

**CBSE Board**  
**Class XI Mathematics**  
**Sample Paper – 10**

**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  $\lim_{x \rightarrow 0} \frac{3^x - 2^x}{x}$ .

2. Write contrapositive of the statement: If Mohan is a poet then he is poor.

3. Write the value of  $\frac{i^{592} + i^{590} + i^{588} + i^{586} + i^{584}}{i^{582} + i^{580} + i^{578} + i^{576} + i^{574}}$ .

**OR**

Write the value of  $\sqrt{-25} \times \sqrt{-9}$ .

4. What is the total number of elementary events associated to the random experiment of throwing three dice together?

**SECTION – B**

5. Let  $A = \{x, y, z\}$   $B = \{1, 2\}$ , find the number of relations from A to B.

6. If  $f(x) = \sin [\log (x + \sqrt{x^2 + 1})]$  then show that  $f(-x) = -f(x)$ .

**OR**

If  $f(x) = \frac{1+x}{1-x}$  show that  $f[f(\tan \theta)] = -\cot \theta$ .

7. An arc AB of a circle subtends an angle  $x$  radians at the centre O of the circle. Given that the area of a sector AOB is equal to the square of the length of the arc AB, find the value of  $x$ .

**OR**

Find the degree measure of  $\frac{5\pi}{3}$  and  $4\pi$ .

8. i. Is the following pair equal? Justify?  
 $A = \{x : x \text{ is a letter in the word "LOYAL"}\}$ ,  $B = \{x : x \text{ is a letter of the word "ALLOY"}\}$   
ii. Is the set  $C = \{x : x \in \mathbb{Z} \text{ and } x^2 = 36\}$  finite or infinite?
9. In triangle ABC, if  $a = 3$ ,  $b = 5$  and  $c = 7$  find  $\cos A$ ,  $\cos C$ .

**OR**

In triangle ABC,  $(a-b)^2 \cos^2 \frac{C}{2} + (a+b)^2 \sin^2 \frac{C}{2} = c^2$  incomplete question

10. Write converse of the statement "If a number is even then  $n^2$  is even."

11. Find domain of the function  $f(x) = \sqrt{4-x} + \frac{1}{\sqrt{x^2-1}}$

12. Find the centre and radius of a circle :  $x^2 + y^2 - 4x + 6y = 12$

### SECTION - C

13. Compute  $\sin 75^\circ$ ,  $\cos 75^\circ$  and  $\tan 15^\circ$  from the functions of  $30^\circ$  and  $45^\circ$ .

14. If  $f(x) = \log \left( \frac{1-x}{1+x} \right)$  show that  $f(a) + f(b) = f \left( \frac{a+b}{1+ab} \right)$

15. Find the domain of

i.  $\sqrt{x} + \sqrt{2x-1}$

ii.  $\log(x-2) - \sqrt{3-x}$

16. The sum of the first three terms of G. P. is 7 and the sum of their squares is 21. Determine the first five terms of the G. P.

17. For any two complex numbers  $z_1$  and  $z_2$  and any real numbers  $a$  and  $b$ , prove that

$$|az_1 - bz_2|^2 + |bz_1 + az_2|^2 = (a^2 + b^2) \left[ |z_1|^2 + |z_2|^2 \right]$$

18. When two dice are thrown. Calculate the probability of throwing a total of
- A 7 or an 11
  - A doublet or a total of 6.
19. Sum up  $5 + 55 + 555 + \dots$  to  $n$  terms.
20. Find the value of  $(\sqrt{2} + 1)^6 + (\sqrt{2} - 1)^6$  and show that the value of  $(\sqrt{2} + 1)^6$  lies between 197 and 198.

**OR**

A code word is consist of two distinct English alphabets followed by two distinct numbers from 1 to 9. For example CA23 is a code word. How many such code words are there? How many of them end with an even integer?

21. Find the equation of the line through the point (4, -5) and parallel to  $3x + 4y + 5 = 0$  and perpendicular to  $3x + 4y + 5 = 0$ .

**OR**

The length  $L$  (in cm) of a copper rod is a linear function of its Celsius temperature  $C$ . In an experiment, if  $L = 124.942$  when  $C = 20$  and  $L = 125.134$  when  $C = 110$ , express  $L$  in terms of  $C$ .

22. (i) Find the derivative of  $f(x) = -\frac{1}{x}$ , using first principle.

(ii) Evaluate:  $\lim_{x \rightarrow 0} \frac{6^x - 3^x - 2^x + 1}{x^2}$

**OR**

- (i) Find the derivative of the given function using first principle:

$$f(x) = \cos\left(x - \frac{\pi}{16}\right)$$

(ii) Evaluate:  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{5^{\cos x} - 1}{\frac{\pi}{2} - x}$ ,  $x \neq \frac{\pi}{2}$ .

23. Find the equations of the lines through the point (3, 2) which are at an angle of  $45^\circ$  with the line  $x - 2y = 3$ .

**SECTION - D**

24. If in a  $\Delta ABC$ ,  $\frac{b+c}{12} = \frac{c+a}{13} = \frac{a+b}{15}$ , then prove that:  $\frac{\cos A}{2} = \frac{\cos B}{7} = \frac{\cos C}{11}$ .

**OR**

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

25. 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

26. Prove that:

$$\cos^2 x + \cos^2 \left( x + \frac{\pi}{3} \right) + \cos^2 \left( x - \frac{\pi}{3} \right) = \frac{3}{2}$$

27. Find the solution region for the following system of inequations:

$$x + 2y \leq 10, x + y \leq 1, x - y \leq 0, x \geq 0, y \geq 0$$

**OR**

Solve the inequality given below and represent the solution on the number line.

$$\frac{1}{2} \left( \sqrt{\frac{3x+20}{5}} \right) \geq \frac{1}{3} (x-6)$$

28. The sum of the coefficients of the first three terms in the expansion of  $\left( x - \frac{3}{x^2} \right)^m$  is 559,

where  $x \neq 0$  and  $m$  being a natural number. Find the term of the expansion containing  $x^3$ .

29. Find the sum of the following series upto  $n$  terms:

$$\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + \dots + \dots$$

**OR**

If  $S_1, S_2, S_3$  be the sum of  $n, 2n$  and  $3n$  terms of a GP respectively.

Prove that  $S_1(S_3 - S_2) = (S_2 - S_1)^2$