

BUDHA DAL PUBLIC SCHOOL PATIALA
FIRST TERM EXAMINATION (6 September 2024)

Class - XI

Paper- Mathematics (Set-A)

M.M. 80

Time: 3hrs.

General Instructions:

1. Section A has 18 MCQ's 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 studies of 4 marks each.

Section - A

1. A set can be represented in
a) 1 way b) 2 ways c) 3 ways d) many ways
2. If A and B are two sets then $A \cap (A \cup B)$ equals to
a) A b) B c) ϕ d) $A \cap B$
3. The number of subsets of a set containing 'n' elements is
a) 2^n b) 2^{n+1} c) 2^{n-1} d) n^n
4. If $n(A) = 6$ and $n(B) = 3$ then $n(A \times B)$
a) 9 b) 18 c) 36 d) 54
5. Domain of $f(x) = \frac{1}{3x-2}$ is
a) $x \in (\frac{2}{3}, \infty)$ b) $x \in R$ c) $x \in R - \{\frac{2}{3}\}$ d) $x = \frac{2}{3}$
6. Two complex numbers $Z_1 = a + ib$ and $Z_2 = c + id$ are equal if
a) $a = c$ b) $b = d$ c) $a = c$ and $b = d$ d) none of these
7. For complex number $6 - 3i$, $Re(6 - 3i)$ is
a) -6 b) -3 c) 6 d) $3i$
8. i^{257} in simplified form
a) -1 b) i c) 1 d) $-i$
9. If $x < 5$, then
a) $-x < -5$ b) $-x \leq -5$ c) $-x > -5$ d) $-x \geq -5$

A-1

10. $-3x + 17 < -13$, then

- a) $x \in (10, \infty)$ b) $x \in [10, \infty)$ c) $x \in (-\infty, 10]$ d) $x \in [-10, 10]$

11. If $|x - 1| < 3$, then

- a) $x \in (-2, 4)$ b) $x \in [-2, 4]$ c) $x \in (-\infty, 4)$ d) $x \in (0, 4)$

12. The value of $6!$ is

- a) 6 b) 6^6 c) 36 d) 720

13. If $8! = \lambda \cdot 5!$, then λ is

- a) 8 b) 56 c) 40 d) 336

14. In every term, the sum of indices of a and b in the expansion of $(a + b)^n$ is

- a) n b) $n + 1$ c) $n + 2$ d) $n - 1$

15. If three numbers x, y, z are in GP, then

- a) $z = \sqrt{xy}$ b) $y = \sqrt{xz}$ c) $x = \sqrt{yz}$ d) $x + z = 2y$

16. Given GP is 1, 0.12, 0.0144, then common ratio is

- a) 1 b) 12 c) 1.2 d) 0.12

17. Range of a series : 1357, 1090, 1666, 1494, 1623

- a) 676 b) 576 c) 476 d) 376

18. Variance is denoted by

- a) σ b) σ^2 c) $\sqrt{\sigma}$ d) $\frac{\sigma}{n}$

Assertion & Reasoning Questions

The following questions consists of two statements – Assertion (A) and Reason (R). Answer the question selecting appropriate option given below:

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

19. Assertion (A) : The value of k for which $\frac{3}{4}, k, \frac{4}{3}$ are in GP is ± 1 only

Reason (R) : If x, y, z are in GP then $y^2 = xz$

20. Assertion (A) : ${}^{10}C_2 = 45$

Reason (R) : $nC_r = \frac{n!}{(n-r)!}$

Section - B

21. If $A = \{3, 5, 7, 9, 11\}$, $B = \{7, 9, 11, 13\}$, $C = \{11, 13, 15\}$, $D = \{15, 17\}$ find

(a) $A \cap (B \cup C)$ (b) $(A \cup D) \cap (B \cup C)$

22. If $P = \{1, 4\}$ then find $P \times P \times P$

23. Find the conjugates of $z_1 = (2 + i)^2$

24. Solve $5x - 3 < 3x + 1$, when

a) x is an integer b) x is a real number

25. How many 4-digit numbers are there with no digit repeated?

Section - C

26. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$, $B = \{2, 3, 5, 7\}$ verify that

a) $(A \cup B)' = A' \cap B'$ b) $(A \cap B)' = A' \cup B'$

27. Find the domain and range of $f(x) = -|x|$, also draw the graph

28. Find the multiplicative inverse $(3 + \sqrt{2}i)^2$

29. Expand $\left(x + \frac{3}{x}\right)^5$ using binomial theorem

30. Solve the inequalities and represent the solution graphically

$$2(x - 1) < x + 5 ; 3(x + 2) > 2 - x$$

31. Find mean deviation about mean

x_i	2	5	6	8	10	12
f_i	2	8	10	7	8	5

Section - D

32. IQ of a person is given by the formula $IQ = \frac{MA}{CA} \times 100$

Where MA is mental age. CA is chronological age. If $80 \leq IQ \leq 140$ for a group of 12 years old children, find range of their mental age.

33. Find the value of n such that : $n_{P_5} = 42 \cdot n_{P_3}$, $n > 4$

34. The sum of first three terms of a G.P. is $\frac{39}{10}$ and their product is 1. Find the common ratio and the terms.

35. Calculate mean and variance for the following distribution

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

Section - E

Case Study Questions

36. Just ~~now~~ mathematics period got over and teacher introduced binomial expansion of $(x + y)^n$ using binomial theorem

$$(x + y)^n = n_{C_0} x^n + n_{C_1} x^{n-1} + n_{C_2} x^{n-2} y^2 + \dots + n_{C_n} x^0 y^n$$

and how to write coefficients. Some friends were too curious and they started asking each other questions and their answer.

Based on the above information, answer the following questions :

- How many terms are there in the expansion $\left(\frac{x}{2} + \frac{2}{x}\right)^{12}$ (1)
- Find the sum of the coefficients of terms in the expansion $(a + b)^3$ (1)
- Evaluate $(10 - 1)^4$, using binomial theorem. (2)

37. If $A = \{1, 2, 3, 5\}$, $B = \{4, 6, 9\}$ and a relation R from A to B is defined by $R = \{(x, y) : \text{the difference between } x \text{ and } y \text{ is odd, } x \in A, y \in B\}$. Then

- Write R in the roster form (1)
- Write domain and range of R (1)
- Represent R by an arrow diagram (2)

38. Four friends decide to play a game of cards. They picked a normal deck of cards with 52 playing cards. The deck has four suits (hearts, diamonds, spades and clubs). Hearts and diamonds are red in colour while spades and clubs are black in colour. Each suit has 13 cards with one Ace (A), 9 number cards (2 to 10) and 3 face cards (Jack (J), King (K) and Queen (Q)).

Based on above information, answer these following questions:

- In how many different ways can four cards be drawn from the deck? (1)
- What are the number of ways of selecting 4 cards belonging to four different suits? (1)
- What are the number of ways of selecting 4 cards of same colour? (2)

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Section - A

1. Set of letters of the word COOL in the Roster form is
a) $\{C, O, L\}$ b) $\{C, O, O, L\}$ c) $\{L, O, O, C\}$ d) $\{O, L, O, C\}$
2. Let set A = set of vowels and set B = $\{a, i, o\}$. Then $A \cup B$ is
a) B b) A c) ϕ d) $\{\phi\}$
3. For two non empty sets, set A and set B, the Cartesian product is
a) $A \times B = B \times A$ b) $A \times B = \phi = B \times A$ c) $A \times B \neq B \times A$ d) none of these
4. The set of $A = \{x \in N; x^2 - 4 = 0\}$ is
a) $\{-2, 2\}$ b) -2 c) 2 d) not a well defined set
5. Given $f(x) = \frac{1}{4x-3}$, its domain is
a) R b) $R - \{\frac{3}{4}\}$ c) $[0, \frac{3}{4}]$ d) $(-\frac{3}{4}, \frac{3}{4})$
6. If $Z_1 = 3 + 4i$ and $Z_2 = -7 + 2i$, then $Re(z_1 + z_2)$ is
a) 10 b) 4 c) -4 d) 6
7. Imaginary part of $z = 3i^4 - i^2$ is
a) 3 b) 2 c) 1 d) 0
8. $|(1+i)(1-i)|$ is equal to
a) -2 b) $\sqrt{2}$ c) 2 d) 0
9. Solution of $-x > 5, x \in R$ on number line is
a) $(5, \infty)$ b) $(-5, \infty)$ c) $(-\infty, -5)$ d) $(-\infty, -5]$

B-1

10. If $|x - 1| < 5$, then

- a) $x \in (4, 6)$ b) $x \in (-4, 6)$ c) $x \in (-\infty, 6)$ d) $x \in (4, 0)$

11. If $3x - 5 < x + 7, x \in R$, then

- a) $x > 6$ b) $x < 6$ c) $x \in (-6, 6)$ d) $\{1, 2, 3, 4, 5, 5\}$

12. The value of $3! + 4!$ is

- a) $7!$ b) 7 c) 24 d) 30

13. In how many ways can 6 persons occupy 3 seats?

- a) 18 b) 120 c) 36 d) 720

14. The value of $\frac{n!}{(n-r)!}$, when $n = 5, r = 2$ is

- a) 10 b) 5 c) 20 d) 25

15. The number of terms in the expansion of $(x - 2y)^{10}$ are

- a) 10 b) 12 c) 11 d) 20

16. For the sequence $\{a_n\}$, whose n th term is given by $a_n = (-1)^{n+1} 2^{n-1}$, then its 5th term is

- a) 32 b) 16 c) -16 d) -32

17. The next term of G.P $\sqrt{3}, \sqrt{6}, \sqrt{12} \dots$ is

- a) $\sqrt{18}$ b) $2\sqrt{6}$ c) $\sqrt{30}$ d) 6

18. Which is not the measure of dispersion

- a) Range b) step deviation c) mean deviation d) standard deviation

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Reason (R) : If x, y, z are in GP, then $2y = x + z$

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Section - B

21. If $A = \{3, 5, 7, 9, 11\}$, $B = \{7, 9, 11, 13\}$, $C = \{11, 13, 15\}$, $D = \{15, 17\}$ find

(a) $A \cap (B \cup C)$ (b) $A \cap (B \cup D)$

22. If $A = \{-1, 1\}$ then find $A \times A \times A$

23. Find the conjugate of $z = (3 - 2i)^2$

24. Solve the inequality: $4x - 5 < x + 7$, when

a) x is whole number b) x is a real number

25. How many 4-digit numbers can be formed by using the digits 1 to 9 if repetition of digits is not allowed?

Section - C

26. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$ and $C = \{3, 4, 5, 6\}$, then find

a) $(A \cup C)'$ b) $(B - C)'$ c) $(A \cup B)'$

27. Find the domain and range of $f(x) = -|x|$ also draw its graph also

28. Find the multiplicative inverse of $z = \frac{3-2i}{1+2i}$

29. Expand $\left(\frac{x}{3} + \frac{1}{x}\right)^5$, using binomial theorem

30. Solve the inequalities and represent the solution graphically on number line

$$3x - 7 > 2(x - 6); 6 - x > 11 - 2x$$

31. Find the mean deviation about median for the following data:

x_i	5	7	9	10	12	15
f_i	8	6	2	2	2	6

Section - D

32. In an experiment a solution of hydrochloric acid is to be kept between 30° and 35° Celsius. What is the range of temperature in degree Fahrenheit if conversion formula is given by $C = \frac{5}{9}(F - 32)$. Where C and F represent temperature in degree Celsius and degree Fahrenheit.

33. Find r if ${}^5P_r = 6 {}^5P_{r-1}$

34. The sum of first three terms of a G.P. is $\frac{13}{12}$ and their product is -1. Find the common ratio and the terms.
35. Calculate mean and variance for the following data:

Class	0-10	10-20	20-30	30-40	40-50
Frequency	5	8	15	16	6

Section - E

Case Study Questions

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