INDIAN SCHOOL AL WADI AL KABIR
Assessment – 1 (2024 – 2025)

Class: XI | Sub: MATHEMATICS (041) | Max Marks: 80
Date: 19.09.2024 | Set- 2 | Time: 3 hrs

General Instructions:

1. This question paper is divided in to 5 sections- A, B, C, D and E
2. Section A comprises of 20 MCQ type questions of 1 mark each.
3. Section B comprises of 5 Very Short Answer Type Questions of 2 marks each.
4. Section C comprises of 6 Short Answer Type Questions of 3 marks each.
5. Section D comprises of 4 Long Answer Type Questions of 5 marks each.
6. Section E comprises of 3 source based / case based / passage-based questions (4 marks each) with sub parts.
7. Internal choice has been provided for certain questions
8. This question paper contains 6 pages

SECTION – A
(Each MCQ Carries 1 Mark)

1 If A = {x : x is a multiple of 3, x<100} and B = {x : x is a multiple of 10, x<100}, then n(A ∩ B) is

a) 30 c) 3

b) 10 d) 13

2 The roster form of the set $A = \{x: x = n^2 + 1, n \in N, n \leq 5\}$

a) {2, 5, 10, 17, 26} c) {2, 5, 10, 17, 26....}

b) {5, 10, 17, 26} d) {2, 5, 10, 17, 26, 37}

3 $1 + i^2 + i^4 + i^6 + \ldots\ldots + i^{100} =$ _____

a) 0 b) i c) 1 d) -1

4 The range of the function $f(x) = \frac{|x-1|}{x-1}, x \neq 1$ *is*

a) R c) {-1, 1}

b) (-1, 1) d) R-(-1, 1)

5 The mean of a group of 10 items is 30 and variance is 9. If each observation is multiplied by 2, then new mean and variance will be:

a) 30 and 18 b) 90 and 18 c) 60 and 81 d) 60 and 36

6 $1-2\sin^2 15° = ?$

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

7 If a wheel makes 300 revolutions per minute, then radian measure covered in 1 second is:

a) $(3\pi)^c$ b) $(5\pi)^c$ c) $(10\pi)^c$ d) $(2\pi)^c$

8 $\dfrac{\cos 15^0 + \sin 15^0}{\cos 15^0 - \sin 15^0} =$ ___

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

9 $\frac{cos(2\pi-x)\ \sin(\pi-x)}{cos\left(\frac{\pi}{2}-x\right)\ \sin\left(\frac{\pi}{2}+x\right)}=$

a) tanx b) 1 c) -1 d) cotx

10 If $\frac{1+i}{(1-i)} = a + ib$, then $a + b =$ _____

a) 0 b) 1 c) 2 d) 4

11 If $\bar{x}$ is the mean of observations $x_1, x_2, x_3, \ldots\ldots\ldots x_n$, then the mean of $2x_1 + 3, 2x_2 + 3, 2x_3 + 3, \ldots\ldots\ldots 2x_n + 3$

a) $\bar{x}$ b) $2\bar{x}$ c) $\bar{x} + 3$ d) $2\bar{x} + 3$

12 $If\ \left(\frac{2a-3}{5}, a+2b\right) = (1,2), then\ values\ of\ a\ and\ b$:

a) $a = -4, b = 1$ c) $a = 4, b = 1$

b) $a = 4, b = -1$ d) $a = -4, b = -1$

13 $\frac{x}{2} + \frac{x}{5} + x < 17\ then$:

a) x = 10 b) x > 10 c) x < 10 d) x< 0

14 The marks obtained by a student of Class XI in first and second assessments are 62 and 48, respectively. The minimum marks he should get in the annual examination to have an average of at least 60 marks is:

a) 60 c) 50

b) 70 d) 40

15 12 persons meet in a room and each shakes hand with all the others. How many handshakes are there?

a) 66 b) 72 c) 132 d) 144

16 If it is required to seat 5 men and 4 women in a row so that the women occupy the even places, then the total number of such arrangements is:

a) 480 b) 20 c) 1440 d) 2880

17 If $\frac{1}{5!} + \frac{1}{6!} = \frac{x}{7!}$, then the value of x is

a) 30 b) 64 c) 49 d) 210

18 The number of ways in which 8 men can be arranged in a row so that three particular men are consecutive, is

a) 4! b) 2! x 3! c) 3! x 3! d) 6! x 3!

Directions: In the following 2 questions, A statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as.
(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 and R is True

19 **Assertion (A):** The set A = {x : x^2 +1=0, x∈ R } is not an empty set.
Reason (R): Empty set is a subset of every set.

a) b) c) d)

20 **Assertion (A):** If Z_1 = 2 + 3i and Z_2 = 3 +i, then Z_1. Z_2 = 3 + 7i.
Reason (R): If Z_1 = a + ib and Z_2 = c + id, then Z_1 . Z_2 = (ac -bd) + i(ab +cd).

a) b) c) d)

SECTION – B(Each Question Carries 2 Marks)

21 (a)Prove that $\frac{sin5x-2sin3x+sinx}{cos5x-cosx} = tanx$

- OR -

(b) Prove that: If $A + B + C = \pi, prove: tanA + tanB + tanC = tanA.tanB.tanC.$

22 Find the multiplicative inverse of the complex number $z = 2 - 3i$

23 Solve the linear inequality $\frac{3x-4}{2} \geq \frac{x+1}{4} - 1$ and represent the solution on the number line

24 a) Find the number of integers greater than 7000 that can be formed with the digits 3, 5, 7, 8 and 9 where no digits are repeated.

- OR

b) Evaluate: C(15, 8) + C(15,9) – C(15,6) – C(15,7)

25 Find the mean deviation about the mean for the following data:
12, 13, 15, 16, 19, 10, 12, 17, 20, 26.

SECTION – C
(Each Question Carries 3 Marks)

26 If $A = \{1,2,3,4\}$, $B = \{3,4,5,6\}$, $C = \{5,6,7,8\}$ and $D = \{7,8,9,10\}$ then find
$(i) B \cup C$ $(ii) A \cup B \cup D$ $(iii) B \cup (C \cap D)$ $(iv) A - (B \cup C)$

27 The function " t " maps the temperature in degree Celsius into temperature in degree Fahrenheit is defined by $t(C) = \frac{9C}{5} + 32$ find (i) t(28) (ii) the value of C when t(C)=212.

28 (a) Prove that $sin^2 6x - sin^2 4x = sin2xsin10x$

- OR -

(b) Prove that: $(cosx - cosy)^2 + (sinx - siny)^2 = 4sin^2 \frac{x-y}{2}$

29 Find the real numbers x and y if $(x - iy)(1 + 2i)$is the conjugate of $(8 - i)$.

OR -

b) Find the conjugate of the complex number $z = \frac{(3-2i)(2+3i)}{(1+2i)(2-i)}$

30 (a) A bag contains 6 white marbles and 5 red marbles. Find the number of ways in which four marbles can be drawn from the bag if

(i) they can be of any color

(ii) 2 must be white and 2 must be red

(iii) they must be all of the same color

- OR -

(b) Find 'r' if $5\ ({}^4P_r) = 6\ ({}^5P_{r-1})$

31 Find the mean deviation about median for the following frequency distribution:

x	3	5	7	9	11	13
f	2	4	5	6	5	3

SECTION – D

(Each Question Carries 5 Marks)

32 Let $U = \{x: x \in N, x \leq 9\}$ $A = \{x: x\ is\ an\ even\ number\ , 0 \leq x < 10\}$ and $B = \{x: x \in N, x\ is\ a\ multiple\ of\ 3\ and\ less\ than\ 8\}$

(i) Write the set A and B in roster form

(ii) Find $(A \cup B)'$

(iii) Represent the above sets in Venn diagram

(iv) Show that $A - (A \cap B) = A - B$

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

- OR -

b) Prove that: $\frac{\sin 3x+\sin 5x+\sin 7x+\sin 9x}{\cos 3x+\cos 5x+\cos 7x+\cos 9x} = \tan 6x$

34 (a) In how many ways can final 11 players be selected from 15 cricket players if

(i) There is no restriction

(ii) One of them must be included

(iii) One of them must be excluded

(iv) Two of them being leg spinners, one and only one leg spinner must be included

- OR -

(b) Find the number of arrangements of the letters of the word 'STATISTICS'. In how many of these arrangements

(i) do the words start with S and end with S

(ii) do all the vowels always occur together

(iii) do the vowels never occur together?

35 Calculate the mean, variance and standard deviation 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 - Each Question Carries 4 Marks)

36 Ram and Ravi decide to play a game on sets. Ram says "I LOVE MATHEMATICS" and Ravi says "I LOVE STATISTICS". If they form the letters of their statements in the set and named Ram's saying as set A and Ravi's saying as set B.

Based on the above answer the following questions.

(i) Write roster form of A and B. (1m)

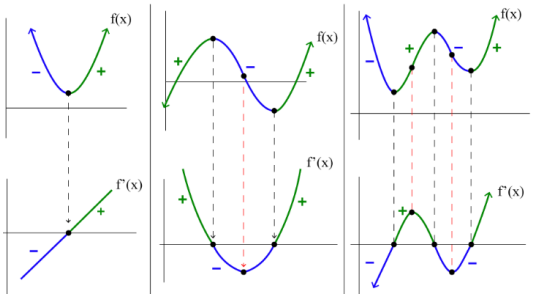
(ii) Check whether the following statements are True or False with reason:
a) A=B b) B⊂A (1m)

iii) a) Check whether : $(A-B)U(B-A)=(AUB)-(A\cap B)$ (2m)

- OR -

b) Verify: $n(AUB)=n(A)+n(B)-n(A\cap B)$. (2m)

37 Nikita was explaining "method to find domain codomain and range of relations and functions" to her daughter. There are four functions given below:



a) $g(x) = sin2x$

b) $p(x) = \frac{x^2}{1+x^2}$

c) $h(x) = \sqrt{9 - x^2}$

d) $u(x) = \begin{cases} \frac{|x|}{x}, x \neq 0 \\ 0, \ x = 0 \end{cases}$

Based on the above answer the following:

i) Which of th above function(s) has a range [-1, 1] (1m)

ii) Evaluate: $g\left(\frac{3\pi}{4}\right) + h(2\sqrt{2})$ (1m)

iii) a) Write domain and range of $p(x)$ (2m)

-OR-

b) $If\ R = \{(x, y): x + 2y < 10, x, y \in N\}$ then write the domain of relation R. Also determine whether R is a function. Give reason. (2m)

38 In a lamp manufacturing company, cost of equation for a week is $C = 200 + 1.5x$ and the revenue equation is $R = 2x$. Lamps sold per week is denoted by 'x'.

Based on this information answer the following:

i) How many lamps be sold to obtain profit? (2m)

ii) If the profit of the first two weeks of January 2024 is between 900 and 1200 then calculate the number of lamps sold in those weeks. (2m)

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ANSWERS

1	b) 3
2	a) {2, 5, 10, 17, 26}
3	c) 1
4	c) {-1, 1}
5	d) 60 and 36.
6	d) $\frac{\sqrt{3}}{2}$
7	c) $(10\pi)^c$
8	a) $\sqrt{3}\,\frac{5\pi}{4}$
9	b) 1
10	b) 1
11	d) $2\bar{x} + 3$
12	b) $a = 4, b = -1$
13	c) x< 10
14	b) 70
15	a) 66
16	d) 120
17	c) 64
18	d) 4! x 3!
19	(D) A is false but R is true
20	(A) Both A and R are true and R is the correct explanation of A
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23	- OR –
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