

Sample Question Paper -1

(Session 2022-23)

Class XI

Sub: Mathematics

Time Allowed: 3 Hours

Maximum Marks: 80

I. .

SECTION A (Multiple Choice Questions) Each question carries 1 mark

1. If $A = \{x \in \mathbb{C}, x^2 = 1\}$, $B = \{x \in \mathbb{C}, x^4 = 1\}$ then the union of A and B is
a) $(-i, i)$ b) $\{-1, 1\}$ c) $\{1, -1, i, -i\}$ d) \emptyset
2. If A is a proper subset B, then $(A - B) \cup (B - A)$ is equal to
a) $(A - B) \cap (B - A)$ b) $A - B$ c) $B - A$ d) none of these
3. If $f: \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = 3x + |x|$, then $f(2x) - f(-x) - 6x$ is equal to
a) $f(x)$ b) $f(2x)$ c) $f(-x)$ d) $-f(x)$
4. The solution set of the inequality : $3(2-x) \geq 2(1-x)$, if x is an integer
a) $(4, \infty)$ b) $[4, \infty)$ c) $(-\infty, 4]$ d) $(-\infty, 4)$
5. If ABCD is a cyclic quadrilateral, then the value of $\cos A + \cos B + \cos C + \cos D$.
a) $\frac{\pi}{2}$ b) 0 c) π d) 22π
6. If $\left(\frac{1+i}{1-i}\right)^x = 1$, then
a) $x=2n+1$ b) $x=4n+1$ c) $x=2n$ d) $x=4n$, n is a natural number.
7. A line passes through the point(2,2) and is perpendicular to the line $3x+y = 3$, then the y intercept of the line is
(a) $\frac{1}{3}$ (b) $\frac{2}{3}$ (c) 1 (d) $\frac{4}{3}$
8. The equation of the circle concentric with $x^2+y^2-3x+4y-7=0$ and passing through $(-1,-2)$ is
a) $x^2+y^2-3x+4y-1=0$ c) $x^2+y^2-3x+4 = 0$ b) $x^2+y^2+3x-4y-2=0$ d) $x^2+y^2+3x-4y=0$

9. If a polygon has 44 diagonals, then the number of its sides is
 a) 11 b) 7 c) 8 d) none of these
10. The mean deviation of the numbers 3, 4, 5, 6, 7 from the mean is
 a) 2.5 b) 5 c) 1.2 d) 0
11. The probability that at least one of the events A and B occurs is 0.6. If A and B occur simultaneously with probability 0.02, then $P(A) + P(B)$ is
 a) 1 b) 0.58 c) 0 d) 0.62
12. Three numbers are chosen from 1 to 20. The probability that they are not consecutive is
 a) $\frac{187}{190}$ b) $\frac{186}{190}$ c) $\frac{3}{190}$ —
 d) $\frac{1}{90}$
13. The mean of 100 observations is 50 and standard deviation is 5. The sum of all squares of observations is
 a) 50,000 b) 250000 c) 252500 d) 255000
14. If $f(x) = \frac{x-4}{2\sqrt{x}}$, then $f'(1)$ is
 a) $\frac{5}{4}$ b) $\frac{4}{5}$ c) 0 d) 4
15. $\lim_{x \rightarrow \frac{\pi}{2}} (\sec x - \tan x)$ is
 a) 2 b) -1 c) 1 d) 0
16. The third term of a G.P is 4. The product of first five terms is
 a) 512 b) 1024 c) 40 d) none of these
17. The arithmetic mean of 10 observations is 28. If 3 is added to last number, find the new arithmetic mean
 a) 28.3 b) 31 c) 38 d) 30.3
18. The equation of line passing through (1,1) and parallel to $y=3x+4$ is
 a) $y = 3x+2$ b) $y = 3x+1$ c) $y = 3x-1$ d) $y = 3x-2$

ASSERTION- REASON BASED QUESTIONS

In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.

- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

19. Assertion (A): The expression $6^n - 5^n$ is always divisible by 25

Reason (R) : The expansion of $6^n = 5^n + nC_{n-1} \cdot 5^{n-1} + nC_{n-2} \cdot 5^{n-2} + \dots + nC_1 \cdot 5 + 1$

20. Assertion (A): The limit of $f(x) = \frac{x+2}{x^2-4}$ does not exist at $x=2$

Reason (R) : The function $f(x)$ is not defined at $x=2$

SECTION B

This section comprises of very short answer type-questions (VSA) of 2 marks each

21. Find the domain and range of $f(x) = \frac{-x}{x+5}$

OR

Prove that $\frac{\sin 7x + \sin 5x}{\cos 7x - \cos 5x} = -\cot x$

22. If $A = \{3, 5, 8\}$, $B = \{4, 6, 9, 10\}$ and $C = \{3, 4, 10\}$, write $A \cap (B - C)$

23. Find the equation of an ellipse whose vertices are $(0, \pm 10)$ and eccentricity $e = \frac{4}{5}$

24. Find the 12th term of a G.P. whose 8th term is 192 and the common ratio is 2.

OR

Insert 4 geometric means in between 8 and 12.

25. Two students Anil and Ashima appeared in an examination. The probability that Anil will qualify the examination is 0.07 and that Ashima will qualify the examination is 0.30. The probability that both will qualify the examination is 0.02. Find the probability that Both Anil and Ashima will not qualify the examination.

SECTION C

(This section comprises of short answer type questions (SA) of 3 marks each)

26. Find the number of ways in which the word HEXAGON be permuted with vowels together.

OR

Sports team of 7 students is to be constituted, choosing at least 3 from each class XI and XII. If there are 8 students in each of these classes, in how many ways can the team be constituted?

27. The longest side of a triangle is twice the shortest side and the third side is 2 cm longer than the shortest side. If the perimeter of the triangle is more than 166 cm, then find the minimum length of the shortest side.
28. Prove that $(\cos x - \cos y)^2 + (\sin x - \sin y)^2 = 4 \sin^2 \left(\frac{x-y}{2} \right)$
29. Find the equation of circle which circumscribes the triangle with vertices (3,4), (3,-6) and (-1,-2).

OR

Find the coordinates of the foci and the vertices, the eccentricity and the length of the latus rectum of the hyperbola.

$$49y^2 - 16x^2 = 784.$$

30. Find $(a+b)^4 - (a-b)^4$. Hence evaluate

$$(\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4$$

OR

Find the middle term in the expansion of $\left(\frac{x}{3} + 9y\right)^{10}$

31. If $A = \{a, b, c, d, e\}$, $B = \{a, c, e, g\}$ and $C = \{a, b, g\}$ verify that

$$A - (B \cap C) = (A - B) \cup (A - C)$$

SECTION D

(This section comprises of long answer-type questions (LA) of 5 marks each) (4X3=12)

32. The first three numbers in the expansion of $(a+b)^n$ are 729, 7290 and 30375. Find the values of a, b and n.

OR

If $nP_r = nP_{r+1}$ and $nC_r = nC_{r-2}$, then find the values of n and r.

33. Prove that $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \frac{3}{16}$

Or

If $\sin A + \sin B = p$ and $\cos A + \cos B = q$, find the value of $\sin(A+B)$ and $\cos(A+B)$.

34. Find the derivative of (i) $f(x) = x \tan x \sec x + \tan x$ (3 marks)

(ii) $f(x) = x^2 \tan x$ (2 marks)

35. Calculate mean and standard deviation for the following table of age distribution of a group of people.

Age	Number of persons
20-30	3
30-40	51
40-50	122
50-60	141
60-70	130
70-80	51
80-90	2

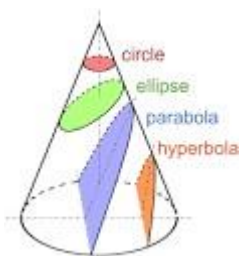
SECTION E

This section comprises of 3 case-study/passage-based questions of First two case study questions have three sub-parts (i), (ii), (iii) of marks 1, 1, 2 respectively. The third case study question has two sub parts (i) and (ii) of 2 marks each.

CASE-BASED/DATA-BASED

36. Read the following passage and answer the questions given below

Conic sections have applications in various fields. When an object is thrown in space, then the path traced by the object is (called a projectile) a PARABOLA. Another example can be a parabolic reflectors which are used in Cars, Automobiles ,Solar cookers, Telescopes and Cables shape like Parabolic arcs used in suspension bridge. The Planets in a solar system moves in an ELLIPTICAL path with the Sun at one of the foci, also Artificial satellites are made to move in an ELLIPTICAL path around Earth. HYPERBOLA have their applications in the field of Ballistics, the shape of EIFFEL Tower is also Hyperbolic .



- i) What is the length of latus rectum of $y^2 = -3x$ (1 mark)
- ii) Write the equation of an equilateral hyperbola with length of transverse axis is 12cm . (1 mark)
- iii) A man is running a race course in such a way that that the sum of his distances from two flag posts is always a constant and it is 10m. if the distance between two flag posts is 8m, what is the locus of path traced by him? Write the equation. (2 marks)

37. The importance of games and sports in a student's life is to a great extent. It has proved to be very therapeutic in nature. Sports in a student's life helps in improving and building skills, and also aid in other concepts such as dispute management and sport-based interaction. Sports and games not only improve physical and mental health they also inculcate discipline in students. They learn to work in teams and their self-confidence gets a boost.



A Physical Education teacher conducted a survey of 500 students to study about their interest in various sports and games. It was found that 285 are interested in playing football, 195 are interested in playing basket ball, 115 are interested in playing hockey. 45 are interested in playing football and hockey, 70 are interested in playing football and basket ball and 50 are interested in playing hockey and basket ball. 50 students are not interested any of these three games.

- i. How many students are interested in at least one of the three games? (1 mark)
- ii. How many are interested in all three games? (1 mark)
- iii. How many are interested exactly in one game? (2 marks)
38. The number lock has three/four wheels each labeled with 10 digits 0 to 9. The lock can be opened with the digits are set in a particular specific order. In mathematics, a permutation of a set is an arrangement of its members into a sequence or linear order, or if the set is already ordered, a rearrangement of its elements. The word "Permutation" also refers to the act or process of changing the linear order of an ordered set.



Now answer the questions given below

(i) A number lock in a suitcase has three wheels each labeled with ten digits 0 to 9 and the number lock is a three digit even number, then find the number of all possible attempts if repetition of numbers is not allowed.

2. Find the number of unsuccessful attempts if repetition of digits is allowed. (2 marks

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Sample Question
Paper 2 Class XI
Session 2022-23 Mathematics

Time Allowed: 3 Hrs

Maximum Marks: 80

SECTION A(Multiple Choice Questions) Each question carries 1 mark

1. Write the solution in roster form $A = \{x: x \in \mathbb{R}, x^2 - 3x - 40 = 0\}$

- (a) $\{8, -5\}$ (b) $\{-8, 5\}$ (c) $\{10, -4\}$ (d) $\{-10, 4\}$

2. In a school there are 20 teachers who teach mathematics or physics. Of these, 12 teach mathematics and 4 teach both physics and mathematics. How many teach physics ?

- (a) 4 (b) 8 (c) 12 (d) 16

3. If $(x/3, y-1) = (3, 7)$ find x, y

- (a) 9, 8 (b) 32, 4, 43 (c) 16, 45 (d) 64, 54

4. Range of signum junction is

- (a) $[0, \infty)$ (b) $(-\infty, \infty)$ (c) $\{-1, 0, 1\}$ (d) $(-\infty, 0]$

5. If $A = \{a, b, c, \emptyset\}$, then numbers of subsets A has

- (a) 4 (b) 16 (c) 32 (d) 8

6. $\operatorname{cosec}(-1410^\circ)$

- (a) -1 (b) 0 (c) 1 (d) 2

7. $\cot^2 \frac{\pi}{6} + \operatorname{cosec} \frac{5\pi}{6} + 3 \tan^2 \frac{\pi}{6} = ?$

- (a) 6 (b) 10 (c) $3/2$ (d) $-1/2$

8. Solve : $3x - 7 > 5x - 1$

- (a) $[2, \infty)$ (b) $(-\infty, 4]$ (c) $(-\infty, 4)$ (d) $[4, \infty)$

9. $3(7 + i7) + i(7 + i7)$

- (a) $14 + 28i$ (b) $28 + 14i$ (c) $14 - 28i$ (d) $-14 + 28i$

10. How many 3-digit even numbers can be formed from the digits 1, 2, 3, 4, 5, 6 if the digits can be repeated?

- (a) 216 (b) 120 (c) 108 (d) 72

11. Find the multiplicative inverse of $4 - 3i$

(a) $4+3i$ (b) $\frac{4}{25} + i\frac{3}{25}$ (c) $4-3i$ (d) $\frac{4}{25} - i\frac{3}{25}$

12. How many chords can be drawn through 21 points on a circle?

(a) 200 (b) 180 (c) 420 (d) 210

13. Find the 4th term in the expansion of $(x - 2y)^{12}$

(a) $-1760 x^9 y^3$ (b) $1760 x^3 y^9$ (c) $.760 x^9 y^3$ (d) $-760 x^3 y^9$

14. If the sum of a certain number of terms of the A.P. 25, 22, 19, ... is 116. Find the last term

(a) 3 (b) 4 (c) 2 (d) 6

15. Find the distance between the points P(1, -3, 4) and Q (-4, 1, 2)

(a) $3\sqrt{5}$ (b) $2\sqrt{5}$ (c) 45 (d) 35

16. Evaluate : $\lim_{x \rightarrow 1} \frac{x^{15}-1}{x^{10}-1}$

(a) 2 (b) $\frac{2}{3}$ (c) 3 (d) $\frac{3}{2}$

17. Find the limits $\lim_{x \rightarrow 2} \frac{x^3 - 2x^2}{x^2 - 5x + 6}$

(a) -4 (b) 4 (c) 3 (d) -2

18. Evaluate $\lim_{x \rightarrow 0} \frac{\sin 4x}{\sin 2x}$

(a) 3 (b) 1 (c) 2 (d) 4

Assertion Reason Based Questions

In the following questions , a statement of assertion (A) is followed by a statement of Reason (R) . Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

19. **Assertion (A):** Range of relation $R = \{(x,y) : x,y \in \mathbb{N}, y = x^2 + 3, 0 < x < 5\}$ is $\{4, 7, 12, 19\}$

Reason (R) : The set which contains all the second elements, on the other hand, is known as the range of the relation

20. **Assertion (A):** If A is the set of even natural numbers less than 8 and B is the set of prime numbers less than 7, then the number of relations from A to B is 2^9
Reason (R) : If set A has P elements and set B has q elements then the number of relations from A to B is 2^{pq}

Section B

(This section comprises of very short answer type questions (VSA) of 2 marks each)

21. Let $A = \{1, 2\}$, $B = \{1, 2, 3, 4\}$, $C = \{5, 6\}$ and $D = \{5, 6, 7, 8\}$. Verify that

(i) $A \times (B \cap C) = (A \times B) \cap (A \times C)$.

OR

Let $A = \{9, 10, 11, 12, 13\}$ and let $f: A \rightarrow \mathbb{N}$ be defined by $f(n) =$ the highest prime factor of n . Find the range of f .

22. If in two circles, arcs of the same length subtend angles 60° and 75° at the centre, find the ratio of their radii

23. How many terms of the A.P. $-6, -11/2, -5, \dots$ are needed to give the sum -25 ?

OR

Insert five numbers between 8 and 26 such that the resulting sequence is an A.P

24. Evaluate $\lim_{n \rightarrow 0} \frac{\cos 2x - 1}{\cos x - 1}$

25. In an entrance test that is graded on the basis of two examinations, the probability of a randomly chosen student passing the first examination is 0.8 and the probability of passing the second examination is 0.7. The probability of passing at least one of them is 0.95. What is the probability of passing both?

Section C

(This section comprises of short answer type questions (SA) of 3 marks each)

26. $\frac{\cos 4X + \cos 3X + \cos 2X}{\sin 4X + \sin 3X + \sin 2X} = \cot 3X$

27. In how many ways can one select a cricket team of eleven from 17 players in which only 5 players can bowl if each cricket team of 11 must include exactly 4 bowlers?

OR

Determine the number of 5-card combinations out of a deck of 52 cards if each selection of 5 cards has exactly one king

28. $1 \times 2 + 2 \times 3 + 3 \times 4 + 4 \times 5 + \dots$

OR

How many terms of G.P. $3, 3^2, 3^3, \dots$ are needed to give the sum 120?

29. Find the equation of a line that cuts off equal intercepts on the coordinate axes and passes through the point $(2, 3)$.

OR

Find equation of the line parallel to the line $3x - 4y + 2 = 0$ and passing through the point $(-2, 3)$.

30. Find the ratio in which the YZ-plane divides the line segment formed by joining the points $(-2, 4, 7)$ and $(3, -5, 8)$.

31. Find the derivative of $\cos x$ from first principle.

Section D

(This section comprises of long answer type questions (LA) of 5 marks each)

Find the general solution $\cos 3x + \cos x - \cos 2x = 0$

OR

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

33. A manufacturer has 600 litres of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%?

34. The coefficients of three consecutive terms in the expansion of $(1 + a)^n$ are in the ratio 1 : 7 : 42. Find n.

OR

Prove that the coefficient of x^n in the expansion of $(1 + x)^{2n}$ is twice the coefficient of x^n in the expansion of $(1 + x)^{2n-1}$.

35. Find the foci, vertices, eccentricity and length of latus rectum of the ellipse $\frac{x^2}{36} + \frac{y^2}{16} = 1$

Section - E

(This section comprises of 3 case study / passage - based questions of 4 marks each with two sub-parts. First two case study questions have 3 sub parts (i),(ii),(iii) of marks 1,1,2 respectively. The third case study question has two sub parts of 2 marks each.)

36. In a survey of 50 persons of an apartment, it was found that 15 persons read magazine A, 16 persons read magazine B, 16 persons read magazine C, 8 read both A and B, 10 read both B and C, 7 read both C and A, 5 read all the three magazines.

- (a) How many persons only read magazine A.
- (b) How many persons read only magazine C.
- (c) How many read at least one of the magazines.

37. Mohan is doing one of his project. For this he asked shoe size of 10 of his class mates which are as follows-

6,5,5,6,8,6,7,7,8,8

- (a) What would be the mean shoe size for the data?
- (b) What would be the median for the data?
- (c) What would be the mean deviation about mean for the data?

38. A bag contains 20 white slips, 10 red slips, 40 yellow slips and 10 blue slips. If these 80 slips are thoroughly shuffled so that each slip has the probability of drawing a slip of paper that-

- (a) White
- (b) Blue or White

