INDIAN SCHOOL AL WADI AL KABIR

Assessment - 2 (2023-24)

SUB: Mathematics (041)

Date: 30/11/2023   Set 2   Time Allowed :3 hours

Class: XI   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.*

Q. No	SECTION A (MCQ)	Marks

1. If A and B are disjoint sets and $n(A) = 3$ and $n(B) = 4$, then the number of subsets of $A \cup B = $ ___   1

A	0	**B**	7	**C**	128	**D**	12

2. $A = \{0, 1\}, B = \{x: x \in N, x \le 2\}, C = \{x: x \in W, x^2 - x = 0\}, D = \{1, -1\}$, then _____ are equal sets.   1

A	A and C	**B**	A and B	**C**	B and C	**D**	A and D

3. The sum of n terms of the series 5+55 + 555+….. = _____   1

A	$\frac{5}{9}\left[\frac{10^n}{9} - n\right]$	**B**	$\frac{5}{9}\left[\frac{(10^n - 1)}{9} - 1\right]$
C	$\left[\frac{10^n}{9} - n\right]$	**D**	$\frac{5}{81}[10(10^n - 1) - 9n]$

4. Which of the following relations are functions?

   i) $\{(1, 2), (2, 2), (3, 2), (4, 2)\}$
   ii) $\{(3, 5), (4, 7), (5, 8), (6, 10), (7,12)\}$
   iii) $\{(2, 1), (2, 2), (3, 1), (4, 2), (5, 2)\}$
   iv) $\{(5, 1), (5, 2), (5, 3), (5, 4)\}$ 1

A	*i and ii*	B	*ii and iv*	C	*i, ii, iii and iv*	D	*iv only*

5.

If $f(x) = \begin{cases} 3x - 1, & 0 \le x < 3 \\ 2x + 1, & 3 \le x < 5 \\ x^2 - 10, & 5 \le x < 8 \end{cases}$, $x \in W$, then $f(0) + f(3) + f(5)$ 1

A   25   B   21   C   19   D   -10

6.

If $2 Sin\dfrac{7\pi}{6} - x \cos \dfrac{2\pi}{3} = 0$, then $x =$ ____   1

A -1 B $\dfrac{2}{3}$ C $\dfrac{1}{2}$ D   2

7.

If the coefficient of x^2 in the expansion of $(1 + x)^m$ is 28, then $m =$ _____   1

A   4   B   6   C   8   D   10

8. $\cot\dfrac{\pi}{8} =$ ____   1

A $\sqrt{2} + 1$ B $\sqrt{2} - 1$ C $1 - \sqrt{2}$ D $\sqrt{2} + 2$

9.   The equation of a circle with centre (0, 2) and radius 2 units is _____.   1

A $x^2 + y^2 = 4$ B $x^2 + y^2 - 4y = 0$

C $x^2 + y^2 - 4x = 0$ D $x^2 + y^2 + 4y = 8$

10. $|2x - 1| \le 3$ then ____   1

A $x \in \{1, 2\}$ B $x \in [-1, 2]$ C $x \in [1, 2]$ D $x \in (-1, 2)$

11.   If AM and GM of two numbers are 10 and 6 respectively, then the numbers are   1

A   12 and 3   B   10 and 10   C   12 and 8   D   18 and 2

12.   If $nC_2 = nC_8$, find $nC_3 =$ ____   1

A   10   B   45   C   120   D   720

13.   How many three-digit numbers are there will all digits distinct?   1

A   999   B   648   C   899   D   729

14.   There are 10 points, out of these 3 points are collinear. The number of straight lines obtained from the points = _____   1

A   43   B   42   C   45   D   90

15. The nth term of the series $(2 \times 3) + (5 \times 9) + (8 \times 27) + (11 \times 81) + \cdots$ is: 1

    A $2n(n+1)^2$ **B** $3n(n+1)^n$ **C** $(3n-1)3^n$ **D** $(2n+1)(n+1)^n$

16. $If \left(\dfrac{1-i}{1+i}\right)^{100} = a + ib \ then \ a^2 + b^2 = \underline{\ \ }$ 1

    A   0   B   4   C   16   D   1

17. Which of the following represents the equation of a line whose sum of intercepts is 1 and product of intercepts is -6 ?   1

    A $3x + 2y = 6$ **B** $3x - 2y = 6$ **C** $-3x + 2y = 6$ **D** $3x + 2y = -6$

18. The equation of the parabola with vertex $(0, 0)$ passing through $(5, 2)$ and symmetric with respect to y axis is _____   1

    A $2x^2 = 25y$ **B** $2y^2 = 25x$ **C** $25x^2 = 2y$ **D** $25y^2 = 2x$

ASSERTION-REASON BASED QUESTIONS

In the following questions (19 and 20), 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. (A) If A (3, 7) B (2, 5) and C(k,9) are collinear, k =4.

   (R) The slope of a line is the change in y coordinate with respect to the change in x coordinate.   1

      A   B   C   D

20. $A) \ 1 + i^2 + i^4 + i^6 + \ldots\ldots + i^{100} = 1$

   $R) \ For \ any \ integer \ k, \ i^{4k} = 1 \ and \ i^{4k+2} = -1.$ 1

      A   B   C   D

SECTION B

21. Write the following sets A, B and C in roster form:

$A = \{x : x \in Z, x^2 \leq 4\}$, $B = \{y : y \in N, y \leq 5\}$ and
$C = \{k : k \text{ is a prime number}, k < 10\}$.   Hence write $(A - B) \cap (B - C)$.

2

22. Find equation of a circle passing through origin and makes intercepts 8 and 6 on x axis and y axis respectively.

2

OR

Given that equation of a parabola is $x^2 = 16y$. Find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum.

23. Find n and r if $nP_r = 120 \text{ and } nC_r = 20$

2

OR

If the number of diagonals of a polygon is 44, find the number of its sides.

24. Write the multiplicative inverse of the complex number $\frac{(2-i)^2}{1+7i}$ in standard form.

2

25. Evaluate mean deviation about mean: 4, 7, 8, 9, 10, 12, 13, 17.

2

SECTION C

26. Given: For two finite sets A and B, $n(A - B) = 20 + x$, $n(B - A) = 3x$ and $n(A \cap B) = x + 5$. If n(A) = n(B), then the value of x and hence $n(A \cup B)$

3

27. $If \ tanA = \frac{p}{p-1}$, $and \ tanB = \frac{1}{2p-1}$ $then, prove \ A - B = \frac{\pi}{4}$

3

OR

$If \ tanA = -\frac{3}{4}, A \in IVth \ Quadrant \ then \ evaluate \ sin\frac{A}{2} \ and \ cos\frac{A}{2}.$

28. Solve the inequalities and represent the solution on a number line:

$$5(2x - 7) - 3(2x + 3) \leq 0; 2x + 19 \leq 6x + 47$$

3

29. Using binomial theorem prove that $6^n - 5n - 1$ is divisible by 25 for n$\in N$.

3

30. Find r if $5 \left(4_{P_r}\right) = 6_{P_{(r-1)}}$

3

31. If the sum of two numbers is 6 times their geometric mean, prove that the numbers are in the ratio $3 + 2\sqrt{2} : 3 - 2\sqrt{2}$.

3

OR

Find three consecutive terms of a GP if the sum and product of these terms are $\frac{13}{3} \ and \ 1 \ respectively.$

32.

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

OR

Prove: $\frac{(1+cos4x)}{cotx-tanx} = \frac{1}{2}sin4x$

5

33.

Find the mean, variance and standard deviation using short cut method

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

5

34. Expand and simplify: $(x + 1)^6 + (x - 1)^6$ and
hence evaluate $(\sqrt{2} + 1)^6 + (\sqrt{2} - 1)^6$.

5

35. Find the image of the point P (3, 4) with respect to the line $2x + y - 5 = 0$.

OR

Given: The vertices of ΔABC are $A(0, 4), B(3, 2) and C(1, -4)$.
    i)   Evaluate area of ΔABC.
    ii)   Find the equation of median AD.
    iii)   Find the distance to the line BC from the point A.

5

SECTION E- Case study-based Questions

36. The side of an equilateral triangle is 20 cm. The midpoints of the sides are joined to form another triangle. The process is continued as shown in the figure.
Based on the given information answer the following:
    i)   Find the length of side of fifth triangle so obtained.
    ii) Write the sides of triangle in order to form a sequence and verify that the sequence is a GP.
    iii) (a) Find the sum of perimeters of first 7 triangles.   OR
       (b) If the process of making triangles continued indefinitely, what will be the sum of areas of all triangles.

4
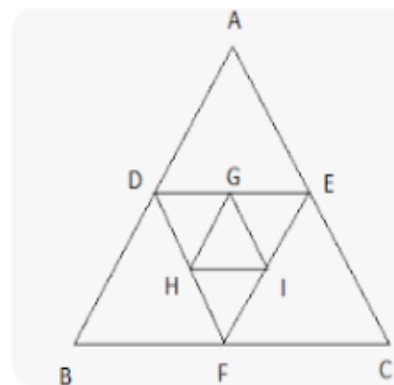
37. There are four graphs p(x), f(x), g(x) and h(x) given below   4
Based on the graph, answer the following questions:
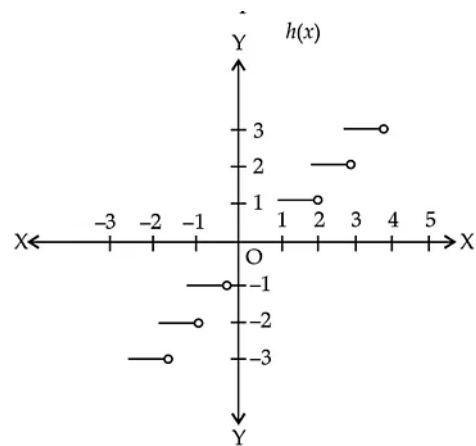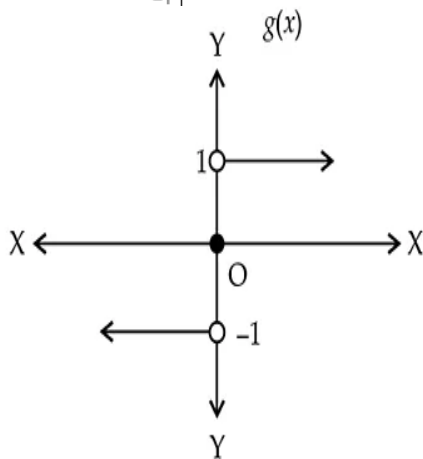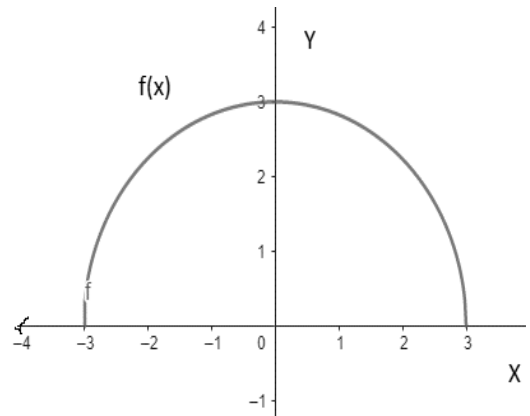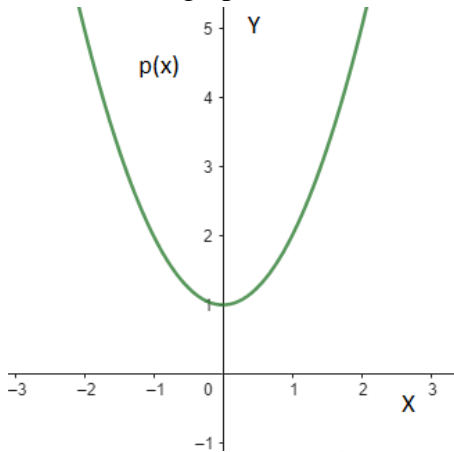
i) If $p(x) = x^2 + 1$ then write the domain and range of $p(x)$.
ii) If $f(x) = \sqrt{9 - x^2}$ write domain and range of $f(x)$
iii) a) Identify the function g(x). Also write domain and range of g(x).

OR

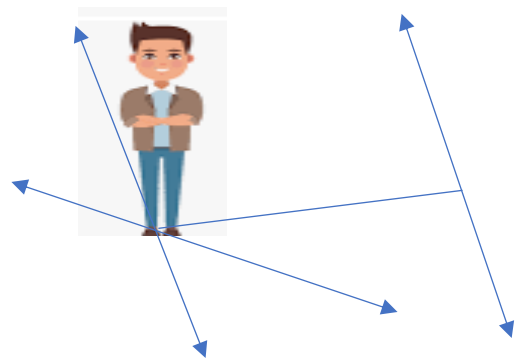b) Evaluate $h(2.5) + h(-2.5) + h(2)$ where h(x) =[x].

38. A person standing at the junction (crossing)   4
of two straight paths represented by the
equations
$2x - 3y - 5 = 0$ and
$3x + 4y - 16 = 0$ wants to reach the
path whose equation is 6x − 7y + 8 = 0 in
the least time.
Based on the above information, answer the
following:

i) Find coordinates of the point where
the person is standing.

ii) Find equation of the path that he
should follow.

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