CBSE Board
Class XI Mathematics
Sample Paper – 6

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 $\cos[\sin\sqrt{x}]$.

2. Write negation of : "Either he is bald or he is tall."

3. Express $\frac{6}{-i}$ in the form of b or bi where b is a real number.

OR

Find modulus of $\sin\theta - i\cos\theta$.

4. Two coins tossed simultaneously, find the probability that getting two heads.

SECTION – B

5. A and B are sub-sets of U where U is universal set containing 700 elements. n(A) = 200, n(B) = 300 and n (A ∩ B) = 100. Find n(A' ∩ B').

6. If the function $f : N \to N$ is defined by $f(x) = \sqrt{x}$ then find $\frac{f(25)}{f(16)+f(1)}$.

OR

If $f(x) = x^2 - 1$ and $g(x) = \sqrt{x}$ find $f \circ g(x)$ =?

7. Find the range of the function f(x) = |x – 3|

OR

Let a and B be two sets such that : n(A) = 50, n(A ∪ B) = 60 and n(A ∩ B) = 10.
Find n(B) and n(A – B).

8. Let A = {6, 8} and B = {3, 5}. Write A × B and A × A.

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

OR

Prove that $\tan^4 \theta + \tan^2 \theta = \sec^4 \theta - \sec^2 \theta$

10. By giving an example, show that the following statement is false.
"If n is an odd integer, then n is prime."

11. If a, b, c are in GP then prove that $\log a^n$, $\log b^n$ and $\log c^n$ are in AP.

12. The focal distance of a point on the parabola $y^2 = 12x$ is 4. Find the abscissa of this point.

SECTION – C

13. If $\tan(\pi\cos\theta) = \cot(\pi\sin\theta)$ prove that $\cos\left(\theta-\frac{\pi}{4}\right)=\pm\frac{1}{2\sqrt{2}}$.

14. Let a relation R_1 on the set of R of all real numbers be defined as $(a, b) \in R_1 \Leftrightarrow 1 + ab > 0$ for all a, b $\in$ R. Show that $(a, a) \in R_1$ for all $a \in R$ and $(a, b) \in R_1 \Rightarrow (b, a) \in R_1$ for all a, b $\in$ R.

15. Prove that $\cos\frac{\pi}{9}\cos\frac{2\pi}{9}\cos\frac{3\pi}{9}\cos\frac{4\pi}{9}=\frac{1}{2^4}$.

16. If x = a + b, $y = a\alpha + b\beta$, $z = a\beta + b\alpha$ where α, β are complex cube root of unity. Show that $xyz = a^3 + b^3$.

17. A bag contains 7 white, 5 black and 4 red balls. If two balls are drawn at random from the bag, find the probability that they are not of the same colour.

18. The sums of first p, q, r terms of an AP are a, b, c respectively. Prove that $\frac{a}{p}(q-r)+\frac{b}{q}(r-p)+\frac{c}{r}(p-q)=0$

19. How many different numbers can be formed with the digits 1, 3, 5, 7, 9 when takes all at a time, and what is their sum?

OR

A student is to answer 10 out of 13 questions in an examination such that he must choose at least 4 from the first five questions. Find the number of choices available to him.

20. Find all the points on the line x + y = 4 that lie at a unit distance from the line 4x + 3y = 10.

OR

Find the equation of the internal bisector of angle BAC of the triangle ABC whose vertices A, B, C are (5, 2), (2, 3) and (6, 5) respectively.

21. If in a ΔABC, $\frac{\sin A}{\sin C}=\frac{\sin(A-B)}{\sin(B-C)}$ prove that a^2, b^2, c^2 are in AP.

OR

Prove that $\frac{\cos 5x+\cos 4x}{1-2\cos 3x}=-\cos 2x-\cos x$

22. Find the value of k, if $\lim_{x\to 1}\frac{x^4-1}{x-1}=\lim_{x\to k}\frac{x^3-k^3}{x^2-k^2}$

23. Using binomial theorem, prove that 6^n – 5n always leaves the remainder 1 when divided by 25.

SECTION – D

24. Prove that

1. tan3A tan2AtanA = tan3A – tan2A – tanA
2. cotAcot2A – cot2Acot3A – cot3AcotA = 1

OR

If A = $\cos^2 \theta + \sin^4 \theta$ prove that $\frac{3}{4}\le A\le 1$ for all values of θ.

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

x	10	15	20	25	30	35	40	45
f	7	3	8	5	6	8	4	9

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

27. Solve the following system of inequalities graphically:
$3x + 2y \le 150$; $x + 4y \ge 80$; $x \le 15$; $x \ge 0$; $y \ge 0$

OR

How many litres of water will have to be added to 1125 litres of the 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% acid content?

28. If the coefficients of a^{r-1}, a^r and a^{r+1} in the binomial expansion of $(1 + a)^n$ are in AP, prove that $n^2 - n(4r + 1) + 4r^2 - 2 = 0$

29. Along a road lie an odd number of stones placed at intervals of 10 m. These stones have to be assembled around the middle stone. A person can carry only one stone at a time. A man carried the job with one of the end stones by carrying them in succession. In carrying all the stones he covered a distance of 3 km. Find the number of stones.

OR

Find the sum of an infinitely decreasing GP, whose first term is equal to b +2 and the common ratio to 2/c, where b is the least value of the product of the roots of the equation $(m^2 + 1)x^2 - 3x + (m^2 + 1)^2 = 0$ and c is the greatest value of the sum of its roots.