BK BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS

SENIOR SECONDARY CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOL

ANNUAL EXAMINATION- 2024-25

APPLIED MATHEMATICS (241)

Class : 11B. Marking key Duration: 3hrs

Date : 18 /02/25 Max. Marks: 80

Admission No.: Roll No.:

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 of 4 marks each with Sub-parts.

SECTION A

Each question carries 1 mark

1. Which of the following binary numbers is equivalent to decimal number 24?
   a) 1101111 **b) 11000** c) 111111 d) 11001
2. $\sqrt[4]{\sqrt[3]{2^2}}$ is equal to
   a) $2^{-1/6}$ b) 2^{-6} **c) $2^{1/6}$** d) 2^6
3. If $\log_5 (0.04)=x$, then the value of x is:
   a) 2 b) 4 c) -4 **d) -2**
4. Walking at 6/7th of his usual speed a man is 12 minute late. The usual to cover the distance is:
   a) **1hour 12min** b) 1hour 20min c) 48 min. d) 1 hour
5. If R= $\{(x, y): x, y \in N, x + 2y = 21\}$, then the range of R is:
   a) $\{1,2,3, \dots ,7,8\}$ **b) $\{1, 2, 3, \dots 9, 10\}$** c)$\{1,3,5,7 \dots 19\}$ d) $\{1,35,7, \dots .15\}$
6. If 9 times the 9th term is equal to 13 times the 13th term , then the 22nd term of the A.P is:
   a) **0** b) 22 c) 220 d) 198
7. If the second term of G.P is 2 and the sum of its infinite terms is 8, then G.P is :
   a) 8,2,1/2,1/8,... b)10,2,2/5,2/25,… **c) 4,2,1,1/2,1/4…** d) 6,3,3/2,3/4,…
8. The number of six digit numbers that can be formed by using the digits 1,2,1,2,0,2 is:
   a) **50** b) 60 c)110 d) 10
9. Everybody in a room shakes hands with everybody else. The total number of handshakes is 66. The total numbers of person in room is:
   a) 11 **b) 12** c) 13 d) 14
10. The domain of the function f defined by f(x) = $\sqrt{a^2 - x^2}$ (a> 0) is :
    a) (-a,a) **b) $[-a, a]$** c) $[0, a]$ d) $(-a, 0]$
11. Let A be a finite set containing 3 elements, then the number of function from A to A:
    a) 512 b) 511 **c) 27** d) 26
12. If f(x)= px+q, where p and q are integers f(-1)=1and f(2)=13, then p and q are:
    a) **P=4,q=5** b) p=-4,q=5 c)p=-4,q=-5 d) p=4,q=-5

13. $\lim_{x \to 2} \frac{\log(x-1)}{x-2}$ is equal to:

a) 0 b) -1 c) 1/2 **d) 1**

14. $\lim_{x \to 0} \frac{|x|}{x}$ is equal to:

a) 1 b) -1 c)0 **d) Does not exist**

15. If y= $\sqrt{x}+\frac{1}{\sqrt{x}}$, then $\frac{dy}{dx}$ at x=1 is

a) 1 b) 1/2 c)$1/\sqrt{2}$ **d) 0**

16. If P(A) =7/13, P(B)= 9/13 and P(A∩B) = 4/13 , then P(A'/B) is equal to:

a) 6/13 b) 5/13 c)4/9 **d) 5/9**

17. The variance of first 5 natural numbers:

a) 1 **b) 2** c)3 d)

18. Health and education cess payable on :

a) Gross Income b) Taxable Income **c)Income Tax** d) Education loan

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 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. ASSERTION (A): The points A (-2, 1), B (0, 5), C (-1, 2) are collinear.
REASON(R): Three points are collinear if and only if AB+BC=AC. **D**

20. ASSERTION (A): If f(x) = $1-x+x^2-x^3+\ldots-x^{99}+x^{100}$, f' (1) = 50.
REASON (R): $f'(x^n) = nx^{n-1}$. **A**

SECTION B

Each question carries 2 mark

21. Solve: $16^{x+1} = \frac{64}{4^x}$.

Sol: $2^{4x+4} = \frac{64}{4^x}$

$2^{4x+4} = \frac{2^6}{2^{2x}}$

$2^{4x+4} = 2^{-2x+6}$

$4x + 2x = 6 - 4$

x= 1/3

22. By walking at ¾ of his usual speed, a man reaches his office 10 minutes late than his usual time. Find the usual time taken by him to reach his office.

Sol: $D = (\frac{3}{4}S) \times (T + 10).$

$$S \times T = \frac{3}{4} S \times (T + 10)$$

$$4T = 3(T + 10)$$

$T = 30$ minutes

23. If f(x) $= \frac{x-1}{x+1}$, show that f $\left(\frac{x-1}{x+1}\right) = -\frac{1}{x}$.

Sol:

$$f\left(\frac{x-1}{x+1}\right) = \frac{\left(\frac{x-1}{x+1}\right) - 1}{\left(\frac{x-1}{x+1}\right) + 1}$$

$$f\left(\frac{x-1}{x+1}\right) = \frac{-2}{x+1} \times \frac{x+1}{2x} = \frac{-2(x+1)}{2x(x+1)}$$

$$f\left(\frac{x-1}{x+1}\right) = \frac{-2}{2x} = -\frac{1}{x}$$

24. Differentiate the following w.r.t x: f(x) = $\frac{2(x+1)}{x^2+2x-3}$.

$$f'(x) = \frac{(2)(x^2 + 2x - 3) - (2(x+1))(2x+2)}{(x^2 + 2x - 3)^2}$$

$$f'(x) = \frac{2x^2 + 4x - 6 - 4(x+1)^2}{(x^2 + 2x - 3)^2}$$

$$f'(x) = \frac{2x^2 + 4x - 6 - 4x^2 - 8x - 4}{(x^2 + 2x - 3)^2}$$

$$f'(x) = \frac{-2x^2 - 4x - 10}{(x^2 + 2x - 3)^2}$$

$$f'(x) = \frac{-2(x^2 + 2x + 5)}{(x^2 + 2x - 3)^2}$$

OR

Differentiate $\sqrt{1 + x^2}$ w.r.t.x

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx} = \left(\frac{1}{2\sqrt{u}}\right) \cdot (2x)$$

$$\frac{dy}{dx} = \frac{2x}{2\sqrt{1 + x^2}} = \frac{x}{\sqrt{1 + x^2}}$$

25. Find y if the slope of the line joining (-8, 11) and (2, y) is $-\frac{4}{3}$.

$$-\frac{4}{3}=\frac{y-11}{10}$$

$$-4\times 10=3\times(y-11)$$

$$-40=3y-33$$

$$-40+33=3y$$

$$-7=3y$$

$$y=-\frac{7}{3}$$

OR

Find the value of x for which the point (x,-1), (2, 1) and (4, 5) are collinear.

$$\frac{1-(-1)}{2-x}=2$$

Simplify and solve the equation for x:

$$\frac{2}{2-x}=2$$

$$2=2(2-x)$$

$$1=2-x$$

$$x=2-1$$

$$x=1$$

SECTION C

Each question carries 3 mark

26. In a flight of 600km, an aircraft was slowed down due to bad weather. The average speed of the aircraft for the trip was reduced by 200km/hr and the time of the flight increased by 30 minutes. What is the actual duration of the flight?

Let D be the distance, S be the actual speed, and T be the actual time. The relationship between them is $\text{Distance} = \text{Speed} \times \text{Time}$, so $D = S \times T$. We are given $D = 600\text{km}$.

$$600 = S \times T$$

We can express the actual speed as $S = \frac{600}{T}$.

The scenario due to bad weather changes the speed and time:

- Reduced Speed: $S - 200$ (km/hr)
- Increased Time: $T + 0.5$ (hours) (30 minutes = 0.5 hours)
  The distance remains the same:
  $600 = (S - 200) \times (T + 0.5)$

Substitute the expression for S from the first equation into the second equation:

$$600 = \left(\frac{600}{T} - 200\right) \times (T + 0.5)$$

Expand the equation:

$$600 = 600 + \frac{300}{T} - 200T - 100$$

Simplify and rearrange into a standard quadratic form $aT^2 + bT + c = 0$:

$$2T^2 + T - 3 = 0$$

$$T = \frac{-1 \pm \sqrt{1^2 - 4(2)(-3)}}{2(2)}$$

$$T = \frac{-1 \pm \sqrt{25}}{4}$$

The two possible solutions are $T = \frac{-1+5}{4} = 1$ hour and $T = \frac{-1-5}{4} = -1.5$

OR

A can do a 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?

The daily work rate for A (R_A) is the reciprocal of the total days required by A, and similarly for B (R_B).

$R_A = \frac{1}{12}$ work per day.

$R_B = \frac{1}{16}$ work per day.

$$\text{Work}_A = R_A \times T_A = \frac{1}{12} \times 9 = \frac{9}{12} = \frac{3}{4}$$

$$\text{Remaining Work} = 1 - \text{Work}_A = 1 - \frac{3}{4} = \frac{1}{4}$$

The number of days B works (T_B) can be found by dividing the remaining work by B's daily rate (R_B).

$$T_B = \frac{\text{Remaining Work}}{R_B} = \frac{1/4}{1/16} = \frac{1}{4} \times 16 = 4 \text{ days}$$

B must work for 4 days. Since the total project duration is 9 days, B should join after the project has been running for $9 - T_B$ days.

$$\text{Days until B joins} = 9 - 4 = 5 \text{ days}$$

27. If A={4,5,8,12} , $B = \{1,4,6,9\}, C = \{1,2,3,4\}$, then find (i) A-(B-A), (ii) A-(C-B).

First, find the set difference $B - A$, which contains elements in B but not in A.

$$B - A = \{1, 4, 6, 9\} - \{4, 5, 8, 12\} = \{1, 6, 9\}$$

Next, find the set difference $C - B$, which contains elements in C but not in B.

$$C - B = \{1, 2, 3, 4\} - \{1, 4, 6, 9\} = \{2, 3\}$$

To find $A - (B - A)$, subtract the elements of the set $(B - A)$ from the set A.

$$A - (B - A) = \{4, 5, 8, 12\} - \{1, 6, 9\} = \{4, 5, 8, 12\}$$

To find $A - (C - B)$, subtract the elements of the set $(C - B)$ from the set A.

$$A - (C - B) = \{4, 5, 8, 12\} - \{2, 3\} = \{4, 5, 8, 12\}$$

28. Find the domain and range of the following function, f(x) =$\sqrt{9 - x^2}$.

$$9 - x^2 \geq 0$$

Rearrange the inequality:

$$x^2 \leq 9$$

Taking the square root of both sides gives the condition for x:

$$-3 < x < 3$$

The function $f(x) = \sqrt{9 - x^2}$ involves a square root, so the output values $f(x)$ must always be non-negative, meaning $f(x) \geq 0$.

The maximum value of $f(x)$ occurs when $9 - x^2$ is maximum. This happens when x^2 is minimum (which is 0, when $x = 0$).

$$f(0) = \sqrt{9 - 0^2} = \sqrt{9} = 3$$

The minimum value of $f(x)$ occurs when $9 - x^2$ is minimum (which is 0, when $x = 3$ or $x = -3$).

$$f(3) = \sqrt{9 - 3^2} = \sqrt{0} = 0$$

The range is the closed interval **[0, 3]**.

OR

Find the domain and range of the following function, f(x) = $\frac{x^2-1}{x-1}$.

The domain can be expressed as $(-\infty, 1) \cup (1, \infty)$.

First, simplify the function by factoring the numerator:

$$f(x) = \frac{(x-1)(x+1)}{x-1}$$

For any value in the domain ($x \neq 1$), the $(x-1)$ terms cancel out, leaving $f(x) = x + 1$. The graph of this function is a line with a hole at the point where $x = 1$. We find the y-value of this hole by substituting $x = 1$ into the simplified expression:

$$y = 1 + 1 = 2$$

The function takes on all real number values except $\mathbf{y = 2}$. The range can be expressed as $(-\infty, 2) \cup (2, \infty)$.

29. Evaluate the following limit: $\lim_{x \to 0} \frac{\sqrt{1+x^2} - \sqrt{1+x}}{x}$.

$$\frac{\sqrt{1+x^2} - \sqrt{1+x}}{x} \cdot \frac{\sqrt{1+x^2} + \sqrt{1+x}}{\sqrt{1+x^2} + \sqrt{1+x}} = \frac{(1+x^2) - (1+x)}{x(\sqrt{1+x^2} + \sqrt{1+x})}$$

The numerator simplifies to $1 + x^2 - 1 - x = x^2 - x = x(x-1)$.
So the expression becomes:

$$\frac{x(x-1)}{x(\sqrt{1+x^2} + \sqrt{1+x})}$$

$$\lim_{x \to 0} \frac{x-1}{\sqrt{1+x^2} + \sqrt{1+x}} = \frac{0-1}{\sqrt{1+0^2} + \sqrt{1+0}} = \frac{-1}{\sqrt{1} + \sqrt{1}} = \frac{-1}{2}$$

OR

If the function f(x) = $\begin{cases} 3ax + b, & x > 1 \\ 11, & x = 1 \\ 5ax - 2b, & x < 1 \end{cases}$, is continuous at x=1, find the values of a and b.

For $f(x)$ to be continuous at $x = 1$, the left-hand limit, the right-hand limit, and the function value must all be equal:

$\lim_{x \to 1^-} f(x) = \lim_{x \to 1^+} f(x) = f(1)$

Calculating the limits and function value yields the following equations:

- Left-hand limit: $\lim_{x \to 1^-} (5ax - 2b) = 5a(1) - 2b = 5a - 2b$
- Right-hand limit: $\lim_{x \to 1^+} (3ax + b) = 3a(1) + b = 3a + b$
- Function value: $f(1) = 11$

Equating these gives us a system of linear equations:

$$5a - 2b = 11$$

$$3a + b = 11$$

We can solve this system using substitution. From the second equation, we express b in terms of a:

$$b = 11 - 3a$$

Substitute this expression for b into the first equation:

$$5a - 2(11 - 3a) = 11$$

$$5a - 22 + 6a = 11$$

$$11a = 33$$

$$a = 3$$

Now substitute the value of a back into the expression for b:

$$b = 11 - 3(3) = 11 - 9$$

$$b = 2$$

30. Two-third of the students of a class are boys and the rest are girls. It is known the probability of a girl getting a first class marks in Board's Exam is 0.4 and a boy getting first class marks is 0.35. Find the probability that a student's chosen at random will get first class marks in Exam.

- $P(B) = \frac{2}{3}$
- $P(G) = 1 - P(B) = 1 - \frac{2}{3} = \frac{1}{3}$
- $P(F|G) = 0.4$
- $P(F|B) = 0.35$

$$P(F) = (0.35)\left(\frac{2}{3}\right) + (0.4)\left(\frac{1}{3}\right)$$

$$P(F) = \frac{0.7}{3} + \frac{0.4}{3}$$

$$P(F) = \frac{1.1}{3}$$

$$P(F) = \frac{11}{30} \approx 0.3666...$$

31. Find the equation of the circle which passes through the point (2,4) and centre at the intersection of the lines x-y=4 and 2x+3y+7=0.

The center of the circle is at the intersection of the lines $x - y = 4$ and $2x + 3y + 7 = 0$. We solve this system of linear equations.

From the first equation, we express y in terms of x:

$$y = x - 4$$

Substitute this into the second equation:

$$2x + 3(x - 4) + 7 = 0$$

$$2x + 3x - 12 + 7 = 0$$

$$5x - 5 = 0$$

$$5x = 5$$

$$x = 1$$

Substitute $x = 1$ back into the expression for y:

$$y = 1 - 4$$

$$y = -3$$

The circle passes through the point $(2, 4)$, and its center is $(1, -3)$. The radius r is the distance between these two points. We use the distance formula:

$$r = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$r = \sqrt{(2 - 1)^2 + (4 - (-3))^2}$$

$$r = \sqrt{(1)^2 + (7)^2}$$

$$r = \sqrt{1 + 49}$$

$$r = \sqrt{50}$$

SECTION D

Each question carries 5 mark

32. In a test, an examinee either guess or copies or knows the answer to a multiple choice question with four choices and only one correct option. The probability that he makes a guess is 1/6. The probability that he copies the answer is 1/9. The probability that the answer is correct, given that the copied it, is 1/8. Find the probability that he knew the answer to the question, given that he correctly answered it.

Let G be the event of guessing, C be the event of copying, and K be the event of knowing the answer. Let A be the event that the answer is correct.
The given probabilities are $P(G) = 1/6$ and $P(C) = 1/9$.
The events are mutually exclusive and exhaustive, so $P(K) = 1 - P(G) - P(C)$.

$$P(K) = 1 - \frac{1}{6} - \frac{1}{9} = 1 - \frac{3}{18} - \frac{2}{18} = 1 - \frac{5}{18} = \frac{13}{18}$$

The conditional probabilities of a correct answer are $P(A|G) = 1/4$, $P(A|C) = 1/8$, and $P(A|K) = 1$.

Using the law of total probability, the probability of the answer being correct $P(A)$ is:

$$P(A) = P(A|G)P(G) + P(A|C)P(C) + P(A|K)P(K)$$

$$P(A) = \left(\frac{1}{4}\right)\left(\frac{1}{6}\right) + \left(\frac{1}{8}\right)\left(\frac{1}{9}\right) + (1)\left(\frac{13}{18}\right)$$

$$P(A) = \frac{1}{24} + \frac{1}{72} + \frac{13}{18} = \frac{3}{72} + \frac{1}{72} + \frac{52}{72} = \frac{56}{72} = \frac{7}{9}$$

We want to find the probability that he knew the answer, given that it was correct, $P(K|A)$. Using Bayes' theorem:

$$P(K|A) = \frac{P(A|K)P(K)}{P(A)}$$

$$P(K|A) = \frac{(1)\left(\frac{13}{18}\right)}{\frac{7}{9}} = \frac{13/18}{14/18} = \frac{13}{14}$$

OR

A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six.

- Probability of rolling a six: $P(S) = \frac{1}{6}$ [1]
- Probability of not rolling a six: $P(\neg S) = 1 - P(S) = \frac{5}{6}$
- Probability the man speaks the truth: $P(\text{Truth}) = \frac{3}{4}$ [1]
- Probability the man lies: $P(\text{Lie}) = 1 - P(\text{Truth}) = \frac{1}{4}$
- The probability he reports a six given it is a six (truth): $P(R|S) = \frac{3}{4}$
- The probability he reports a six given it is not a six (lie): $P(R|\neg S) = \frac{1}{4}$

$$P(R) = P(R|S)P(S) + P(R|\neg S)P(\neg S)$$

$$P(R) = \left(\frac{3}{4} \times \frac{1}{6}\right) + \left(\frac{1}{4} \times \frac{5}{6}\right)$$

$$P(R) = \frac{3}{24} + \frac{5}{24} = \frac{8}{24} = \frac{1}{3}$$

$$P(S|R) = \frac{P(R|S)P(S)}{P(R)}$$

$$P(S|R) = \frac{\frac{3}{4} \times \frac{1}{6}}{\frac{1}{3}}$$

$$P(S|R) = \frac{\frac{3}{24}}{\frac{1}{3}} = \frac{1}{8} \times 3 = \frac{3}{8}$$

33. The following table gives information regarding weekly income of labourers working at a dam site:

Income(Rs)	600-700	700-800	800-900	900-1000	1000-1100	1100-1200	1200-1300
No. of labourers	40	68	86	120	90	40	26

Estimate: (i) median, (ii) Lower Quartile, (iii) Upper Quartile.

Construct a proper table, Formulae used:

Median: 446.15

Lower Quartile: 221.80

Upper Quartile: 563.9

OR

Calculate the mean, Variance and standard deviation of the following data:

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

Construct a proper Table, Correct formulae

Mean:62, Variabce:201, Standard deviation: 14.18

34. Mukesh borrows Rs. 20000 on condition to repay it with compound interest at 5% p.a. by annual instalment of Rs. 2000 each. In how many years will the debt be paid off?

$$P = R \times \frac{1-(1+r)^{-n}}{r}$$

$$20000 = 2000 \times \frac{1-(1+0.05)^{-n}}{0.05}$$

Simplify the equation:

$$\frac{20000}{2000} = \frac{1-(1.05)^{-n}}{0.05}$$

$$10 = \frac{1-(1.05)^{-n}}{0.05}$$

$$10 \times 0.05 = 1-(1.05)^{-n}$$

$$0.5 = 1-(1.05)^{-n}$$

$$(1.05)^{-n} = 1-0.5$$

$$(1.05)^{-n} = 0.5$$

To solve for n, take the natural logarithm of both sides:

$$-n\ln(1.05) = \ln(0.5)$$

$$n = -\frac{\ln(0.5)}{\ln(1.05)}$$

$$n \approx -\frac{-0.693147}{0.04879} \approx 14.2 \text{ years}$$

OR

Find the present value of a regular annuity of Rs 1000 payable for 3 years at 12% per annum compounded annually.

$$\text{PV} = \text{PMT} \times \frac{1-(1+r)^{-n}}{r}$$

$$PV = 1000 \times \frac{1-(1+0.12)^{-3}}{0.12}$$

$$PV = 1000 \times \frac{1-(1.12)^{-3}}{0.12}$$

$$PV = 1000 \times \frac{1-0.71178}{0.12}$$

$$PV = 1000 \times \frac{0.28822}{0.12}$$

$$PV \approx 2401.83$$

35. A shopkeeper sells an article at the listed price of Rs. 1500. The rate of GST on the article is 18%. If the sales are intra-state and the shopkeeper pays a tax (under GST) of Rs.27 to the central government, find the amount inclusive of tax at which the shopkeeper purchased article from the wholesaler.

$$\text{Net CGST Paid} = \text{Output CGST} - \text{Input CGST}$$

$$27 = 135 - \text{Input CGST}$$

$$\text{Input CGST} = 135 - 27 = 108$$

$$\text{Input GST Rate} \times CP = \text{Total Input GST}$$

$$0.18 \times CP = 216$$

$$CP = \frac{216}{0.18} = 1200$$

$$\text{Total Purchase Price} = CP + \text{Total Input GST}$$

$$\text{Total Purchase Price} = 1200 + 216 = 1416$$

SECTION E

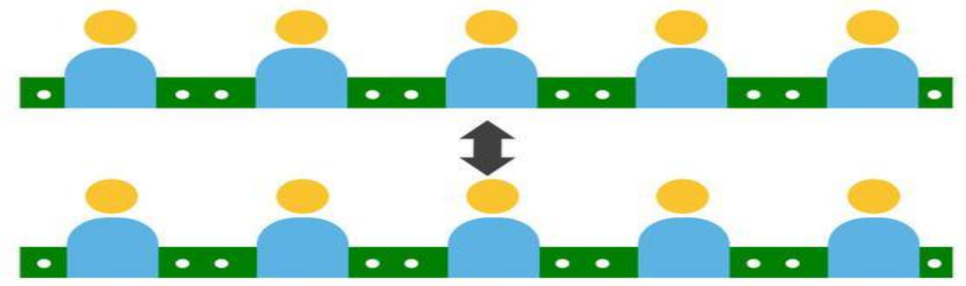
Each question carries 4 mark

(This section comprises of with two sub-parts. First two case study questions have three sub of marks 1, 1, 2 respectively. The third case study question has two sub marks each.)

36. Read the following information carefully and answer the questions given below:

Eleven friends A,B,C,D,E,F,G,H,I,J and K are watching a movie in a cinema hall sitting in a row. H is immediate left of D and third to the right of I. J is the immediate neighbour of A and B and third to the left of G. A is the second to the right of E who is at one end of the row. F is sitting next to the right of D and d is second to the right of C.

On the basis of above information, answer the following questions.



Linear Seating Arrangement

i) Write the sitting arrangement.

The sitting arrangement is **E, K, A, J, B, I, G, C, H, D, F**.

ii) Who is sitting at the centre of row?

The person sitting at the centre of the row is **I**.

iii) Who are the neighbours of H?

The neighbours of **H** are **C** and **D**.

37. In a University, out of 100 students 15 offered Mathematics only; 12 offered statistics only; 8 offered only Physics and Mathematics; 20 offered Physics and Statistics; 10 offered Mathematics and Statistics; 65 offered Physics. By drawing the Venn diagram, find the number of students who: On the basis of above information, answer the following questions.

i) Offered Mathematics.

$$15 + 37 + 7 + 3 = 62$$

ii) Offered Statistics.

$$12 + 17 + 7 + 3 = 39$$

iii) Did not offer any of the above three subjects.

$$15+12+8+37+17+7+3=99$$

Then subtract from the total number of students (100):

$$100-99=1$$

38. A cricket team has 15 players in squad, In how many ways can final eleven be selected from 15 cricket player if
On the basis of above information, answer the following questions.

i) If there is no restriction.

$$^{15}C_{11} = {}^{15}C_4 = \frac{15\times14\times13\times12}{4\times3\times2\times1} = 1365 \text{ ways}$$

ii) One of them must be included.

$$^{14}C_{10} = {}^{14}C_4 = \frac{14\times13\times12\times11}{4\times3\times2\times1} = 1001 \text{ ways}$$

iv) One of them, who is in bad form, must always be excluded.

$$^{14}C_{11} = {}^{14}C_3 = \frac{14\times13\times12}{3\times2\times1} = 364 \text{ ways}$$

v) Two of them being leg spinners, one and only one leg spinner must be included?
Ways to choose 1 leg spinner from 2: $^{2}C_1 = 2$

Remaining players to choose: $11-1=10$

Remaining pool of players (excluding both leg spinners): $15-2=13$

Ways to choose 10 players from 13: $^{13}C_{10} = {}^{13}C_3 = \frac{13\times12\times11}{3\times2\times1} = 286$

Total ways: $2\times286 = 572$ ways

**********End of Paper**********