

**Class XI Session 2023-24**  
**Subject - Mathematics**  
**Sample Question Paper - 4**

**Time Allowed: 3 hours**

**Maximum Marks: 80**

**General Instructions:**

1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.
4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.
5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.
6. Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.

**Section A**

1. The value of  $\cos 1^\circ \cos 2^\circ \cos 3^\circ \dots \cos 179^\circ$  is [1]
  - a)  $\frac{1}{\sqrt{2}}$
  - b) 1
  - c) -1
  - d) 0
2. Let  $f(x) = \sqrt{9 - x^2}$  then,  $\text{dom } f(x) = ?$  [1]
  - a)  $(-\infty, -3]$
  - b)  $[-3, 3]$
  - c)  $(-\infty, -3] \cup (4, \infty)$
  - d)  $[3, \infty)$
3. What is the standard deviation of 7, 9, 11, 13 and 15? [1]
  - a) 2.7
  - b) 2.8
  - c) 2.5
  - d) 2.4
4.  $\lim_{x \rightarrow 0} \frac{\sin x}{x(1 + \cos x)}$  is equal to [1]
  - a)  $\frac{1}{2}$
  - b) 0
  - c) 1
  - d) -1
5. The distance of the point P (1, -3) from the line  $2y - 3x = 4$  is [1]
  - a) 13
  - b) None of these
  - c)  $\sqrt{13}$
  - d)  $\frac{7}{13}\sqrt{13}$
6. What is the locus of a point for which  $y = 0, z = 0$ ? [1]
  - a) none of these
  - b) equation of y-axis

- c) equation of z-axis  
d) equation of x-axis
7. If  $\frac{3+2i \sin \theta}{1-2i \sin \theta}$  is a real number and  $0 < \theta < 2\pi$ , then  $\theta =$  [1]  
 a)  $\frac{\pi}{3}$  b)  $\frac{\pi}{2}$   
 c)  $\pi$  d)  $\frac{\pi}{6}$
8. If  ${}^n C_3 = 220$ , then  $n = ?$  [1]  
 a) 11 b) 10  
 c) 12 d) 9
9. If  $f(x) = 1 - x + x^2 - x^3 + \dots - x^{99} + x^{100}$ , then  $f'(1)$  is equal to: [1]  
 a) 150 b) -50  
 c) -150 d) 50
10. The value of  $\sin^2 5^\circ + \sin^2 10^\circ + \sin^2 15^\circ + \dots + \sin^2 85^\circ + \sin^2 90^\circ$  is [1]  
 a) 10 b) 9.5  
 c) 8 d) 7
11. Two finite sets have  $m$  and  $n$  elements. The number of subsets of the first set is 112 more than that of the second set. The values of  $m$  and  $n$  are, respectively, [1]  
 a) 7, 7 b) 4, 4  
 c) 7, 4 d) 4, 7
12. In Pascal's triangle, each row begins with 1 and ends in [1]  
 a) -1 b) 0  
 c) 2 d) 1
13. In the expansion of  $(x + a)^n$ , if the sum of odd terms be  $P$  and the sum of even terms be  $Q$ , then  $4PQ = ?$  [1]  
 a)  $(x + a)^n - (x - a)^n$  b)  $(x + a)^{2n} - (x - a)^{2n}$   
 c)  $(x + a)^n + (x - a)^n$  d) None of these
14. Solve the system of inequalities  $4x + 3 \geq 2x + 17$ ,  $3x - 5 < -2$ , for the values of  $x$ , then [1]  
 a) no solution b)  $\left(-\frac{3}{2}, \frac{2}{5}\right)$   
 c)  $(-4, 12)$  d)  $(-2, 2)$
15. If  $A = \{x : x \neq x\}$  represents [1]  
 a)  $\{1\}$  b)  $\{\}$   
 c)  $\{x\}$  d)  $\{0\}$
16. If  $\theta$  lies in quadrant II, then  $\sqrt{\frac{1-\sin \theta}{1+\sin \theta}} - \sqrt{\frac{1+\sin \theta}{1-\sin \theta}}$  is equal to [1]  
 a)  $\cot \theta$  b)  $\tan \theta$   
 c)  $2\cot \theta$  d)  $2\tan \theta$
17.  $\lim_{x \rightarrow 0} \frac{\sin x}{\sqrt{x+1} - \sqrt{1-x}}$  is equal to [1]



If  $S_1$ ,  $S_2$  and  $S_3$  be respectively the sum of  $n$ ,  $2n$  and  $3n$  terms of a GP then prove that  $S_1(S_3 - S_2) = (S_2 - S_1)^2$ .

31. Let  $A$ ,  $B$  and  $C$  be the sets such that  $A \cup B = A \cup C$  and  $A \cap B = A \cap C$ . Show that  $B = C$ . [3]

**Section D**

32. There are 60 students in a class. The following is the frequency distribution of the marks obtained by the students in a test: [5]

Marks	0	1	2	3	4	5
Frequency	$x - 2$	$x$	$x^2$	$(x + 1)^2$	$2x$	$x + 1$

where  $x$  is a positive integer. Determine the mean and standard deviation of the marks.

33. Find the (i) lengths of major and minor axes, (ii) coordinate of the vertex, (iii) coordinate of the foci, (iv) eccentricity, and (v) length of the latus rectum of ellipse:  $x^2 + 4y^2 = 100$ . [5]

OR

A visitor with sign board 'DO NOT LITTER' is moving on a circular path in an exhibition. During the movement he stops at points represented by  $(3, -2)$  and  $(-2, 0)$ . Also, centre of the circular path is on the line  $2x - y = 3$ . What is the equation of the path? What message he wants to give to the public?

34. Solve the following system of linear inequalities. [5]

$$2(2x + 3) - 10 < 6(x - 2)$$

$$\text{and } \frac{2x-3}{4} + 6 \geq 2 + \frac{4x}{3}$$

35. If  $2 \tan \frac{\alpha}{2} = \tan \frac{\beta}{2}$ , prove that  $\cos \alpha = \frac{3+5 \cos \beta}{5+3 \cos \beta}$ . [5]

OR

$$\text{Prove that } \cos \frac{2\pi}{15} \cdot \cos \frac{4\pi}{15} \cdot \cos \frac{8\pi}{15} \cdot \cos \frac{16\pi}{15} = \frac{1}{16}$$

**Section E**

36. **Read the text carefully and answer the questions:** [4]

**Ordered Pairs** The ordered pair of two elements  $a$  and  $b$  is denoted by  $(a, b)$ :  $a$  is first element (or first component) and  $b$  is second element (or second component).

Two ordered pairs are equal if their corresponding elements are equal.

$$\text{i.e. } (a, b) = (c, d) \Rightarrow a = c \text{ and } b = d$$

**Cartesian Product of Two Sets** For two non-empty sets  $A$  and  $B$ , the cartesian product  $A \times B$  is the set of all ordered pairs of elements from sets  $A$  and  $B$ .

In symbolic form, it can be written as

$$A \times B = \{(a, b): a \in A, b \in B\}$$

- (i) Let  $A$  and  $B$  be two sets such that  $A \times B$  consists of 6 elements. If three elements of  $A \times B$  are  $(1, 4)$ ,  $(2, 6)$  and  $(3, 6)$ , then find  $A \times B$  and  $B \times A$ .
- (ii) If  $(x + 2, 4) = (5, 2x + y)$ , then find the value of  $x$  and  $y$ .
- (iii) If  $(x + 6, y - 2) = (0, 6)$ , then find the value of  $x$  and  $y$ .

OR

$$\text{If } (a - 3, b + 7) = (3, 7), \text{ then find the value of } a \text{ and } b.$$

37. **Read the text carefully and answer the questions:** [4]

On her vacation, Priyanka visits four cities. Delhi, Lucknow, Agra, Meerut in a random order.



Meerut



New Delhi



Agra



Lucknow

- (i) What is the probability that she visits Delhi before Lucknow?
- (ii) What is the probability she visit Delhi before Lucknow and Lucknow before Agra?
- (iii) What is the probability she visits Delhi first and Lucknow last?

**OR**

What is the probability she visits Delhi either first or second?

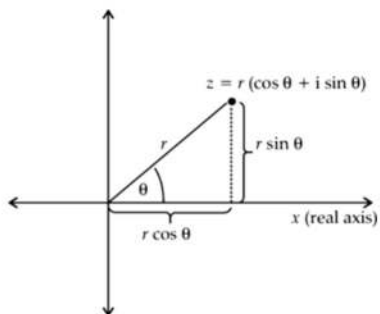
38. **Read the text carefully and answer the questions:**

[4]

Consider the complex number  $Z = 2 - 2i$ .

Complex Number in Polar Form

Complex Numbers in Polar Form  
 $i$  (imaginary axis)



- (i) Find the principal argument of  $Z$ .
- (ii) Find the value of  $z\bar{z}$ ?