NIMCET ACTUAL PAPER-2023

MATHEMATICS

1. Odds in favour of an event A are 2 to 1 and odds in favour of A ∪ B are 3 to 1. Consistent with this information, the bound for P(B) is given by

   (a) $\frac{1}{12} \le P(B) \le \frac{3}{4}$ (b) $\frac{1}{3} \le P(B) \le \frac{1}{2}$

   (c) $\frac{1}{6} \le P(B) \le \frac{1}{3}$ (d) $0 \le P(B) \le \frac{3}{4}$

2. If n_1 and n_2 are the number of real valued solutions of equations $x = |\sin^{-1} x|$ and x = sin (x) respectively, then the value of $n_2 - n_1$ is

   (a) 0 (b) 3 (c) 1 (d) 2

3. Let $\vec{a} = \hat{i} - \hat{k}, \vec{b} = x\vec{i} + \vec{j} + (1-x)\vec{k}$ and $\vec{c} = y\vec{i} + x\hat{j} + (1+x-y)\hat{k}$, then $\left[\vec{a} \quad \vec{b} \quad \vec{c}\right]$ depends on

   (a) Only y (b) Only x

   (c) Neither x nor y (d) Both x and y

4. Number of non-differentiable points of the function f(x) = 3 + |cos (x)| in the interval [-π, π] is

   (a) 1 (b) N.O.T (c) 4 (d) 3

5. The coefficient of x^{50} in the expression of $(1 + x)^{1000} + 2x(1 + x)^{999} + 3x^2(1 + x)^{998} + \ldots\ldots + 1001x^{1000}$ is

   (a) $^{1002}C_{50}$ (b) $^{1002}C_{51}$ (c) $^{1005}C_{50}$ (d) $^{1005}C_{48}$

6. If $|x - 6| = |x^2 - 4x| - |x^2 - 5x + 6|$, where x is a real variable, then choose the correct option

   (a) x = (2, 5) (b) x = [2, 3] ∪ [6, ∞)

   (c) x = R – [2, 6] (d) None of these options.

7. If $\prod_{i=1}^{n} \tan(\alpha_i) = 1$, where $\alpha_i \in \left[0, \frac{\pi}{2}\right] \forall i = 1, 2, \ldots\ldots n$, then the maximum value of $\prod_{i=1}^{n} \sin(\alpha_i)$ is

   (a) 2^{-n} (b) $2^{-n/2}$ (c) 1 (d) None of these

8. Largest value of $\cos^2\theta - 6 \sin\theta \cos\theta + 3 \sin^2\theta + 2$ is

   (a) - 4 (b) 0

   (c) $4 - \sqrt{10}$ (d) $4 + \sqrt{10}$

9. If the equation $|x^2 - 6x + 8| = a$ has four real solution then choose the correction option

   (a) a = 1 (b) a = 0

   (c) a ∈ (0, 1) (d) a ∈ [1, 2]

10. If $\int f(x)dx = g(x)$ then $\int x^5 f(x^3)dx$ is equal to

    (a) $\frac{1}{3}x^3 g(x^3) - 3\int x^3 g(x^3)dx + c$

    (b) $\frac{1}{3}x^3 g(x^3) - \int x^2 g(x^3)dx + c$

    (c) $\frac{1}{3}x^3 g(x^3) - 3\int x^4 g(x^3)dx + c$

    (d) None of these

11. Let $f(x)=(x^2 - 1) / (|x| - 1)$. Then the value of $\lim_{x \to -1}$ is

    (a) – 2 (b) 1 (c) 2 (d) - 1

12. For a group of 100 candidates, the mean and standard deviation of scores were found to be 40 and 15 respectively. Later on, it was found that the scores 25 and 35 were misread as 52 and 53 respectively. Then the corrected mean and standard deviation corresponding to the corrected figures are

    (a) 39.5, 14 (b) 39.55, 14.97

    (c) 40.19, 15.1 (d) 39.9, 14.97

13. If $\int x \sin x \sec^3 x dx = \frac{1}{2}\left[f(x)\sec^2 x + g(x)\left(\frac{\tan x}{x}\right)\right] + c$, where f and g are real valued functions of x and c is an arbitrary constant, then which of the following statement is true?

    (a) f(x) = g(x) (b) f(x) . g(x) = 1

    (c) f(x) + g(x) = 0 (d) f(x) – g(x) = c

14. In a ΔABC (a, b, c are the lengths of the opposite sides of angles A, B, C respectively), the perimeter of a ΔABC is 6 times the arithmetic mean of the sine values of its angles. If the side a=1, then the angle A is

    (a) π/3 (b) π (c) π/4 (d) π/6

15. The value of $\sum_{k=1}^{n}(x_k)$, where $x_k = \cos\left(\frac{2\pi k}{n}\right) + i\sin\left(\frac{2\pi k}{n}\right)$ is equal to

    (a) 1 (b) 0 (c) 2 (d) -1

16. If A and B are square matrices such that $B = - A^{-1} BA$, then $(A + B)^2$ =

    (a) A^2+B^2 (b) $A^2–B^2$ (c) A+B (d) A–B

17. If a vector having magnitude of 5 units, makes equal angle with each of the three mutually perpendicular axes, then the sum of the magnitude of the projections on each of the axis is

    (a) $\frac{15}{3}$ unit (b) $5\sqrt{3}$ unit

    (c) $\frac{15\sqrt{3}}{2}$ unit (d) None of these

18. The graph of the real function $f(x) = \log_e\left(x^3 + \sqrt{x^6 + 1}\right)$ is symmetric about the

    (a) y = x line (b) origin

    (c) y-axis (d) x-axis

19. Let A and B be two sets such that A ∩ X = B ∩ X = Φ and A ∪ X = B ∪ X for some set X. Then

    (a) A ∪ B = X (b) B = X

    (c) A = B (d) A = X

20. If $\vec{a}$ and $\vec{b}$ are two unit vectors and $2\vec{a} + \vec{b}$ is 3 units then which of the following statement is true?

    (a) $\vec{a}$ and $\vec{b}$ are parallel

    (b) $\vec{a}$ and $\vec{b}$ are perpendicular to each other

    (c) $\vec{a}$ is perpendicular to $2\vec{a} + \vec{b}$

    (d) $\vec{b}$ is parallel to $2\vec{a} + \vec{b}$

21. If $\lim_{x \to 1} \frac{x^4 - 1}{x - 1} = \lim_{x \to k} \frac{x^3 - k^3}{x^2 - k^2}$ then k =

    (a) 2/3 (b) 4/3 (c) 1 (d) 8/3

22. Let R be a reflexive relation on a set A having 10 elements. If m is the number of ordered pairs in R, then

    (a) m≤10 (b) m=10 (c) m=100 (d) m≥10

23. The range of values of θ in the interval (0, π) such that the points (3, 2) and (cos θ, sin θ) lie on the same side of the line x + y – 1 = 0 is

    (a) (0,π/2) (b) (0,π/4) (c) (0,π/3) (d) (0,3π/4)

24. Let f(x) be a polynomial of degree 4 and f(n) = n + 1 for n = 1, 2, 3, 4. Now, if f(0) = 25, then f(5) =

    (a) 20 (b) 25 (c) N.O.T (d) 30

INFOMATHS

25. An urn contains 5 yellow, 4 black and 3 white balls. 3 balls are drawn at random. The probability that no black ball is selected is
(a) 1/66 (b) 2/9 (c) N.O.T (d) 14/55

26. The sum of infinite terms of a decreasing GP is equal to the greatest value of the function $f(x) = x^3 + 3x - 9$ in the interval [-2, 3] and the difference between the first two terms is f'(0). Then the common ratio of the GP is
(a) 4/3 (b) -4/3 (c) 2/3 (d) -2/3

27. Between any two real roots of the equation $e^x \sin x - 1 = 0$, the equation $e^x \cos x + 1 = 0$ has
(a) no root (b) exactly one root
(c) at most one root (d) at least one root

28. A computer producing factory has only two plants T_1 and T_2. Plant T_1 produces 20% and plant T_2 produces 80% of the total computers produced. 7% of computers produced in the factory turn out to be defective. It is known that P (computer turns out to be defective given that it is produced in plant T_1) = 10P (computer turns out to be defective given that it is produced in plant T_2). A computer produced in the factory is randomly selected and it does not turn out to be defective. Then the probability that it is produced in plant T_2 is
(a) 47/79 (b) 75/83 (c) 78/93 (d) 36/73

29. The foci of the graph represented by $x^2 - 4y^2 + 2x + 8y - 7 = 0$ is
(a) $(-1, -1 \pm \sqrt{5})$ (b) $(1, -1 \pm \sqrt{5})$
(c) $(1 \pm \sqrt{5}, 1)$ (d) $(-1 \pm \sqrt{5}, 1)$

30. Let $\vec{a} = \dfrac{\hat{i} - 2\hat{j}}{\sqrt{5}}$ and $\vec{b} = \dfrac{2\hat{i} + \hat{j} + 3\hat{k}}{\sqrt{14}}$ be two vectors, then the value of $\left(2\vec{a} + \vec{b}\right).\left[\left(\vec{a} \times \vec{b}\right) \times \left(\vec{a} - 2\vec{b}\right)\right]$
(a) 5 (b) 6 (c) 3 (d) 4

31. Let a ,b, c and d be non-zero numbers. If the point of intersection of the lines $4ax + 2ay + c = 0$ and $5bx + 2by + d = 0$ lies in the fourth quadrant and is equidistant from the two axes, then
(a) 3bc+2ad=0 (b) 2ad-3bc=0
(c) a+b+c+d=0 (d) ad-bc=0

32. A speaks truth in 60% and B in 50% of the cases. The probability that they contradict each other while narrating some incident is
(a) 2/3 (b) 1/4 (c) 1/2 (d) 1/3

33. If the numbers a, b, c and d are in harmonic progression and arithmetic mean of ab, bc and cd is 9, then which of the following number is the value of ad?
(a) 12 (b) 9 (c) 3 (d) 4

34. A real valued function f is defined as $f(x) = \begin{cases} -1, & -2 \le x \le 0 \\ x - 1, & 0 < x \le 2 \end{cases}$, . Which of the following statement is false?
(a) f (| x |) = |x| - 1, if $0 \le x \le 1$
(b) f (x) | = x – 1, if $1 \le x \le 2$
(c) f(|x|) + |f (x)| = 1, if $0 \le x \le 1$
(d) f(|x|) –| f (x) | = 0, if $1 \le x \le 2$

35. The negation of $\sim s \vee (\sim r \wedge s)$ is equivalent to
(a) $s \vee (r \vee \sim s)$ (b) $s \wedge r$
(c) $s \wedge \sim r$ (d) $s \wedge (r \wedge \sim s)$

36. A circle C touches the X-axis and touches another circle with centre at (0, 3) and radius 2. Then the locus of the centre of the circle C is
(a) a parabola (b) a circle
(c) an ellipse (d) a hyperbola

37. If the maximum value of the function $f(x) = (x - 1)^2 (x + 1)^3$ is $\dfrac{2^p 3^q}{3125}$, then the value of (p, q) is
(a) (5, 5) (b) (7, 3) (c) (3, 7) (d) (4, 4)

38. If $\cos^{-1}\left(\dfrac{3}{\sqrt{20}}\right)$ is the angle between the vectors $\hat{i} - 2x\hat{j} + 3y\hat{k}$ and $x\hat{i} + \hat{j} + y\hat{k}$, x, y are real numbers then which of the following points satisfies the locus of (x, y)?
(a) (1,0) (b) (1,1) (c) (0,1) (d) (-1,-1)

39. A point P in the first quadrant, lies on $y^2 = 4ax$, $a > 0$ and keeps a distance of 5a units from its focus. Which of the following point lies on the locus of P?
(a) (1,0) (b) (0,1) (c) (2,0) (d) (1,1)

40. Let $\vec{a} = 2\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} + \hat{j}$. Let $\vec{c}$ be a vector such that $\left|\vec{c} - \vec{a}\right| = 3, \left|\left(\vec{a} \times \vec{b}\right) \times \vec{c}\right| = 3$ and the angle between $\vec{c}$ and $\vec{a} \times \vec{b}$ be 30°. Then $\vec{a}.\vec{c}$ is equal to
(a) 1/8 (b) 2 (c) 25/8 (d) 5

41. Box A contains 4 green, 5 black and 6 white balls. Box B contains 5 green, 3 black and 2 white balls. A ball is chosen at random from the box A and placed in box B and then a ball is chosen at random from box B. What is the probability that a black ball was transferred from box A to box B given that the final ball chosen from box B is green?
(a) 30/79 (b) 24/79 (c) N.O.T (d) 25/79

42. A line segment AB of length 10 meters is passing through the foot of the perpendicular of a pillar, which is standing at right angle to the ground. Tip of the pillar subtends angles $\tan^{-1}3$ and $\tan^{-1}2$ at A and B respectively. Which of the following choice represents the height of the pillar?
(a) 10 m (b) 8 m (c) 15 m (d) 12 m

43. Let $f(x) = \dfrac{6^x + 3^x - 2^x + 1}{\log_e 9(1 - \cos x)}$ be a real number. Then $\lim\limits_{x \to 0} f(x)$ equals
(a) 2 (b) 3 (c) $\log_e 2$ (d) $\log_e 3$

44. The mean of 5 observations is 5 and their variance is 12.4. If three of the observations are 1, 2, 6. Then the mean deviation from the mean of the data is
(a) 2.6 (b) 2.4 (c) 2.5 (d) 2.8

45. The value of $\int_{-\pi/3}^{\pi/3} \dfrac{x \sin x}{\cos^2 x} dx$ is
(a) $\dfrac{1}{3}(4\pi + 1)$ (b) $\dfrac{4\pi}{3} - 2\log\tan\left(\dfrac{5\pi}{12}\right)$
(c) $\dfrac{4\pi}{3} + \log\tan\left(\dfrac{5\pi}{12}\right)$ (d) $\dfrac{4\pi}{3} - \log\tan\left(\dfrac{5\pi}{3}\right)$

46 In an examination of 9 papers, a candidate has to pass in more papers than the number of papers in which he fails in order to get the success. The number of ways in which he can be fail, is
(a) 128 (b) 9×8! (c) 255 (d) 256

47. Which of the following number is the coefficient of x^{100} in the expansion of $\log_e\left(\frac{1+x}{1+x^2}\right), |x|<1$?
(a) 0.02 (b) 0.01 (c) -0.01 (d) -0.03

48. The locus of the mid points of all chords of the parabola $y^2 = 4x$, which are drawn through its vertex, is
(a) $y^2 = 8x$ (b) $y^2 = 2x$
(c) $x^2 + 4y^2 = 16$ (d) $x^2 = 2y$

49. Consider the following frequency distribution table:

Class interval	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	180	f_1	34	180	136	f_2	50

If the total frequency is 685 and the median is 42.6 then the possible values of f_1 and f_2 are
(a) 83, 22 (b) 82, 23 (c) 79, 26 (d) 80, 25

50. The equation of the tangent at any point of the curve x = a cos2t, $y = 2\sqrt{2}a\sin t$, with m as its slope, is
(a) $y = mx + a\left(m - \frac{1}{m}\right)$ (b) $y = mx - a\left(m + \frac{1}{m}\right)$
(c) $y = mx + a\left(m + \frac{1}{m}\right)$ (d) $y = amx + a\left(m - \frac{1}{m}\right)$

51. Book: Publisher :: Film: ?
(a) Writer (b) Director
(c) Producer (d) Editor

52. Hemant deposits 10% of his salary in PF. He saves 30% of the remaining salary. The ratio of his expense on medicine and groceries is 3:4 of the remaining salary after saving. If his expense on the medicine was Rs. 2700, then find his monthly salary.
(a) Rs 20,000 (b) Rs 30,000
(c) Rs 15,000 (d) Rs 10,000

53. A sum of money distributed among four person P, Q, R, S in the proportion 2:5; 4:3. if Q gets Rs. 2000 more than S, then what will be the total amount?
(a) 14000 (b) 16000 (c) 18000 (d) 15000

54. Find a number from the given options which best completes the series: 39, 416, 525,…....., 749, 864
(a) 644 (b) 439 (c) 636 (d) 436

55. In the given word "LAVISHLY" if all the consonants replaced with its previous letter and all the vowels replaced with its next letter after that remove all the repeated letter and arranged them in alphabetical order then, which of the following letters is 3rd from the left end?
(a) U (b) R (c) J (d) G

56. P, Q, R, S, T, U, V, W are sitting around a round table in the same order, for group discussion at equal distances. Their positions are clockwise. If V sits in the north, then what will be the position of S?
(a) East (b) South-west
(c) South (d) South-East

57. A university is offering elective courses in Mathematics, Economics and Sociology. Each of its 100 undergraduate students has to opt for at least one of these electives. Course enrollment data showed that 47 students enrolled for Mathematics, 47 students enrolled for Economics and 57 students enrolled for Sociology. If 7 students enrolled for all three courses, how many students enrolled for exactly one course?
(a) 60 (b) 58
(c) 56 (d) Cannot be determined

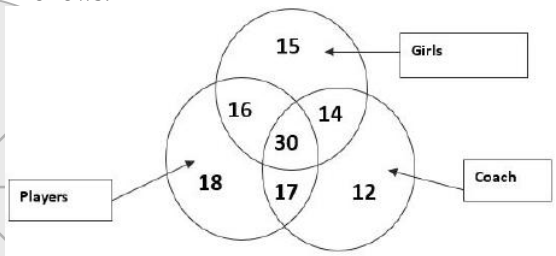
58. Shweta, Yamini, Pooja, and Rakhi are sisters. Yamini is older than at least two of her sisters. Pooja is younger than Rakhi, who is not the oldest. Shweta is older than Pooja but younger than Rakhi. Who is the oldest among them?
(a) Pooja (b) Yamini (c) Rakhi (d) Shweta

59. Rajdhani Train running at a speed of 54 km/hr crosses a platform of length same as that of the train in 36 sec. If a Duronto train, which is 230 meters long crosses the same platform in 25 sec, then find speed of Duronto train (in km/hr)?
(a) 54 km/hr (b) 90 km/hr
(c) 84 km/hr (d) 72 km/hr

60. On Monday, Akash ran 4 km less than the distance he ran on Tuesday. Sanjay, who ran the same distance on Monday and Tuesday, ran 5 km more on Tuesday than the distance Akash ran on Monday. Find the difference between the distances covered by Akash and Sanjay over the two days.
(a) 9 km (b) 4 km (c) 5 km (d) 6 km

61. Complete the series: 3,10,24,45,73, ____
(a) 108 (b) 121 (c) 69 (d) 91

62. Study the diagram and answer the question that follows:



How many players are there who are girls but not a coach?
(a) 31 (b) 15 (c) 16 (d) 61

63. In a certain language, DENMARK is coded as FCPKCPM. Find the code of SINGAPORE.
(a) UGPEDNQTC (b) UGPECNQTC
(c) UGPFCNRPG (d) UGPECNQPG

64. If 3 is subtracted from the middle digit of each of the following numbers and then the position of the digits are reversed, which of the following will be last digit of the middle number after they are arranged in descending order?
589 362 554 371 442
(a) 1 (b) 4 (c) 2 (d) 3

65. How many meaningful words can be formed with the first, the third, the seventh, and the ninth letters of the word SEPARATION using each letter only once in each word?
(a) 3 (b) More than 4
(c) 2 (d) 4

66. Hari invested an amount at a certain rate of interest on simple interest and he got 60% more amount after eight years. If he invests Rs. 9600 at the same rate of interest on simple interest, then find the total interest he would get after four years?
(a) Rs.2160 (b) Rs.2520
(c) Rs.2880 (d) Rs.2260

67. In a reality show, two judges independently provided marks based on the performance of the participants. If the marks provided by the second judge are given

by y= 1+ x, where x is the marks provided by the first judge. Then for a participant
(a) Rank given by the second judge is more than that of the first judge
(b) Ranks given by both the judges differ by 2
(c) Rank given by the first judge is more than that of the second judge
(d) Ranks given by both the judges are same

68. Arrange the words given below in a meaningful sequence.
(1) Database (2) Analysis
(3) Survey (4) Policy formulation
(5) Interpretation
(a) 1. 3, 1, 2, 4, 5 (b) 2. 5, 4, 3, 1, 2
(c) 3. 2, 1, 5, 3, 4 (d) 4. 3, 1, 2, 5, 4

69. For security reasons, a bank manager decided to encrypt the account number in the server.
If A/C No. 46873 is coded as 91317157, then 52191 is coded as
(a) 4108041 (b) 1153193
(c) 5219152 (d) 1043293

70. Which word among the following words can be formed from the letters of "RECOMMENDATION"?
(a) COMMUNICATE (b) REMINDER
(c) MEDIATE (d) MEDICINE

71. Three persons A, B and C are standing in a queue. There are five persons between A and B and eight persons between B and C. If there are three persons ahead of C and 21 behind A, then what could be the minimum number of persons in the queue?
(a) 27 (b) 41 (c) 40 (d) 28

72. Ritu purchased 20 dozen of bananas at the rate of Rs. 375 per dozen. she sold each one of them at the rate of Rs. 33. What was her profit percentage?
(a) 10% (b) 5.6% (c) 12.3% (d) 6.5%

73. Identify the next two numbers in the following sequence: 17, 20, 9, 12, 5, 6, 3, 2, ____, ____
(a) 0, 2 (b) 2, 0 (c) 2, 1 (d) 1, 2

74. Thirty-six vehicles are parked in a parking lot in a single row. After the first car, there is one scooter. After the second car, there are two scooters. After the third car, there are three scooters and so on. Work out the number of scooters in the second half row.
(a) 15 (b) 17 (c) 12 (d) 10

75. If 20 -10 means 200, 8 ÷ 4 means 12, 6×2 means 4, then 100 -10 ×1000 ÷1000 +100×10 = ?
(a) 1090 (b) 20
(c) None of the above (d) 0

76. A can do a work in 10 days, B can do the same work in 20 days. After working for 4 days B left the job & C started working at the place of B. The remaining work was done by both A & C in 2 days. In how many days C alone can do the work?
(a) 20 days (b) 15 days
(c) 12 days (d) 10 days

77. Rakesh says to Mahesh, "I am as old as you were when I was one-third as old as you are." If the sum of their ages is 60 years, find the present age of Mahesh (in years).
(a) 24 (b) 30 (c) 45 (d) 36

78. Pointing towards a person in the photograph, Anjali said, "He is the only son of the father of my sister's brother." How is that person related to Anjali?
(a) Cousin (b) None of these
(c) Mother (d) Father

79. A junior school is offering five after-school activities – Karate, Handwork, Music, Dance, and Gymnastics. Each of the five students – Leena, Megan, Neha, Omar, and Pixie, has subscribed to at least one activity. As per the school rules, anyone who subscribes to Gymnastics must also subscribe to Dance. Karate and Handwork must always be subscribed together. Music and Dance cannot be subscribed together.
The following information is available about the students' subscriptions.
• Megan subscribed to four activities.
• Leena subscribed to Gymnastics but not Karate.
• Pixie subscribed to only one activity and is the only one to subscribe to that activity.
• Omar subscribed to three activities.
• Neha subscribed to only one activity.
How many activities are subscribed by exactly two people each?
(a) 3 (b) 2 (c) 4 (d) 1

80. Deepa moved a distance of 75 metres towards the north. She then turned to the left and after walking for about 25 metres, turned left again and walked 80 metres. Finally, she turned to the right at an angle of 45°. In which direction was she moving finally?
(a) South-east (b) North-east
(c) South-west (d) North-west

81. In the half yearly exam only 60% of the students were passed. Out of these (passed in halfyearly) only 70% students are passed in annual exam, out of remaining students (who fail in half-yearly exam) 80% passed in annual exam. What percent of the students passed the annual exam?
(a) 74% (b) 65% (c) 76% (d) 72%

82. A 30 litres mixture of milk and water contains 10% water. How much milk should be added so that the percentage of water in the mixture comes down to 2%?
(a) 80 litres (b) 120 litres
(c) 60 litres (d) 90 litres

83. If yellow is called white, white is called black, black is called green, green is called pink, pink is called blue and blue is called water, what is the colour of sky?
(a) White (b) Water (c) Blue (d) Black

84. If the word IMPACT is coded as RNKZXG, then which of the following represents the code for the word DESCEND?
(a) MFBDFOM (b) MNBLNWM
(c) WVHXVMW (d) MFBDNOM

85. If 'E' stands for '+', `F' stands for '-' ,'M' stands for '×' , `N' stands for `÷' , then 19 M 5 E 39 N 3 F 8=?
(a) 105 (b) 90 (c) 95 (d) 100

86. Statements: Most teachers are boys.
Some boys are students.
Conclusion: I. Some students are boys.
II. Some teachers are students.
(a) Only I follows (b) Neither I nor II follows
(c) Only II follows (d) Either I or II follows

87. Fill the blanks with the most appropriate combination of options.
Further, to augment bond market liquidity, corporates need to be encouraged to

_____ exiting bonds under the same International Securities Identification Number, to duly shore up floating _____.
(a) abandon, imply (b) affect, negotiate
(c) reissue, stocks (d) precaution, abstract

88. Statement:- No table is chair
Not a single chair is stand
Every stand is statue
Conclusion:-1. Some statue which are stand are table as well
2. Some statue are not chair
(a) Only conclusion 2 follows
(b) If neither conclusion 1 nor 2 follow
(c) If only conclusion 1 follows
(d) None follows

89. A vessel contains total 95 litre mixture of milk & water in the ratio of 15 : 4 respectively. P litre of mixture taken out from the vessel and 18 litres water added in the remaining mixture, then the new ratio of milk to water becomes 3 : 2, find the value of P?
(a) 57 (b) 27.5 (c) 38 (d) 19

90. Two friends A and B were standing at the diagonally opposite corners of a rectangular plot whose perimeter is 100m. A first walked x meters along the length of the plot towards East and then y meters towards the South. B walked x meters along the breadth towards North and then y meters towards West. At the end of their walks, A and B were standing at the diagonally opposite corners of a smaller rectangular plot whose perimeter is 40m. How much distance did A walk?
(a) 15 (b) 25 (c) 50 (d) 40

91. The number of minterms in a n variable truth table is
(a) n^2 (b) $(n-1)^2$ (c) 2^n (d) 2^{n-1}

92. The maximum and minimum value represented in signed 16-bit 2s compliment representation are
(a) 0 and 65535 (b) -32678 and 32767
(c) -16384 and 16383 (d) 0 and 32767

93. Consider the following minterm expression for F: F(P, Q, R, S) = ∑0, 2, 5, 7, 8, 10, 13, 15. The minterms 2, 7, 8 and 13 are don't care terms. The minimal sum of products form for F is
(a) $\overline{Q}S + Q\overline{S}$ (b) $\overline{Q}\overline{S} + SQ$
(c) $\overline{Q}\overline{R}S + \overline{Q}R\overline{S} + Q\overline{R}S + QRS$
(d) $\overline{P}\overline{Q}\overline{S} + \overline{P}QS + PQS + P\overline{Q}\overline{S}$

94. The time required for fetching and execution of one machine instruction is:
(a) CPU cycle (b) Real time
(c) Seek time (d) Delay time

95. Which of the following is true about Von Neumann architecture?
(a) It has separate storage for input/output operations
(b) It has a single memory unit for both data and instructions
(c) It has a separate processing unit for data and instructions
(d) It has separate memory for data and instructions

96. Let ⊕ and ⊙ denote the Exclusive –OR and Exclusive –Nor operations respectively. Which one of the following is not correct?
(a) $\overline{P} \oplus \overline{Q} = P \odot Q$ (b) $\overline{P} \oplus Q = P \odot Q$
(c) $\overline{P} \oplus \overline{Q} = P \oplus Q$
(d) $\left(P \oplus \overline{P}\right) \oplus Q = \left(P \odot \overline{P}\right) \odot \overline{Q}$

97. A CPU generates 32-bit virtual addresses. The page size is 4 KB. The processor has a translation look-aside buffer (TLB) which can hold a total of 128 page table entries and is 4-way set associative. The minimum size of the TLB tag is:
(a) 11 bits (b) 20 bits
(c) 15 bits (d) 13 bits

98. Equivalent of the decimal number (25.375)10 in binary form
(a) $(11001.011)_2$ (b) $(11101.011)_2$
(c) $(11011.111)_2$ (d) $(11001.101)_2$

99. Which of the following registers is used to keep track of address of the memory location where the next instruction is located?
(a) Program Counter
(b) Memory Data Register
(c) Memory Address Register
(d) Instruction counters

100. A wrong sentence related to FAT 32 and NTFS file systems is
(a) FAT 32 store individual files of size up to 32 GB
(b) Read and write speeds of NTFS are faster than that of FAT 32
(c) FAT 32 has lower disk utilisation compared to NTFS
(d) NTFS stands for New Technology File System

101. Suppose we have a 10-bit computer that uses 10-bit int (2's complement representation). The number representation of -35 is
(a) 0000100011 (b) 1100100011
(c) 1111011101 (d) 1111011101

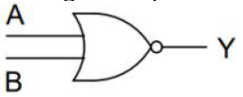
102. Suppose we have a 10-bit computer that uses 10-bit floating point computational unit (Float number uses IEEE floating-point arithmetic where a floating point number has 1 sign bit, 5 exponent bits, and 4 fraction bits). The representation for +∞ (plus infinity) is
(a) 0 11111 0000 (b) 0 00000 1111
(c) 0 11111 1111 (d) 1 11111 0000

103. How many 32K × 1 RAM chips are needed to provide a memory capacity of 256K-bytes?
(a) 128 (b) 64 (c) 32 (d) 8

104. Consider the following Boolean expression for F:
F (P, Q, R, S) $= PQ + \overline{P}QR + \overline{P}Q\overline{R}S$. The minimum sum of products of F is.
(a) PQ + QR + QS (b) P + Q + R + S
(c) $\overline{P} + \overline{Q} + \overline{R} + \overline{S}$ (d) $\overline{P}R + \overline{P}\overline{R}S + P$

105. The reduced form of the Boolean function F = xyz + xyz' + x'yz + xy'z
(a) xy+yz+xz (b) xy+yz
(c) x+yz+xz (d) x+y+z

106. Consider the circuit shown below and find minimum number of NAND gates required to design it.



(a) 5 (b) 6 (c) 4 (d) 3

107. A bulb in the staircase has two switches, one switch is at the ground floor and the other one is at the first floor. The bulb can be turned ON and also can be turned OFF by any of the switches irrespective of the state of the other switch. The logic of the switching of the bulb resembles

(a) XOR Gate (b) OR Gate
(c) AND Gate (d) XNOR Gate

108. If a processor clock is rated as 2500 million cycles per second, then its clock period is :
(a) 2.50×10^{-10} sec (b) 4.00×10^{-10} sec
(c) 1.00×10^{-10} sec (d) 5.00×10^{-10} sec

109. What is a potential problem of 1's complement representation of numbers?
(a) Multiplication of two numbers cannot be carried out
(b) Binary additions are not possible
(c) There are two different representations of zero
(d) Binary substructions are not possible

110. What is the name of the storage device that compensates the difference in rates of flow of data from one device to another?
(a) Buffer (b) Concentrator
(c) Cache (d) RAM

Comprehension:

Read the following passage carefully and answer the questions:

Science and religion - the two terms have come to signify a mutual antagonism. The two, it is commonly declared, are poles apart; their spheres of activity and their methods differ widely, so much so that they are considered to be irreconcilable. On the face of it, science and religion appear to be the two opposite poles of man's consciousness. Science is basically concerned with the material world; its efforts are directed towards unravelling the "how" of reality while religion is concerned with the "why" of reality. Science deals with analysing tangible entities into its minutest parts, and then arrives at conclusions about the way in which tangible realities are organized. While science is analytical, religion takes the ultimate reality for granted. Religion follows the metaphysical path; the concept of God is ultimately a matter of faith and it is this faith which is the basis of the religious man's attribution of a design or meaning for the reality. The modes of action are different in science and religion. Science relies on experiment, whereas religion is based on experience. Science benefits mankind by providing material comforts. The frontiers of science do not end in knowledge but are extended to the formation of appliances for actual use. Science, it has been somewhat unfairly charged, cultivates the materialistic thinking. However, it has to be admitted that the mental attitude promoted by religion is entirely different. While the basis of scientific progress is unbridled curiosity and courageous endeavour, the truly religious spirit cavils at such presumption that man's mind can penetrate the mysteries of the universe. Science promotes fearless inquiry, while an essential ingredient of religion is the humility born of fear of God. Science incorporates a love of experimental knowledge, while religion does not believe in the rational approach.

111. Which of the following statements according to the passage is correct:
(a) Science believes in the humility born of fear of God.
(b) Religion believes in ultimate reality.
(c) Science follows the metaphysical path.
(d) The religious spirit assumes that human mind can penetrate the mysteries of the universe.

112. Which of the following reasons according to the passage provide material comforts to people in case of science?
(a) The subjectivity of science
(b) Promotion of fearless inquiry by science
(c) Materialistic thinking being cultivated by science
(d) Tangible p

roofs of the theories of science

113. Select the most appropriate preposition to fill in the blank.
We haven't been to Delhi _____ almost five years.
(a) since (b) from (c) to (d) for

114. I have _____ umbrella. I bought it _____ year ago.
(a) A, An (b) The, An
(c) An, A (d) An, The

115. Select the most appropriate preposition to fill in the blank.
A baby sitter is someone who looks _____ other people's children.
(a) on (b) over (c) for (d) after

116. Meaning of "Abrogate" is
(a) Absorb (b) Abstract
(c) Ablaze (d) Abolish

117. Synonym for "Nonplussed" is:
(a) Oriented (b) Flummoxed
(c) Befuddled (d) Dumbfounded

118. Choose the best option that indicates the change of voice for the sentence given below:
They sent for a doctor because Pamela had fainted
(a) A doctor was sent for because Pamela had fainted
(b) Pamela had sent for a doctor because they had fainted
(c) Pamela fainted and a doctor was sent for
(d) A doctor was sent for them because Pamela had fainted

119. Select the most appropriate meaning of the underlined idioms in the given sentence:
Off and on, I take a break from my hectic schedule to refresh myself.
(a) C (b) B (c) A (d) D

120. Antonym for "Spendthrift" is:
(a) Frugal (b) Profligate
(c) Extravagant (d) Squanderer

NIMCET-2023 ANSWERS

1	2	3	4	5	6	7	8	9	10
a	a	C	b	a	b	B	d	c	b
11	12	13	14	15	16	17	18	19	20
c	b	C	d	b	a	B	b	c	a
21	22	23	24	25	26	27	28	29	30
d	d	A	d	d	c	D	c	d	a
31	32	33	34	35	36	37	38	39	40
b	c	B	c	b	a	B	c	d	b
41	42	43	44	45	46	47	48	49	50
d	d	C	d	b	d	B	b	b	b
51	52	53	54	55	56	57	58	59	60
c	d	A	c	c	b	C	b	d	d
61	62	63	64	65	66	67	68	69	70
c	c	D	d	b	c	D	d	b	c
71	72	73	74	75	76	77	78	79	80
d	b	B	a	d	d	D	d	a	c
81	82	83	84	85	86	87	88	89	90
a	b	B	c	d	a	C	a	c	a
91	92	93	94	95	96	97	98	99	100
c	b	B	a	b	d	C	a	a	a
101	102	103	104	105	106	107	108	109	110
c	d	B	a	a	c	A	b	c	a
111	112	113	114	115	116	117	118	119	120
b	d	D	c	d	d	A	a	a	a

NIMCET-2023 (SOLUTIONS)

1. **Ans. (a)** Here $P(A) = \frac{2}{3}$

$P(A \cup B) = \frac{3}{4}$

$P(B) = P(A \cup B) - P(A) + (P \cap B)$

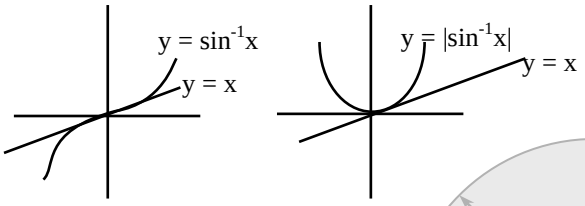
$P(B) = \frac{3}{4} - \frac{2}{3} + P(A \cap B)$

As $0 \le P(A \cap B) \le \frac{2}{3}$ as $P(A \cap B) \le P(A)$

$\Rightarrow \frac{3}{4} - \frac{2}{3} \le P(B) \le \frac{3}{4} - \frac{2}{3} + \frac{2}{3}$

$\Rightarrow \frac{1}{12} \le P(B) \le \frac{3}{4}$

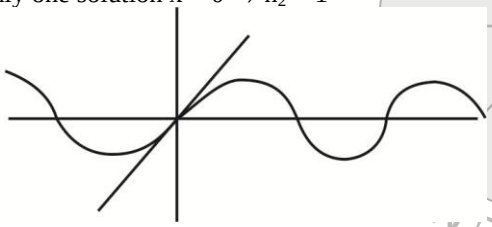
2. **Ans. (a)**



$x = |\sin^{-1}x| \Rightarrow$ only $x = 0$ is a solution $\Rightarrow n_1 = 1$

Also as $x \ge \sin x \Rightarrow x = \sin x$

$\Rightarrow$ only one solution $x = 0 \Rightarrow n_2 = 1$



$\Rightarrow n_2 - n_1 = 1 - 1 = 0$

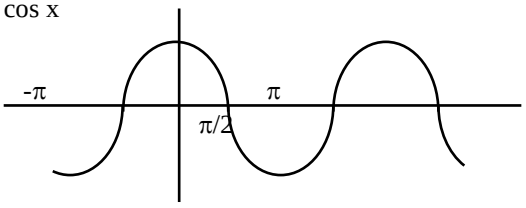
3. **Ans. (c)** $[a \quad b \quad c] = \begin{vmatrix} 1 & 0 & -1 \\ x & 1 & 1-x \\ y & x & 1+x-y \end{vmatrix}$

$= (1 + x - y - x + x^2) - (x^2 - y) = 1$

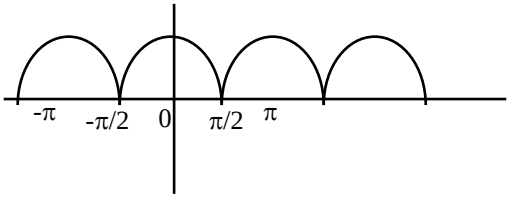
$\Rightarrow$ Independence of x, y both

4. **Ans. (b)** $f(x) = |\cos x| + 3$

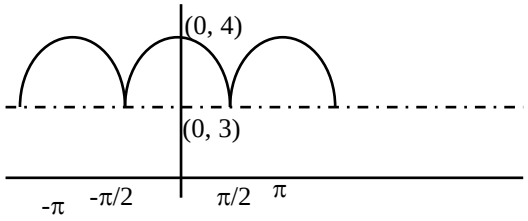
$y = \cos x$



$y = |\cos x|$



$y = 3 + |\cos x|$



So in $[-\pi, \pi]$ there are only two corner points at

$x = \pm\frac{\pi}{2} \Rightarrow$ not diff. at $x = \pm\frac{\pi}{2}$

Or

At $x = \frac{\pi}{2}$, $y = \begin{cases} 3 + \cos x, & x < \frac{\pi}{2} \\ 3 - \cos x, & x > \frac{\pi}{2} \end{cases}$

$\frac{dy}{dx} = \begin{cases} 0 - \sin x, & x < \frac{\pi}{2} \\ 0 + \sin x, & x > \frac{\pi}{2} \end{cases}$

$y'\left(\frac{\pi}{2}^-\right) = -1, \quad y'\left(\frac{\pi}{2}^+\right) = 1 \Rightarrow$ Not diff at $\pi/2$

IIly at $x = \frac{-\pi}{2}$

5. **Ans. (a)**

$(1 + x)^{1000} + 2x(1 + x)^{999} + 3x^2 (1 + x)^{998} + \ldots$

It's AG with a = 1, d = 1

$b = (1 + x)^{1000}, \; r = \frac{x}{1+x}, n = 1001$

$s = \frac{ab}{1-r} + \frac{dbr\left(1 - r^{n-1}\right)}{(1-r)^2} - \frac{\left(a + (n-1)d\right)br^n}{1-r}$

$= \frac{(1+x)^{1000}}{1 - \frac{x}{1+x}} + \frac{x(1+x)^{999}\left(1 - \left(\frac{x}{1+x}\right)^{1000}\right)}{\left(1 - \frac{x}{1+x}\right)^2} - \frac{(1+1000)}{1 - \frac{x}{1+x}}(1+x)^{1000} \cdot \left(\frac{x}{1+x}\right)^{1001}$

$= (1+x)^{1001} + (1+x)^{1001} \cdot x\left(1 - \left(\frac{x}{1+x}\right)^{1000}\right) - 1001x^{1001}$

$= (1 + x)^{1001} + (1 + x)^{1001} \cdot x - (1 + x) \cdot x^{1001} - 1001x^{1001}$

$\Rightarrow$ coeff of x^{50} is ${}^{1001}C_{50} + {}^{1001}C_{49} = {}^{1002}C_{50}$

6. **Ans. (b)** By choices only (b) satisfies

7. **Ans. (b)** $\prod_{i=1}^{n} \tan\alpha_i = 1$

$\Rightarrow \tan\alpha_1 \tan\alpha_2 \ldots\ldots \tan\alpha_n = 1$

$\Rightarrow \sin\alpha_1 \sin\alpha_2 \ldots\ldots \sin\alpha_n = \cos\alpha_1 \ldots\ldots \cos\alpha_n$

Let $y = \prod_{i=1}^{n} \sin\alpha_i = \sin\alpha_1 \sin\alpha_2 \ldots\ldots \sin\alpha_n$

$\Rightarrow y^2 = (\sin\alpha_1 \ldots.. \sin\alpha_n)(\sin\alpha_1 \ldots\ldots \sin\alpha_n)$

$= (\sin\alpha_1 \ldots\ldots \sin\alpha_n)(\cos\alpha_1 \ldots. \cos\alpha_n)$

INFOMATHS

$= \frac{1}{2^n}\left[(2\sin\alpha_1\cos\alpha_1)(2\sin\alpha_2\cos\alpha_2).....(2\sin\alpha_n\cos\alpha_n)\right]$

$= \frac{1}{2^n}(\sin 2\alpha_1 \sin 2\alpha_2 .....\sin 2\alpha_n)$

$\Rightarrow y^2 \le \frac{1}{2^n}$ as $\sin 2\theta \le 1 \Rightarrow y \le \frac{1}{2^{\frac{n}{2}}} = 2^{-\frac{n}{2}}$

8. **Ans. (d)** $\cos^2\theta - 6\sin\theta\cos\theta + 3\sin^2\theta + 2$

$= \frac{1+\cos 2\theta}{2} - 3\sin 2\theta + \frac{3}{2}(1-\cos 2\theta) + 2$

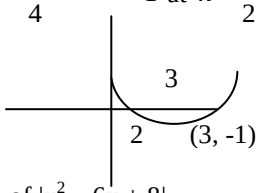
$= -3\sin 2\theta - \cos 2\theta + 4$

$\Rightarrow$ largest value $\le \sqrt{3^2+1} + 4 = 4 + \sqrt{10}$

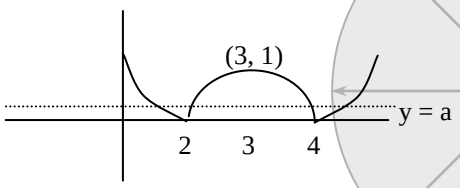
9. **Ans. (c)** $x^2 - 6x + 8 = (x-2)(x-4)$

and min. value $= \frac{4ac-b^2}{4a}$ at $x = \frac{-b}{2a}$

$= \frac{4(1)(8)-6^2}{4} = -1$ at $x = \frac{6}{2} = 3$



graph of $|x^2 - 6x + 8|$



Now y = a and $|x^2 - 6x + 8|$ has four roots then cut in four points if $0 < a < 1$.

10. **Ans. (b)** $\int f(x)dx = g(x)$

$\int x^5 f(x^3)dx = \int \frac{x^3}{3}(3x^2 f(x^3))dx$

$= \frac{1}{3}\int t f(t)dt$ as $x^3 = t \Rightarrow 3x^2dx = dt$

$= \frac{1}{3}\left[t\int f(t)dt - \int(\int f(t)dt)dt\right]$

$= \frac{1}{3}\left[tg(t) - \int g(t)dt\right] = \frac{1}{3}\left[x^3 g(x^3) - \int g(t)dt\right]$

$= \frac{1}{3}\left[x^3 g(x^3) - \int g(x^3)3x^2dx\right]$

$= \frac{1}{3}x^3 g(x^3) - \int x^2 g(x^3)dx + c$

11. **Ans. (c)** $\lim_{x\to -1}\frac{x^2-1}{|x|-1} = \lim_{x\to -1}\frac{x^2-1}{-x-1}$

as $x \to -1 \Rightarrow |x| < 0 \Rightarrow |x| = -x$

$\Rightarrow -\lim_{x\to -1}(x-1) = 2$

12. **Ans. (b)** Incorrect sum = $40 \times 100 = 4000$

Correct sum = $4000 - 52 - 53 + 25 + 35$

$= 4000 - 105 + 60 = 3955$

Correct mean $= \frac{3955}{100} = 39.55$

Only (b) choices satisfies

13. **Ans. (c)** $\int x\sin x\sec^3 x dx = \int x\tan x\sec^2 x dx$

$= \frac{x\tan^2 x}{2} - \int\frac{\tan^2 x}{2}dx = \frac{x\tan^2 x}{2} - \frac{1}{2}\int(\sec^2 x - 1)dx$

$= \frac{x\tan^2 x}{2} - \frac{\tan x}{2} + \frac{x}{2} + c$

$= \frac{x}{2}(\sec^2 x - 1) - \frac{\tan x}{2} + \frac{x}{2} + c$

$= \frac{1}{2}\left[x\sec^2 x - \tan x\right] + c$

$= \frac{1}{2}\left[f(x)\sec^2 x + g(x)\frac{\tan x}{x}\right] + c$

$\Rightarrow$ f(x)= x, g(x) = - x $\Rightarrow$ f(x) + g(x) = 0

14. **Ans. (d)** $a + b + c = 6\left(\frac{\sin A + \sin B + \sin C}{3}\right)$

as a = k sin A, b = k sin B , c = k sin C

$\Rightarrow$ k[sinA + sin B + sin C] $\Rightarrow$ 2[sinA + sin B + sin C] $\Rightarrow$ k = 2

Also a = k sinA $\Rightarrow$ 1 = 2 sin A as a = 1

1 = 2 sin A $\Rightarrow$ A = 30°

15. **Ans. (b)** $I = \frac{cis2\pi k}{n} = n^{th}$ roots of unity

$\Rightarrow \sum_{k=1}^{n} cis\frac{2\pi k}{n} = 0$ as sum of n, nth roots of unity is zero.

16. **Ans. (a)** $B = -A^{-1}BA$

$\Rightarrow AB = -BA \Rightarrow (A+B)^2 = A^2 + B^2 + AB + BA$

$= A^2 + B^2$

17. **Ans. (b)** Let vectors makes an angle α with each of axes

$\Rightarrow \cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$ as $l^2 + m^2 + n^2 = 1$

$\alpha = \beta = \gamma \Rightarrow 3\cos^2\alpha = 1 \Rightarrow \cos\alpha = \frac{1}{\sqrt{3}}$

$\Rightarrow$ sum of projections on x-axis , y-axis ,z-axis

$= 5\cos\alpha + 5\cos\alpha + 5\cos\alpha$

$= \frac{5}{\sqrt{3}} + \frac{5}{\sqrt{3}} + \frac{5}{\sqrt{3}} = 5\sqrt{3}$

18. **Ans. (b)** As $\log_e\left(x^3 + \sqrt{x^6+1}\right)$

is odd function as composition of odd functions x^3 and $\log_e\left(x + \sqrt{x^2+1}\right)$

so graph symmetrical about origin.

19. **Ans. (c)** From choices

20. **Ans. (a)** Here $|\vec{a}| = |\vec{b}| = 1$

Now $|2\vec{a} + \vec{b}| = 3$

INFOMATHS

$4|a|^2 + |b|^2 + 4a.b = 9$

$\Rightarrow 4.1 + 1 + 4(1)(1)\cos\theta = 9$

$\Rightarrow \cos\theta = 1 \Rightarrow \theta = 0 \Rightarrow \vec{a} \| \vec{b}$

21. **Ans. (d)** $\lim_{x\to1}\frac{x^4-1}{x-1} = \lim_{x\to1}\frac{x^3-k^3}{x^2-k^2}$

$\Rightarrow 4 = \frac{3k^2}{2k} = \frac{3}{2}k \Rightarrow k = \frac{8}{3}$

22. **Ans. (d)** As Identity relation $\subseteq$ Reflexive relation

$\Rightarrow$ No. of reflexive relations ≥ 10.

23. **Ans. (a)** As if two points lie on same side of line $ax + by + c = 0 \Rightarrow (ax_1 + by_1 + c)(ax_2 + by_2 + c) > 0$

So (3,2),(cos θ,sinθ) lie on same side of x+y-1=0

$\Rightarrow (3 + 2 - 1)(\cos\theta + \sin\theta - 1) > 0$

$\Rightarrow 4(\cos\theta + \sin\theta - 1) > 0$

$\Rightarrow \cos\theta + \sin\theta > 1 \Rightarrow \frac{1}{\sqrt{2}}\cos\theta + \frac{1}{\sqrt{2}}\sin\theta > \frac{1}{\sqrt{2}}$

$\sin\left(\theta + \frac{\pi}{4}\right) > \frac{1}{\sqrt{2}} = \sin\frac{\pi}{4} \Rightarrow \frac{\pi}{4} < \theta + \frac{\pi}{4} < \frac{3\pi}{4}$

$\Rightarrow 0 < \theta < \frac{\pi}{2} \Rightarrow \theta \in \left(0, \frac{\pi}{2}\right)$

24. **Ans. (d)** $f(n) = n + 1$

Let $f(x) = ax^4 + bx^3 + cx^2 + dx + e$

$\Rightarrow f(0)=25 \Rightarrow e = 25$

$\Rightarrow f(1) = 2 \Rightarrow a + b + c + d + 25 = 2$

$\Rightarrow a + b + c + d = -23$ …(1)

$f(2) = 3 \Rightarrow 16a + 8b + 4c + 2d + 25 = 3$

$16a + 8b + 4c + 2d = -22$ …(2)

$f(3) = 4 \Rightarrow 81a + 27b + 9c + 3d + e = 4$

$\Rightarrow 81a + 27b + 9c + 3d = -21$ …(3)

$f(4) = 5 \Rightarrow 256a + 64b + 16c + 4d = -20$ …(4)

$(2) - 2(1) \Rightarrow 14a + 6b + 2c = 24$

$7a + 3b + c = 12$ …(5)

$(3) - 3(1) \Rightarrow 78a + 24b + 6c = 48$

$13a + 4b + c = 8$ …(6)

$(4) - 4(1) \Rightarrow 252a + 60b + 12c = 72$

$21a + 5b + c = 6$ …(7)

From (5), (6) $\Rightarrow 6a + b = -4$ …(8)

(6), (7) $\Rightarrow 8a + b = -2$ …(9)

From (8), (9)

$\Rightarrow 2a = 2 \Rightarrow a = 1$ and from above (9) , $b = -10$

from (5) $\Rightarrow 7 - 30 + c = 12 \Rightarrow c = 35$

From (1) $\Rightarrow 1 - 10 + 35 + d = -23$

$26 + d = -23 \Rightarrow d = -49$

$\Rightarrow x^4 - 10x^3 + 35x^2 - 49x + 25 = f(x) \Rightarrow f(5) = 625 - 1250 + 825 - 245 + 25 = 275 - 245 = 30$

25. **Ans. (d)** $= \frac{{}^8C_3}{{}^{12}C_3} = \frac{\frac{|8}{|3|5}}{\frac{|12}{|3|9}} = \frac{8\times7\times6}{12\times11\times10} = \frac{28}{110} = \frac{14}{55}$

26. **Ans. (c)** As $f(x) = x^3 + 3x - 9$

$f'(x) = 3x^2 + 3 > 0 \Rightarrow f(x)$ is always increasing

so in $[-2, 3] \Rightarrow f(3)$ is max. value

As $f(3) = 3^3 + 3(3) - 9 = 27$

And S = sum to infinite G.P.

$= \frac{a}{1-r} = 27$ …(1)

As $f'(0) = 3 \Rightarrow a(1 - r) = 3$ …(2)

Divide (2) and (1)

$(1-r)^2 = \frac{3}{27} = \frac{1}{9} \Rightarrow 1 - r = \pm\frac{1}{3} \Rightarrow r = \frac{2}{3}, \frac{4}{3}$

As G.P. is decreasing $\Rightarrow r = \frac{2}{3} < 1$

27. **Ans. (d)** Let $f(x) = e^x \sin x - 1 \rightarrow (1)$

Let α, β be roots of f(x)

$\Rightarrow$ (1) continuous in [α, β]

(2) differentiable

(3) $f(\alpha) = f(\beta)$

Rolle's theorem is satisfied

$\Rightarrow f'(x) = e^x \sin x + e^x \cos x = 0$ for alteast one x in (α, β)

$\Rightarrow e^x \cos x = -e^x \sin x = -1$ from (1)

$\Rightarrow 1 + e^x \cos x = 0$ has atleast are root.

28. **Ans. (c)** Let P_1 be the defective computers that are produced from plant T_1 and P_2 be that from plant T_2.

The total percentage of the defective computers produced is 7%.

Now, $P_1 = 10P$ and $P_2 = P$.

The computers produced that are defective:

$\frac{20}{100}\times P_1 + \frac{80}{100}\times P_2 = \frac{7}{100}$

$20P_1 + 80P_2 = 7$

$200P + 80P = 7$

$P = \frac{7}{280} = \frac{1}{40}$

P(computers that are not defective) = 1 - 1/40 = 39/40

Now, the probability of the defective products is calculated as follows:

$\frac{20}{100}P_1 + \frac{80}{100}P_2 = \frac{20}{100}\times\frac{1}{4} + \frac{80}{100}\times\frac{1}{40} = \frac{28}{400} = \frac{7}{100}$

The probability of producing NOT defective computers is 1 - 7/100 = 93/100

The probability that plant T_2 produces NOT defective computers is calculated as follows:

$\frac{(80/100)\times(39/40)}{(93/100)} = \frac{78}{93}$

29. **Ans. (d)** $x^2 - 4y^2 + 2x + 8y - 7 = 0$

$x^2 + 2x = 4y^2 - 8y + 7$

$(x^2 + 2x + 1) = 4y^2 - 8y + 8 = 4(y^2 - 2y + 1) + 4$

$(x + 1)^2 - 4(y - 1)^2 = 4$

$\Rightarrow \frac{(x+1)^2}{4} - \frac{(y-1)^2}{1} = 1$

$\Rightarrow e^2 = \frac{a^2+b^2}{a^2} = \frac{5}{4} \Rightarrow e = \frac{\sqrt{5}}{2}$

$\Rightarrow$ Foci $\Rightarrow x + 1 = \pm ae \Rightarrow x = -1 \pm 2\frac{\sqrt{5}}{2} = -1 \pm \sqrt{5}$

$y - 1 = 0 \Rightarrow y = 1 \Rightarrow F\left(-1 \pm \sqrt{5}, 1\right)$

30. **Ans. (a)** Here $\vec{a}=\frac{\hat{i}-2\hat{j}}{\sqrt{5}},\vec{b}=\frac{2\hat{i}+\hat{j}+3\hat{k}}{\sqrt{14}}$

$\Rightarrow \vec{a}.\vec{b}=0\Rightarrow \vec{a}\perp\vec{b}$ and $|\vec{a}|=|\vec{b}|=1$

$(2\vec{a}+\vec{b}).(\vec{a}\times\vec{b})\times a-2(\vec{a}\times\vec{b})\times\vec{b}$

$=(2\vec{a}+\vec{b})((\vec{a}.\vec{a})\vec{b}-(\vec{b}.\vec{a})\vec{a})$

$-2((\vec{a}.\vec{b})\vec{b}-(\vec{b}.\vec{b})\vec{a}) \ =(2\vec{a}+\vec{b}).(|\vec{a}|^2\vec{b}+2|\vec{b}|^2\vec{a})$

$=(2\vec{a}+\vec{b}).(\vec{b}+2\vec{a}) \ =(2\vec{a}+\vec{b})^2=4|\vec{a}|^2+|\vec{b}|^2+4\vec{a}.\vec{b}$

As $|\vec{a}|=|\vec{b}|=1=4|\vec{a}|^2+|\vec{b}|^2$ = 4.1+1 = 5

31. **Ans. (b)** 4ax + 2ay + c = 0 × b

5bx + 2by + d = 0 × a

abx +(ad – bc) = 0 $\Rightarrow x=\frac{bc-ad}{ab}$

IIly 10aby + 5bc – (8aby + 4ad) = 0

$\Rightarrow$ 2aby = 4ad – 5bc$\Rightarrow y=\frac{4ad-5bc}{2ab}$

Now x = - y $\Rightarrow \frac{bc-ad}{ab}=-\left(\frac{4ad-5bc}{2ab}\right)$

2(bc – ad) = - (4ad – 5bc) $\Rightarrow$ 2ad = 3bc

32. **Ans. (c)** $P(A)=\frac{60}{100},P(B)=\frac{50}{100}$

$P(\overline{A}B)+P(A\overline{B})=\frac{40}{100}.\frac{50}{100}+\frac{60}{100}.\frac{50}{100}$

$=\frac{5000}{10000}=\frac{1}{2}$

33. **Ans. (b)** If a, b, c, d in H.P.

$\Rightarrow b=\frac{2ac}{a+c},c=\frac{2bd}{b+d}$

$\Rightarrow (a+c)(b+d)=\frac{2ac}{b}.\frac{2bd}{c}$

ab + ad + bc + cd = 4ad

ab + bc + cd = 3ad …(1)

Also $\frac{ab+bc+cd}{3}=9$

ab + bc + cd = 27 …(2)

$\Rightarrow$ 27 = 3ad $\Rightarrow$ ad = 9

34. **Ans. (c)** In $0 < x \le 1$

f(x) = x – 1

|f(x)| = |x-1| = - (x - 1), as $0 < x \le 1$

f(|x|) = |x| - 1 = x – 1, as $0 < x \le 1$

$\Rightarrow$ |f(x)| + f(|x|) = 0 in $0 < x \le 1$

But at x = 0 $\Rightarrow$ f(x) = - 1

$\Rightarrow$ |f(x)| = 1 at x = 0

And f(|x|) = f(0) = - 1

$\Rightarrow$ |f(x)| + f(|x|) = 0

$\Rightarrow$ |f(x)| + f(|x|) = 0 in $0 \le x \le 1\Rightarrow$ (c) not satisfied

Also in $1 \le x \le 2$

f(x) = x – 1 $\Rightarrow$ |f(x)| = |x - 1| = x – 1 as $1 \le x \le 2$

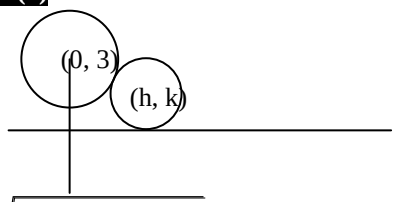
f(|x|) = f(x) = x – 1 as $1 \le x \le 2$

$\Rightarrow$ |f(x)| - f(x) = 0 so only (c) not satisfied.

35. **Ans. (b)** ~(~sV(~rΛs)) ⇒ sΛ~(~rΛs)

⇒sΛ(rV~s)⇒sΛr

36. **Ans. (a)**



$\Rightarrow \sqrt{(h-0)^2+(k-3)^2}=k+2$

$\Rightarrow$ $h^2 + (k - 3)^2 = (k + 2)^2$

$h^2 + k^2 - 6k + 9 = k^2 + 4k + 4$

$h^2 - 10k + 5 = 0 \Rightarrow x^2 - 10y + 5 = 0 \Rightarrow$ Parabola

37. **Ans. (b)** $f(x) = (x - 1)^2 (x + 1)^3$

$f' = 2(x - 1) (x + 1)^3 + 3(x - 1)^2 (x + 1)^2$

$= (x - 1) (x + 1)^2 [2(x + 1) + 3(x - 1)]$

$= (x - 1) (x + 1)^2 (5x - 1) = 0$

$\Rightarrow$ critical points $1,\frac{1}{5},-1$

At $x=\frac{1}{5}\Rightarrow f'$ changes sign from +ve to –ve

$\Rightarrow x=\frac{1}{5}$ is a point of maxima.

Now $f\left(\frac{1}{5}\right)=\left(\frac{1}{5}-1\right)^2\left(\frac{1}{5}+1\right)^3$

$=\frac{4^2}{5^2}.\frac{6^3}{5^3}=\frac{2^4.2^3.3^3}{5^5}=\frac{2^7.3^3}{3125}$

38. **Ans. (c)** $\theta=\cos^{-1}\frac{3}{\sqrt{20}}\Rightarrow\cos\theta=\frac{\vec{a}.\vec{b}}{|\vec{a}||\vec{b}|}$

$=\frac{x-2x+3y^2}{\sqrt{1+4x^2+9y^2}\sqrt{x^2+1+y^2}}=\frac{3}{\sqrt{20}}$

$\frac{-x+3y^2}{\sqrt{1+4x^2+9y^2}\sqrt{x^2+y^2+1}}=\frac{3}{\sqrt{20}}$

Only (c) choice satisfies

39. **Ans. (d)** Let point be (x, y); x, y > 0

and focus be (a, 0)

$\Rightarrow \sqrt{(x-a)^2+y^2}=5a\Rightarrow (x-a)^2+y^2=25a^2$

$\Rightarrow (x - a)^2 + 4ax = 25a^2$ as $y^2 = 4ax$

$\Rightarrow (x + a)^2 = 25a^2 \Rightarrow x = 4a$ satisfies

By putting in $y^2 = 4ax \Rightarrow y = 4a$

$\Rightarrow$ (x, y) = (4a, 4a)

from choices only (1, 1) satisfies.

40. **Ans. (b)**

$\vec{a}\times\vec{b}=\begin{vmatrix}\hat{i}&\hat{j}&\hat{k}\\2&1&-2\\1&1&0\end{vmatrix}=\hat{i}(2)-\hat{j}(2)+\hat{k}(1)\Rightarrow|\vec{a}\times\vec{b}|=3$

and $|(\vec{a}\times\vec{b})\times\vec{c}|=3\Rightarrow 3.|\vec{c}|.\frac{1}{2}=3\Rightarrow|\vec{c}|=2$

Also $|\vec{a}|=\sqrt{9}=3,|\vec{c}-\vec{a}|=3$

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$\Rightarrow |\vec{c}|^2 + |\vec{a}|^2 - 2\vec{a}\vec{c} = 9 \Rightarrow 2^2 + 3^2 - 2\vec{a}.\vec{c} = 9 \Rightarrow \vec{a}.\vec{c} = 2$

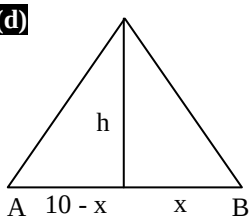
41. **Ans. (d)**

A	B
4G	5-G
5B	3-B
6W	2-W

$$\frac{P(B_1)P(G_2)}{P(B_1)P(G_2)+P(W_1)P(G_2)+P(G_1)P(G_2)}$$

$$= \frac{\frac{5}{15}.\frac{5}{11}}{\frac{5}{15}.\frac{5}{11}+\frac{6}{15}.\frac{5}{11}+\frac{4}{15}.\frac{6}{11}} = \frac{25}{25+30+24} = \frac{25}{79}$$

42. **Ans. (d)**



$$\frac{h}{10-x} = \tan A = \tan\left(\tan^{-1} 3\right) = 3$$

$$\frac{h}{x} = \tan B = \tan\left(\tan^{-1} 2\right) = 2$$

$\Rightarrow$ Divide these two $\frac{x}{10-x} = \frac{3}{2}$

$2x = 30 - 3x \Rightarrow x = 6$

Also $\frac{h}{x} = 2 \Rightarrow h = 2 \times 6 = 12$

43. **Ans. (c)** $f(x) = \frac{6^x - 3^x - 2^x + 1}{\log_e 9(1-\cos x)}$

$$\lim_{x\to 0} f(x) = \lim_{x\to 0} \frac{3^x\left(2^x-1\right)-1\left(2^x-1\right)}{(\log_e 9)(1-\cos x)}$$

$$= \lim_{x\to 0} \frac{\left(2^x-1\right)\left(3^x-1\right)}{(\log_e 9)(1-\cos x)} \times \frac{x^2}{x^2}$$

$$= \lim_{x\to 0} \frac{2^x-1}{x}.\frac{3^x-1}{x}.\frac{x^2}{(1-\cos x)\log_e 9}$$

$$= \lim_{x\to 0} \frac{1}{2\log_e 3} \times \frac{(\log 2)(\log 3)\frac{x^2}{4}\times 4}{2\sin^2\frac{x}{2}}$$

as $\lim_{x\to 0} \frac{a^x-1}{x} = \log_e a$ and $1-\cos x = 2\sin^2\frac{x}{2}$

$$= \log 2 \lim_{x\to 0} \frac{\frac{x^2}{4}}{\sin^2\frac{x}{2}} = \log_e 2$$

44. **Ans. (d)** $\sum_{i=1}^{5} x_i = 5\bar{x} = 5.5 = 25$

As three observations are 1, 2, 6

$\Rightarrow x_4 + x_5 = 25 - (1 + 2 + 6) = 16$

$$\frac{1}{5}\sum (x_i - 5)^2 = 12.4$$

$$\sum (x_i - 5)^2 = 62.0$$

$\Rightarrow (1-5)^2 + (2-5)^2 + (6-5)^2 + (x_4-5)^2 + (x_5-5)^2 = 62$

$16 + 9 + 1 + (x_4-5)^2 + (x_5-5)^2 = 62$

$(x_4-5)^2 + (x_5-5)^2 = 36$

$(x_4-5)^2 + (16 - x_4 - 5)^2 = 36$

$(x_4-5)^2 + (11-x_4)^2 = 36$

$\Rightarrow 2x_4^2 - 32x_4 + 146 = 36$

$2x_4^2 - 32x_4 + 110 = 0 \Rightarrow x_4^2 - 16x_4 + 55 = 0$

$\Rightarrow x_4 = 5, 11 \Rightarrow x_5 = 11, 5$

$\Rightarrow$ sum of deviators about mean $= \frac{1}{n}\sum_{i=1}^{n} |x_i - A|$

$$= \frac{1}{5}\left[|1-5| + |2-5| + |6-5| + |11-5| + |5-5|\right]$$

$$= \frac{1}{5}\left[4+3+1+6+0\right] = \frac{14}{5} = 2.8$$

45. **Ans. (b)** $\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} \frac{x\sin x}{\cos^2 x}dx = \int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} x\tan x\sec x$

$$= \left|x\sec x\right|_{-\frac{\pi}{3}}^{\frac{\pi}{3}} - \int \sec x dx = x\sec x\Big|_{-\frac{\pi}{3}}^{\frac{\pi}{3}} - \log\left|\sec x + \tan x\right|_{-\frac{\pi}{3}}^{\frac{\pi}{3}}$$

$$= \left[x\sec x - \log|\sec x + \tan x\right]_{-\frac{\pi}{3}}^{\frac{\pi}{3}}$$

$$= \left(\frac{\pi}{3}\sec\frac{\pi}{3} - \log\left|\sec\frac{\pi}{3} + \tan\frac{\pi}{3}\right.\right)$$

$$-\left(-\frac{\pi}{3}\sec\left(\frac{\pi}{3}\right) - \log\left|\sec\left(\frac{-\pi}{3}\right) + \tan\left(-\frac{\pi}{3}\right)\right.\right)$$

$$= 2\frac{\pi}{3} - \log\left|2+\sqrt{3}\right| + \frac{2\pi}{3} + \log\left|2-\sqrt{3}\right|$$

$$= \frac{4\pi}{3} - \log\left|\frac{2+\sqrt{3}}{2-\sqrt{3}}\right| = \frac{4\pi}{3} - \log\left(2+\sqrt{3}\right)^2$$

$$= \frac{4\pi}{3} - 2\log\left(2+\sqrt{3}\right) = \frac{4\pi}{3} - 2\log\tan\frac{5\pi}{12}$$

46. **Ans. (d)** He will pass if

pass in 5, 6, 7, 8, 9 subjects out of 9 subjects.

Total ways = ${}^9C_5 + {}^9C_6 + {}^9C_7 + {}^9C_8 + {}^9C_9$

As ${}^9C_0 + {}^9C_1 + {}^9C_2 + {}^9C_3 + {}^9C_4 + {}^9C_5 + {}^9C_6 + {}^9C_7 + {}^9C_8 + {}^9C_9 = 2^9$

$2[{}^9C_5 + {}^9C_6 + {}^9C_7 + {}^9C_8 + {}^9C_9] = 2^9$

$\Rightarrow {}^9C_5 + {}^9C_6 + \ldots\ldots\ldots + {}^9C_9 = 2^8 = 256$

So no. of times he fails = $2^9 - 256 = 256$

47. **Ans. (b)** $\log\left(\frac{1+x}{1+x^2}\right) = \log(1+x) - \log(1+x^2)$

$$= \sum \frac{x^r(-1)^{r-1}}{r} - \sum \frac{\left(x^2\right)^r(-1)^{r-1}}{r}$$

$$\Rightarrow \text{coeff of } x^{100} = \frac{(-1)^{99}}{100} - \frac{(-1)^{49}}{50}$$

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$$= -\frac{1}{100} + \frac{1}{50} = \frac{1}{100}$$

48. **Ans. (b)** As parabola is $y^2 = 4x$
Equation of chord with mid point (x_1, y_1) to $y^2 = 4ax$ is $T = S_1$
$yy_1 - 2a(x + x_1) = y_1^2 - 4ax_1$ with mid point (x_1y_1)
as passes through (0, 0)
$\Rightarrow 0 - 2a(x_1) = y_1^2 - 4ax_1 \Rightarrow y_1^2 = 2ax_1$
So to parabola $y^2 = 4x$, locus of mid point is $y^2 = 2x$

49. **Ans. (b)**

Cont	f	c.f
10-20	180	180
20-30	f_1	$180+f_1$
30-40	34	$214 + f_1$
40-50	180	$394 + f_1$
50-60	136	----
60-70	f_2	----
70-80	50	----

Now $\frac{N}{2} = \frac{685}{2}$

$$\text{Median} = L + \frac{\frac{N}{2} - C}{f} \times h$$

$$42.6 = 40 + \left(\frac{\frac{685}{2} - (214 + f_1)}{180} \right) \times 10$$

$$\Rightarrow f_1 = 81.7 = 82(approx), \text{ so } f_2 = 23$$

$\Rightarrow 2.6 \times 18 = 129 - f_1 \Rightarrow f_1 = 129 - 46.8 = 82.2$
$\Rightarrow f_1 = 82.2$, $f_2 = 105 - 82.2 = 23.80$
$\Rightarrow f_1 = 82$, $f_2 = 23$

50. **Ans. (b)** $\frac{dx}{dt} = -2a\sin 2t$, $\frac{dy}{dt} = 2\sqrt{2}a\cos t$

$$\Rightarrow \frac{dy}{dx} = \frac{2\sqrt{2}\cos t}{-2\sin 2t} = -\frac{\sqrt{2}}{2\sin t} = -\frac{1}{\sqrt{2}\sin t} = m$$

$\Rightarrow y - y_1 = m(x - x_1)$

$$y - 2\sqrt{2}a\sin t = mx - m(a\cos 2t)$$

$$y - 2\sqrt{2}\left(-\frac{a}{\sqrt{2}m}\right) = mx - m\left(a\left(-2\sin^2 t + 1\right)\right)$$

$$y + \frac{2a}{m} = mx - am\left(-\frac{1}{m^2} + 1\right)$$

$$y + \frac{2a}{m} = mx + \frac{a}{m} - am \Rightarrow y = mx - \left[\frac{a}{m} + am\right]$$

51. **Ans. (c)** Book is related to publisher.
In same way, Film is related to Producer. Publisher puts in money for publishing the book. Similarly, producer puts in money for producing a movie (Film).

52. **Ans. (d)** Total = 100x
Deposited = 10% = 10x
Remaining salary = 90 x
Saving = 70% of 90x = 63 x

Ratio of Medicine	:	Grocery
3	:	4

Expense $= \frac{3}{7} \times 63x = 2700 \Rightarrow x = 100$
Total = 100x = 100 × 100 = 10000

53. **Ans. (a)**

P	:	Q	R	:	S
2	:	5	4	:	3

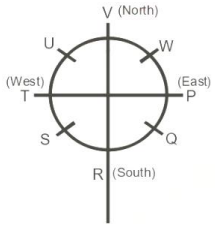
1 part → 1000 2 part → 2000
Total 14parts → 14000

54. **Ans. (c)**

3^2 4^2 5^2 6^2 7^2 8^2

55. **Ans. (c)**

56. **Ans. (b)**



57. **Ans. (c)** Let n(M), N(E), n(S) be the no. of enrolled students in Mathematics, Economics and Sociology respectively.
Given, n(M) = 47, n(E) = 47, n(S) = 57
$n(M \cap E \cap S) = 7$, $n(M \cup E \cup S) = 100$
$\Rightarrow n(M \cup E \cup S) = 100$
$\Rightarrow n(M) + n(E) + n(S) - [n(M \cap E) + n(E \cap S) + n(S \cap M)] + 7 = 100$
$\Rightarrow 47+47+57-[n(M \cap E)+n(E \cap S)+n(S \cap M)+7=100$
$\Rightarrow n(M \cap E) + n(E \cap S) + n(S \cap M) = 58$
For exactly one subject,
$\Rightarrow n(M) + n(E) + n(S) - 2[n(M \cap E) + n(E \cap S) + n(S \cap M)] + 3[M \cap E \cap S]$
$\Rightarrow 151-2583\times7 \Rightarrow 151-116+21 \Rightarrow 56$

58. **Ans. (b)**
Y > _ _ (two)
R > P
S > P
R > S
So Y > R > S > P

59. **Ans. (d)** Let length of Rajdhani train be L meters
Then, length of platform also equal to L metres.

Given, $\frac{L+L}{54 \times \frac{5}{18}} = 36 \Rightarrow$ L = 270 metres

So, speed of Duronto train $= \frac{270+230}{25}$

= 20 m/s $= 20 \times \frac{18}{5}$ km/h = 72 km/h

60. **Ans. (d)** Let Aakash ran on Tuesday x km
So He ran on Monday x – 4 km

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And Sanjay ran on Tuesday x – 4 + 5 = x + 1 km
So total distance ran by Aakash will be 2x – 4
And total distance ran by Sanjay will be 2x + 2
By both will be = (2x + 2) – (2x – 4) = 6

61. **Ans. (c)** Pattern is +7, +14 , + 21, + 28, + 35

62. **Ans. (c)** Girls are represented by 15, 16, 30, 14 but not a coach is represented by 16.

63. **Ans. (d)** Pattern is +2, -2, +2, -2, +2, -2, +2

64. **Ans. (d)**

	Given,	589	362	554	371	442
	Step 1:	559	332	524	341	412
	Step 2:	955	233	425	143	214
(Descending)	Step 3:	955	425	233	214	143

Middle No. ⇒ Last digit = 3

65. **Ans. (b)** Required letter are – S, P, T, O
There are 5 words are formed.
POST SPOT, STOP, POTS, TOPS.

66. **Ans. (c)** Let p is principal
A.T.Q.

$60\%\text{ of P} = \frac{P \times R \times 8}{100}$

So $I = \frac{P \times R \times T}{100} = \frac{9600 \times 4 \times \frac{15}{2}}{100} = 2880$ Rs.

by solving P = 9600
t = 4 year

$R = \frac{15\%}{2}$

67. **Ans. (d)** Let us assume x = 1, 2, 3, ……..

x	Marks given by first judge (x)	Marks given by second judge (y = x + 1)
1	1	2
2	2	3
3	3	4
4	4	5
5	5	6
|	|	|
|	|	|
|	|	|

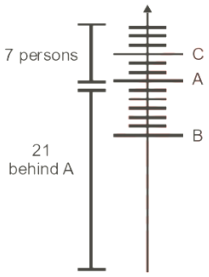
So, we observe that the marks given by both the judges will be same for a participant.

68. **Ans. (d)** So Pattern is
Survey → Database → Analysis → Interpretation → Policy formulation

69. **Ans. (b)** Pattern is × 2 + 1
So 4 × 2 + 1 = 7
6 × 2 + 1 = 13
8 × 2 + 1 = 17
7 × 2 + 1 = 15

70. **Ans. (c)** MEDIATE is formed from the word RECOMMENDATION.

71. **Ans. (d)**

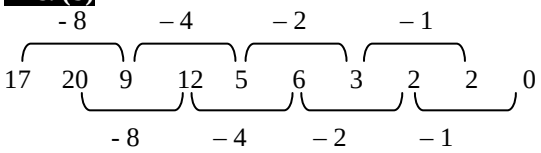


So, total minimum number of person in the queue will be 21 + 7 = 28

72. **Ans. (b)** CP = 375 × 20 = Rs. 7500
SP = 33 × 240= Rs. 7920
Profit SP – CP

$P\% = \frac{420}{7500} \times 100 = 5.6\%$

73. **Ans. (b)**



74. **Ans. (a)**

(1st half)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
C	S	C	S	S	C	S	S	S	C	S	S	S	S

15	16	17	18
C	S	S	S

(2nd half)

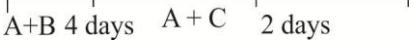
19	20	21	22	23	24	25	26	27	28	29	30	31
S	S	C	S	S	S	S	S	S	C	S	S	S

32	33	34	35	36
S	S	S	S	C

Scooters in 2nd half = 15

75. **Ans. (d)** From given question following observations
- will be treated as ×
÷ will be treated as +
× will be treated as -
Hence, + should be treated as ÷
So, 100 – 10 × 100 ÷ 1000 + 100 × 10
= 100 × 10 – 1000 + 1000 ÷ 100 – 10
= 1000 – 1000 + 10 – 10 = 0 + 0 = 0

76. **Ans. (d)**
A = 10 2
20
B = 20 1
3



Remaining work = 8

Efficiency of A + C $= \frac{8}{2} = 4$

A + C = 4 ⇒2 + C = 4 ⇒ C = 2

C alone $= \frac{20}{2} = 10$ days

77. **Ans. (d)** By options, Mahesh's age = 36
and Rakesh' age = 24
satisfies all given conditions.

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78. **Ans. (d)**

Father
|
Anjali - - - - - - - - - - - + Brother

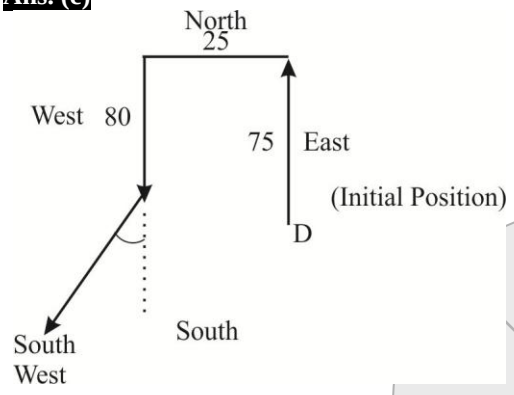
79. **Ans. (a)**

As per given conditions

	Karate	Handwork	Music	Dance	Gymnastics	
Leena	×			√	√	
Megan	√	√		√	√	
Neha				√		
Omar	√	√		√		
Pixie			√			

So, Karate, handwork and gymnastics are subscribed by exactly two people each.

80. **Ans. (c)**



81. **Ans. (a)** Let Total student = 100
60% are passed i.e. = 60
40% are failed = 40
ATQ
70% of 60 + 80% of 40 = 42 + 32= 74

Required percentage $= \frac{74}{100} \times 100 = 74\%$

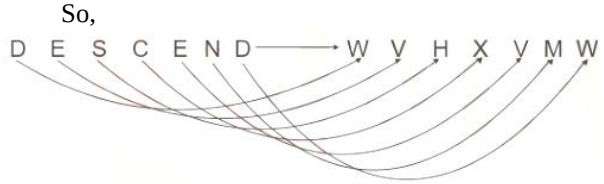
82. **Ans. (b)** Let x lt milk be added for required condition $\left(\frac{3}{30+x}\right) \times 100 = 2$

150 = x + 30 $\Rightarrow$ x = 120 lt

83. **Ans. (b)** Colour of sky is blue which is called water.

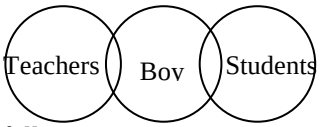
84. **Ans. (c)**

So,



85. **Ans. (d)** 19 × 5 + 39 ÷ 3 – 8 = 100

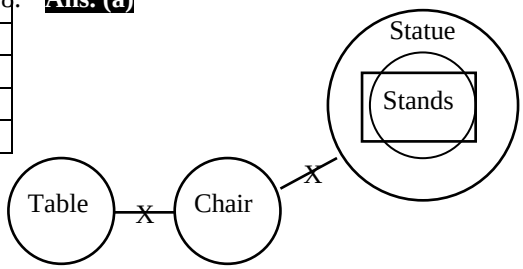
86. **Ans. (a)**



I. follows
II. does not follow

87. **Ans. (c)** Only (resisue, stocks) seems appropriate.

88. **Ans. (a)**



Only conclusion 2 follows

89. **Ans. (c)** Given, total mixture = 95 litres
and milk water = 15 : 4
so, milk75 litres
and water = 20 litres
according to given conditions,

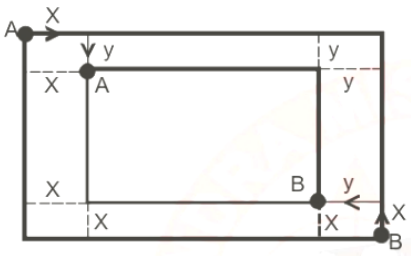
new quantity of milk $= 75 - \frac{15}{19}P$

new quantity of water $= 20 - \frac{4}{19}P + 18$

also, new ratio, $\frac{\text{milk}}{\text{water}} = \frac{3}{2} \Rightarrow \frac{75 - \frac{15}{19}P}{38 - \frac{4}{19}P} = \frac{3}{2}$

$\Rightarrow$ P = 38

90. **Ans. (a)**



Given perimeter of bigger rectangle = 100
and perimeter of smaller rectangle = 100
100 = 40 + 4x + 4y $\Rightarrow$ 60 = 4(x + y)
x + y = 15
So, distance covered by A = x + y = 15 m

COMPUTER AWARENESS

91. **Ans. (c)**

92. **Ans. (b)** Wrong option

93. **Ans. (b)** Binary Representation of given decimal values
0 = 0000
2 = 0010 (don't care condition)
5 = 0101
7 = 0111
8 = 0111 (don't care condition)
10 = 1010

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13 = 1101 (don't care condition)
15 = 1111
K-map of given value

RS \ PQ	00	01	11	10
00	1			x
01		1	x	
11		x	1	
10	x			1

Minimum sum of product $= \overline{S}\overline{Q} + QS$

94. **Ans. (a)** 95. **Ans. (b)**

96. **Ans. (d)** (A) $\overline{P} \oplus \overline{Q} = P \odot Q$ (given)
$\overline{P}Q + P\overline{Q} = P \oplus Q$
So LHS ≠ RHS
So option A is incorrect.
(B) $\overline{P} \oplus \overline{Q} = P \odot Q$ (given)
LHS $= \overline{P}\overline{Q} + PQ$
RHS $= PQ + \overline{P}\overline{Q}$
LHS = RHS
So option B is true.
(C) $\overline{P} \oplus \overline{Q} = P \odot Q$ (given)
LHS $= \overline{P} \oplus \overline{Q} = \overline{P}Q + P\overline{Q}$
$= P \oplus Q$
Optin (C) is true
(D) $\left(P \oplus \overline{P}\right) \oplus Q = \left(P \oplus \overline{P}\right) \oplus \overline{Q}$
LHS $= \left(P \oplus \overline{P}\right) \oplus Q = \left(P \oplus \overline{P}\right) \oplus Q$
$= P \oplus Q = \overline{Q}$
RHS $= \left(P \odot \overline{P}\right) \odot \overline{Q} = O \odot \overline{Q}$
$= O \odot \overline{Q} + 1.Q = Q$
LHS ≠ RHS
So, option D is incorrect.

97. **Ans. (c)** Set $= \frac{128}{4} = 2^5$
Number of bits in set = 5
32 = tag + 5 + 12
∴ tag = 15 bits
The minimum size of the TLB tag is 15 bits.

98. **Ans. (a)** Decimal number $(25.375)_{10}$
Binary representation of 25 = 11001
Binary representation of fractional part will be 0.011

99. **Ans. (a)** 100. **Ans. (a)**

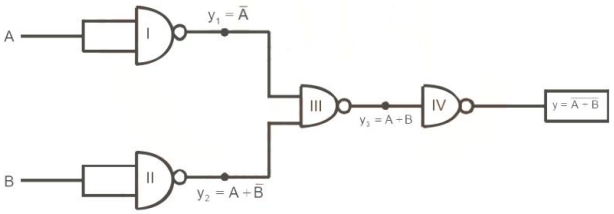
101. **Ans. (c)** Binary representation of 35 is 0000100011
For – 35 Binary Representation will be 10000100011
1's complement will be 1111011100
2's complement will be 1111011101

102. **Ans. (d)** 103. **Ans. (b)**

104. **Ans. (a)** F(P, Q, R, S0 = PQ + P'QR + P'Q . R'S
= Q(P + P'R + P'R'S) = Q(P + R + S)
= PQ + QR + QS

105. **Ans. (a)** x'yz + xy'z + xyz' + xyz
x'yz + xy'z + xy(z' + z) ⇒ x'yz + xy'z + xy . 1
x'yz + xy'z + xy⇒ x'yz + x(y'z + y)
x'yz + x[(y' + y) . (y + z)]
x'yz + x(y + z) ⇒x'yz + xy + xz
y(x'z + x) + xz
y[(x' + x). (x + z)] + xz
y[1(x' + x) . (x + z)] + xz
y[1(x + z)] + xz
y(x + z) + xz
xy + yz + zx
Proved.

106. **Ans. (c)** We know that
NAND gate $\Rightarrow y = \overline{A.B}$
NOR gate $\Rightarrow y = \overline{A + B}$



107. **Ans. (a)** Truth table of XOR gate $A \oplus B = A\overline{B} + \overline{A}B$

A	B	$\overline{A}$	$\overline{B}$	$A\overline{B}$	$\overline{A}B$	$A\overline{B} + \overline{A}B$
0	0	1	0	0	0	0
0	1	1	0	0	1	1
1	0	0	1	1	0	1
1	1	0	1		0	0

From truth table, we observe that required circuit will be XOR gate

108. **Ans. (b)** Period $= \frac{1}{T}$
$= \frac{1}{2500 \times 10^6} = 4.00 \times 10^{-10}$

109. **Ans. (c)**

110. **Ans. (a)** Buffer, According to theory.

111. **Ans. (b)** Religion believes in ultimate reality.

112. **Ans. (d)** Tangible proofs of the theories of science.

113. **Ans. (d)** for 114. **Ans. (c)**

115. **Ans. (d)** After 116. **Ans. (d)** Abolish

117. **Ans. (d)** Flummoxed, Befuddled, Doumbfounded

118. **Ans. (a)** A doctor was send for because Pamela had fainted.

119. **Ans. (a)** Periodically

120. **Ans. (a)** Frugal

INFOMA