

CBSE Board
Class XI Mathematics
Sample Paper – 7

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 $\lim_{x \rightarrow 1} \frac{x^n - 1}{x - 1}$.

2. Write the statement in the form “if p, then “: You can access the website only if you pay a subscription fee.
3. Write complex conjugate of $-4i - 8$.

OR

Find argument of $4 + 4i$.

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

SECTION – B

5. If $X = \{a, b, c, d\}$ and $Y = \{f, b, d, g\}$ find $X - Y$ and $Y - X$.
6. Find the domain of the function $f(x) = \log_{3+x}(x^2 - 1)$

OR

If $f(x) = 2x\sqrt{1-x^2}$ then show that $f(\sin x/2) = \sin x$

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

OR

Find in degrees and radians the angle between the hour hand and the minute-hand of a clock at half past three.

8. If R is the set of all real numbers, what do the Cartesian products $R \times R$ and $R \times R \times R$ represent?

9. Prove that: $\frac{1 + \cos 4x}{\cot x - \tan x} = \frac{1}{2} \sin 4x$

OR

Prove that $8\cos^3 \frac{\pi}{9} - 6\cos \frac{\pi}{9} = 1$.

10. Find the component statement and check whether it is true or not?
All integers are positive or negative.

11. Find the range of the function $f(x) = \frac{4-x}{x-4}$.

12. Find the distance between the directrices the ellipse $\frac{x^2}{36} + \frac{y^2}{20} = 1$

SECTION - C

13. Given that $\sin A = \frac{3}{5}$ and that A is an acute angle, find without using tables, the values of $\sin 2A$, $\cos 2A$ and $\tan 2A$. Hence find the value of $\sin 4A$.

14. Let A be the set of two positive integers. Let $f : A \rightarrow Z^+$ (set of positive integers) be defined by $f(n) = p$ where p is the highest prime factor of n . If range of $f = \{3\}$. Find set A . Is A uniquely determined?

15. Sum to n terms the series : $0.7 + 0.77 + 0.777 + \dots$

16. Show that a real value of x will satisfy the equation $\frac{1-ix}{1+ix} = a-ib$ if $a^2 + b^2 = 1$ where a and b are real.

17. Tickets are numbered from 1 to 100. They are well shuffled and a ticket is drawn at random. What is the probability that the drawn ticket has

1. An even number
2. A number 5 or multiple of 5
3. A number which is greater than 75

4. A number which is a square
18. The side of a given square is equal to a . The mid-points of its sides are joined to form a new square. Again, the mid-points of the sides of this new square are joined to form another square. This process is continued indefinitely. Find the sum of the areas of the square and the sum of the perimeters of the squares.
19. A committee of 4 is to be selected from amongst 5 boys and 6 girls. In how many ways can this be done so as to include
- exactly one girl
 - At least one girl.

OR

If the letters of the word "AGAIN" be arranged in a dictionary, what is the 50th word?

20. Find the equation of the hyperbola whose conjugate axis is 5 and the distance between the foci is 13.

OR

A circle has radius 3 units and its centre lies on the line $y = x - 1$. Find the equation of the circle, if it passes through $(7, 3)$.

21. Differentiate xe^x from first principles.

OR

If $y = \sqrt{\frac{x}{a}} + \sqrt{\frac{a}{x}}$ prove that $2xy \frac{dy}{dx} = \frac{x}{a} - \frac{a}{x}$

22. Find the equation of the ellipse with foci at $(\pm 5, 0)$ and $x = 36/5$ as one of the directrices.

SECTION - D

23. If $\sin \alpha + \sin \beta = a$ and $\cos \alpha + \cos \beta = b$ show that $\cos(\alpha + \beta) = \frac{b^2 - a^2}{b^2 + a^2}$ and

$$\sin(\alpha + \beta) = \frac{2ab}{b^2 + a^2}$$

SECTION - D

24. Given below is the frequency distribution of weekly study hours of a group of class 11 students. Find the mean, variance and standard deviation of the distribution using the short cut method.

Classes	Frequency
0 - 10	5
10 - 20	8
20 - 30	15
30 - 40	16
40 - 50	6

25. If $x \in Q_3$ and $\cos x = -\frac{1}{3}$, then show that $\sin \frac{x}{2} = \pm \sqrt{\frac{2}{3}}$.

OR

If $\tan(\alpha + \theta) = n \tan(\alpha - \theta)$ show that $(n + 1) \sin 2\theta = (n - 1) \sin 2\alpha$

26. A man wants to cut three lengths from a single piece of board of length 91 cm. The second length is to be 3 cm longer than the shortest and the third length is to be twice as long as the shortest. What are the possible lengths of the shortest board if the third piece is to be at least 5 cm longer than the second?

OR

Solve the following system of inequalities graphically: $5x + 4y \leq 20$, $x \geq 1$, $y \geq 2$

27. Find the term independent of x in the expansion of $\left(\frac{x+1}{x^{\frac{2}{3}} - x^{\frac{1}{3}} + 1} - \frac{x-1}{x - x^{\frac{1}{2}}} \right)^{10}$

28. The sum of three numbers in G. P. is 42. If the first two numbers are increased by 2 and third is decreased by 4, the resulting numbers form A.P. Find the numbers of G.P.

OR

Suppose x and y are two real numbers such that the r^{th} mean between x and $2y$ is equal to the r^{th} mean between $2x$ and y when n arithmetic means are inserted between them

in both the cases. Show that $\frac{n+1}{r} - \frac{y}{x} = 1$