DELHI PUBLIC SCHOOL @ SECTOR 98
ANNUAL EXAMINATION 2024-2025
Subject : Mathematics, Class : XI

Date : 24.02.2025
Time : 3hrs.
M.M. : 80
P.S : 4

General Instructions:

1. *This question paper consist five sections A, B C, D and E.*
2. *Section A has 18 MCQ and 02 Assertion-Reason based questions of 1 mark each.*
3. *Section B has 5 very short answer type questions of 2 marks each.*
4. *Section C has 6 short answer type questions of 3 marks each.*
5. *Section D has 4 Long answer type questions of 5 marks each.*
6. *Section E has 3 case based integrated units of assessment (4 marks each) with sub parts.*
7. *All questions are compulsory to attempt.*

Section-A

Q1. Let A = {x : x is a multiple of 5} and B = { x : x is a multiple of 3}, then $A \cap B$ is____.
a. {5, 10 , 15, 20, …} b. {15, 30 , 45, 20, …}
c. {3, 6 , 9, ., …} d. Ø

Q2. If R = {(x, y) : x, y ∈ Z, $x^2 + y^2 \leq 4$} is a relation on z , then domain of R is____.
a. { 0, 1, 2} b. { - 2, - 1, 0}
c. { - 2, - 1, 0, 1, 2} d. { - 2, - 1}

Q3. If U = { 1, 2, 3, 4, 5, 6, 7, 8, 9}, B = {2, 4, 6, 8} and C = {3, 4, 5, 6}, then $(B - C)'$ is____.
a. {1, 3, 4, 6, 7} b. {1, 3, 4, 6, 7, 9}
c. {1, 3, 4, 5, 6, 7, 9} d. {2, 3, 4, 5, 6}

Q4. The value of $i^n + i^{n+1} + i^{n+2} + i^{n+3}$, $\forall\, n \in N$ is_____.
a. 0 b. - i
c. i d. 1

Q5. Which term of the G.P 5, 10, 20, 40,…….is 5120?
a. 10^{th} b. 12^{th}
c. 11^{th} d. 14^{th}

Q6. The sum of three number in A.P is – 3 , then first term is____.
a. – 1 b. 1
c. - 3 d. 3

Q7. The middle term in the expansion of $(\sqrt{x} - \frac{1}{\sqrt{x}})^{10}$ is____.
a. – 1 b. 1
c. - 3 d. 3

Q8. The third term of G.P is 4. The product of its first five terms is____.
a. 4^4 b. 4^3
c. 4^6 d. 4^5

Q9. The coordinates of the foot of perpendiculars from the point (2, 3) on the line y = 3x + 4 is given by_____.
a. 2/3, -1/3 b. 10/37, - 1 0
c. 37/10, - 1/10 d. -1/10, 37/10

Q10. The multiplicative inverse of 3 + 2i is____.
a. 3 + 2 i b. - 3 + 2 i
c. -3-2i d. none of these

Q11. A wheel makes 360^0 revolution in one minute, through how many radian does it turn in one second?

a. 12π b. 10π

c. 8π d. 6π.

Q12. The number of different arrangements (permutations) of the letters of the word 'BANANA' is____.

a. 40 b. 120

c. 60 d. 50

Q13. Conversion of $40^0\ 20'$ into radian measure is_____π radians.

a. 123/540 b. 121/540

c. 119/540 d. None of these

Q14. The value of the trigonometry function, $\sin(-11\ \pi/3)$ is_____.

a. $-\sqrt{3}/2$ b. 1/2

c. 3/2 d. -1/2

Q15. In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls?

a. 14 b. 80

c. 10 d. 40

Q16. If $-2 < 2x - 1 < 2$ then the value of x lies in the interval____.

a. (1/2, 3/2) b. (-1/2, 3/2)

c. (3/2, 1/2) d. (3/2, -1/2)

Q17. If $|x| < 5$ then the value of x lies in the interval____.

a. $(-\infty, -5)$ b. $(\infty, 5)$

c. $(-5, \infty)$ d $(-5, 5)$

Q18. Given $R = \{ (x, y) : y = x - 3; x, y \in Z \}$. Which of the ordered pairs belong to the given relation?

a. (0, 2) b. (1, 2)

c. (0, - 3) d. (7, - 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 and R is the not correct explanation of A.

c.A is true but R is false

d.A is false but R is true.

Q19. **Assertion(A):** If each of the observations $x_1, x_2, ..., x_n$ is increased by 'a', where 'a' is a negative or positive number, then the variance remains unchanged.

Reason (R) : Adding or subtracting a positive or negative number to (or from) each observation of a group does not affect the variance.

Q20. **Assertion(A):** ${}^{10}C_n = {}^{10}C_4$ so r = 4 or 6.

Reason (R) : ${}^nC_r = C_{n-r}$.

Section-B

Q21. If $U = \{ x : x \in N \text{ and } 2 \le x \le 12 \}$, $A = \{ x : x \text{ is even prime} \}$ and $B = \{ x: x \text{ is a factor of } 24 \}$, then verify each of the $A - B = A \cap B'$.

Q22. Find the derivative of the function from the first principle: $\sin x^2$.

– OR-

Find the equation of the parabola whose: focus is (2, 3) and the directrix is x - 4y + 3 = 0.

Q23. Find n, if ${}^{n-1}P_3 : {}^{n}P_4 = 1 : 9$.

Q24. Find the equation of the parabola whose: focus is (2, 3) and the directrix is x - 4y + 3 = 0.

-OR-

Find the equation of the circle which touches the lines 4x - 3y +10 = 0 and 4x - 3y - 30 = 0 and whose center lies on the line 2x + y = 0.

Q25. Find the equation of the perpendicular bisector of the line joining the points (1, 3) and (3, 1).

Section-C

Q26. Two finite set have m and n elements. The number of subset of the first set is 112 more than that of the second set. Find the value of m and n.

-OR-

Let f = { (1,1), (2, 3), (0, -1)……} be a function from Z to Z defined by f(x) = ax + b, for some integers a and b. Determine a and b.

Q27. If tana= m/m+1 and tanb= m/2m+1, prove that a+b = π/4.

-OR-

Find the point in yz-plane which is equidistant from the points A(3, 2, -1), B(1, -1, 0) and C(2, 1, 2).

Q28. In how many of the distinct permutations of the letters in MISSISSIPPI do the four I's not come together?

Q29. If the sum of n term of an A.P is $3n^2 + 5n$ and its m^{th} term is 164, find the value of m.

-OR-

The sum of first three terms of a G.P is 16 and the sum of the next three terms is 128. Determine the first term.

Q30. Find a, if 17^{th} and 18^{th} terms in the expansion of $(2 + a)^{20}$ are equal.

Q31. Find the modulus and conjugate of the complex number z = - 1 – i √3. Verify $\bar{z}\, z = |z|^2$.

Section-D

Q32. Find the domain and range of the function f(x)= $\sqrt{4 - x^2}$.

-OR-

Prove that: tan 20° tan 30° tan 40° tan 80° = 1

Q33. Solve: 3x + 4y ≤12 , 7x + y ≥6 and x, y ≥0.

Q34. Prove that $Sin5x = 16Sin^5x - 20Sin^3x + 5Sinx$.

–OR-

Evaluate: $\lim_{x \to \sqrt{10}} \frac{\sqrt{7-2x} - (\sqrt{5} - \sqrt{2})}{x^2 - 10}$.

Q35. If A and G be A.M and G.M, respectively between two positive numbers, prove that the number are A ±√$(A + G)(A - G)$.

-OR-

A bag contains 6 red, 4 white and 8 blue balls. If three balls are drawn at random, find the probability that:

i. one is red and two are white.

ii. two are blue and one is red.

iii. one is red.

Section-E

Q36. **Case Study 1**

During the mathematics class, a teacher clears the concept of permutation and combination to the 11^{th} standard students. After the class he asks the students some questions, one of the question was in how many- ways numbers between 99 and 1000 (both excluding) can be formed such that:

a. Every digit is either 3 or 7.

b. There is no restriction.

c. No digit is repeated.

Q37. **Case Study 2**

Two complex numbers $Z_1=a+ib$ and $Z_2=c+id$ are said to be equal, if $a=c$ and $b=d$. On the basis of above information, answer the following questions.

a. If $(3a-6)+2ib=-6b+(6+a)i$, then find a and b.

b. If $(1+i^3)= x + iy$, find the value of y .

c. If $(2a+2b) + i(b-a) = -4i$, find the modulus of Z_1.

Q38. **Case Study 3**

A class teachers of class XI writes three sets A, B and C such that A = {1, 3, 5, 7, 9}, B = {2, 4, 6, 8} and C= {2, 3, 5, 7, 11}. Answer the following questions.

a. Find $A \cap B \cap C$.

b. Write n(P(B)).

c. Find (A-B) ∪ (B-C).

-OR-

For a group of 200 candidates, the mean and the standard deviation of scores were found to be 40 and 15 respectively. Later on, it was discovered that the scores of 43 and 35 were misread as 34 and 53 respectively.

Student	Eng	Hindi	S.St	Science	Maths
Ramu	39	59	84	80	41
Rajitha	79	92	68	38	75
Komala	41	60	38	71	82
Patil	77	77	87	75	42
Pursi	72	65	69	83	67
Gayathri	46	96	53	71	39

a. Find the correct variance.

b. What is the formula of standard deviation.

c. Find the correct mean.

-OR-

Find the sum of correct scores.