

**CBSE Board
Class XI Mathematics
Sample Paper – 9**

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 $\lim_{x \rightarrow 0} \frac{\sin ax}{bx}$

2. Is the given sentence statement? Justify. “There are 35 days in a month.”

3. Write in the form of $a + bi$: $\frac{1}{i-1}$

OR

Find modulus of $2i$.

4. If variance of 20 observations is 5. If each observation is multiplied by 2, then find variance of the new observations.

SECTION – B

5. Let $A = \{1, 2\}$, $B = \{1, 2, 3, 4\}$, $C = \{5, 6\}$ and $D = \{5, 6, 7, 8\}$ verify that $A \times C$ is a subset of $B \times D$.

6. Let f be defined by $f(x) = x - 4$ and g be defined by

$$g(x) = \frac{x^2 - 16}{x + 4} \quad x \neq -4$$

$$= \lambda \quad x = -4$$

Find λ such that $f(x) = g(x)$ for all x .

OR

Find domain and range of the function $f(x) = \frac{x^2 - 9}{x - 3}$

7. Assuming that a person of normal sight can read print at such a distance that the letters subtend an angle of $5'$ at this eye, find the height of the letters that he can read at a distance of 12 m.

OR

If the arcs of the same length in two circles subtend angles of 60° and 75° at their centres. Find the ratio of their radii.

8. If $n(U) = 600$, $n(A) = 460$, $n(B) = 390$ and $n(A \cap B) = 325$ then find $n(A \cup B)$ and $n(A \cup B)'$
9. Prove that $\sin(\theta + 30^\circ) = \cos \theta + \sin(\theta - 30^\circ)$

OR

Prove that $\frac{\sin 7A - \sin 5A}{\cos 5A + \cos 7A} = \tan A$

10. Find compound statements of the "It is raining and it is cold."

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

12. Find the equation of line joining the points $(-1, 3)$ and $(4, -2)$.

SECTION - C

13. Prove that $\frac{\cos^2 33^\circ - \cos^2 57^\circ}{\sin^2 \frac{21^\circ}{2} - \sin^2 \frac{69^\circ}{2}} = -\sqrt{2}$

14. If f is a real function defined by $f(x) = \frac{x-1}{x+1}$ then prove that $f(2x) = \frac{3f(x)+1}{f(x)+3}$

15. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be given by $f(x) = x^2 + 3$. Find

- $\{x : f(x) = 28\}$
- The pre-image of 39 and 2 under f .

16. A man accepts a position with an initial salary of Rs. 5200 per week. It is understood that he will receive an automatic increase of Rs. 320 in the very next and each month.
- find his salary for the tenth month
 - his total earning during the first year.

17. If $(x + yi)^3 = u + vi$ prove that $\frac{u}{x} + \frac{v}{y} = 4(x^2 + y^2)$

18. Two cards are drawn from a pack of cards. What is the probability that either both are red or both are kings?

19. Determine the number n in a geometric progression $\{a_n\}$, if $a_1 = 3$, $a_n = 96$ and $S_n = 189$.

20. Find n , if ${}^{2n}C_1$, ${}^{2n}C_2$ and ${}^{2n}C_3$ are in A. P.

OR

Prove that the product of $2n$ consecutive negative integers is divisible by $(2n)!$.

21. Find the equation of the straight line through the origin making angle of 60° with the straight line $x + \sqrt{3}y + 3\sqrt{3} = 0$

OR

Find the equations of the lines, which cut off intercepts on the axes whose sum and product are 1 and -6 respectively.

22. Differentiate $x^{-3/2}$ with respect to x using first principle.

OR

Differentiate $\frac{x+2}{x^2+3}$ and find the value of derivative at $x = 0$.

23. Find the equation of hyperbola whose foci are $(8, 3)$ and $(0, 3)$ and $e = 4/3$

SECTION - D

24. Prove that $\cot \theta \cot 2\theta + \cot 2\theta \cot 3\theta + 2 = \cot \theta (\cot \theta - \cot 3\theta)$

OR

Prove that $5\cos \theta + 3\cos \left(\theta + \frac{\pi}{3} \right) + 3$ lies between -4 and 10.

25. Find the mean and variance of the following data

Classes	0 - 30	30 - 60	60 - 90	90 - 120	120 - 150	150 - 180	180 - 210
Frequency	2	3	5	10	3	5	2

26. Find $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$ where $\tan x = -\frac{4}{3}$, x is in quadrant II
27. Plot the given linear inequations and shade the region which is common to the solution of all inequations $x \geq 0$, $y \geq 0$, $5x + 3y \leq 500$; $x \leq 70$ and $y \leq 125$.

OR

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

28. Using principle of mathematical induction prove that $5^n - 5$ is divisible by 4 for all $n \in \mathbb{N}$.
Hence, prove that $2 \times 7^n + 3 \times 5^n - 5$ is divisible by 24 for all $n \in \mathbb{N}$.

29. If a , b , and c are in A.P.; b , c , and d are in G.P. and $\frac{1}{c}$, $\frac{1}{d}$, and $\frac{1}{e}$ are in A.P., prove that a , c , and e are in G.P.

OR

Show that:

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