Find the value of $\dfrac{-1}{i}$.

OR

Find modulus of 1 – 3i.

4. If variance of a distribution is 4 then find standard deviation of the distribution.

SECTION – B

5. If A = {a, b, c, d}, B = {f, b, d, g} and n(A ∪ B) = total number of elements = 8 then find n(A' ∪ B').

6. Let f : R → R be a function given by f(x) = x² + 1, find : f⁻¹ (-5).

OR

If f(x) = $\dfrac{x - 1}{x + 1}$ then show that f(1/x) = -f(x).

7. Find the radian measures corresponding to the 5° 37' 30''.

OR

Find the length of an arc of a circle of radius 5 cm subtending a central angle measuring 15°.

8. If A = {1, 4}, B = {2, 3, 6} and C = {2, 3, 7} verify that A × (B – C) = A × B – A × C

9. Solve $\sin^2 x + \sin x - 2 = 0$ where $0° < \theta < 360°$

OR

Prove that $\tan\left(\dfrac{\pi}{4}+\dfrac{\theta}{2}\right)+\tan\left(\dfrac{\pi}{4}-\dfrac{\theta}{2}\right)=2\sec\theta$

10. Given below are two statements :
    p: 25 is a multiple of 5
    q: 25 is a multiple of 8
    Write the compound statement connecting these two statements with "OR" and check its validity.

11. Find the domain for which the functions $f(x) = 2x^2 - 1$ and $g(x) = 1 - 3x$ are equal.

12. In what ratio the line joining (-1, 1) and (5, 7) is divided by the line x + y = 4.

SECTION – C

13. Prove that $\dfrac{\sec 8\theta - 1}{\sec 4\theta - 1} = \dfrac{\tan 8\theta}{\tan 2\theta}$

14. Which of the following relations are functions?
    1. A is the capital of b where b $\in$ B and B is the set of all countries, a $\in$ A and A is the set of capital cities of countries.
    2. y < x + 3
    3. y is a Maths pupil of x, where x represents any Maths teacher in a school.
    4. y = 3x + 2

15. Let A be the set of first ten natural numbers and let R be a relation on A defined by $(x, y) \in R \Leftrightarrow x + 2y = 10$ i. e. R = {(x, y) : x $\in$ A, y $\in$ A and x + 2y = 10} Express R and R^{-1} as sets of ordered pairs. Also determine domains of R and R^{-1} and ranges of R and R^{-1}.

16. If $\log_{10} 2$, $\log_{10} (2^x - 1)$ and $\log_{10} (2^x + 3)$ are in A. P. then find the value of x.

17. If 1, ω, ω^2 are the cube roots of unity, prove that
    $(1 + \omega)^3 - (1 + \omega^2)^3 = 0$ and $(x - y)(x\omega - y)(x\omega^2 - y) = x^3 - y^3$

18. An integer is chosen at random from the first two hundred positive integers. What is the probability that the integer chosen is divisible by 6 or 8?

19. Evaluate $0.23\overline{45}$

20. Determine the number of natural numbers smaller than 10^4, in the decimal notation of which all the digits are distinct.

OR

Find the sum of all the numbers that can be formed with the digits 2, 3, 4, 5 taken all at a time.

21. Find the equation of the locus of all points such that the difference of their distances from (4, 0) and (-4, 0) is always equal to 2.

OR

Find the lengths of the transverse and conjugate axes, co-ordinates of the foci, vertices and eccentricity for the hyperbola $9x^2 - 16y^2 = 144$

22. Evaluate the derivative of the following function at indicated points :
$\dfrac{1-\sin x}{1+\cos x}$ at $x = \dfrac{\pi}{2}$

OR

If y = $1 + \dfrac{x}{1!} + \dfrac{x^2}{2!} + \dfrac{x^3}{3!} + ...$ show that $\dfrac{dy}{dx} = y$

23. Find the vertex, focus and directrix of the parabola $4y^2 + 12x - 12y + 39 = 0$.

SECTION – D

24. Prove that $\sin 10° \sin 30° \sin 50° \sin 70° = 1/16$

OR

Prove that $\cos A \cos(60° - A) \cos(60° + A) = \dfrac{1}{4}\cos 3A$

25. For a group of 200 candidates the mean and S. D. were found to be 40 and 15 respectively. Later on it was found that the score 43 was misread as 34. Find the correct mean and correct S. D.

26. If $\tan\left(\dfrac{\pi}{4} + \dfrac{\theta}{2}\right) = \tan^3\left(\dfrac{\pi}{4} + \dfrac{\alpha}{2}\right)$ prove that $\sin\theta = \dfrac{3\sin\alpha + \sin^3\alpha}{1 + 3\sin^2\alpha}$

27. Solve the following system of inequalities graphically:

$x + 2y \le 10$; $x + y \ge 1$; $x - y \le 0$; $x \ge 0$; $y \ge 0$

OR

For the purpose of an experiment an acid solution between 4% and 6% is required. 640 liters of 8% acid solution and a 2% acid solution are available in a laboratory. How many liters of the 2% solution needs to be added to the 8% solution?

28. Show by mathematical induction that the sum to n terms of the series

$1^2 + 2 \times 2^2 + 3^2 + 2 \times 4^2 + 5^2 + 2 \times 6^2 + ...$ is

$$S_n = \begin{cases} \dfrac{n(n+1)^2}{2}, & \text{when n is even} \\ \dfrac{n^2(n+1)}{2}, & \text{when n is odd} \end{cases}$$

29. A student wants to buy a computer for Rs. 12,000. He has saved up to Rs. 6000 which he pays as cash. He is to pay the balance in annual installments of Rs. 500 plus an interest of 12% on the unpaid amount. How much will the computer cost him?

OR

Find the value of $\dfrac{1 \times 2^2 + 2 \times 3^2 + 3 \times 4^2 + ...\text{uptill the nth term}}{1^2 \times 2 + 2^2 \times 3 + 3^2 \times 4 + ...\text{uptill the nth term}}$.