CBSE Board
Class XI Mathematics
Sample Paper – 1

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 the derivative of sin(x + 1).

2. Find the truth value of p: 'Every real number is either prime or composite.'

3. Simplify: $\dfrac{1+3i}{1-2i}$

OR

Show that $i^n + i^{n+1} + i^{n+2} + i^{n+3} = 0$, for all $i \in$ N.

4. A coin is tossed twice. Find the probability of getting at least one head.

SECTION – B

5. A and B are two sets such that n(A − B) = 14 + x , n(B − A) = 3x and n(A $\cap$ B) = x, draw a Venn diagram to illustrate the information. If n(A) = n(B) , then find the value of x .

6. If the power sets of two sets are equal, then show that the sets are also equal.

OR

If a $\in$ N such that aN = {ax : x $\in$ N}. Describe the set 3N ∩ 7N?

7. There are 11 teachers who teach mathematics or physics in school. Of these, 7 teach mathematics and 3 teach both subjects. How may teach physics?

OR

Let A and B be two sets such that : n(A) = 20, n(A ∪ B) = 42 and n(A ∩ B) = 4. Find n(B) and n(A – B).

8. Let A = {1, 2} and B = {3, 4}. Write A × B. How many subsets will A × B have? Also list them

9. Prove that: $\left(\dfrac{\cos A}{1-\tan A}\right) + \left(\dfrac{\sin A}{1-\cot A}\right) = \cos A + \sin A$

OR

Prove that $\cot^4 \theta + \cot^2 \theta = \operatorname{cosec}^4 \theta - \operatorname{cosec}^2 \theta$

10. Write contrapositive of the following statements :
    1. A number is divisible by 9, then it is divisible by 3.
    2. If you are born in India, then you are citizen of India.

11. Find sum : $10^3 + 11^3 + 12^3 + \ldots + 20^3$

12. Three consecutive vertices of a parallelogram ABCD are A (4, -11), B (5, 3) & C (2, 15). Find D.

SECTION – C

13. If f and g are two functions: R → R; f(x) = 2x – 1, g(x) = 2x + 3, then evaluate

    $(i)(f+g)(x)$ $(ii)(f-g)(x)$ $(iii)(fg)(x)$ $(iv)\left(\dfrac{f}{g}\right)(x)$

14. Let R be a relation from N to N defined by R = {(a, b) ∈ N and a = b⁴ }. Determine if the relation is
    (i) Reflexive   (ii) Symmetric (iii) Transitive (iv) Equivalence

15. In a ΔABC, if a = 3, b = 5, c = 7, find cosA, cosB and cosC.

16. Find the square root of the complex number 5 − 12i.

17. Find the probability such that when 7 cards are drawn from a well shuffled deck of 52 cards, all the aces are obtained.

18. Find the sum to infinity of the series: $\dfrac{1}{3} + \dfrac{1}{5^2} + \dfrac{1}{3^3} + \dfrac{1}{5^4} + \dfrac{1}{3^5} + \dfrac{1}{5^6} + \ldots$

19. In how many ways can the letters of the word 'Mathematics' be arranged so that the (i) vowels are together (ii) vowels are not together

OR

In how many ways can 5 girls and 3 boys be seated in a row with 11 chairs so that no two boys sit together?

20. A point M with x-coordinate 4 lies on the line segment joining the points P(2, –3, 4) and Q (8, 0, 10). Find the co-ordinates of the point M.

OR

Find the equation of the set of points such that the sum of the square of its distance from the points (3, 4, 5) and (–1, 3,–7) is a constant.

21. Solve for x: $\tan 2x + \sec^2 2x - 1 = 0$

OR

Solve for x: $\sin x + \sin 2x + \sin 3x = 0$

22. Evaluate: $\lim\limits_{x \to 0} \dfrac{\log 10 + \log\left(x + \dfrac{1}{10}\right)}{x}$

23. Write down the binomial expression $(1 + x)^{n+1}$, when x = 8. Deduce that $9^{n+1} - 8n - 9$ is divisible by 64, when n is an integer.

SECTION – D

24. If $\dfrac{\pi}{2} \le x \le \pi$ and $\tan x = -\dfrac{4}{3}$, find $\sin\dfrac{x}{2}, \; \cos\dfrac{x}{2}, \; \tan\dfrac{x}{2}$.

OR

Show that $\sqrt{3}\cosec 20° - \sec 20°$.

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

Marks	No. of students
0–10	5
10–20	10
20–30	20
30–40	5
40–50	10

26. Prove by the principle of Mathematical Induction that every even power of every odd integer greater than one when divided by 8 leaves one as the remainder.

27. Solve the following system of inequalities graphically:
x + 2y ≤ 10; x + y ≥ 1; x − y ≤ 0; x ≥ 0; y ≥ 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. The first three terms in the binomial expansion of $(a + b)^n$ are given to be 729, 7290 and 30375 respectively. Find a, b and n.

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