MAYOOR SCHOOL, NOIDA
PRACTICE PAPER
CLASS-XI
SUBJECT: STANDARD MATHEMATICS

Time: 3 hours **MM:80**

General Instructions:

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with subparts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks and 2 Qs of 3 marks has been provided
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated

SECTION-A

Q1. Let n(A) denotes the number of elements in set A. If n(A) =p and n(B) = q, then how many ordered pairs (a, b) are there with a ∈ A and b ∈ B ?

A.) P^2 B.) p x q C) p + q D) 2 pq

Q2. Let A={1,2} and B={3,4}. Which of the following cannot be relation from set A to set B?

A) {(1,1), (1,2), (1,3), (1,4)} B) {(1,3), (1,4)} C) {(2,3), (2,4) D) {(1,3), (1,4), (2,3), (2,4)}

Q3. Which of the following sets is a null set ?

I. X = {x | x= 9, 2x = 4}

II. Y= {x| x= 2x.x ≠0}

III. Z={x|x-8=4}

A) I and II only B) I, II and III C) I and III only D) II and III only

Q4. If f(x + y + z) = f(x) f(y) f(z) for all x , y z and if f(2) = 4, f'(0) = 5 and f(0) ≠ 0, then f'(2) is equal to

A) ±30 B) ±100 C) ±80 D) ±20

Q5. The domain of the function f = {(1, 3), (3, 5), (2, 6)} is

A) 1, 3 and 2 B) {1, 3, 2} C) {3, 5, 6} D) 3, 5 and 6

Q6. $2\cos\frac{5\pi}{24} \cdot \cos\frac{\pi}{24} =$ .....

(A) $\frac{\sqrt{2}+\sqrt{3}}{4}$ (B) $\frac{\sqrt{3}-\sqrt{2}}{2}$ (C) $\frac{\sqrt{2}+\sqrt{3}}{2}$ (D) $\frac{\sqrt{2}-\sqrt{3}}{4}$

Q7. The value of $\frac{\tan 3x}{\tan x}$ do not lie between .....

(A) $-\frac{1}{3}$ and 0 (B) $\frac{1}{3}$ and 3 (C) $-\frac{1}{3}$ and $\frac{1}{3}$ (D) -3 and 3

Q8. if $x + 1/x = 1$ find the value of $x^{2000} + 1/x^{2000}$ is

(A) 0 (B) 1 (C) -1 (D) None of these

Q9. The complex numbers $\sin x + i \cos 2x$ are conjugate to each other for

(A) $x = n\pi$ (B) $x = 0$ (C) $x=(n+1/2)\pi$ (D) no value of x

Q10. The region of the XOY-plane represented by the inequalities $x \geq 6$, $y \geq 2$, $2x + y \leq 10$ is

(A) unbounded (B) a polygon (C) none of these (D) exterior of a triangle

Q11. **T**here are 20 chair patterns and ten table layouts available to a party planner. How many different ways can she create a set of tables and chairs for the party.

A) 230 B) 300 C) 200 D)400

Q12. 7 men and 7 women sit in a row. The number of ways in which they can be arranged so that no two women sit together is:

(A) $7! \times {}^8P_7$ (B) $7! \times {}^7P_7$ (C) $8! \times 7!$ (D) $7! \times 7!$

Q13. In how many ways can 12 different books be distributed equally among 3 students such that each student gets 4 books?

(A) $12! / (4!)^3$ (B) $12! / 3!$ (C) $12! / (4!)^3 \times 3!$ (D) $12!$

Q14. The number of different words that can be formed using all the letters of the word **ASSASSINATION** such that all the S's are together is:

(A) 3326400 (B) 3328000 (C) 3324000 (D) 3312000

Q15. A committee of 5 is to be formed from 6 men and 4 women such that at least 2 women are included. The number of such committees is:

(A) 246 (B) 244 (C) 222 (D) 242

Q16. If the 4th, 10th and 16th terms of a G.P. are x, y, z respectively, then the relation between x, y, z is:

(A) $y^2 = xz$ (B) $y^3 = x^2 z$ (C) $y^2 = x^2 z$ (D) $y^3 = xz^2$

Q17. The sum of an infinite geometric series is 15 and the sum of the squares of these terms is 45. The first term of the series is

(A) 6 (B) 7 (C) 5 (D) 9

Q18. The 8th term from the end of the GP 3, 6, 12, 24, ..., 12288 is

(A) 96 (B) 192 (C) 48 (D) 288

Questions number 19 and 20 are Assertion and Reason based questions.

Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes A), B), C) and D) as given below.

A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

C) Assertion (A) is true, but Reason (R) is false.

D) Assertion (A) is false, but Reason (R) is true.

Q19. Assertion (A): The domain of the relation R = {(x +2, x +4) : x ∈ N, x<8} is {3,4, 5, 6, 7, 8, 9).

Reason (R): The range of the relation R = {(x + 2, x +4) : x ∈N, x < 8} is {1, 2, 3, 4, 5, 6, 7}.

Q20. **Assertion (A):** If z is a complex number, then $(\bar{z})^{-1}(\bar{z})$ is equal to 4.

Reason (R): The region of the complex plane for which $\left|\frac{z-a}{z+a}\right| = 1$ [Re(a) ≠ 0] is Y-axis.

SECTION-B

Q21 A) Express in the form of $a + ib$: $\left(\frac{1}{1-4i} - \frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)$

OR

B) If $z_1 = 2 + i, z_2 = 2 - 3i, z_3 = 4 + 5i$, evaluate $\text{Re}\left(\frac{z_1\bar{z}_2}{z_3}\right)$

Q22. Prove that $\frac{\sin 8x\cos x - \sin 6x\cos 3x}{\cos 2x\cos x - \sin 4x\sin 3x} = \tan 2x$

Q23 . Find the values of x and y, if $\frac{(1+i)x-2i}{3+i} + \frac{(2-3i)y+i}{3-i} = i$

Q24 If x + iy = $\sqrt{\frac{a+ib}{c+id}}$, prove that $(x^2+y^2)^2 = \frac{a^2+b^2}{c^2+d^2}$.

Q25 A) The marks obtained by a student of Class 11 in a test are at least 20 but less than 35. Write this statement in the form of a linear inequality and represent the solution set on a number line.

Or

B) Find the range of values of x satisfying both inequalities:

$$x - 2 > -3 \quad \text{and} \quad 3x + 4 < 10$$

SECTION-C

Q26 Find the domain and the range of the function : $f(x) = \sqrt{x^2 - 4}$

In a triangle ABC, prove that, $\cos^2\frac{A}{2} + \cos^2\frac{B}{2} + \cos^2\frac{C}{2} = 2\left(1 + \sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}\right)$

Q27. **OR**

If α, β are the roots of $a\cos\theta + b\sin\theta = c$, show that, $\cos(\alpha + \beta) = \frac{a^2 - b^2}{a^2 + b^2}$.

Q28. If α and β are different complex numbers with $|\beta| = 1$, then find $\left|\frac{\beta - \alpha}{1 - \bar{\alpha}\beta}\right|$.

Q29. What is the number of ways of choosing 4 cards from a pack of 52 playing cards ?
In how many of these
(i) four cards are of the same suit? (ii) four cards belong to four different suits?
(iii) are face cards? (iv) two are red cards and two are black cards?
(v) cards are of the same colour?

Q30. If a, b, c and d are in G.P. Prove that, $(a^n + b^n)$, $(b^n + c^n)$, $(c^n + d^n)$ are in G.P.

Q31. 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

OR

Solve the system of inequalities:
$5(2x - 7) - 3(2x + 3) \leq 0$, $2x + 19 \leq 6x + 47$

SECTION-D

Q32. In a class, 36 students offered physics, 48 students offered chemistry and 50 students offered mathematics. Of these, 13 are in both chemistry and mathematics; 26 in physics and chemistry; 11 in mathematics and physics and 6 in all the subjects. Find

(i) how many students are there in the class
(ii) how many students offered only mathematics and
(iii) how many students are taking exactly two of the three subjects

Q33. Find $\sin\frac{x}{2}, \cos\frac{x}{2}$ *and* $\tan\frac{x}{2}$ if $\tan x = -\frac{4}{3}$, x in quadrant II

OR

Prove that: $\sin x + \sin 3x + \sin 5x + \sin 7x = 4 \cos x \cos 2x \sin 4x$

Q34. The ratio of the A.M. and G.M. of two positive numbers a and b, is m : n. Show that a : b = $(m+\sqrt{m^2-n^2}):(m-\sqrt{m^2-n^2})$.

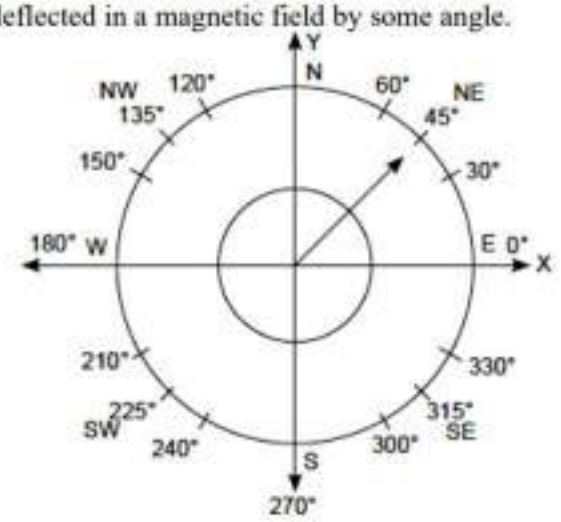
OR

If S_n denotes the sum of n terms of a G.P., prove that $(S_{10} - S_{20})^2 = S_{10}(S_{30} - S_{20})$.

Q35. In how many ways can the letters of the word PERMUTATIONS be arranged so that:
i) Words starting with P and ending with S,
ii) Vowels are all together,
iii) There are always 4 letters between P and S?

SECTION -E

Q36 The below figure shows the compass. The East direction is along the positive X-axis (0° angle) and North direction is along the +ve Y-axis (90° angles). Initially the pointer is pointed towards North-East direction. Pointer is deflected in a magnetic field by some angle.



On the basis of above answer the following.

(i) If pointer move in anticlockwise direction by an angle of 90°, then find the value of sine of angle made by pointer from East direction. (1)

(ii) If pointer moves an angle of 165° from its initial position in anticlockwise direction, then find the value of cosine of angle made by pointer from East direction. (1)

(iii)If the sine and cosine of angle made by pointer with East direction is $-\frac{1}{\sqrt{2}}$ then find where the

(iv) How much angle will pointer move in anticlock wise direction if tangent of angle made by pointer with x-axis is – 1? (1)

Q37. Seema wants a mobile number having 10 digits. It is not just a group of numbers strung out at random. All mobile numbers have 3 things in common. a 2-digit Access code (AC), a 3-digit provider code (PC), and a 5 digit subscriber code (SC). AC code and PC code are fixed, then

(i) How many mobile numbers are possible if no start with 98073 and no other digit can repeat? (1)

(ii) How many AC code are possible if both digit in AC code are different and must be greater than 6? (1)

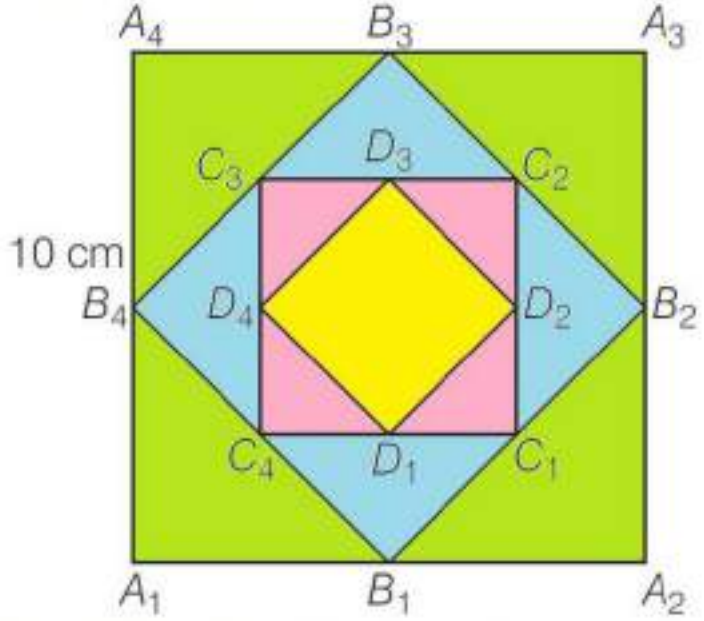
(iii) A) How many mobile numbers are possible if AC and PC code are fixed and digits can repeat? (2)

OR

B) How many mobile numbers are possible with AC code 98 and PC code 123 and digit used in AC and PC code will not be used in SC code? (2)

Q38

A student of class XI draws a square of side 10 cm and filled green colour. Another student join the mid-point of this square to form new square and filled blue colour. Again, the mid-points of the sides of this new square are joined to form another square by another student and filled pink colour. This process is continued indefinitely.



Based on above information, answer the following questions.

(i) Find the side of fourth square (in cm). [1]

(ii) Find the area of the fifth square (in sq cm). [1]

(iii) Find the sum of areas of all the square formed (in sq cm). [2]

OR

(iii) Find the sum of the perimeter of all the square formed (in cm) [2]