NIMCET
Previous year paper 2010

Included Subjects
Mathematics
Logical Reasoning
Computer
English

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NIMCET 2010

Mathematics:

1. How many proper subsets of $\{1, 2, 3, 4, 5, 6, 7\}$ contain the number 1 and 7?
(A) 7
(B) 31
(C) 32
(D) 62

2. Identify the wrong statement from the following:
(A) If A and B are two sets, then $A - B = A \cap B$.
(B) If A, B and C are sets, then $(A - B) - C = (A - C) - (B - C)$.
(C) If A and B are two sets, then $\bar{A} \cup \bar{B} = \overline{A \cap B}$.
(D) If A, B and C are sets, then $A \cap B \cap C \subseteq A \cap B$.

3. A survey shows that 63% of the American like cheese where as 76% like apples. If x% of the Americans like both cheese and apples, then we have
(A) $x \geq 39$
(B) $x \leq 63$
(C) $39 \leq x \leq 63$
(D) None of these

4. Set A has 3 elements and set B has 4 elements. The number of injections that can be defined from A to B is:
(A) 144
(B) 12
(C) 24
(D) 64

5. If $(1 + x)^n = a_0 + a_1 x + a_2 x^2 + \cdots + a_n x^n$, then $\left(1 + \frac{a_1}{a_0}\right)\left(1 + \frac{a_2}{a_1}\right)\left(1 + \frac{a_3}{a_2}\right) \ldots \left(1 + \frac{a_n}{a_{n-1}}\right)$ is equal to
(A) $\frac{n^n}{n!}$
(B) $\frac{(n+1)^n}{n!}$
(C) $\frac{n^{n+1}}{(n+1)!}$
(D) $\frac{(n-1)^n}{n!}$

6. India plays two matches each with West Indies and Australia. In any match the probabilities of India getting points 0, 1 and 2 are 0.45, 0.05 and 0.05 respectively. Assuming that the outcomes are independent, the probability of India getting at least 7 points is
(A) 0.8750
(B) 0.0875
(C) 0.0625
(D) 0.0250

7. A coin is tossed three times. The probabilities of getting head and tail alternatively is
(A) $\frac{1}{11}$
(B) $\frac{2}{3}$
(C) $\frac{3}{4}$
(D) $\frac{1}{4}$

8. One hundred identical coins, each with probability p of showing up a head, are tossed. If $0 < p < 1$ and if the probability of heads on exactly 50 coins is equal to that of head on exactly 51 coins then the value of p, is
(A) $\frac{1}{2}$
(B) $\frac{49}{101}$
(C) $\frac{50}{101}$
(D) $\frac{51}{101}$

9. In a Poisson distribution if $P(X = 3) = \frac{1}{4} P(X = 4)$ then $P(X = 5) = kP(X = 7)$ where k equals to
(A) $\frac{1}{7}$
(B) $\frac{21}{128}$
(C) $\frac{128}{21}$
(D) $\frac{21}{256}$

10. The average marks per student in a class of 30 students were 45. On rechecking it was found that marks had been entered wrongly in two cases. After correction these marks were increased by 24 and 34 in the two cases. The corrected average marks per student are:
(A) 75
(B) 60
(C) 56
(D) 47

11. The value of 'a' for which the system of equations
$a^3 x + (a + 1)^3 y + (a + 2)^3 z = 0$
$ax + (a + 1)y + (a + 2)z = 0$
$x + y + x = 0$ has a non-zero solution, is
(A) 1
(B) 0
(C) -1
(D) None of these

12. The value of $x^4 + 9x^3 + 35x^2 - x + 4$ for $x = -5 + 2\sqrt{-4}$ is
(A) 0
(B) -160
(C) 160
(D) -164

13. If $y = a \log x + bx^2 + x$ has its extremum value at $x = -1$ and $x = 2$ then

(A) $a = 2, b = -1$ (B) $a = -2, b = \frac{1}{2}$

(C) $a = 2, b = -\frac{1}{2}$ (D) $a = 1, b = -\frac{1}{2}$

14. If a, b, c are in A. P., p, q, r are in H.P. and ap, bq, cr are in G.P., then $\frac{p}{r} + \frac{r}{p}$ is equal to

(A) $\frac{a}{c} - \frac{c}{a}$ (B) $\frac{a}{c} + \frac{c}{a}$

(C) $\frac{b}{q} - \frac{a}{p}$ (D) $\frac{b}{q} + \frac{a}{p}$

15. If $a \neq p, b \neq q, c \neq r$ and $\begin{vmatrix} p & b & c \\ a & q & c \\ a & b & r \end{vmatrix} = 0$, then the

value of $\frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c}$ is

(A) 0   (B) 1

(C) -1 (D) 2

16. Let $\omega \neq 1$ be a cube root of unity and $i = \sqrt{-1}$. The value of the determinant

$\begin{vmatrix} 1 & 1 + i + \omega^2 & \omega^2 \\ 1 - i & -1 & \omega^2 - 1 \\ -i & -i + \omega - 1 & -\omega^3 \end{vmatrix}$ is

(A) 0   (B) ω

(C) ω^2 (D) $1 + \omega^2$

17. The point $(4, 1)$ undergoes the following three transformations successively:

(i) reflection about the line $y = x$

(ii) transformation through a distance 2 unit along the positive direction of x-axis

(iii) rotation through an angle of $\frac{\pi}{4}$ about the origin in the anticlockwise direction. The final position of the point of the point is given by coordinates

(A) $\left(\frac{-1}{\sqrt{2}}, \frac{7}{\sqrt{2}} \right)$ (B) $\left(\frac{1}{\sqrt{2}}, \frac{7}{\sqrt{2}} \right)$

(C) $\left(-2, 7\sqrt{2} \right)$ (D) $\left(\sqrt{2}, 7\sqrt{2} \right)$

18. If the two pairs of lines $x^2 - 2mxy - y^2 = 0$ and $x^2 - 2nxy - y^2 = 0$ are such that one of them represents the bisector of the angles between the other, then

(A) $mn + 1 = 0$ (B) $mn - 1 = 0$

(C) $\frac{1}{m} + \frac{1}{n} = 0$ (D) $\frac{1}{m} - \frac{1}{n} = 0$

19. The circle $x^2 + y^2 = 9$ is contained in the circle $x^2 + y^2 - 6x - 8y + 25 = c^2$ if

(A) $c = 2$ (B) $c = 3$

(C) $c = 5$ (D) $c = 10$

20. If any tangent to ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ intercepts equal length l on the axes, then $l =$

(A) $a^2 + b^2$ (B) $\sqrt{a^2 + b^2}$

(C) $(a^2 + b^2)^2$ (D) None of these

21. The angle between the asymptotes of the hyperbola $27x^2 - 9y^2 = 24$ is

(A) 60°   (B) 120°

(C) 30°   (D) 150°

22. The angle of intersection of the cordioids $r = a(1 + \cos \theta), r = a(1 - \cos \theta)$ is

(A) $\frac{\pi}{2}$ (B) 0

(C) $\frac{\pi}{4}$ (D) π

23. If $f(x) = \begin{cases} x \sin \left(\frac{1}{x} \right) & for\ x \neq 0 \\ 0 & for\ x = 0 \end{cases}$ then

(A) f is continuous function

(B) $f'(0+)$ exists but $f'(0-)$ does not exist

(C) $f'(0+) \neq f'(0-)$

(D) $f'(0+)$ and $f'(0-)$ do not exist

24. 7. If the tangents at the extremities of a focal chord of the parabola $x^2 = 4ay$ meet the tangent at the vertex at points whose abscissa are x_1 and x_2 then $x_1 x_2 =$

(A) a^2 (B) $a^2 - 1$

(C) $a^2 + 1$ (D) $-a^2$

25. The value of the integral $\int_3^6 \frac{\sqrt{x}}{\sqrt{9-x+\sqrt{x}}} dx$ is

(A) 1   (B) $\frac{1}{2}$

(C) $\frac{3}{2}$ (D) 2

26. The value of integral $\int_0^4 \frac{\sin x + \cos x}{3 - \sin 2x} dx$ is

(A) $\log 2$ (B) $\log 3$

(C) $\frac{1}{4} \log 3$ (D) $\frac{1}{8} \log 3$

27. $\int \log_{10} x\ dx$ is

(A) $(x - 1) \log_e x + c$ (B) $\log_e 10 \cdot x \log_e \left(\frac{x}{e} \right) + c$

(C) $\log_{10} e \cdot x \log_e \left(\frac{x}{e} \right) + c$ (D) $\frac{1}{x} + c$

28. If $I_1 = \int_0^1 2^{x^2} dx$, $I_2 = \int_0^1 2^{x^3} dx$, $I_3 = \int_1^2 2^{x^2} dx$, and $I_4 = \int_1^2 2^{x^3} dx$ then

(A) $I_3 = I_4$ (B) $I_3 > I_4$

(C) $I_2 > I_1$ (D) $I_1 > I_2$

29. The area between the curves $y = 2 - x^2$ and $y = x^2$ is

(A) $\frac{8}{3}$ (B) $\frac{4}{3}$

(C) $\frac{2}{3}$ (D) $\frac{5}{3}$

30. A vector $\vec{a}$ has has components $2p$ and 1 with respect to rectangular Cartesian system. This system is rotated through a certain angle about the origin in the counter clockwise sense. If, with respect to the new system, $\vec{a}$ has components $p + 1$ and 1, then

(A) $p = 0$ (B) $p = 1$ or $p = \frac{1}{3}$

(C) $p = -1$ or $p = \frac{1}{3}$ (D) *None of these*

31. The vector $\vec{a}, \vec{b}$ and $\vec{c}$ are equal in length and taken pairwise make equal angles. If $\vec{a} = \hat{\imath} + \hat{\jmath}, \vec{b} = \hat{\jmath} + \hat{k}$ and $\vec{c}$ make an obtuse angle with the base vector i, then $\vec{c}$ is equal

(A) $\hat{\imath} + \hat{k}$ (B) $-\hat{\imath} + 4\hat{\jmath} - \hat{k}$

(C) $-\frac{1}{3}\hat{\imath} + \frac{4}{3}\hat{\jmath} - \frac{1}{3}\hat{k}$ (D) $\frac{1}{3}\hat{\imath} + \frac{4}{3}\hat{\jmath} - \frac{1}{3}\hat{k}$

32. The position vector of A, B, C and D are $\hat{\imath} + \hat{\jmath} + \hat{k}, 2\hat{\imath} + 5\hat{\jmath}, 3\hat{\imath} + 2\hat{\jmath} - 3\hat{k}$ and $\hat{\imath} - 6\hat{\jmath} - \hat{k}$, then the angle between $\overrightarrow{AB}$ and $\overrightarrow{CD}$ is

(A) 0 (B) $\frac{\pi}{4}$

(C) $\frac{\pi}{2}$ (D) π

33. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three non-zero vectors, no two of which are collinear and the vector $\vec{a} + \vec{b}$ is collinear with $\vec{c}$ while $\vec{b} + \vec{c}$ is collinear with $\vec{a}$, then $\vec{a} + \vec{b} + \vec{c}$ is equal to

(A) $\vec{a}$ (B) $\vec{b}$

(C) $\vec{c}$ (D) None of these

34. If C is the middle point of AB and P is any point outside AB, then

(A) $\overrightarrow{PA} + \overrightarrow{PB} = \overrightarrow{PC}$ (B) $\overrightarrow{PA} - \overrightarrow{PB} = 2\overrightarrow{PC}$

(C) $\overrightarrow{PA} + \overrightarrow{PB} + \overrightarrow{PC} = \vec{0}$ (D) $\overrightarrow{PA} + \overrightarrow{PB} + 2\overrightarrow{PC} = \vec{0}$

35. The value of $\sqrt{3} \cot 20° - 4 \cos 20°$ is

(A) 1 (B) -1

(C) 0 (D) None of these

36. If $\sin^{-1}\frac{2a}{1+a^2} - \cos^{-1}\frac{1-b^2}{1+b^2} = \tan^{-1}\frac{2x}{1-x^2}$ then x is equal to

(A) a (B) b

(C) $\frac{a+b}{1-ab}$ (D) $\frac{a-b}{1+ab}$

37. In a triangle ABC, R is circumradius and $8R^2 = a^2 + b^2 + c^2$. The triangle ABC is

(A) Acute angled   (B) Obtuse angled

(C) Right angled   (D) None of these

38. The rate of length of the shadow of a man 2 height, due to a lamp at 10 meters height, when he is moving away from it at the rate of 2m/sec is

(A) $\frac{1}{2}$ m/sec   (B) $\frac{2}{5}$ m/sec

(C) $\frac{1}{3}$ m/sec   (D) 5 m/sec

39. A person stands at a point A due south of a tower and observes that its elevation is 60°. He then walks westwards towards B, where the elevation of 45°. At a point C on AB produced, he finds it to be 30°. Then AB/BC is equal to

(A) $\frac{1}{2}$ (B) 1

(C) 2   (D) $\frac{5}{2}$

40. The distance between the parallel lines $y = 2x + 4$ and $6x - 3y + 5$

(A) $\frac{17}{\sqrt{3}}$ (B) 1

(C) $\frac{3}{\sqrt{5}}$ (D) $\frac{17\sqrt{5}}{15}$

Computer:

41. Which of the following is NOT one of the four major data processing function of a computer?
(A) gathering data
(B) processing data into information
(C) analyzing the data or information
(D) storing the data or information

42. Simplified form of a Boolean function $F(X, Y, Z) = \sum(0, 2, 6, 5, 6)$
(A) $\bar{Z}X - X\bar{Y}$
(B) $\bar{Z} - X\bar{Y}$
(C) $\overline{YZ} = X\bar{Z}$
(D) None of these

43. Which gate is equivalent to (NOR) OR (XOR)?
(A) NAND gate
(B) OR gate
(C) AND gate
(D) XOR gate

44. Which of the following places the common data elements in order from smallest to largest?
(A) Field, record, character, database
(B) Character, record, field, database
(C) Character, field, record, database
(D) Bit, Byte, character, record, field, database

45. Who one of the following is a stored program machine?
(A) Micro-processor
(B) Calculator
(C) Analog-computer
(D) Micro-computer

46. A main memory has an access time of 45 ns. A 5 ns time gap is necessary for the completion of one access to beginning access. The bandwidth of the memory:
(A) 25 MHz
(B) 40 MHz
(C) 45 MHz
(D) 50 MHz

47. A CPU has 12 bit address for memory addressing. If the memory has a total capacity of 16 KB, what is the length of the memory?
(A) 2 bytes
(B) 4 bytes
(C) 8 bytes
(D) 16 bytes

48. For a microprocessor using I/O mapped I/O
(A) Memory and I/O addresses are distinct
(B) Not all data transfer instructions are available for I/O
(C) Both (A) and (B)
(D) None of these

49. Execution of an operating system is initiated by program called the
(A) Window manager
(B) Scheduler
(C) Bootstrap
(D) None of the above

50. If $(12x)_3 = (123)_x$ then the value of x
(A) 1
(B) 2
(C) Both A & B
(D) None of these

English:

Directions (Q. Nos. 51 and 52): Read the passage and select the most suitable answer to questions from the given choices.
Observe the dilemma of the fungus: It is a plant, but it possesses no chlorophyll. While all other plants put the sun's energy to work for them combining the nutrients of ground and air into the body structure, the chlorophylls must look elsewhere for energy supply. It finds it in those other plants which having received their energy free from the sum, relinquish it at some point in their cycle either to animals (like us humans) or to the fungi.

In this search for energy the fungus has become the earth's major source of rot and decay. % Wherever you see mold forming on a piece of bread, or a pile of leaves turning to compost, or a blown-down tree becoming pulp on the ground, you are watching a fungus eating. Without fungus action the earth would be piled high with the dead plant life of past centuries. In fact, certain plants which contain resins that are toxic to fungi will last indefinitely; specimens of the redwood, for instance, can still be found resting on the forest floor centuries after having been blown down.

51. The passage states all the following about fungi EXCEPT:
(A) They are responsible for the decomposition of much plant life

(B) They cannot live completely apart from other plants

(C) They are vastly different form other plants

(D) They are poisonous to resin-producing plants

52. The passage is primarily concerned with

(A) Warning people of the dangers of fungi

(B) Rot and decay of plants in nature

(C) Describing the action of fungi

(D) Relating how most plants use solar energy

53. Fill in the blank:

The sugar dissolved in water _____; finally, all that remained was an almost ____ residue on the bottom of the glass.

(A) Quickly …… lumpy

(B) Immediately …. fragrant

(C) Gradually ….. imperceptible

(D) Subsequently … glassy

54. Find the synonym that is most nearly similar in meaning to the word CLANDESTINE

(A) abortive   (B) secret

(C) tangible   (D) doomed

55. Choose the word that is opposite in meaning to the word COMPOSE

(A) disturb   (B) reveal

(C) strengthen   (D) isolate

Directions (Question 56 and 57): In each of the following sentences, a part of the sentence is underlined. Beneath each sentence, four different ways of phrasing the underlined part are indicated. Choose the best alternative from among the four.

56. It was us who had left before he arrived.

(A) We who had left before time he had arrived.

(B) Us who has went before he arrived.

(C) Us who had went before he had arrived.

(D) We who had left before he arrived.

57. Many of these environmentalists proclaim to save nothing less than the planet itself.

(A) to save nothing lesser than

(B) that they are saving nothing less than

(C) that they save nothing less than

(D) to have saved nothing less than

Directions (Question 58 and 59): Select the pair of words which are related in the some way as the capitalized words are related to each them

58. MOTH : CLOTHING ::

(A) egg : larva   (B) hole : repair

(C) suit : dress   (D) stigma : reputation

59. ASCETIC : LUXURY ::

(A) philosopher : knowledge

(B) general : victory

(C) misogynist : women

(D) teacher : blackboard

60. There are four statements, of which one is **incorrect**. Choose the incorrect one,

(A) A hater of the institution of marriage is misogamist.

(B) The violation of sacred things is sacrilege.

(C) To prevaricate is to make evasive or misleading statements.

(D) A torpid person is generally hyperactive.

61. Following sentence has one or two blanks, each blank indicating that something has been omitted. Beneath the sentence are given four words or sets of words. Choose the word or set of words for each blank that best fits meaning of the sentence as a whole. His presentation was so lengthy and ____ that it was difficult for us to find out the real ____ in it.

(A) Verbose, content   (B) tedious, skill

(C) laborious, coverage (D) simple, meaning

62. Choose the word opposite in meaning to the given word; FLAMBOYANT

(A) Quiet   (B) Excited

(C) Disturbed   (D) Distressed

63. Out of the four alternatives, choose the one which best expresses the meaning of the given word: CLEMENCY

(A) Empathy   (B) Kindness

(C) Sympathy   (D) Forgiveness

64. The sentences given below, when properly sequenced, form a coherent paragraph, Each sentence is labeled with a letter. Choose the most logical order of sentences from among the given choices to construct a coherent paragraph.

P. Surrendered, or captured, combatants cannot be incarperated in tazor wire cages; this 'war' has a dubious legality.

Q. How can then one characterize a conflict to be waged against a phenomenon as war?

R. The phrase 'war against terror', which has passed into the common lexicon, is a huge misnomer.

S. Besides, was has a juridical meaning in international law, which has confided the laws of war, imburing them with a humanitarian content.

T. Terror is a phenomenon, not an entity – either State or non-State.

(A) TRSQP   (B) QTRSP
(C) TQRPS   (D) RTQSP

65. In the question, the word "BUNDLE" is used in four different ways, numbered A to D. Choose the option in which the usage of the word is INAPPROPRIATE.
(A) The newborn baby was a bundle of joy for the family.
(B) Mobile operators are offering a bundle of additional benefits.
(C) He made a bundle in the share market.
(D) It was sheer luck that brought a bundle of boy-scouts to where I was lying wounded.

Reasoning:

66. Steel Express runs between Tatanagar and Howrah and has five stoppages in between. Find the number of different kinds of one-way second class ticket that Indian Railways will have to print to service all types of passengers who might travel by Steel Express?
(A) 49   (B) 42
(C) 21   (D) 7

67. There are 6561 balls out of them 1 is heavy. Find the minimum number of times the balls have to be weighed for finding out the heavy ball.
(A) 12   (B) 9
(C) 8   (D) 15

68. Find the word that names a necessary part of the underlined word.
Gala
(A) Celebration   (B) Tuxedo
(C) Appetizer   (D) Orator

69. How many numbers between 1 to 1000 (both excluded) are both squares and cubes?
(A) none   (B) 1
(C) 2   (D) 3

70. Rita, an accomplished pastry chef who is well known for her artistic and exquisite wedding cakes, opened a bakery one year ago and is supported that business has been so slow. A consultant she hired to conduct market research has reported that the local population doesn't think of her shop as one they would visit on a daily basis but rather a place they'd visit if they were celebrating a special occasion.
Which of the following strategies should Rita employ to increase her daily business?
(A) making coupons available that entitle the coupon holder to receive a 25 % discount on wedding, anniversary, or birthday cakes
(B) exhibiting at the next Bridal Expo and having pieces of one of her wedding cakes available for tasting
(C) placing a series of ads in the local newspaper that advertise the wide array of breads, muffins, and cookies offered at her shop
(D) moving the bakery to the other side of town

71. There are 6 tasks and 6 persons. Task 1 cannot be assigned either to person 1 or to person 2; task 2 must be assigned to either person 3 or person 4. Every person is to be assigned one task. In how many ways can the assignment be done?
(A) 144   (B) 180
(C) 192   (D) 360

72. What are X and Y?
(A) X is 6, T is 7   (B) X is 5, Y is 5
(C) X is 4, Y is 6   (D) X is 16, Y is 23

73. Which should be the next two number in the series:

28, 25, 5, 21, 18, 5, 14

(A) 11, 5   (B) 10, 7

(C) 11, 8   (D) 5, 10

74. A, B, C, D and E are five integers. When written in the ascending order of values, the difference between any two adjacent integers is 4. D is the greatest and A is the least. B is greater than E but less than C. The sum of the integers is equal to E. What is the product of integers?

(A) −945   (B) 945

(C) 315   (D) 0

75. Person X, Y, Z and Q live in red, green, yellow or blue colored houses placed in a sequence on a street. Z lives in a yellow house. The green house is adjacent to the blue house. X does not live adjacent to Z. The yellow house is in between the green and red house. The color of the house X lives in is

(A) Green   (B) Blue

(C) Red   (D) Cannot be determined

Directions (Questions 76 to 78)

220 guests are to be transported from A to B. Any number of buses of the following passenger carrying capacities are available.

Type P : 60, Type Q : 50, Type R : 40, Type S : 30

The cost per trip for a bus of each of these types in given as follows:

Type P : Rs. 200, Type Q : Rs. 140, Type R : Rs. 125, Type S : Rs 95

No buses can be overloaded and prefer no vacant seats in each trips.

76. What is the minimum possible cost for the trip?

(A) Rs. 690   (B) Rs. 615

(C) Rs. 640   (D) Rs. 695

77. How many buses are needed for the above (Minimum cost trip)

(A) 5   (B) 4

(C) 7   (D) 6

78. The second cheapest trip arrangement would involve:

(A) Rs. 630   (B) Rs. 680

(C) Rs. 710   (D) Rs. 655

79. A child can do a piece of work 15 hours slower than woman. The child works, for 18 hours on the job and then the woman takes charge for 6 hours. In this manner, 3/5 of the word can be completed. To complete the job now, how much time the woman takes:

(A) 24 hours   (B) 18 hours

(C) 12 hours   (D) 30 hours

80. A culprit was spotted by the police from a distance of 250 m. When the police men started running towards the culprit at a speed of 10 km/h, find out how far the culprit had run before he was overpowered.

(A) 2 km   (B) 1 km

(C) 1.5 km   (D) 0.8 km

Directions (Questions 81 to 83)

The following sketch shows the pipeline carrying material from one location to another. The capacity of each pipeline is 2000. The demand for the material at B is 800, at D is 1400 and at E is 400. The arrow indicates the direction of material flow through pipeline. The flow through pipeline meets exactly the demand at each location. Flow from B to C is 600.
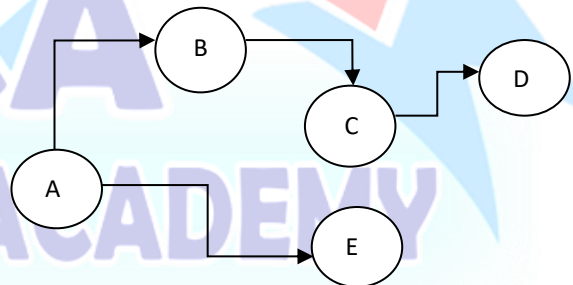
81. The quantity moved from A to E is

(A) 400   (B) 1600

(C) 1400   (D) 2000

82. The free capacity in the A – B pipeline is

(A) 0   (B) 200

(C) 400   (D) 600

83. What is the free capacity available in the E – C pipeline:
(A) 600   (V) 400
(C) 200   (D) 0

Direction (Question 84 to 87)

The plan given below, shows office for six officers namely A, B, C, D, E and F. Both B and C occupy offices to the right of the corridor (as one enters the office block) and A occupy the office to the left of the corridor. E and F occupy offices on opposite sides of the corridor but their officers do not face each other. The offices of C and D face each other. E does not have a corner office. F's office is further down the corridor than A's but on the same side.

Entrance
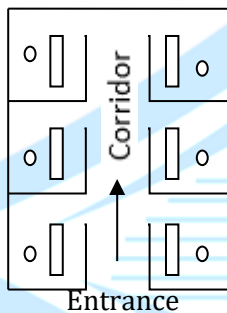
84. If E site in his office and faces the corridor, whose office is to his left:
(A) A   (B) B
(C) C   (D) D

85. Whose office faces A's Office:
(A) B   (B) C
(C) D   (D) E

86. Who is/are F's neighbor(s):
(A) A only   (B) A and D
(C) C only   (D) B and C

87. D was heard telling someone to go further down the corridor to the left office on the right. To whose room was he trying to direct that person:
(A) A   (B) B
(C) C   (D) F

Direction (Questions 88-91)

Given below is a binary tree, where every letter has been coded with a string of digits 0 and 1. At any node

going left is denoted by 1; at any node going right is denoted by 0. Thus N is denoted as: 10000. All the codes are in binary notation.
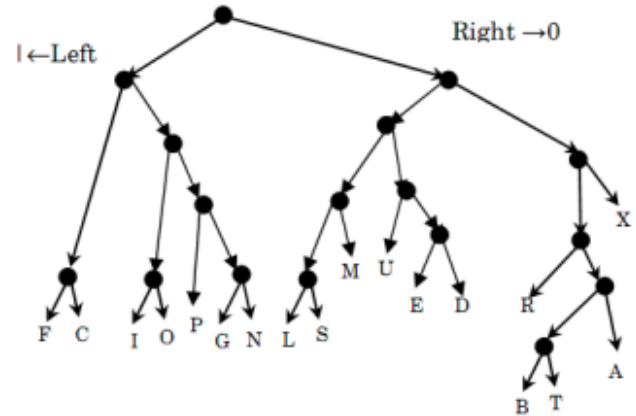
88. What will be the code for S:
(A) 01011   (B) 01110
(C) 01111   (D) None of these

89. Which letter is represented by 11001:
(A) G   (B) L
(C) U   (D) None of these

90. What is the value of C + R in binary notation:
(A) 11101   (B) 1101
(C) 1001   (D) None of these

91. If all the codes are converted into decimal notation, then how many letters have their value greater than L:
(A) 1   (B) 2
(C) 3   (D) None of these

Directions (Questions 92 to 94)

Read the following information carefully and answer the questions that follow:
(i) There is group of five persons – P, Q, R, S and T.
(ii) One of them is a horticulturist, one is physicist, one is journalist, one is an industrialist and one is an advocate.
(iii) Three of them – P, R and advocate prefer tea to coffee and two of them – Q and the journalist prefer coffee of tea.
(iv) The industrialist, S and P are friends to one another but two of these prefer coffee of tea.
(v) The horticulturist is R's brother.

92. Who is a horticulturist:
(A) P   (B) Q
(C) R   (D) S

93. Who is an industrialist:
(A) T   (B) R
(C) Q   (D) S

94. Which of the following groups include a person who likes tea but is not an advocate:
(A) PRT   (B) ST
(C) QRT   (D) None of these

95. If REASON is coded as 5 and BELIEVED as 7, what is the code number for GOVERNMENT:
(A) 6   (B) 8
(C) 9   (D) 10

Direction (Questions 96 to 97) :
In the following questions, select one alternative in which the third statement is implied by the first two statements.

96. (A) All elephants are wild. All lions are wild. So all lions are elephants.
(B) All mangoes are red. Some apples are mangoes. So all apples are red.
(C) All roads are boxes. All foxes are roads. So all boxes are foxes.
(D) All XYZ can run. All ABC are XYZ. So all ABC can run.

97. (A) All dogs are mad. All sick person are mad. So all sick persons are dogs.
(B) All oranges are black. All figs are oranges. So all figs are black.
(C) All windows are dogs. Some doors are dogs. So all windows are doors.
(D) No man can fly. No kite can fly. So all men are kites.

Direction (Questions 98-100)
In each of the following three questions, four numbers are given. Out of these, three are alike in a certain way but the rest one is different. Choose the one which is different from the rest three.

98. (A) 2384   (B) 3629
(C) 3756   (D) 4298

99. (A) 325   (B) 236
(C) 178   (D) 639

100. (A) 5698   (B) 4321
(C) 7963   (D) 4232

101. If finger is called toe, toe is called foot, foot is called thumb, thumb is called ankle, ankle is called palm and palm is called knee, which one finger has a different name:
(A) Thumb   (B) Ankle
(C) Knee   (D) Palm

102. In a certain code language, '617' means 'sweet and hot'; '735' means 'coffee is sweet' and '263' means 'tea is hot'. Which of the following would mean 'coffee is hot'.
(A) 731   (B) 536
(C) 367   (D) 753

103. If the direction North-East becomes, South-East, how will other directions change:
(A) West to North
(B) South to South-West
(C) North-West to East
(D) East to South-West

Direction (Questions 104-105)
In each of the following questions, a number series is given with one term missing. Choose the correct alternative that will continue the same pattern and fill in the blank spaces.

104. 3, 8, 24, 41, (...)
(A) 70   (B) 75
(C) 80   (D) 85

105. 4, 23, 60, 121, (...)
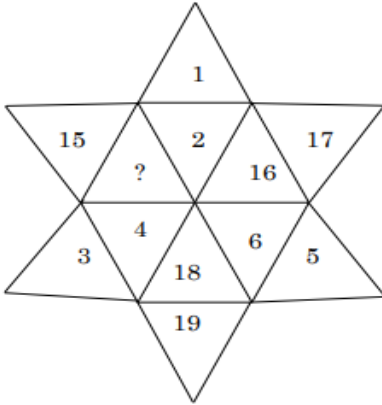(A) 212   (B) 221
(C) 241   (D) 242

Direction (Question 106-107)

Find the missing number in each of the following questions.
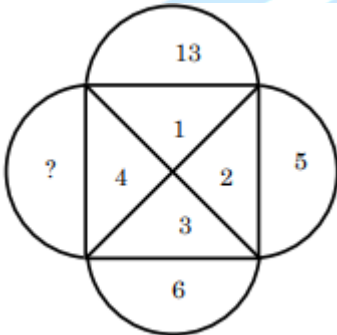
106.

(A) 13   (B) 14

(C) 20   (D) 21

107.

(A) 10   (B) 11

(C) 12   (D) 13

108. If $\frac{3}{4}$ of a number is equal to $\frac{2}{3}$ of another, what is the ratio between these two numbers:

(A) 3 : 4   (B) 5 : 6

(C) 8 : 9   (D) 9 : 10

109. Q is shorter than P, but taller than R, R is shorter than P but taller than A. If they stand in ascending order of their height the sequence is:

(A) ARQP   (B) AQPR

(C) QPAR   (D) RPQA

110. A man starts walking towards south, after walking 5 km he again turns left at right angles in what direction is he finally walking in:

(A) North   (B) South

(C) East   (D) West

111. Find the missing number in the following series: 4, 6, 3, 2, ?

(A) 8   (B) 4

(C) 3   (D) 6

112. If UNDERSTAND is coded as 1234567823 how will START be coded:

(A) 56781   (B) 83243

(C) 73652   (D) 67857

113. A cyclist goes 30 km to North and then turning of East he goes 40 km. again he turns to his right and goes 20 km. After he turns to his right and goes 40 km. How far is he from his straight point:

(A) 0 km   (B) 10 km

(C) 25 km   (D) 40 km

114. A one rupee coin is placed on a plain paper. How many coins of the same size can be placed round it so that each one touches the central and adjacent coins:
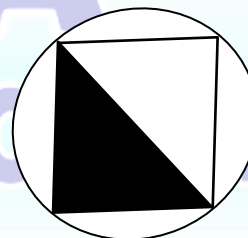
(A) 9   (B) 8

(C) 4   (D) 6

115. A, B, C, D and E distribute some cards among themselves in a manner that A gets one less than B; C gets 5 more than D; E gets 3 more than B while D get as many as B who gets the least cards:

(A) A   (B) C

(C) D   (D) E

116. If r is the radius of the circle given below, what is the area of the shaded region.

(A) $4r^2$ (B) r^2

(C) $\frac{4}{3}r^2$ (D) $4r$

117. An elevator has a capacity of 12 adults or 20 children. How many adults can be board the elevator with 15 children:

(A) 4   (B) 5

(C) 3   (D) 6

118. Which two months in a year have the same calendar:

(A) June – October   (B) April – November

(C) April – July   (D) October – December

119. How many numbers from 1 to 100 are such each of which is divisible by 8 and whose at least one digit is 8:

(A) Four   (B) Zero

(C) Eight   (D) Six

120. In the following square, numbers have been filled according to some rule. One space has been left blank. Find the correct number out of those given below for the blank space.

56	63	78
12		30
44	14	48

(A) 14   (B) 44

(C) 62   (D) 51
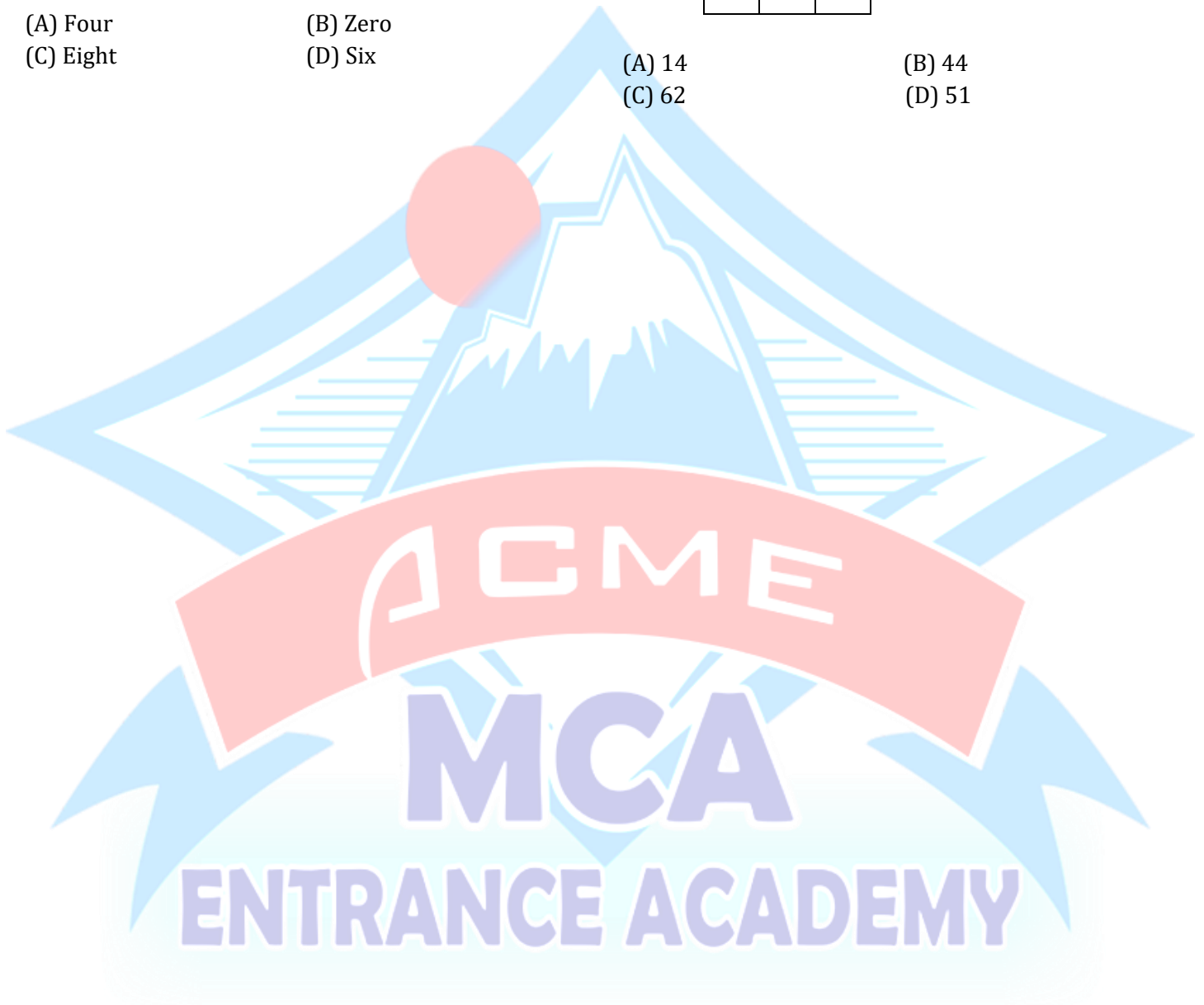
Answer Key

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

Solution

Mathematics:

1. (B) 31.

    Proper subsets of $\{1, 2, 3, 4, 5, 6, 7\}$ containing 1 and 7.
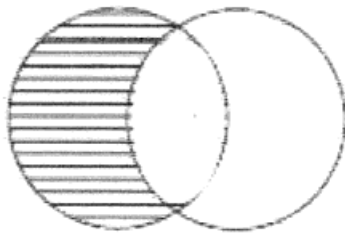
    The given set consists of seven elements.

    The number of subsets containing 1 and 7 are 32

    The number of proper subsets containing 1 and 7 are 32 − 1 = 31.
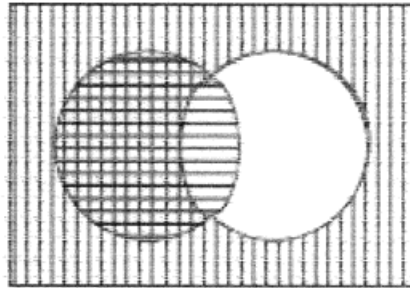
2. Identify the wrong statement from the given choices.

    Option (A) is true since
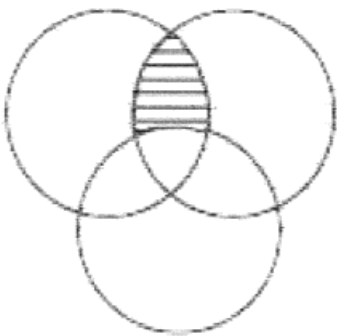
    $A - B = A \cap B$, as shown below.

    Option (B) is also true, as $(A - B) - C = (A - C) - (B - C)$ standard result

    Option (C) is also true, because it demonstrates demorgan law.

    Option (D) is also true, as explained below.

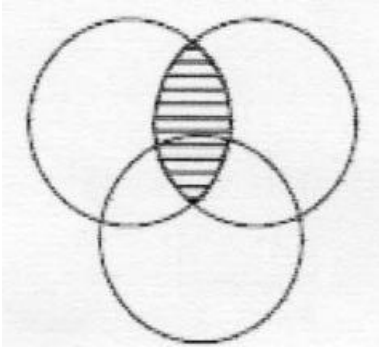   The venn diagram of $A \cap B \cap \bar{C}$ is as follows.

    The venn diagram of $A \cap B$ is as follows.

$\therefore A \cap B \cap \bar{C} \subseteq A \cap B$.

Note: Among the given choices, there is no statement which is false. All the statements are true.

3. (C) $39 \leq x \leq 63$.

63% of the Americans like cheese where as 76% like apples. If $x\%$ of the Americans like both, then

It is given that $n(C) = 63\%$

$n(A) = 76\%$

$n(A \cap C) = x$

$63 - x + 76 \leq 100$

$-x \leq -39$

$x \leq 39$

But x cannot be $> 63 \Rightarrow 39 \leq x \leq 63$.

4. (C) 24.

Set A has 3 elements, set B has 4 elements. Number of injections from A to B =

The number of injections from set A to set B where $n(A) = r$

and $n(B) = s$ is $^{s}P_r$.

Here $r = 3, s = 4$ i.e. $^{4}P_3 = 4 \times 3 \times 2 = 24$.

5. (B) $\frac{(n+1)^n}{n!}$.

It is given that $(1 + x)^n = a_0 + a_1 x + a_2 x^2 + \cdots \ldots + a_n x^n$

Here $a_0 = C_0, a_1 = C_1, a_2 = C_2, \ldots \ldots, a_n = C_n$

$\left(1 + \frac{a_1}{a_0}\right)\left(1 + \frac{a_2}{a_1}\right)\left(1 + \frac{a_3}{a_2}\right) \ldots \ldots \ldots \left(1 + \frac{a_n}{a_{n-1}}\right)$

$1 + \frac{a_1}{a_0} = n + 1, 1 + \frac{a_2}{a_1} = 1 + \frac{n-1}{2} = \frac{n+1}{n}$

Similarly, $1 + \frac{a_3}{a_2} = \frac{n+1}{3} \ldots \ldots \left(1 + \frac{a_n}{a_{n-1}}\right) = \frac{n+1}{n}$

$\therefore \left(1 + \frac{a_1}{a_0}\right)\left(1 + \frac{a_2}{a_1}\right)\left(1 + \frac{a_3}{a_2}\right) = \frac{(n+1)(n+1)\ldots\ldots n \; times}{1.2.3\ldots\ldots n}$

$= \frac{(n+1)^n}{n!}$

6. (B) 0.0875.

The total number of matches played is four.

In 4 matches the possibility of getting 7 points is three matches. India has to get 2 points and in the other it has to get one point i.e., $(1, 2, 2, 2)$ which can happen in 4 ways.

In four matches, the possibility of getting 8 points = $(2, 2, 2, 2)$

The required probability = 4 (P(one point)(P(2 points))3+$\left(P(2\ points)\right)^4$ = $4 \times 0.05 \times (0.5)^3 + (0.5)^4$

$= 0.0250 + 0.0625$

$= 0.0875$

7. (D) $\frac{1}{4}$.

When a coin is tossed thrice the favourable outcomes are (HTH) or (THT) i.e. = 2.

The total outcomes are 8.

The required probability $= \frac{2}{8} = \frac{1}{4}$.

8. (D) $P = \frac{51}{101}$.

It is given that $P(H) = p \Rightarrow \text{P(T)} = 1 - \text{p}$

Also given $P(H = 50) = P(H = 51)$

$\Rightarrow {}^{100}C_{50}(1 - p)^{50}p^{50} = {}^{100}C_{51}(1 - p)^{49}.p^{51}$

$\Rightarrow \frac{100!\,(1-p)^{50}}{50!\,50!\,(1-p)^{48}} = \frac{100!\,p^{51}}{51!\,49!\,p^{50}}$

$\Rightarrow \frac{1-p}{50} = \frac{1}{51}, p = 51 - 51p = 50p$

$\Rightarrow 101p = 51$

$\Rightarrow p = \frac{51}{101}$

9. (B) $\frac{21}{128}$.

It is given that $P(X = 3) = \frac{1}{4}P(X = 4)$

$\Rightarrow \frac{e^{-\lambda}\lambda^3}{3!} = \frac{1}{4} . \frac{e^{-\lambda}\lambda^4}{4!}$

$1 = \frac{\lambda}{16} \Rightarrow \lambda = 16$

Given $P(X = 5) = k\,P(X = 7)$

$\Rightarrow \frac{e^{-\lambda}\lambda^5}{5!} = \frac{k\,e^{-\lambda}\lambda^7}{7!} \Rightarrow k\lambda^2 = 42$

$k(16)^2 = 42$

$k = \frac{42}{256} = \frac{21}{128}$

10. (D) 47

The given average of 30 students is 45

$\Rightarrow$ The total marks of 30 students $= 30 \times 45 = 1350$.

But two of the marks were increased by 24 and 34 after correction.

$\Rightarrow$ The sum of the marks increased by $24 + 34 = 58$

$\therefore$ The correct sum of marks $1350 + 58 = 1408$.

$\therefore$ The correct average marks of the class

$= \frac{1408}{30} = 46.9 = 47$

11. (C)

When the given equation are expressed in a matrix form,

We have,

$$\begin{bmatrix} a^3 & (a+1)^2 & (a+2)^3 \\ a & (a+1) & (a+2) \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = 0$$

If the given equations have a non-zero solution, the determinant of the coefficient matrix is zero.

Proceeding form the options, if $a = -1$

$$\begin{vmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ 1 & 1 & 1 \end{vmatrix} = 0 \ (\because R_1 = R_2)$$

$\therefore$ When $a = -1$ the equation have a non-zero solution.

12. (B) -160.

It is given that $x = -5 + 4i$. Then $x^2 = 25 - 16 - 40i = 9 - 40i$

Consider $x^4 + 9x^3 + 35x^2 - x + 4 = x^2(x^2 + 35) + x(9x^2 - 1) + 4$

$= (9 - 40i)(9 - 40i + 35) + (4i - 5)\{9(9 - 40i) - 1\} + 4$

$= (9 - 40i)(44 - 40i) + (4i - 5)(81 - 360i - 1) + 4$

$= 396 - 360i - 1760i - 1600 + 320i + 1440 - 400 + 1800i + 4$

$= -160$.

13. (C)

$y = a \log x + bx^2 + x$

Differentiate w.r.t. x

$y' = \frac{a}{x} + 2bx + 1$

It is given that y has extreme values at $x = -1$ and $x = 2$

$\Rightarrow y'(-1) = 0$ and $y'(2) = 0$

$\Rightarrow -a - 2b + 1 = 0$ and $\frac{a}{2} + 4b + 1 = 0$

$a + 2b + 1 \to (1)$ and $a + 8b = -2 \to (2)$

Solving (1) and (2), we get $a = 2$ and $b = -\frac{1}{2}$

14. (B) $\frac{a}{c} + \frac{c}{a} = \frac{p}{r} + \frac{r}{p}$.

It is given that a, b, c are in A.P. $\Rightarrow 2b = a + c$ ......(1)

and p, q, r are in H.P.$\Rightarrow q = \frac{2pr}{p+r}$ ......(2)

ap, bq, cr are in G.P. $\Rightarrow b^2q^2 = apcr$

Substitute the values of b and q in the above equation

$\Rightarrow \frac{(a+c)^2}{4} \cdot \frac{4p^2r^2}{(p+r)^2}$

$\Rightarrow \frac{a^2+c^2+2ac}{ac} = \frac{p^2+r^2+2pr}{pr}$

$\Rightarrow \frac{a^2+c^2}{ac} + 2 = \frac{p^2+r^2}{pr} + 2$

$\Rightarrow \frac{a}{c} + \frac{c}{a} = \frac{p}{r} + \frac{r}{p}$

15. (D)

Given $\begin{vmatrix} p & b & c \\ a & q & c \\ a & b & r \end{vmatrix} = 0$

$R_1 - R_2 = \begin{vmatrix} p-a & b-q & 0 \\ a & q & c \\ a & b & r \end{vmatrix}$, $R_2 - R_3 = \begin{vmatrix} p-a & b-q & 0 \\ a & q-c & c-r \\ a & b & r \end{vmatrix} = 0$

$(p-a)(q-b)(r-c)\begin{vmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ \frac{a}{p-a} & \frac{b}{q-b} & \frac{r}{r-c} \end{vmatrix} = 0$

$\begin{vmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ \frac{a}{p-a} & \frac{b}{q-b} & \frac{r}{r-c} \end{vmatrix} = 0$ $(\because p \neq a, q \neq b, r \neq c)$

Expanding $1\left(\frac{r}{r-c} + \frac{b}{q-b}\right) + 1\left(\frac{a}{p-a}\right) = 0$

$\frac{p-(p-a)}{p-a} + \frac{q-(q-b)}{q-b} + \frac{r}{r-c} = 0$

$\Rightarrow \frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c} = 2$

16. (A)

Given determinants $\begin{vmatrix} 1 & 1+i+\omega^2 & \omega^2 \\ 1-i & -1 & \omega^2-1 \\ -i & -i+\omega-1 & -\omega^3 \end{vmatrix}$

$= \begin{vmatrix} 1 & 1+i+\omega^2 & \omega^2 \\ 1-i & -1 & \omega^2-1 \\ -i & -i+\omega-1 & -\omega^3 \end{vmatrix}$ $(\because 1+\omega+\omega^2 = 0$ and $\omega^3 = 1)$

$R_1 + R_3 \begin{vmatrix} 1-i & 1+i+\omega^2-i+\omega-1 & \omega^2-1 \\ 1-i & -1 & \omega^2-1 \\ -i & -i+\omega-1 & -\omega^3 \end{vmatrix}$

$= \begin{vmatrix} 1-i & -1 & \omega^2-1 \\ 1-i & -1 & \omega^2-1 \\ -i & -i+\omega-1 & -\omega^3 \end{vmatrix}$ $(R_1 = R_2)$

17. (A) The reflection of a point (x_1, y_1) when reflected about $y = x$

(i) is (x_2, y_2) then $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$ lies on $y = x$

$\therefore$ Reflection of $(4, 1)$ when reflected on $y = x$ is $(1, 4)$ as $\left(\frac{4+1}{2}, \frac{1+4}{2}\right)$ lies on y = x

(ii) when transformed through a distance of 2 units along x-axis in positive direction, then x = x + 2, y = y + 0

$\therefore$ The coordinates of $(1, 4)$ after transformation becomes i.e., $(3, 4)$ let P$(3, 4)$.

(iii) when the point is rotated thorugh an angle of $\frac{\pi}{4}$ in anticlockwise direction, P transforms to Q from $\triangle$OPR cosθ

$= \frac{3}{5}$ and sin$\theta = \frac{4}{5}$.

Let Q(x, y) and OP = OQ = 32 + 42 = 5.

Using symmetric form of line $x = x_1 + r cos\phi$ and $y = y_1 + r sin\phi$

Here $(x_1, y_1) = (0, 0)$ and $\phi = \frac{\pi}{4} + \theta$ and $r = OP = OQ$ = 5 units

$\Rightarrow x = 5cos\left(\frac{\pi}{4} + \theta\right) = 5\left(\frac{1}{\sqrt{2}}\cos\theta - \frac{1}{\sqrt{2}}\sin\theta\right)$

$= \frac{5}{\sqrt{2}}\cdot\frac{3}{5} - \frac{5}{\sqrt{2}}\cdot\frac{4}{5} = \frac{-1}{\sqrt{2}}$

Similarly, y = 5 $\sin\left(\frac{\pi}{4} + \theta\right) = \frac{7}{\sqrt{2}}$

$\therefore$ The required point is $\left(\frac{-1}{\sqrt{2}}, \frac{7}{\sqrt{2}}\right)$

18. (A) The angle bisector of $x^2 - 2mxy - y^2 = 0$ is $-m(x^2 - y^2) = 2xy$ is $-mx^2 - 2xy + my^2 = 0$ ....(1)

But the angle bisector is given $x^2 - 2nxy - y^2 = 0$ ....(2)

Comparing (1) and (2), we have $\frac{-m}{1} = \frac{-2}{-2n} \Rightarrow mn = -1$ or $mn + 1 = 0$

19. (D) Two circles with centers C_1, C_2 and r_1, r_2 as their radii and if one circle is contained the other, then

$C_1, C_2 < |r_1 - r_2|$

It is given that $x^2 + y^2 = 9$; $x^2 + y^2 - 6x - 8y + 25 = c^2$

$\Rightarrow (x - 3)^2 + (y - 4)^2 = c^2$

Here $C_1(0, 0), r_1 = 3$ and $C_2 = (3, 4), r_2 = c$

$\Rightarrow 5 < |3 - c|$ or $|c - 3| > 5$

$c - 3 > 5$ or $c - 3 < -5$

$\Rightarrow c < -2$ or $c > 8$

20. (B) The equation of the tangent at θ on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is $\frac{x}{a}\cos\theta + \frac{y}{b}\sin\theta = 1$.

The intercepts mad e by tangent on axes are $\frac{a}{\cos\theta}$ and $\frac{b}{\sin\theta}$.

Given that each intercepts is $t = \frac{a}{\cos\theta}$; $t = \frac{a}{\sin\theta}$

Eliminate θ from the above equations

$\Rightarrow a^2 + b^2 = t^2$ or $t = \sqrt{a^2 + b^2}$

21. (B) The given equation of hyperbola is $\frac{x^2}{24/27} - \frac{y^2}{\frac{24}{9}} = 1$

The angle between the asymptotes is θ = 2 $tan^{-1}\left(\frac{b}{a}\right)$

$= 2 tan^{-1}\left(\sqrt{\frac{24/9}{24/27}}\right)$

$= 2tan^{-1}(\sqrt{3}) = 2 \times 60^o = 120^o$

22. (A) Standard result

23. (A, D) It is given that $f(x) = x\ sin\left(\frac{1}{x}\right)$ for $x \neq 0$

$= 0$ for $x = 0$

We know that $-1 \leq sin\left(\frac{1}{x}\right) \leq 1$

$-x \leq x \sin\left(\frac{1}{x}\right) \leq x$

$\underset{x \to 0}{\text{Lt}} -x \leq \underset{x \to 0}{\text{Lt}} x \sin\frac{1}{t} \leq \underset{x \to 0}{\text{Lt}} x$

$\therefore$ We know result, $\underset{x \to 0}{\text{Lt}} x \sin \frac{1}{x} = 0$

$\therefore f(x)$ is continuous at $x = -1$

(ii) $f(x)$ is differentiable at $x = 0$ if

$\underset{x \to 0^+}{\text{Lt}} \frac{f(x+h)-f(0)}{h-0} = \underset{x \to 0}{\text{Lt}} \frac{h \sin\frac{1}{h}}{h}$ does not exist

$\underset{x \to 0}{\text{Lt}} \frac{-h \sin\left(\frac{-1}{h}\right)}{h}$ does not exist.

$\therefore$ Both option A and D are both, correct.

24. (D) Let t_1 and t_2 be the extremities of the parabola $x^2 = 4ay$

$\Rightarrow t_1 = (2at, at_1^2)$ and $t_2 = (2at_2, at_2^2)$

The equation of the tangent at t_1 to the parabola is $s_1 = 0$

i.e., $x_1 - 2a(y + y_1) = 0$

The tangent at the vertex of the parabola is x-axis at P, then P$(at_1, 0)$

let it meet the x-axis

Similarly, the equation of the tangent at t_2 is $xt_2 - y - at_2^2 = 0$

let it meet the x-axis at Q, then Q$(at_2, 0)$.

Given $x_1 = at_1$ and $x_2 = at_2$

$x_1 x_2 = a^2 t_1 t_2 = -a^2$ (Q the chord is a focal chord $\Rightarrow t_1 t_2 = -1$)

25. (C) Let $\int_3^\pi \frac{\sqrt{x}}{\sqrt{9-x}+\sqrt{x}} dx$

$I = \int_3^6 \frac{\sqrt{6+3-x}}{\sqrt{9-(9-x)}+\sqrt{9-x}} dx$

$= \int_3^6 \frac{\sqrt{9-x}}{\sqrt{x}+\sqrt{9-x}} dx \left(\because \int_a^b f(x)dx = \int_a^b f(a+b-x)dx\right)$

$I + I = 2I\int_3^6 \frac{\sqrt{x}}{\sqrt{9-x}+\sqrt{x}} dx + \int_3^6 \frac{\sqrt{9-x}}{\sqrt{x}+\sqrt{9-x}} dx$

$2I = \int_3^6 1 \, dx = [x]_3^6 = 3$

$I = \frac{3}{2}$

26. (C) Put $\sin x - \cos x = t$

$\Rightarrow (\cos x + \sin x)dx = dt$

If $x = \frac{\pi}{4} \Rightarrow t = 0$ and if $x = 0, \ t = -1$

$\Rightarrow \int_0^{\pi/4} \frac{\sin x}{3+\sin x} dx = \int_{-1}^0 \frac{dt}{3+1-t^2} = \int_{-1}^0 \frac{dt}{2^2-t^2}$

$= \frac{1}{4}\left(\log\frac{2+t}{2-t}\right)_{-1}^0 = \frac{-1}{4}\log\frac{1}{3} = \frac{1}{4}\log 3$

27. (C) $\int \log_{10} x \ dx$

$\int \frac{\log_e x}{\log_e 10} dx$

$= \log_{10} e \int \log_e x \ dx$

$$= \log_{10} e \left[x \log_e x - \int \frac{x\, dx}{x} \right] + c$$
$$= \log_{10} e \left[x \log_e x - x \log_e e \right] + c$$
$$= (\log_{10} e) \times \left[\log_e \frac{x}{e} \right] + c$$

28. In the interval $[0, 1]$, $x^2 > x^3 \Rightarrow 2^{x^2} > 2^{x^3}$

$\therefore I_1 = \int_0^1 2^{x^2} dx > \int_0^1 x^{x^3} dx = I_2$

$\therefore I_1 > I_2$
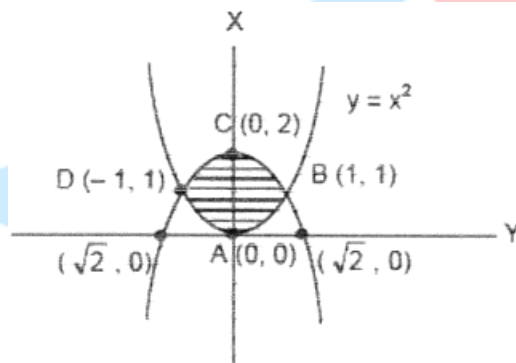
Similarly, in the interval $(1, 2)$, $x^2 < x^3$

$2^{x^2} < 2^{x^3}$

$I_3 = \int_1^2 2^{x^2} dx < \int_1^2 2^{x^3} dx = (I_4)$

$\therefore I_3 < I_4$

$\therefore$ Option (D) follows.

29. (A)

The required area $=$ ABCD (shaded in the figure)

$= 2 \int_0^1 \left((2 - x^2) - x^2 \right) dx$ [$\because$ it is symmetric about y-axis]

$= 2 \int_0^1 (2 - 2x^2) dx$

$= 2 \left[2x - \frac{2x^3}{3} \right]_{-1}^1$

$= 2 \left[2 - \frac{2}{3} \right] = \frac{8}{3}$

30. When the vector is rotated through any angle, its magnitude does not change.

$\Rightarrow \sqrt{(2p)^2 + (1)^2} = \sqrt{(p+1)^2 + 1^2}$

$4p^2 + 1 = p^2 + 2p + 2$

$3p^2 - 2p - 1 = 0$

$3p(p - 1) + 1(p - 1) = 0$

$(3p + 1)(p - 1) = 0$

$\Rightarrow p = -\frac{1}{3}$ or 1.

No correct answer in given options.

31. $a = \hat{i} + \hat{j}, b = \hat{j} + \hat{k}$

$|a| = |b| = \sqrt{2}$

The vector of option A and option C have a magnitude is $\sqrt{2}$.

$\therefore \vec{c} = \hat{\imath} + \hat{k}$ or $\frac{-1}{3}\hat{\imath} + \frac{4}{3}\hat{\jmath} - \frac{1}{3}\hat{k}$

Since $\vec{c}$ makes an obtuse angle with $\hat{\imath}$,

$\therefore$ Only option C satisfies this condition.

$\therefore \vec{c} = \frac{-1}{3}\hat{\imath} + \frac{4}{3}\hat{\jmath} - \frac{1}{3}\hat{k}$ (C)

32. $\vec{a} + \vec{b} = \lambda_1 \vec{c}$ ⠀⠀⠀⠀⠀⠀.....(1) ($\because \vec{a} + \vec{b}$ is collinear with $\vec{c}$)

Similarly, $\vec{b} + \vec{c} = \lambda_2 \vec{a}$ ⠀⠀⠀⠀.....(2) ($\because \vec{b} + \vec{c}$ is collinear with $\vec{a}$)

$\vec{b} = \lambda_1 \vec{c} - \vec{a}$ (from (1))

$\vec{b} = \lambda_2 \vec{a} - \vec{c}$ (from (2))

$\Rightarrow \lambda_1 \vec{c} - \vec{a} = \lambda_2 \vec{a} - \vec{c}$

$\Rightarrow (\lambda_1 + 1)\vec{c} = (\lambda_2 + 1)\vec{a}$

As no two vector are collinear,

$\Rightarrow$ either $\lambda_1 + 1 = 0$ or $\lambda_2 + 1 = 0$

$\Rightarrow \lambda_1 = -1$ or $\lambda_2 = -1$

$\therefore$ If $\lambda_1 = -1$ from (1) we get $\vec{a} + \vec{b} + \vec{c} = 0$

If $\lambda_1 = -1$ from (2) we get $\vec{a} + \vec{b} + \vec{c} = 0$

Ans (D)

34. Let A, B, P be represented by the vectors $\vec{a}, \vec{b}, \vec{p}$ respectively.

As C is the midpoint of $AB \Rightarrow \vec{OC} = \left(\frac{\vec{a}+\vec{b}}{2}\right)$

$PA = a - p, PB = b - p$

$PC = c - p - \dfrac{\vec{a} + \vec{b}}{2} - p$

$= \dfrac{a+b-2p}{2}$

$= \dfrac{a - p + b - p}{2} = \dfrac{PA + PB}{2}$

$\therefore PA + PB = 2PC$

Ans (B)

35. $= \sqrt{3}\dfrac{\cos 20°}{\sin 20°}° - 4\cos 20°$

$= \dfrac{\sqrt{3}\cos 20° - 2\sin 40°}{\sin 20°}$

$= \dfrac{2}{\sin 20°}\left[\dfrac{\sqrt{3}}{2}\cos 20° - \sin 40°\right]$

$= \dfrac{2}{\sin 20°}[\cos 30° \cos 20° - \sin 40°]$

$= \dfrac{1}{\sin 20°}[\cos 50° + \cos 10° - \sin 40° - \sin 40°]$

$= \dfrac{1}{\sin 20°}[\cos 10° - \cos 50°]$

$= \dfrac{1}{\sin 20°}[2\sin 20° \sin 30°] = 1$

Ans. (A)

36. Let $a = \tan\theta$

$$\sin^{-1}\left(\frac{2}{1+a^2}\right) = \sin^{-1}\left(\frac{2\tan\theta}{1+\tan^2\theta}\right)$$
$$= \sin^{-1}(\sin 2\theta) = 2$$
$$= \tan^{-1}(a)$$

Similarly, If $b = \tan\alpha$

$$\Rightarrow \cos^{-1}\left(\frac{1-b^2}{1+b^2}\right) = \cos^{-1}\left(\frac{1-\tan^2\alpha}{1+\tan^2\alpha}\right)$$
$$= \cos^{-1}(\cos 2\alpha) = 2\alpha$$
$$= 2\tan^{-1}(b)$$

It is given that $\sin^{-1}\left(\frac{2a}{1+a^2}\right) - \cos^{-1}\left(\frac{1-b^2}{1+b^2}\right) = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$

$$= 2\tan^{-1}(a) - 2\tan^{-1}(b) = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$$
$$= 2\left(\tan^{-1}(a) - \tan^{-1}(b)\right) = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$$
$$= 2\tan^{-1}\left(\frac{a-b}{1+ab}\right) = \tan^{-1}\left(\frac{2x}{1-x^2}\right) \text{ (given)}$$
$$= 2\tan^{-1}\left(\frac{a-b}{1+ab}\right) = 2\tan^{-1}(x)$$
$$\Rightarrow x = \frac{a-b}{1+ab}$$

Ans. (D)

37. In any triangle,

$a = 2R\sin A$ ………(1)
$b = 2R\sin B$ ………(2)
$c = 2R\sin C$ ………(3)

Given $8R^2 = a^2 + b^2 + c^2$

Substituting (1), (2), (3) in (4) we get,

$8R^2 = 4R^2(\sin^2 A + \sin^2 B + \sin^2 C)$
$\Rightarrow \sin^2 A + \sin^2 B + 1 - \cos^2 C = 2$
$\sin^2 A - \cos^2 C + \sin^2 B = 1 - \cos(A+C)\cos(A-C) = \cos 2B$.
$\cos B \cos(A-C) = \cos^2 B$ ($\because A + C = 180 - B$)
$\Rightarrow \cos B = 0$ or $A - C = B$
$\Rightarrow B = 90°$ or $A = B + C$
$\Rightarrow B = 90°$ or $2A = A + B + C = 180°$
$\Rightarrow A = 90°$
$\Rightarrow$ In either case, ABC is a right angled triangle

Ans. (C)

38. Let AB the lamp post, CD be the position of the man.

Ac is the distance moved by the man and CE be the shadow.
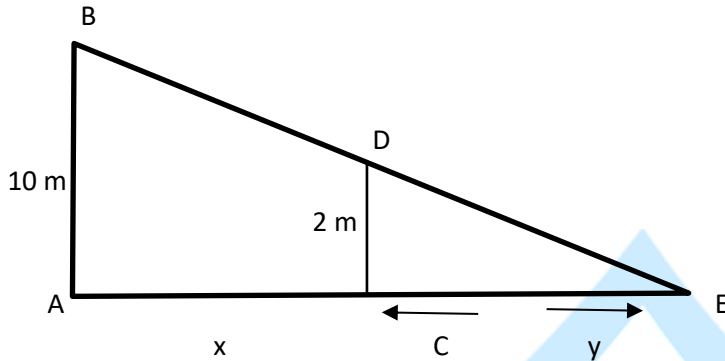
It is given t hat AB = 10 m, CD = 2 m.

Let AC = x m, CE = y m.

Given that $\frac{dx}{dt} = 2\ m/sec$

We know that $\Delta ABE - \Delta CDE$

$\frac{AB}{CD} = \frac{AE}{CE}$

$\Rightarrow \frac{10}{2} = \frac{x+y}{y} \Rightarrow 5y = x + y$

$\Rightarrow x = 4y$

Differentiate w.r.t. 't'

$\frac{dx}{dt} = 4.\frac{dy}{dt} \Rightarrow 2 = 4\frac{dy}{dt} \Rightarrow \frac{dy}{dt} = \frac{1}{2}\ m/sec$

Ans. (A)

39. Let TF be the tower with top represented by T and foot by F.

Let the height of he tower TF = h units

From ΔAFT.

$\Rightarrow AF = \frac{h}{\tan 60°} = \frac{h}{\sqrt{3}}$

From ΔCFT

$CF = \frac{h}{\tan 30°} = h\sqrt{3}$

From ΔBFA

$BF2 = BA2 = AF2$

$h^2 = BA^2 + \frac{h^2}{3}$
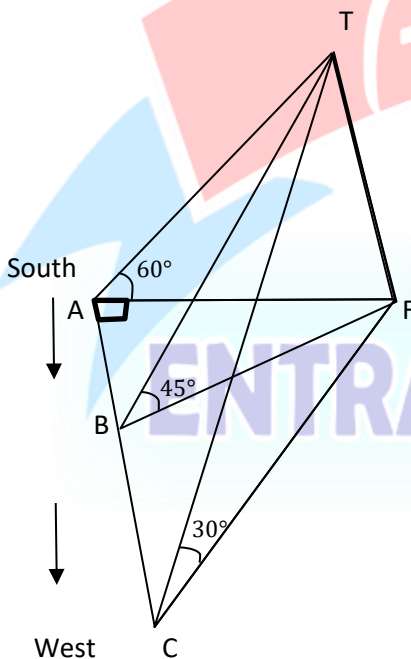
$\therefore AB = \frac{\sqrt{2}}{\sqrt{3}} h$

Similarly from ΔACF

$AC^2 + AF^2 = CF^2$

$AC^2 + \frac{h^2}{3} = 3h^2$

$AC = \frac{8h^2}{3}$

$AC = \frac{2\sqrt{2}h}{\sqrt{3}}$

$BC = AC - AB$

$= \frac{2\sqrt{2}h}{\sqrt{3}} - \frac{\sqrt{2}h}{\sqrt{3}} = \frac{\sqrt{2}h}{\sqrt{3}}$

$\frac{AB}{BC} = \frac{\frac{\sqrt{2}h}{\sqrt{3}}}{\frac{\sqrt{2}h}{\sqrt{3}}} = 1$

Ans. (B)

40. Ans. (D) The distance between two parallel lines $a_1x + b_1y + c_1 = 0$

and $a_1x + b_1y + c_2 = 0$ is $\frac{|c_1 - c_2|}{\sqrt{a_1^2 + b_1^2}}$

The given parallel lines are

$2x - y + 4 = 0$ ....(1)

$6x - 3y - 5 = 0$ ....(2)

(2) is equivalent to $2x - y - \frac{5}{3} = 0$ ....(3)

$\therefore$ The distance between the given parallel line (1) and (3) is $\frac{|4 - \left(-\frac{5}{3}\right)|}{\sqrt{2^2 + t^2}} = \frac{17\sqrt{5}}{15}$

Computer:

41. (A) The major data processing functions of a computer are processing data into information, anakyzzing data and storing the data, but not 'gathering data'.

42. (B) It is given that the Boolean function is $F(X, Y, Z) = \sum(0, 2, 3, 5, 6)$

Binary equivalents of the given decimal numbers and fundamental products are given below:

$0 \rightarrow 0\ 0\ 0$ $\bar{A}\bar{B}\bar{C}$

$2 \rightarrow 0\ 1\ 0$ $\bar{A}B\bar{C}$

$4 \rightarrow 1\ 0\ 0$ $A\bar{B}\bar{C}$

$5 \rightarrow 1\ 0\ 1$ $A\bar{B}C$

$6 \rightarrow 1\ 1\ 0$ $AB\bar{C}$

The Karnaugh map for the given fundamental product is

	C	C
A B	1	0
A B	1	0
A B	1	0
A B	1	1

Considering that 2 groups are quad and one pair in above K-map the Boolean expression in a simplified from is Z + XY.

43. (B) Of the given choices, 'NAND' gate is equivalent to (NOR) or (XOR) gate, since NAND gate is a universal gate and is equivalent to any logic gate.

44. (A) Of the given choices, the data elements in order from the smallest to the largest are: character, field, record, database. A field consists of several characters. A record is a group of fields and several records constitute a database.

45. (D) 'Micro Computer' is a stored program machine whereas other choices are not.

46. (B) Access time = 45 ns (nano seconds)

Time gap = 5 ns

∴ Total time taken = 45 + 5 = 50 ns

The bandwidth of the memory = $\frac{1}{50 \times 10^{-9}}$ ($\because$ 1 nano = 10^{-9})

= $\frac{10^9}{50} = \frac{1000}{50} \times 10^6$

= 20 x 10^6 = 20 MHz ($\because$ 1 mega = 10^6)

47. (B) Total capacity of the memory = 16 KB

= $2^4 \times 2^{10}$ Bytes ($\because$ 1 KB = 2^{10} Bytes)

= 2^{14} Bytes

= $2^2 \times 2^{12}$ Bytes.

It is given that 12 bits are used for addresses. Therefore, the remaining '4 bytes' are used for data i.e., word length.

48. (C) A micro processor uses either a memory mapped I/O or I/O mapped I/O. In memory I/O, all share the same memory but in I/O, memory and I/O addresses are distinct. Also in I/O mapped I/O, not all data transfer instruction are available for I/O.

49. (C) In computer terminology, boot strap is to load a program into computer which is usually an operating system.

50. (D) It is given that $(12x)_3 = (123)_x$

$1 \times 3^2 + 2 \times 3^1 + x \times 3^6 = 1 \times x^2 + 2 \times x^1 + 3 \times x^6$

$x + 15 = x^2 + 2x + 3$

$x^2 + x - 12 = 0$

$(x + 4)(x - 3) = 0$; x = 3 as x can't be negative. But in base 3, the maximum digit is only 2.

English:

51. (D) is not true – fungus are not poisonous, certain plants are. Refer to the last sentence of the passage

52. (C) The passage describes the actions of the fungi. It does not warn people, it is not about rot and decay of plants nor about how plants use solar energy.

53. (C) All the four words could go in the first blank. But what follows this – finally all that remained – tells us that it dissolves slowly (not quickly or immediately) and very little residue is left.

54. (B) **Clandestine** means conducted with secrecy.

55. (A) **Compose** means to form by putting together. Its opposite is disturb (interrupt).

56. Only choice (D) is grammatically right. Since it is the subject it should be 'we' not 'us' (rules out B and C) A is incorrect with 2 'had' [the earlier action takes 'had' (had left) and the later simple past (arrived)].

57. (D) The environmentalist proclaim something that something is a noun clause and hence begins with that (rules out A and D). The present continuous (-ing form) is better since it describes what they are doing.

58. (D) Moth harms clothing; so, stigma harms repulation.
Hence Moth : Clothing : : Stigma : Repulation.

59. (C) As ascetic hates luxury; so a misogynist hates women.
Hence Ascentic : Luxury : : Misogynist : Women

60. (D) Statement (D) is incorrect – a torpid person is lazy so he will not be hyperactive.

61. (A) The presentation was lengthy; so it can be verbose or tedious or laborious not simple. The second blank can take only content. A presentation will not reveal skill or coverage.

62. (A) **Flamboyant** means elaborate display. Its opposite is quiet.

63. (B) **Clemency** means merciful. The word closest in meaning is kindness, althrough forgiveness is close to it.

64. (D) R is the first statement since it introduces the topic for the paragraph – the phrase 'war or terror' is a misnomer. T follows statin why it is a misnomer. Q elaborates on what is said in T and so follows it. S follows giving additional reason and P concludes with 'dubious legality' of this war.

65. (D) Sentence (D) is incorrect – boy scouts cannot collectively be called bundle.

Reasoning:

66. (B) Let us denote the five stops in between Tatanagar and Howrah by S_1, S_2, S_3, S_4 and S_5 respectively.

Now, there are a total of 7 stations and there must be a ticket from one station to any of the other stations. The total number of tickets will be the same as the number of ways in which 2 stations can be selected from the 7 stations.

Therefore, the total number of different one-way tickets $= {}^7C_2 \times 2 = 42$.

[Two one-way tickets are required for each pair of selected stations.]

67. (C) Divide the coins into three groups of equal number of coins.

Let us call them A, B and C. Take A on one side of the balance and B on the other side. If they are equal, the heavier coin is in C, otherwise in the heavier group between A and B. After identifying the group in which the heavier coin is, repeat the process. Since $6561 = 3^8$, the minimum number of weightings required is 8.

68. (A) Gala means celebration.

69. (C) As the numbers are both squares and cubes, they must be of the form of n^6 which can be written both as $(n^3)^2$ or $(n^2)^3$.

Only for $n = 2$ and 3, we get the number more than 1 and less than 1000.

For $n = 4$, we get a number greater than 1000.

Thus the numbers are 2^6 and 3^6 i.e., 64 and 729.

∴ There are two such numbers.

70. (C) The business is slow because people think that the bakery does not sell snacks. Hence, by letting people know that she also sells items which people consume everyday, i.e., breads, muffins and cookies, her daily business would increase.

71. (A) Task 2 can be assigned in 2 ways i.e., either to person 3 or to person 4. If task 2 is assigned to 3 or 4, then we will have only 3 ways in which we can assign task 1.

Once the first two tasks are assigned, the third task can be assigned to any of the remaining 4 persons. Therefore, task 3 can be assigned in 4 ways.

Similarly, task 4, task 5 and task 6 can be assigned in 3 ways, 2 ways and 1 way respectively.

∴ The total number of ways in which the 6 tasks can be assigned $= 3.2.4.3.2.1 = 144$ ways.

72. (C)

By checking the difference between the place value of the letter and the number in each column, we get the following alternate series.

	S(19)	8	W(23)	16	A(1)	5	C(3)	X	A(1)	4
	20	J(10)	25	T(20)	4	K(11)	7	L(12)	Y	N(14)
Difference	1	2	2	4	3	6	4			10

The differences are 1, 2, 3, 4 and 5 for one series and 2, 4, 6, 8 and 10 for the other series.

∴ The difference between the place value of A i.e. 1 and Y should be 5.

∴ Y is 6.

The difference between the place value of L and X should be 8.

∴ X is 4.

73. (A)

The pattern followed is as follows.

28^{-3},   25 **5** 21^{-3},   18 **5** 14^{-3},   <u>11</u>   <u>5</u>

∴ 11 and 5 are the next numbers.

74. (A)

Arranging the integers in the ascending order, we get

$$A < E < B < C < D.$$

The integers when arranged in the above order will form an arithmetic progression with a common difference of 4.

Let the value of B be x.

Therefore, the values of A, E, C and D will be $x - 8, x - 4, x + 4$ and $x + 8$ respectively.

The sum of the integers $= x - 8 + x - 4 + x + x + 4 + x + 8 = 5x$.

It is given that the sum of the integers is equal to E.

∴ $5x = x - 4$

$\Rightarrow x = -1$.

Therefore, the integers in the increasing order are $-9, -5, -1, 3$ and 7 respectively.

Therefore, the product of the integers $= (-9)(-5)(-1)(3)(7) = -945$.

75. (B)

Z lives in the yellow house which is between the red and the green houses.

As X does not live adjacent to Z, X does not live in the red or green house.

∴ X lives in the blue house.

(76 – 78)

76. (C)

The cost can be minimized by using the buses which cost less, while ensuring that the number of trips required is as less as possible.

∴ The cost will be minimum by using Type Q thrice and Type R and S once each.

Capacity :

Type $Q \times 3 +$ Type $R \times 1 +$ Type $S \times 1 = 220$.

Cost :

$140 \times 3 + 125 \times 1 + 95 \times 1 =$ Rs. 640.

77. (A) The number of buses required, when the cost in minimum, is 5.

78. (D)

The next least cost is obtained by using type Q two times and type R three times.

∴ The cost $= 2 \times 140 + 3 \times 125 =$ Rs. 655.

79. (C)

Let the time (in hours) in which a child and a woman can do the work be t hours and $t - 15$ hours respectively.

It is given that, $\frac{18}{t} + \frac{6}{t-15} = \frac{3}{5}$

where $\frac{18}{t}$ = the work done by a child in 18 hours and $\frac{6}{t-15}$ = the work done by a woman in 6 hours.

$\Rightarrow \frac{6}{t} + \frac{2}{t-15} = \frac{1}{5}$

$5(8t - 90) = t^2 - 15t$

$\Rightarrow t^2 - 55t + 450 = 0$

$\Rightarrow (t - 45)(t - 10) = 0$

Not t cannot be 10, for $t - 15$ will be negative.

Therefore $t = 45$

Thus, the time taken by a woman to do the work $= t - 15 = 30$ hours.

To do the remaining $\left(\frac{2}{5}th\right)$ work, the time taken by a women will be $\frac{2}{5}(30) = 12$ hours.

80. (B)

Every hour the policeman will cover 2 km more than the culprit i.e. the distance between them will decrease by 2 km each hour.

The distance by which they were initially separated = 250 m = 1/4 km

Therefore, the time after which the policeman will catch the culprit $= \frac{1/4}{2} = \frac{1}{8}$ hours

In this time, the culprit would have covered a total distance of $8\left(\frac{1}{8}\right) = 1$ km

Thus, the culprit was overpowered by the policeman after running a distance of 1 km.

(81 - 83)

Here we apply the principal that,

Inflow= Requirement + Outflow.

The given information can be represented as follows.
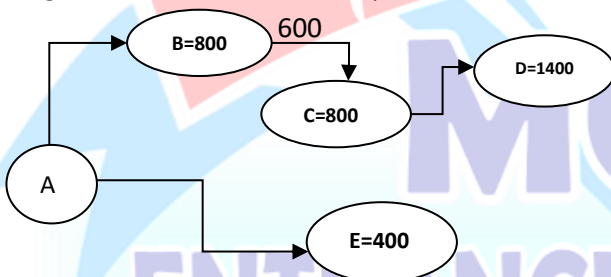
Since the requirement at D is 1400, the outflow from C is 1400.

(i) Inflow to C = Requirement at C + Outflow from C

600 + E to C = 800 + 1400

∴ Flow from E to C = 1600.

(ii) Inflow to E = Requirement at E + Outflow from E

A to E = 400 + 1600 = 2000.

(iii) Inflow to B = Requirement at B + Outflow from B

A to B = 800 + 600 = 1400.

It is given that the capacity of each pipeline is 2000.

81. (D) The quantity moved from A to E = 2000.

82. (D) The quantity following in A – B is 1400.
∴ The free capacity 2000 - 1400 = 600.

83. (B) Flow in the E – C pipeline = 1600.
∴ The free capacity = 2000 – 1600= 400.

(84 – 87) :

It is given that

(i) B and C are on the right side.

(ii) A is on the left side.

(iii) E and F are on either side of the corridor, but not opposite each other.

(iv) C and D are opposite each other.

(v) E is in the middle, either to the left side or the right side.

(vi) F and A are on the same side and F is further down the corridor than A.

From (ii), (iv) and (iii), A and F are on the left side and E is on the right side in the middle office.

From (iii) and (iv) and the above result, we get the following arrangement.
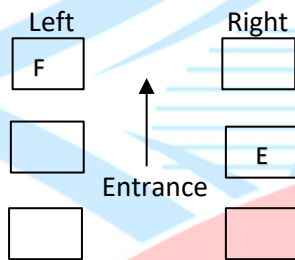
Since C and D are opposite each other, By using (i), we get the following arrangement.
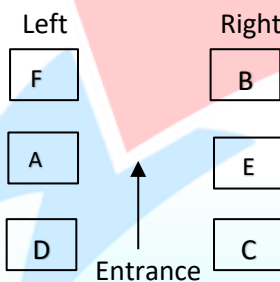
84. (C) If E sits in his office and faces the corridor, C's office will be to his left.

85. (D) E's office faces A's office.

86. (A) Only A is F's neighbour.

87. (B) D was directing the person to B's office.

(88 – 91):

Let us denote the binary codes as follows:

1 ← Left   Right → 0

The questions can answered observing the above diagrams.

88. (B) The code for S is 01110.

89. (D) There is no letter which is represented by 11001.

90. (C) The binary code for C is 110_2 and the binary code for R is 0011_2.

∴ C + R = 110_2 + 0011_2 = 1001_2

= 610 + 310 = 910 = 1001_2

91. (B) The binary value of L is 01111, whose decimal equivalent is 15.

N = 100002 = 1610

G = 100012 = 1710

N and G have values greater than L.

(92 – 94) :

From (iii), we know that neither P nor R is an advocate and Q is not a journalist.

From (iv), we know that neither S nor P is an industrialist.

From (iv), we know that R is not the horticulturist.

The above information is represented as follows.

	Hor	Phy	Jou	Ind	Adv
P				X	X
Q			X		
R	X				X
S				X	
T					

From (iii) and (iv), we know that Q and the journalist prefer coffee to tea and the two among S, P and the industrialist prefer coffee to tea, But according to (iii), two out of the five prefer coffee.

∴ The journalist is one of S and P and Q is the industrialist.

P and R prefer tea but neither of them is the advocate.

∴ P and R are the horticulturist and the physicist. Since R is not a horticulturist (from (v)), P is the horticulturist and R is the physicist.

∴ S is the journalist and R is the advocate.

∴ We get the following arrangement.

P = Horticulturist – Tea
Q = Industrial – Coffee
R = Physicist – Tea
S = Journalist – Coffee
T = Advocate - Tea

92. (A) P is the horticulturist.

93. (C) Q is the industrialist.

94. (D) All the choices contain the advocate – T.

95. (C) The code number is one less than the number of letters.
The word GOVERNMENT has ten letters. Hence, the code is 9.

(96 – 97):

96. Ans. (D)
(A) The middle term 'wild' is not distributed.
(B) One of the statements is particular. Hence, the conclusion cannot be universal.
(C) The term 'boxes' is not distributed in the statements, but it is distributed in the conclusion.
(D) This does not violate any syllogism rule.

97. Ans. (B)
(A) The middle term 'read' is not distributed.
(B) This does not violate any syllogism rule.
(C) The middle term 'dogs' is not distributed.
(D) The two statements are negative.

(98 – 100):

98. (B)
2384, 3629, 3756, 4298
Except 3629, all the others are even numbers.

99. (B)
325, 236, 178, 639
The unit digits in the other numbers is the sum of the hundreds and tens digits except in 236.

100. (D)
5698, 4321, 7963, 4232
Let us consider the sum of the digits in each case
5698 → 28, 4321 → 10, 7963 →25, 4232 → 11,
The sum of the digits is a composite number in all the others except in 4232.

101. (A) The one finger is referred to is the thumb, which has a different name i.e., ankle.

102. (B)

It is given that

(i) Sweet and hot → 617

(ii) Coffee is sweet →735
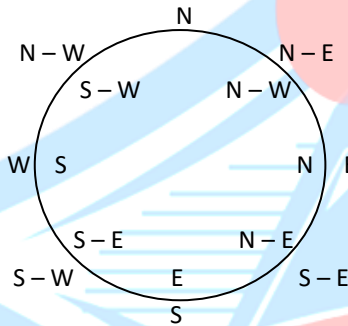
(iii) Tea is hot → 263

From (i) and (ii), '7' means 'sweet'.

From (ii) and (iii), '3' means 'is'.

By substituting these two in (ii), we get that '5' means 'coffee'.

From (i) and (iii) , '6' means 'hot'. And '536' means 'coffee is hot'.

103. (A) Let us indicate the actual direction outside the circle and the changed directions inside the circle.

West becomes North.

(104 - 105) :

104. (A)

The pattern is as given below

$(3 + 8) + 2 = 13$

$(8 + 13) + 3 = 24$

$(13 + 24) + 4 = 41$

$(24 + 41) + 6 = 70$

105.   (A)

4	23	60	121	.....
↓	↓	↓	↓	
$2^3 - 4$	$3^3 - 4$	$4^3 - 4$	$5^3 - 4$	$6^3 - 4 = 212$

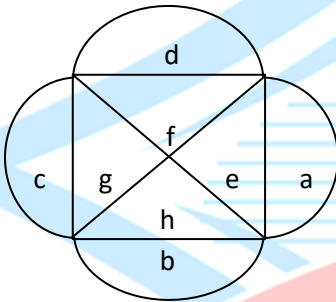**106.** (B)

The pattern followed is as shown below
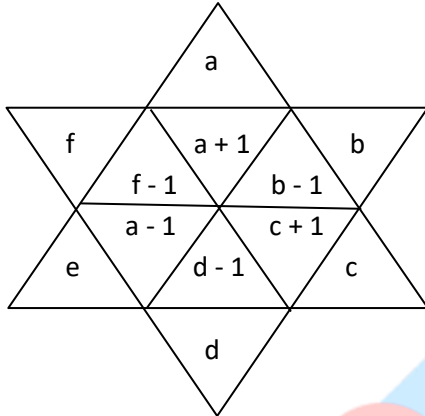
$\therefore 15 - 1 = 14$ is the missing number.

107. (A)

Let us denote the number of follows

The possible pattern followed is as:

$a = e \times$ the number next to it in an anticlockwise direction $+$ the number next to it in a clockwise direction

Similarly,

$b = f \times g + e, c = h \times e + g$ and $d = g \times h + f$

$\therefore c = 3 \times 2 + 4 = 10$

$\therefore$ 10 is the missing number.

108. (C)

Let the two numbers be x and y.

It is given that, $\frac{3}{4}x = \frac{2}{3}y$

$$\frac{x}{y} = \frac{8}{9}$$

Therefore, the ratio of the number is $8 : 9$.

109. (A)

It is given that,

(i) Q < P but Q > R

(ii) R < P but R > A

By combining (i) and (ii), we get A < R < Q < P

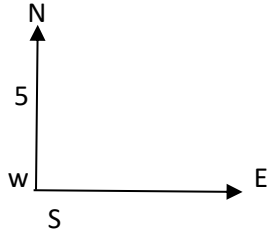$\therefore$ The ascending order of heights is ARQP.

110. (C)

The path walked by the person is as given follow:

∴ The direction that the person is walking in East.

111. (B)

The given series is an alternate series.

Decreasing order

4,   6,   3,   5,   2

Decreasing order
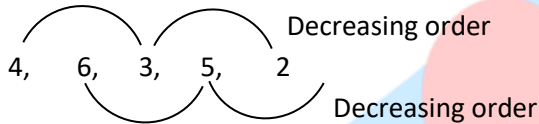
∴ The missing number is 4.

112. (D)

Words:	U	N	D	E	R	S	T	A	N	D
Codes:	1	2	3	4	5	6	7	8	2	3

By observing the repeated letters and the codes, It can be said that each digit is the code for the letter in the corresponding position in the word.

∴ The code for START is 67857.

113. (B) The given path can be shown as below where S is the starting point and F is the final position.
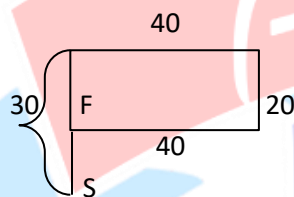
FS = 30 – 20 = 10 km.

114. (D)

If we draw circles touching each other we get an equilateral triangle on joining their centres as shown in the figure below.

Now if we add one more circle to it. We will get one more equilateral triangle on joining the centres of 2 of the previous circles and the new circle as shown in the figure below.

Proceeding in a similar manner, we can get a total of six such equilateral triangles or a regular hexagon on addition of 3 more circles.

Therefore, we can place 6 coins of the same size around a coin so that each one touches the central and the adjacent ones.

115.   (A)

Let the number of cards that A gets be n.

Now B gets one more that A, so B gets $n + 1$ cards.

D gets as many as B, so D gets $n + 1$ cards.

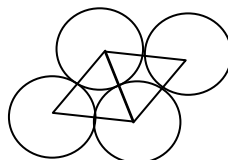C gets 5 more than D, so C gets $n + 6$ cards.

E gets 3 more than B, so E gets $n + 4$ cards.

Therefore, the number of cards that A, B, C, D and E get is as follows:

	A	B	C	D	E
Number of Cards	n	$n+1$	$n+6$	$n+2$	$n+4$

Hence, A gets the least.

116.   (B)

We have to find the area of ACD, where O is the centre of the circle.

$AC = 2r$ and $OD = r$
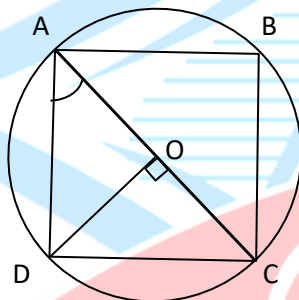
The area of the triangle $ACD = \frac{1}{2}(AC)(OD)$

$$= \frac{1}{2}(2r)(r) = r^2$$

[Note: From the figure, we take ABCD to be a square as it looks like a square and also 'cannot be determined' is not given as an answer option.]

117.   (C)

The capacity of the elevator or the number of persons that it can accommodate is either 12 adults or 20 children.

Therefore, 12 adults is equivalent to 20 children.

$\therefore$ 15 children will be equivalent to $\frac{15}{20}(12)$ adults

$$= 9 \text{ adults.}$$

Since the elevator has a capacity of 12 adults, 3 more adults can board the elevator along with 15 children.

118.   No answer

(A) June   July   August   September

   2   + 3 +   3   + 2   =   10

(B) April   May   June   July   August   September   October

   2   +   3   + 2 + 3 + 3   +   2   +   3   = 18

(C) April   May   June

   2   + 3   + 2 = 7

(D) October   November

   3   +   2   =   5

Only in (C) the number of odd days is 7.

∴ July starts with the same day as April.

But July has 31 days while April has only 30 days. Even in this case, it cannot be said that they have the same calendar.

No Answer.

119.   (A)

Numbers divisible by 8 and less than 100 can be listed down as follows:

1. 8   4.32   7.56   10.80
2. 16   5.40   8.64   11.88
3. 24   6.48   9.72   12.96

Of the above multiples of 8, only 8, 48, 80 and 88 have at least one digit as 8.

Thus, we have 4 such numbers.

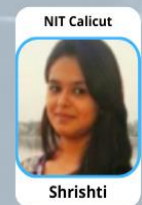**120.**   (D) In each column, the number in the middle is difference of the numbers on either side.

∴ the missing number is 65 − 14 = 51.

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