B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

TERM -1 EXAMINATION 2025-26
MATHEMATICS
Marking Scheme

Class: XI B **Time: 3 hr**
Date:03/09/25 **Max Marks: 80**
Admission no: **Roll no:**

General Instructions:

Read the following instructions very carefully and strictly follow them:

1. This Question paper contains 38 questions. All questions are compulsory.
2. This Question paper is divided into five Sections - A, B, C, D and E.
3. In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) and Questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In Section B, Questions no. 21 to 25 are Very Short Answer (VSA)-type questions, carrying 2 marks each.
5. In Section C, Questions no. 26 to 31 are Short Answer (SA)-type questions, carrying 3 marks each.
6. In Section D, Questions no. 32 to 35 are Long Answer (LA)-type questions, carrying 5 marks each.
7. In Section E, Questions no. 36 to 38 are case study-based questions carrying 4 marks each.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and one sub-part each in 2 questions of Section E.
9. Use of calculators is not allowed.

SECTION A

1. Which of the following binary number is equivalent to decimal number 47?
   a) $(101110)_2$ **b) $(101111)_2$** c) $(100111)_2$ d) $(101010)_2$
2. In binary number system 1+1+1+1 is equal to:
   a) $(111)_2$ b) $(10)_2$ **c) $(100)_2$** d) $(1000)_2$
3. If $8^{x+1}=64$, then the value of 3^{2x+1} is :
   a) 27 b) 3 c) 9 d) 15
4. If $\log_3 x = -2$, then the value of x is:
   a) 4 b) 6 c) -1/3 **d) 1/9**
5. Characteristics of log 432.6 is :
   a) 1 **b) 2** c) 3 d) 4
6. If a man covers a certain distance at x km/hr and an equal distance at y km/hr, then the average speed during the whole journey is:
   a) $\frac{2xy}{x+y}$ b) $\frac{2xy}{x-y}$ c) $\frac{x+y}{2yx}$ d) $\frac{x-y}{2xy}$
7. A bats man in his 17^{th} innings makes a score of 85 and thereby increases his average by 3. What is his average after 17 innings?
   a) 27 b) 30 **c) 37** d) 40
8. A can do a certain work in the same time in which B and C together can do it. If A and B together can do it in 10 days and c alone in 50 days, then the number of days in which B can do the work is:

a) 35 days **b) 25 days** c) 30 days d) 36 days

9. Which of the following is not true:
   a) A∩B =B∩A b) A∩A = A c) A∩ ∅ =∅ **d) A∩U = U**
10. If A = $\{a, b, c, d, e\}$ and B= $\{d, e, f + 8x + 9, g\}$, then (A-B)∩(B-A) is
    a) $\{a, b, c\}$ **b)**∅ c) $\{f, g\}$ d) $\{a, b, c, f, g\}$
11. If n elements are common to A and B, then number of elements common in AxB and BxA is :
    a) n **b) n^2** c) n^3 d) 2n
12. The third term of G.P., is 4. The product of its first 5 terms is:
    a) 4^3 b) 4^4 **c) 4^5** d) none of these
13. The two geometric means between the numbers 1 and 64 are
    a) 1 and 64 **b) 4 and 16** c) 2 and 16 d) 8 and 16
14. If a_n denotes the nth term of the series 2+3+6+11+18+…, then a_{50} is:
    a) 49^2-1 b) 49^2 c) 50^2+1 **d) 49^2+1**
15. The number of two digit numbers that can be formed with the digit 1,2,3,4,5,6, no digits being repeated.
    a) 36 b) 12 **c) 30** d) 11
16. The number of words which can be formed out of the letters of the word ARTICLE, so that vowels occupy even places.
    a) 1440 **b) 144** c) 7! d) $^4C_4x^3C_2$
17. f(x) = $\frac{3x-5}{2x^2+8x+9}$ is a
    a) even function b) odd function **c) rational function** d) linear function
18. Let A and B be any two sets such that n(A) =p and n(B) =q. then the total number of functions f:A→B is
    a) p^{2q} b) q^{2q} **c) p^q** d) q^p

Assertion and Reasoning questions: In the following two 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 not the correct explanation of A.
(C) A is true but R is false.
(D) $A\ is\ false\ but\ R\ is\ true.$

19. **Assertion:** If two trains of lengths 100m and 150m (moving in opposite direction) take 10 seconds and 156 seconds respectively to cross a pole, then they cross each other in 10 seconds.
    Reason: If two trains of lengths l amd m are moving in opposite direction at speed u and v respectively, then tiem taken to cross each other = $\frac{l+m}{u+v}$.
    (D)
20. **Assertion:** 6 different rings can be worn on four fingers of hand in 4^6 ways.
    Reason: The number of permutation of n different objects, taken r at a time, where repetition is allowed is n^r.
    (A)

SECTION B

21. Divide the following binary numbers 100011101 by 101.

Sol: 100011101 by 101

Q= 111001, R= 0

22. If $\log_{10}(a^2-4a+5)=0$, find the value of a.

Sol: log0=1, $a^2-4a+5 = 1$, $a^2-4a+4=0$, $(a-2)^2=0$, a=2.

OR

Find the value of $\log_{10}\sqrt[3]{100}$

Sol: $1/3 \log_{10}(1000 = 2/3 \log_{10} 10 = 2/3 \text{ x}1 = 2/3$

23. Verify the property A ∩ (BUC) = (A∩ B) $U(A \cap C)$ with help of Venn diagram.

Sol: Proper Venn diagram.

24. Find the sum of n terms of A.P whose 7^{th} term is 30 and 13^{th} term is 54.

Sol: $a_7 = a+6d =30$, $a_{30} = a+29d = 54$,

a= 6, d= 4 , $S_n = 2n(n+2)$.

OR

Determine the third term of the G.P., whose common ratio is 3 and the sum to first 7 terms is 2168.

Sol: $S_7 =2168$, $2168 = a(\frac{3^7-1}{3-1})$, 2x2168 = a (2187-1), a= 2

$a_3 = ar^2 = 2x9 =18$.

25. If ${}^nC_9 = {}^nC_6$, find ${}^nC_{12}$.

Sol: As per question n =9+6 =15, ${}^{15}C_{12} = 455$.

SECTION C

26. Find the sum of the following numbers in binary system: 59 and 61.

Sol: $(59) = (111011)_2$ and $61= (111101)_2$

$59+61 = (1111000)_2 = (120)_{10}$

27. Evaluate: $\frac{(3.142)^3\, x\, (0.078)^{1/3}}{(0.005)^{1/4}}$

Sol: logx = 3log3.142 +1/3 log (0.078) -1/4 log(0.005)

1.4916 +$\bar{1}$ +0.6307 -$\bar{1}$ -0.4248

2.1223 -0.4248 = 1.6975

x = antilog (1.6975) = 49.83

28. Two cars P and Q start at the same time from points A and B, which are 120 km apart. If the two cars travel in the opposite direction, they meet after 1 hour and if they travel in the same direction, then P meets Q after 6 hours. What is the speed of the cars P and Q?

Sol: Case 1: When the cars moves in the opposite direction: x+y =120.

Case 2: When the cars moves in the same direction: x-y = 20

Therefore, x= 70 and y = 50.

OR

40 men can cut 60 trees in 8 days. If 8 men leave the job, how many trees will be cut in 12 days?

Sol: $\frac{40x8}{60} = \frac{32x12}{W}$, w= $\frac{32x12x60}{640x8}$ = 72 trees.

29. How many terms of the G.P., 3, 3/2, 3/4, … are needed to give the sum $\frac{3069}{512}$.

Sol: $\frac{3069}{512} = 6\left[1 - \left(\frac{1}{2}\right)^{n}\right]$,

$\frac{3069}{512} \; x \; \frac{1}{6} = \; 1\text{-}\left(\frac{1}{2}\right)^{n}$,

$\left(\frac{1}{2}\right)^{n} = \frac{1}{1024}$, n = 10

30. Find the value of n if: ${}^{n}P_4 : {}^{n-1}P_3 = 9:1$.

Sol: $\frac{{}^{n}P_4}{{}^{n-1}P_3} = \frac{9}{1}$, $\frac{n!}{(n-1)!} = 9$, n =9.

OR

Determine n if, ${}^{2n}C_3 : {}^{n}C_3 = 12:1$.

Sol: $\frac{{}^{2n}C_3}{{}^{n}C_3} = \frac{12}{1}$, 4(2n-1) = 12(n-2), n =5

31. Find the domain and range of $y = \sqrt{9 - x^2}$.

Sol: Domain: $x^2\text{-}9 \leq 0$, (x-3) (x+3) ≤ 0, $-3 \leq x \leq 3$, $x \in [-3,3]$.

Range: $x^2 = 9\text{-}y^2$, (y-3) (y+3)≤0, $-3 \leq y \leq 3$, $y \in [0,3]$.

SECTION D

32. A can do the piece of work in 12 days and B can do the same work in 16 days. A started the work alone. After how many days should B join him, so that the work is finished in 9 days?

Sol: A's One day work = 1/12

Work done by A alone in 9 days= ¾

Work remaining = ¼

Number of days taken by B to do the remaining work =4 days

Hence, B should join A after 9-4= 5 days.

OR

A man covers a certain distance by walking at the rate of 4 km/hr in 2 hr and 45 minutes. In how many minutes, will he cover the same distance by running at a speed of 16.5 km/hr.

Sol: Distance in 2 hrs and 45 min. at speed 4 km/hr is 4x (165/60) km.

Distance travelled in t time at 16.5 km/hr = 33/2 xt

Now, equating both, we have t= 2/3 hrs = 40 m inutes.

33. For a certain test a candidate could offer English or Hindi or both the subjects. Total number of students was 500, of whom 350 appeared in English and 90 in both subjects. Find the following; i) how many appeared in English only? ii) How many appeared in Hindi? iii) How many appeared in Hindi only?

Sol: A= English, B = Hindi

n(A-B) = 350-90 =260,

n(B) = 500-350+90 = 240 ,

n(B-A) = 240-90 =150.

34. If $a^x = b^y = c^z = d^w$, show that $\log_a(bcd) = x\left(\frac{1}{y} + \frac{1}{z} + \frac{1}{w}\right)$.

Sol: as per question: x=ylogb, b=zlogc, c=wlogd

$\log_a b = x/y$, $\log_a c = x/z$, $\log_a d = x/w$,

$\log_a(bcd) = \log_a b + \log_a c + \log_a d = x/y + x/z + x/w = x\left(\frac{1}{y} + \frac{1}{z} + \frac{1}{w}\right)$.

OR

Find the value of x in log(x+1) +log(x-1) = log 11+2log3

Sol: log (x^2-1) = log (11x9)

(x^2-1) =99 , x^2 =100 , x= 10

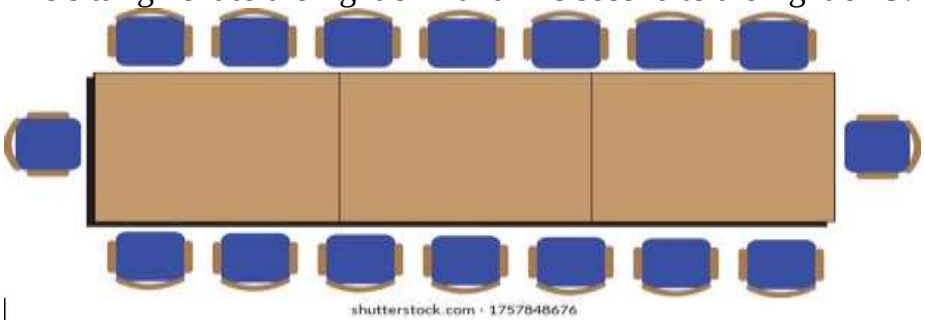
35. If f(x)= 2x-1 , g(x) = x^2 are real functions, find i) (f+g)(0), ii) (f-g)(2) , iii) (fg) (1), iv) (f/g)(4).

Sol: f(x)+g(x) = -1, f(2) –g(2) = -1,
f(1)g(1) = 1, f(4)/g(4) = 7/16.

SECTION E

36. Eleven friends M, N, O, P, Q, R, S, T, U, V and W are sitting in the first row of the stadium watching a cricket match.

M is second to the right of Q, who is at one of the ends.
V is the immediate neighbour of M and N and third to the right to the left of S.
T is to the immediate left of P and P is second to the right of O.
R is sitting next to the right of P and P is second to the right of O.



Based on the above information, answer the following:

i) Who is sitting in the centre of the row?
ii) Which members are sitting to right of S?
iii) Who are the immediate neighbour of T?

Sol: i) U is sitting in the centre of the row.
ii) O, T, P and R sitting to the right of S.
iii) O and P are immediate neighbour of T.

37. A collage awarded 38 medals in football, 15 in basketball and 20 in cricket. If these medals went to a total of 58 sportsmen and only three sportsmen got medals in all the three sports.

Based on the above information, answer the following

i) How many sportsmen received medals in exactly two of the three sports?

Sol: i) 9.

ii) 3

38. A club has 16 players to choose for a team, In how many ways can a cricket team of 11 players be selected from 16 players and also,

Based on the above information find the number of ways:

i) If two particular players are always included.

ii) If one particular player is to be excluded?

iii) If two particular players are to be included and one particular player is to be rejected.

Sol: i) 2002

ii) 1365

iii)715

******ALL THE BEST******