MCA 2010 – EXAMINATION PAPER

Direction for questions 1-5 :

Sentence Completion :

1. People seem to recal the brand of an advertised product, considering most favourably the most frequently advertised product; therefore, an advertisement that is …… in newspaper advertisement would be expected to be very ……. but, actually, it is not.
   1) dominant ……. Impressive
   2) frequent …….. bad
   3) unusual …….. effective
   4) new …….. rare

2. **Just as human beings who depend on each other, there are no ……. foliages.**
   1) Neglectable 2) Existing
   3) Conventional 4) Solitary

3. **The blueprints for the new automobile were …….at first glance. But the designer had been basically too conservative to ……previous standards of beauty.**
   1) striking …… flout
   2) impractical …….ignore
   3) inpeccable ……..dispel
   4) influential ……assess

4. **Because its average annual rainfall is only about four inches, one of the major tasks faced by the country has been to find ……..sources of water.**
   1) Discontinuous 2) Natural
   3) Supplementary 4) Pervasive

5. **Because the order in which the parts of speech appear in the sentences of a given languages is decided merely by custom, it is ……to maintain that every departure from that order constitutes a ……..of a natural law.**
   1) traditional ……..transformation
   2) conventional ……transgression
   3) necessary ……..prototype
   4) unjustifiable…….. violation

Direction for questions 6 – 12:

Give the analogy that matches with that in the question.

6. **ASSUAGE: SORROW::**
   1) retaliate : antipathy
   2) dampen : ardor
   3) entrust : reliability
   4) counsel : reluctance

7. **DIE : SHAPING**
   1) glue : attaching 2) anchor : sailing
   3) drill : boring 4) pedal : propelling

8. **PERFUNCTORILY : INSPECTION ::**
   1) insolently : vcneration
   2) andently : passion
   3) phlegmatically : composure
   4) surreptitiously : obsession

9. **FAWN : IMPERIOUSNESS :**
   1) equivocate : directness
   2) elaborate : originality
   3) boggle : imagination
   4) manipulate : repression

10. **CLOT : DISSOLVED ::**
    1) enthusiast : influenced
    2) carton : distorted
    3) crowd : dispersed
    4) chain : disengaged

11. **STUDY : LEARN ::**
    1) pervade : encompass
    2) search : find
    3) gather : win
    4) agree : keep

12. **APPLE : FRUIT :**
    1) egg : chicken 2) rung : chair
    3) wool : fabric 4) fuse : dynamite

Direction for questions 13-20:

Identify the antonym of the given word

13. **BOISTEROUS**
    1) Angry 2) Clever
    3) Frightened 4) Quiet

14. **JABBER**
    1) Tickle 2) Argue
    3) Storke 4) Speak slowly

15. **AMALGAMATE**

1) Separate 2) Fixate
3) Terminate 4) Calibrate

16. ENDORSE

1) provoke criticism 2) receive payment
3) submit unwillingly 4) oppose publicly

17. GIST

1) artificial manner 2) trivial point
3) informal procedure 4) eccentric method

18. ANARCHY

1) Courtesy 2) Hope
3) Order 4) Neutrality

19. BREACH

1) Garner 2) Solder
3) Keep silent 4) Move forward

20. EXTANT

1) Extensive 2) Extraneous
3) Extricable 4) Extinct

Direction for questions 21-25 :

Reading Comprehension – Answer the questions using the following passage

The function of capital markets is to facilitate an exchange of funds among all partticipants, ad yet in practice we find that certain participants are not on a par with others. Members of society have varying degrees of market strength in terms of information they bring to a transaction, as well as purchasing power and creditworthiness, as defined by lenders. For example, within minority communities, captial markets do not properly fulfill their functions; they do not provide access to the aggregate flow of funds in the United States. The financial system does not generage the credit or investment vehicles needed for underwriting economic development in minority areas. The problem underlying this dysfunction is found in a rationing mechanism affecting both the available alternatives for investment and the amount of financial resources. This creastes a distributive mechanism penalising members of minority groups because of their socioeconomic differences from others. The existing system expresses definite socially based investment preferences that result from the previous allocation of income and that influence the allocation of resources for the present and future.

The ststem tends to increase the inequality of income distribution. And, in the United States economy, a greater inequality of income distribution leads to a greater concentration of capital in certain types of investment. Most traditional financial-market analysis studies ignore financial markets' deficiencies in allocation because of analysts' inherent preferences for the simple model of perfect competition. Conventional financial analysis pays limited attention to issues of market structure and dynamics, relative costs of information, and problems of income distribution. Market participants are viewed as acting as entirely independent and homogeneous individuals with perfect foresight about capital – market behaviour. Also, it is assumed that each individual in the community at large has the same access to the market and the same opportunity to transact and to express the preference appropriate to his or her individual interest. Moreover, it is assumed that transaction costs for various types of financial instruments (stocks, bonds, etc.) are equally known and equally divided among all community members.

21. The passage states that traditional studies of the financial market overlook imbalances in the allocation of financial resources because

1) an optimum allocation of resources is the final result of competition among participants
2) those performing the studies choose an over simplified description of the influences on competition
3) such imbalances do not appear in the statistics usually complied to measure the market's behaviour

4) the analysis who study the market are unwilling to accept criticism of their methods as biased.

22. The author's main point is argued by

1) giving example that support a conventional generalisation.

2) showing that the view opposite to the author's is self-contradictory.

3) criticising the presuppositions of a proposed plan

4) showing that omissions in a theoretical description make it inapplicable in certain cases.

23. A difference in which of the following would be an example of inequality in transaction costs as alluded in the second part of the paragraph?

1) Maximum amounts of loans extended by a bank to businesses in different areas.

2) Fees charged to large and small investors for purchasing stocks.

3) Prices of similar goods offered in large and small stores in an area.

4) Stipends paid to different attorneys for preparing legal suits for damages.

24. Which one of following can be inferred about minority communities on the basis of the passage?

1) They provide a significant portion of the funds that become available for investment in the financial market

2) They are penalised by the tax system, which increases the in equality of the distribution of income between investors and wage earners.

3) They do not receive the share of the amount of funds available for investment that would be expected according to traditional financial-market analysis.

4) They are not granted governmental subsidies to assist in underwriting the cost of economic development.

25. According to the passage, a questionable assumption of the conventional theory about the operation of financial markets is that

1) creditworthiness as determined by lenders is a factor determining market access.

2) market stucture and market dynamics depend on income distribution

3) a scarcity of alternative sources of funds would result from taking socioeconomic factors into consideration.

4) those who engage in financial-market transactions are perfectly well informed about the market.

26. If F(l) = 2 and F(n) = F(n-1)+1/2, the value of F(101) is

1) 49 2) 50

3) 51 4) 52

27. Consider the following sequence of instruction

i. Set k = 999, i=1, p=0

ii. If k>I go to step iii else go to step v

iii. Replace i with 2i and p with p+1

iv. Goto step ii

v. Print p

If the above insructions are followed what will be printed at step v?

1) 1 2) 2

3) 10 4) 512

28. $\int_0^1 \frac{r}{1+r^2}$

1) 1 2) $\log\sqrt{2}$

3) log 2 4) log 1/2

29. If S is non-empty finite set with 'k' elements then the number of one-to-one functions from S onto S is given by

1) k! 2) 2^k

3) 2^{k+1} 4) k^k

30. Let 'g' be a function defined on the set of real numbers given by

$$g(n)\begin{cases}1 \; if \; x \; is \; rational\\ ex \; if \; x \; irrational\end{cases}$$

Then the set of numbers for which 'g' is continuous is given by

1) The empty set
2) (0)
3) (1)
4) Set of irrational numbers

31. For all real numbers 'x' and 'y' the expression $\frac{x+y+|x-y|}{2}$ is equal to

1) Maximum of x and y
2) Minimum of x and y
3) $|x+y|$
4) Average of x and y

32. Let 'B' be a non-empty bounded set of real numbers and let 'b' be the least upper bound of 'B'. If 'b' is not a member of 'B' then which one of the following is necessarily true?

1) B is closed
2) B is open
3) b is a limit point of B
4) No sequence of B converges in b

33. A drawer contains 2 blue, 4 red and 2 yellow socks. If 2 socks are to be randomly selected, what is the probability that they are of the same colour?

1) 2/7 2) 2/5
3) 2/3 4) 3/7

34. Let 'R' be the set of real numbers and let 'f' and 'g' be functions from 'R' into 'R'. The negation of the statement. "For each 's' in R there exists 'r' in 'R', such that if f(r)>0 then g(s) >0" is which one of the following?

1) For each 's' in R there does not exist an 'r' in R, such that if f(r) >0, then g(s)>0
2) For each 's' in R there exists 'r' in R, such that if f(r) >0, then g(s)≤0
3) There exists an 's' in R such that for each 'r' in R, f(r)>0, then g(s)≤0
4) For each 's' R there exists 'r' in R, such that if f(r)<0, then g(s)<0

35. If 'g' is a function defined on the open interval (a,b) then a<g(x)<x, for all x∈(a,b), then 'g' is

1) An unbounded function
2) A unconstant function
3) A non-negative function
4) A strictly increasing function

36. The value of $\sqrt{6+\sqrt{6+\sqrt{6+\cdots..to\ \infty}}}$ is

1) 3 2) 6
3) -2 4) -4

37. In how many ways can 5 persons sit on 8 chairs in a row?

1) 5! 2) 8!
3) $8C_5$ 4) $8P_5$

38. The number of integral terms in the expansion of $\left(5^{\frac{1}{2}}+7^{\frac{1}{8}}\right)^{1024}$ is

1) 129 2) 128
3) 130 4) 131

39. The greatest value of the function $y=\sin^2 x-20\cos x+1$ is

1) 102 2) -19
3) 21 4) 47/4

40. For the circle $x^2+y^2+3x+3y = 0$, which one of the following relations is true?

1) Centre lies on the x-axis
2) Centre lies on the y-axis
3) Centre lies on the origin
4) Circle passes through the origin

41. The value of $9^{1/3}, 9^{1/9}, 9^{1/27}$ – upto ∞, is

1) 1 2) 3
3) 9 4) 81

42. The value of the expression log tan 1°+log tan 2° + …. + log tan 89° is

1) Tan 1 2) 1
3) log (tan 1 + tan 1) 4) 0

43. The foot of perpendicular from the point (1,1) on the line x+y+2=0 is

1) (0,0)
2) (-1,-1)
3) (-2, -2)
4) None of the above

44. The number of solutions of the equation $x^2 + \frac{1}{x^2} = \cos\theta$ is

1) 0 2) 1
3) 2 4) 4

45. The line y = x

1) is a tangent to the circle $x^2+y^2 = 9$
2) does not meet the circle $x^2+y^2 = 9$
3) is a normal to the circle $x^2+y^2 = 9$
4) does not pass through the origin

46. If $\cos^{-1}x+\cos^{-1}y+\cos^{-1}z = 0$, then $x^{100}+y^{100}+z^{100} - \frac{9}{x^{101}+y^{101}+z^{101}}$ is equal to

1) 0
2) 6
3) 3
4) None of the above

47. The maximum slope of the curve $-x^3+6x^2+2x+1$ is

1) 14 2) 16
3) -19 4) 13

48. The differential equation of the family of straight lines y = mx+a/m is

1) $yy = x(y)^2+a$ 2) $yy = x(y^2)/a$
3) yy = xy+a 4) yy = xy/a

49. A letter is faken out at random from the word ASSISTANT and another is taken out from the word STATISTICS. The chance that the two selected letters are identical is

1) 19/45 2) 19/90
3) 89/90 4) 1/90

50. The value of the expression $\frac{1}{(\log_w xyz)+1} + \frac{1}{(\log_x wyz)+1} + \frac{1}{(\log_y wxz)+1} + \frac{1}{(\log_z wxy)+1}$ is

1) 1 2) 0
3) 2 4) 4

51. If the roots of the equation $x^2-3x+b = 0$ are the first and second terms of G.P. and those of $x^2-12x+a = 0$ are third and fourth terms, then a and b are

1) 2, 32 2) 2, -32
3) 32, 2 4) 32, -2

52. The function $f(x) = \frac{x}{1+x^2}$ is

1) Not one – to – one
2) One – to – one
3) Not continuous at x = 0
4) Not derivable at x = 0

53. The number of common tangents to the circles $x^2+y^2+2x+8y-23 = 0$ $x^2+y^2-4x-10y-19 = 0$ are

1) 1 2) 2
3) 3 4) 4

54. If T_p, T_q, T_r are the pth, qth and rth terms of an A.P. then $\det\begin{bmatrix} T_q & T_p & T_r \\ p & q & r \\ 1 & 1 & 1 \end{bmatrix}$ is equal to

1) 1 2) -1
3) 0 4) pqr

55. If the equations $x^2+ax+b = 0$ and $x^2+bx+a = 0$ $(a\neq b)$ have a common root, then

1) a-b = 1 b) a+b = -1
3) a+b = 0 d) a+b = 0

56. Period of $|\sin 2x|$ is

1) p/4 2) p/2
3) p 4) 2p

57. The digits 1, 2, 3, 4, 5, 6, 7, 8, and 9 are written in random order to form a nine-digit number. The probability that this number is divisible by 4 is

1) 1/9
2) 2/9
3) 1
4) None of the above

58. Eccentricity of the ellipse $8x^2+9y^2 = 72$ is

1) 2/3 2) ¾
3) 1/3 4) 1/2

59. If 1, ω, ω^2 are cube roots of unity, then $\frac{\alpha+\beta\omega+\gamma\omega^2+\delta\omega^2}{\beta+\alpha\omega^2+\gamma\omega+\delta\omega^2}$ =

1) ω^2 2) ω
3) – ω 4) 1

60. The number of lines with slope 5 having intercept of length d between the coordinate axis is

1) 1 2) 2
3) 4 4) Infinite

61. **The equation of smallest degree with real co-efficient having 2+3i as one of the root is**

1) $x^2+4x+13 = 0$ 2) $x^2+4x-13 = 0$
3) $x^2-4x+13 = 0$ 4) $x^2-4x-13 = 0$

62. **If $\frac{\sin(x+y)}{\sin(x-y)} = \frac{a+b}{a-b}$, $\frac{\tan x}{\tan y}$ is equal to**

1) b/a
2) a/b
3) ab
4) None of the above

63. **The domain of the function $f(x) = \frac{1}{(x^2-1)\sqrt{1-x^2}}$ is**

1) All real numbers except +1 or -1
2) $(-\infty, -1) \cup (1, \infty)$
3) (-1, 1)
4) (0, 1)

64. **If $A+B = i\frac{\pi}{4}$, then**

1) (1+tan A) (I/tan B) = 2
2) (I+tan A) (I+tan B) = 2
3) (I+tan A) (I+tan B) = 4
4) (I/cot A) (cot B/1) = 2

65. **If m is an integer, then i^{4m+3} equals**

1) i 2) –i
3) 1 4) -1

66. **If the polynomial x^3+5x^2-2 is divided by (x-1) the remainder must be**

1) 4 2) -4
3) 3 4) 1

67. **If a, b, c are in arithmetic progression then the straight the ax+by+c = 0 passes through a fixed point whose coordinates are given by**

1) (0, 1) 2) (-1, -1)
3) (c, a) 4) (1, -2)

68. **If $^nC_{12} = {}^nC_8$ find, $^{22}C_n$**

1) 462 2) 240
3) 232 4) 20

69. **If $x+\frac{1}{x} = 2$ then $x^3+\frac{1}{x^3}$ is equal to**

1) 11 2) 9
3) 6 4) 2

70. **The sum of first n terms of the series 1+(1+3)+(1+3+5)+ ? is**

1) n^2 2) n^3
3) n(n+1) 4) n(n+3)

71. **Atul made a garland using N individual beads together in the repeating pattern red, green, white, blue and yellow. If the garland starts with a red bead and ends with a white bead, then N could be equal to**

1) Rs. 16 2) Rs. 32
3) Rs. 41 4) Rs. 68

72. **Seven friends decided to have a party. Six of them contributed Rs. 10 each and the seventh one contributed Rs. 3 more than the average of all the seven. The total amount collected for the party was**

1) Rs. 63 2) Rs. 63.50
3) Rs. 73 4) Rs. 73.50

73. **A thief running at 8km/hour is chased by a policemen whose speed is 10km/hour. If the thief is 100 metre ahead of the policeman, then the time required for the policeman to catch the thief will be**

1) 10 minutes 2) 6 minutes
3) 3 minutes 4) 2 minutes

74. **Let $a_1 = 97$, $a_2 = 2/a_1$, $a_3 = 3/a_2$, $a_4 = 4/a_3$, …… $a_8 = 8/a_7$,. The product a_1, a_2, …..a_8 is**

1) 184 2) 8!
3) 97*8! 4) 12!

75. **The value of 1+1(1)!+2(2)!+3(3)!+……999(999)! Is**

1) (1000)! +1 2) (1000)!-1
3) (1001)! 4) (1000)!

76. **An AND gate has four inputs A, B, C, D. The input that produces an output 1 is**

1) 0000 2) 00001
3) 1000 4) 1111

77. **Consider the following algorithm**

1. sum ← 0
2. FOR n ←1 TO 999 BY 2
a. sum <- sum + n

End of algorithm
This algorithm gives sum of
1) 1, 3, 5, 7, ……., 999
2) 1, 3, 5, 7, ……., 997
3) 1, 3, 5, 7, ……., 1001
4) 1, 3, 5, 7, ……., 1000

78. If x = 4+25% of 8+35% of 400, then x+1/5th of x =
1) 173.2 2) 179.2
3) 175.2 4) 180

79. The octal equivalent of decimal $(13.65)_{10}$ is
1) 15.514 2) 51.514
3) 51.415 4) 15.415

80. The result if binary addition 111011+100001 is
1) 111100 2) 1011101
3) 1101010 4) 1011100

81. Which one of the following is not a procedural language?
1) COBOL 2) FORTRAN
3) PASCAL 4) LISP

82. What will be the output of the following algorithm?
STEP 1 : Start
STEP 2 : Let a = 1
STEP 3 : Print a
STEP 4 : Let b = 1
STEP 5 : Print b
STEP 6 : Let i = 5
STEP 7 : Let the value of c = a+b
STEP 8 : Let the value of i = i/1
STEP 9 : Let the value of i = 0 then goto STEP 14
STEP 10 : Print the value of c
STEP 11 : Let the value of a = b
STEP 12 : Let the value of b = c
STEP 13 : Goto STEP 7
STEP 14 : Stop
1) 112358 2) 11235
3) 11235813 4) 112355

83. The gray code value of the following binary code number $(1100101)_2$ is
1) 1011010 2) 1010111
3) 0011010 4) 1000101

84. Find the odd one out
1) LINUX 2) SQL
3) UNIX 4) OS/2

85. The truth table shown below represents

A	B	O/P
0	0	1
0	1	1
1	0	1
1	1	0

1) AND gate 2) NOR gate
3) NAND gate 4) EX-NOR gate

86. What would be the output of the following program?
Main ()
{
Char str [ ] = "Part-time musicians are semiconductors";
int a = 5;
printf ("a>10? % 50s: %s", str);
}
1) Part-time musicians are semiconductors
2) Part-time musicians are semiconductors
3) Error
4) None of the above

87. The hexadecimal number A0 has decimal value
1) 80 2) 100
3) 160 4) 256

88. The binary representation of hexadecimal number C3 is
1) 1111 2) 110011
3) 111100 4) 11000011

89. The value of 2^5 in octal system is
1) 40 2) 50
3) 200 4) 400

90. Consider the algorithm
1. x ← 1
2. y ← 0
3. z ← 2
4. For i ← 7 to 12 BY 2
a. X ← Y
b. Y ← Z

c. Z ← X
d. P ← X – Y + Z
e. RETURN P
End of algorithm
What is the output of the algorithm?
1) -2, 2, -2
2) -2, 2, 4
3) -2, 4, -2
4) None of the above

91. If 12 men working 2 hours a day take 10 days to complete a job, how long will 8 men working 6 hours a day take to do the same work?
1) 5 2) 8
3) 12 4) 3

92. In regard to NAND gate the following statement are made:
1. It is equivalent to an AND gate followed by an inverter
2. If all the inputs are low, the output is low
3. If all the inputs are high the output is low
4. NAND operation on two elements is equivalent to OR operation on them. Of these, the correct statements are
1) 1, 2, 3
2) 1, 3
3) 2, 3
4) None of the above

93. By default any number is treated as
1) Float
2) Double
3) Long double
4) Depends on the memory model of the computer

94. The binary equivalent of 5.375 is
1) 101.101110111
2) 101.011
3) 101011
4) None of the above

95. We want to round off x, a float, to an int value. The correct way to do so would be
1) y=(int) (x+0.5)
2) y=int (x+0.5)
3) y=int (x) = 0.5
4) y=int {(int)(x+0.5)}

96. What would be the output of the following program?
Main ()
{float a = 0.7;
If (a<0.7)
Printf("C");
Else
Printf("C++");
1) C
2) C++
3) Error
4) None of the above

97. In the following code in which order the functions would be called?
A = {f1 (23, 14) * f2 (12/4)} + f3 ();
1) f1, f2, f3
2) f3, f2, f1
3) Order may vary from compiler to compiler
4) f2, f1, f3

98. The time taken by a disk to rotate once is known as
1) Maximum access time
2) Maximum latency time
3) Maximum rotation time
4) Maximum spindle time

99. The method in which data from I/O devices to memory and vice-versa is transmitted without the help of C.P.U. is known as
1) Direct memory access
2) Multiplexing
3) Data switching
4) Demand paging

100. The program that translates a high level language to machine language of one machine and runs it on another machine is known as
1) Multiple compiler 2) Dual translator

3) Cross translator 4) Dual interpreter

MCA 2010 – ANSWERS

1……1	2……4	3……1	4…….3	5…….4	6…….2	7……3	8……1	9……1	10……3
11……2	12……3	13……4	14…..4	15……1	16……4	17…..2	18…..3	19….2	20…..4
21……2	22…..4	23…..2	24…..3	25…..4	26…..4	27…..3	28…..2	29…..1	30…..1
31…..1	32…..3	33……1	34…..1	35…..2	36…..1	37…..4	38…..1	39…..2	40…..4
41…..2	42…..4	43…..2	44…..4	45…..3	46…..1	47…..1	48…..1	49…..3	50…..1
51…..3	52…..1	53…..2	54…..3	55…..2	56…..2	57…..2	58…..3	59…..2	60…..2
61…..3	62…..2	63……3	64…..2	65…..2	66…..1	67…..4	68….*	69…..4	70…..1
71…..4	72…..4	73…..3	74…..4	75…..4	76…..4	77….1	78…..3	79…..2	80…..4
81…..4	82…..1	83…..2	84…..2	85……3	86…..1	87…..3	88…..4	89…..1	90…..3
91…..1	92…..2	93…..2	94…..2	95……1	96…..1	97…..3	98…..3	99…..1	100….1

MCA 2010 – DETAILED SOLUTIONS

26. (4)

$F(1) = 2$

$F(n) = F(n-1)+\frac{1}{2}$

$F(2) = F(1)+\frac{1}{2} = 2 + \frac{1}{2}$

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

$F(4) = F(3)+\frac{1}{2} = \left(2 + \frac{2}{2}\right)+\frac{1}{2} = 2 + \frac{3}{2}$

$F(5) = F(4)+\frac{1}{2} = \left(2 + \frac{3}{2}\right)+\frac{1}{2} = 2 + \frac{4}{2}$

$\therefore F(101) = 2+\frac{100}{2}$

$= 2+50 = 52$

28. (2)

$\text{Let } I = \int_0^1 \frac{rdr}{1+r^2}$

Put $t = 1+r^2$

$dt = 2rdr$

$\Rightarrow \frac{dt}{2} = rdr$

When $r = 0, t = 1+0^2 = 1$

When $r = 1, t = 1+1^2 = 2$

$\therefore I = \frac{1}{2}\int_1^2 \frac{dt}{t} = \frac{1}{2}[\log t]^2_1$

$= \frac{1}{2}[\log 2 - \log 1]$

$= \frac{1}{2}\log 2 \; [\because \log 1 = 0]$

$= \log 2^{1/2}$

$= \log \sqrt{2}$

29. (1)

Let S be a non-empty set with k elements, Then the number of one-to-one functions from S on to S is ${}^kP_k = k!$

30. (1)

$$g(x) = \begin{cases} 1 \; if \; x \; is \; rational \\ e^x \; if \; x \; is \; irrational \end{cases}$$

Then the set for which g(x) is continuous is the empty set.

31. (1)

Let x=2; y=3

Then $\frac{x+y+|x-y|}{2} = \frac{2+3+|2-3|}{2}$

$= \frac{5+1}{2} = 3$

$= \max\{2, 3\} = \max\{x, y\}$

Let x = -2; y = -3

Then $\frac{x+y+|x-y|}{2} = \frac{-2-3+|-2+3|}{2}$

$= \frac{-5+1}{2} = \frac{-4}{2} = -2$

$= \max\{x, y\}$

Let x= -2; y = 3

Then $\frac{x+y+|x-y|}{2} = \frac{-2+3+|-2-3|}{2}$

$= \frac{1+5}{2} = 3$

$= \max\{x, y\}$

$\therefore \frac{x+y+|x-y|}{2}$ = maximum of x and y

32. (3)

b is a limit point of B.

33. (1)

$\text{Required probaility} = \frac{{}^2C_2 + {}^4C_2 + {}^2C_2}{{}^8C_2}$

$= \frac{1+\frac{4*3}{1*2}+1}{\frac{8*7}{1*2}} = \frac{1+6+1}{28} = \frac{8}{28} = \frac{2}{7}$

34. (1)

Negation of the given statement is for each 'S' in R there does not exist an 'r' in R such that if f(r)>0, then g(s)>0.

35. (2)

Let g be a constant function

And $g(x) = c \epsilon (a, b)$

$\Rightarrow g(c) = c$

Given a <g(x)<x

For c,

a<g(c)<c

⇒ c<c

Which is a contradiction

Therefore g(x) is a unconstant function.

36. (1)

$$\text{Let } x = \sqrt{6+\sqrt{6+\sqrt{6+\sqrt{6+\cdots}}}}$$

$$\Rightarrow x^2 = 6+\sqrt{6+\sqrt{6+\sqrt{6+\sqrt{6+\cdots}}}}$$

$\Rightarrow x^2 = 6+x$

$\Rightarrow x^2-x-6 = 0$

$\Rightarrow x^2-3x+2x-6 = 0$

$\Rightarrow x(x-3)+2(x-3) = 0$

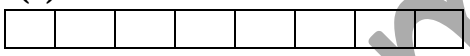
$\Rightarrow (x+2)(x-3) = 0$

$\therefore x = -2, 3$

Since x is a square root of some value implies x is not negative.

$\therefore x = 3$

37. (4)



First person can sit in one of eight chairs.

∴ Number of ways = 8

Second person can sit in one of the seven chairs.

∴ Total number of ways = 7

Continue in this ways

∴ Total ways = 8*7*6*5*4

$= 8p_5$

38. (1)

In $(a+b)^n$

$$T_{r+1} = {}^nC_r\, a^{n-r}\, b_r$$

$$\text{In } \left(5^{\frac{1}{2}} + 7^{\frac{1}{8}}\right)^{1024}$$

$$T_{r+1} = {}^{1024}C_r \left(5^{\frac{1}{2}}\right)^{1024-r}\left(7^{\frac{1}{8}}\right)^r$$

$$= {}^{1024}C_r\, 5^{\frac{1024-r}{2}} 7^{\frac{r}{8}} \quad \ldots..(1)$$

T_{r+1} is an integer if $\frac{1024-r}{2}, \frac{r}{8}$ are integers

Now, LCM of {2, 8} = 8

(1) is an integer if r is a multiple of 8

i.e., r=0, 8, 16, 24, ….. 1024

$\therefore$ Total $= 1+\frac{1024}{8}$

$= 1+128 = 129$

39. (2)

$Y = \sin^2 x - 20\cos x + 1$

$= (1-\cos^2 x) - 20\cos x + 1$

$= -\cos^2 x - 20\cos x + 2$

$\geq -1-20+2$

$[\because \cos x \leq 1 \Rightarrow -\cos x \geq -1]$

$= -19$

40. (4)

$X^2+y^2+3x+3y = 0$

Put x=0; y=0

⇒ 02+92+3(0)+3(0)

= 0

⇒ Circle passes through the origin (0, 0)

41. (2)

$9^{\frac{1}{3}}\, 9^{\frac{1}{9}}\, 9^{\frac{1}{27}} \ldots\ldots\infty$

$9^{\frac{1}{3}+\frac{1}{9}+\frac{1}{27}} \ldots\ldots\infty$

Formula:

$a+ar+ar^2+\ldots = \frac{a}{1-r}$

$\frac{1}{3}+\frac{1}{9}+\frac{1}{27}+\ldots = \frac{1}{3}+\frac{1}{3^2}+\frac{1}{3^3}+\ldots..$

$$= \frac{\left(\frac{1}{3}\right)}{1-\frac{1}{3}} = \frac{\left(\frac{1}{3}\right)}{\left(\frac{2}{3}\right)} = \frac{1}{3} * \frac{3}{2} = \frac{1}{2}$$

$\therefore (1) \Rightarrow 9^{\frac{1}{3}+\frac{1}{9}+\frac{1}{27}+\cdots} = 9^{\frac{1}{2}} \sqrt{9} = 3$

42. (4)

Log tan 1°+log tan 2°+….+ log tan 89°

= log(tan 1°, tan 2°+….tan 89°) …..(1)

Now cot θ = tan (90-θ)

Tan 89 = tan (90-1)

= cot 1

Similarly

tan 88 = cot 2

tan 87 = cot 3

.

.

.

tan 46 = cot 44

∴ (1) ⇒

log(tan 1 tan2+ ….tan89)

= log (tan1 tan2+….tan44 tan45 cot44….cot 1)

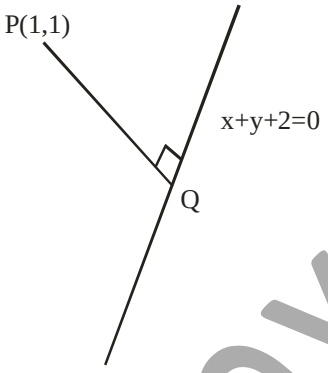
= log (tan1cot1)(tan2cot2)…(tan44cot44) tan45)

= log tan45 [∴ tanθ cotθ = 1]

= log 1

= 0

43. (2)



Formula:

Equation of perpendicular line to ax+by+c = 0 is bx-ay+k=0

∴ Equation of the line perpendicular to x+y+2 =0 is x-y+k = 0 …..(1)

This process through (1, 1)

⇒ 1-1+k = 0

⇒ k = 0

∴ (1) ⇒ x-y = 0

Let Q be the foot of the perpendicular from (1, 1) Then Q is the point of intersection of the lines x+y+2 = 0 and x-y = 0

Solving

x+y +2 = 0

x-y = 0

⇒ 2x = -2

X = -1

∴ y = -1

∴ Foot of the perpendicular Q is (-1, -1)

44. (4)

$\mathbf{x^2+\frac{1}{x^2} = \cos\theta}$

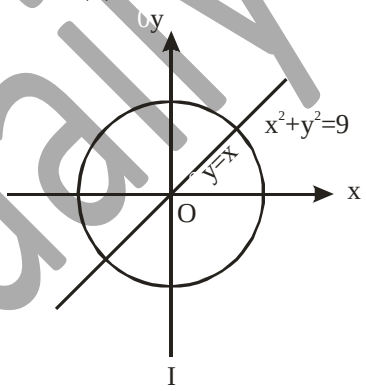
$\mathbf{\frac{x^4+1}{x^2} = \cos\theta}$

$\mathbf{X^4+1 = x^2\cos\theta}$

$\mathbf{x^4-x^2\cos\theta+1 = 0}$

Given equation is a biquadratic equation. Therefore it has 4 roots.

45. (3)



Any line passing through the centre of a circle is a normal to the circle.

y = x passes through origin.

Also center of the circle $x^2+y^2 = 9$ is the origin (0, 0)

Therefore y=x is a normal to the circle $x^2+y^2 = 9$

46. (1)

$\cos^{-1}x+\cos^{-1}y+\cos^{-1}z = 0$

$\Rightarrow \cos^{-1}x = 0; \cos^{-1}y = 0; \cos^{-1}z = 0$

⇒ cos 0 = x

⇒ x = 1

Similarly y = 1; z = 1

Now $x^{100}+y^{100}+z^{100}-\frac{9}{x^{101}+y^{101}+z^{101}}$

$= 1^{100}+1^{100}+1^{100}-\frac{9}{1^{100}+1^{100}+1^{100}}$

$= 1+1+1-\frac{9}{1+1+1} = 3-\frac{9}{3} = 0$

47. (1)

$y = -x^2+6x^2+2x+1$

$\frac{dy}{dx} = -3x^2+12x+2$

Let $\frac{dy}{dx} = f(x)$

Slope is $\frac{dy}{dx}$. To find the maximum slope we have to find the maximum value of f(x).

Now $f(x) = -3x^2+12x+2$

$f'(x) = -6x+12$

$f''(x) = -6$

$\Rightarrow f'(x) = 0$

$\Rightarrow -6x+12 = 0$

$\Rightarrow -6x = -12$

$\therefore x=2$

When x=2, $f''(x) = -6<0$

$\therefore$ x=2 gives maximum value of f(x)

$\therefore$ maximum value of f(x)

$= -3(2)^2+12(2)+2$

$= -3*4+24+2$

$= -12+26 = 14$

48. (1)

$y = mx+\frac{a}{m}$

$y' = m$

$\therefore y = y'x+\frac{a}{y'}$

$= \frac{(y')^2x+a}{y'}$

$\Rightarrow yy' = x(y')^2+a$

49. (3)

Required chance $= \frac{89}{90}$

50. (1)

$\frac{1}{(\log_w xyz)+1}+\frac{1}{(\log_x wyz)+1}+\frac{1}{(\log_y wxz)+1}+\frac{1}{(\log_z wxy)+1}$

$= \frac{1}{\log_w xyz+\log_w w}+\frac{1}{\log_x wyz+\log_x x}+\frac{1}{\log_y wxz+\log_y y}+\frac{1}{\log_z wxy+\log_z z}$

$[\because \log_a a = 1]$

$= \frac{1}{\log_w xyzw}+\frac{1}{\log_x xyzw}+\frac{1}{\log_y xyzw}+\frac{1}{\log_z xyzw}$

$\text{Log}_{xyzw}w+\log_{xyzw}x+\log_{xyzw}y+\log_{xyzw}z$

$\left[\because \frac{1}{log_m n} = log_n m\right]$

$= \log_{xyzw} = xyzw$

$= 1 \qquad [\because \log_a a = 1]$

51. (3)

Consider the G.P.

$x, xr, xr^2, xr^3, \ldots$

Given x, xr are roots of $x^2-3x+b=0$

$\Rightarrow x+xr = 3 \Rightarrow x(1+r) = 3 \quad \ldots\ldots(1)$

$x.xr = b \Rightarrow x^2r = b \quad \ldots\ldots(2)$

xr^2 and xr^3 are roots of

$x^2-12x+a = 0$

$\Rightarrow xr^2+xr^3 = 12$

And $xr^2.xr^3 = a$

$\Rightarrow xr^2(1+r) = 12 \quad \ldots\ldots(3)$

And $x^2r^3 = a \quad \ldots\ldots(4)$

$\frac{(3)}{(1)} \Rightarrow \frac{xr^2(1+r)}{x(1+r)} = \frac{12}{3}$

$\Rightarrow r^2 = 4$

$\therefore r = 2$

$(1) \Rightarrow x(1+2) = 3$

$\Rightarrow 3x = 3$

$\therefore x = 1$

Now $(2) \Rightarrow x^2r = b$

$\Rightarrow 1^2 *2 = b$

$\Rightarrow b = 2$

$(4) \Rightarrow a = x^2r^5$

$= 1^2 * 2^5 = 32$

$\therefore a = 32$

52. (1)

Let $f(x) = \frac{x}{1+x^2}$

Now

$$f(2) = \frac{2}{1+2^2} = \frac{2}{1+4} = \frac{2}{5}$$

$$f\frac{1}{2} = \frac{\frac{1}{2}}{1+\left(\frac{1}{2}\right)^2} = \frac{\frac{1}{2}}{1+\frac{1}{4}}$$

$$= \frac{\left(\frac{1}{2}\right)}{\frac{4+1}{4}} = \frac{\left(\frac{1}{2}\right)}{\left(\frac{5}{4}\right)}$$

$$= \frac{1}{2} * \frac{4}{5} = \frac{2}{5}$$

$\therefore f(2) = f\left(\frac{1}{2}\right)$

$\therefore$f(x) is not one-to-one.

53. (2)

Consider $x^2+y^2+2x+8y-23 = 0$

Center = (-1, -4)

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

$= \sqrt{1 + 16 + 23}$

$= \sqrt{40}$

Consider $x^2+y^2-4x-10y-19 = 0$

Center = (2, 5)

Radius = $\sqrt{2^2 + 5^2 - (19)}$

$= \sqrt{4 + 25 + 9}$

$= \sqrt{48}$

Distance between the centers

$= \sqrt{(2+1)^2 + (5+4)^2}$

$= \sqrt{3^2 + 9^2}$

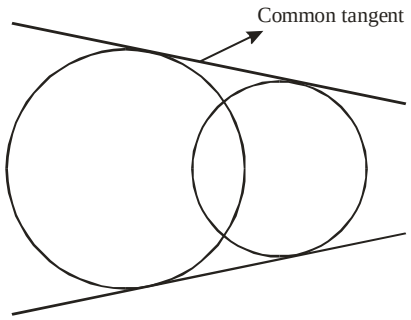
$= \sqrt{9 + 81} = \sqrt{90}$

Clearly $\sqrt{90} < \sqrt{40} + \sqrt{48}$

i.e., Distance between centers < sum of radii

$\therefore$ The circles intercet at 2 points

$\therefore$ There exists 2 common tangents.



54. (3)

$T_p = a+(p-1)d$

$T_q = a+(q-1)d$

$T_r = a+(r-1)d$

Now $\begin{vmatrix} T_p & T_q & T_r \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix}$

$= \begin{vmatrix} a+(p-1)d & a+(q-1)d & a+(r-1)d \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix}$

$= \begin{vmatrix} \boldsymbol{a} & \boldsymbol{a} & \boldsymbol{a} \\ \boldsymbol{p} & \boldsymbol{q} & \boldsymbol{r} \\ \boldsymbol{1} & \boldsymbol{1} & \boldsymbol{1} \end{vmatrix} + \begin{vmatrix} (p-q)d & (q-1)d & (r-1)d \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix}$

$= a \begin{vmatrix} \boldsymbol{1} & \boldsymbol{1} & \boldsymbol{1} \\ \boldsymbol{p} & \boldsymbol{q} & \boldsymbol{r} \\ \boldsymbol{1} & \boldsymbol{1} & \boldsymbol{1} \end{vmatrix} + \boldsymbol{d} \begin{vmatrix} (p-1) & (q-1) & (r-1) \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix}$

$= 0+d \begin{vmatrix} (p-1) & (q-1) & (r-1) \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix} R_1 \to R_1+R_3$

$= \begin{vmatrix} p & q & r \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix}$

$= d(0) = 0$

55. (2)

Let a be a common root of $x^2+ax+b = 0$ and $x^2+bx+a = 0$

Then $\alpha^2+a\alpha+b = 0$ ……..(1)

$\alpha^2+b\alpha+a = 0$ …….(2)

(1)-(2)

$\Rightarrow \alpha(a-b)+(b-a) = 0$

$(a-b)(\alpha-1) = 0$

$a-b = 0$ (or) $\alpha=1$

$a-b = 0 \Rightarrow a\neq b$

but $a\neq b$ (given)

$\therefore \alpha = 1$

$\therefore (1) \Rightarrow 1^2+a.1+b = 0$

$\Rightarrow a+b = -1$

56. (2)

Formula :

If f(x) has period T then period of f(kx) = $\frac{T}{K}$

Period of $|\sin x|$ isπ

$\therefore$ Period of $|\sin 2x|$ is $\frac{\pi}{2}$

57. (2)

A number is divisible by 4

if the last 2 digits are divisible by 4.

S = {11, 12, 13, …19, 21, 22, …29, 31, 32, ….,39, …,91, 92, ….99}

n(S) = 81

A = {12, 16, 24, 28, 32, 36, 44, 48, 52, 56, 64, 68, 72, 76, 84, 88, 92, 96}

n(A) = 18

$\therefore$Required probaility = $\frac{18}{81} = \frac{2}{9}$

58. (3)

Given ellipse

$8x^2+9y^2 = 72$

$\Rightarrow \frac{x^2}{9} + \frac{y^2}{8} = 1$

$a^2 = 9$; $b^2 = 8$

Now $b^2 = a^2(1-e^2)$

$\Rightarrow 8 = 9(1-e^2)$

$\Rightarrow 1-e^2 = \frac{8}{9}$

$\Rightarrow e^2 = 1-\frac{8}{9} = \frac{1}{9}$

$\therefore e = \frac{1}{3}$

59. (2)

w is cubic root of unity $\Rightarrow\omega^3=1$

Now $\frac{\alpha+\beta\omega+\gamma\omega^2+\delta\omega^3}{\beta+\alpha w^2+\gamma\omega+\delta\omega^2}$

$= \frac{\alpha\omega^2+\beta\omega+\gamma\omega^2+\delta\omega^3}{\beta+\alpha\omega^2+\gamma\omega+\delta\omega^2}$

$= \frac{\omega(\alpha\omega^2+\beta+\gamma\omega+\delta\omega^2)}{(\beta+\alpha\omega^2+\gamma\omega+\delta\omega^2)}$

$= \omega$

60. (2)

There are two lines.

61. (3)

2+3i is a root

$\Rightarrow$ 2-3i is also a root

Sum = (2+3i)+(2-3i)

= 4

Product = (2+3i)(2-3i)

= 4+9 = 13

$\therefore$ Required equation

= x^2-(sum of roots) x+ product of roots = 0

$\therefore x^2-4x+13 = 0$

62. (2)

$$\frac{\sin(x+y)}{\sin(x-y)} = \frac{a+b}{a-b}$$

$$\frac{\sin X\cos y+\cos x\sin y}{\sin x+\cos y-\cos x\sin y} = \frac{a+b}{a-b}$$

a = sinx cosy

b = cosx siny

$$\frac{a}{b} = \frac{\sin x\cos y}{\cos x\sin y}$$

$$= \tan x\cot y$$

$$= \frac{\tan x}{\tan y}$$

$$\therefore \frac{\tan x}{\tan y} = \frac{a}{b}$$

63. (3)

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

$x^2-1\neq 0$

$\Rightarrow x \neq \pm 1$

Also $\sqrt{1-x^2} > 0$

$\Rightarrow 1- x^2 > 0$

$\Rightarrow x^2 < 1$

$\Rightarrow -1 < x < 1$

$\therefore x \in (-1, 1)$

64. (2)

$A+B = \frac{\pi}{4}$

$\text{Tan } (A+B) = \tan \frac{\pi}{4} = 1$

$\Rightarrow \frac{\tan A+\tan B}{1-\tan A \tan B} = 1$

$\Rightarrow \tan A+\tan B = 1-\tan A \tan B$

$\Rightarrow \tan A \tan B = 1-\tan A - \tan B$

Now

$(1+\tan A)(1+\tan B)$

$= 1+\tan B+\tan A+\tan A \tan B$

$= 1+\tan B+\tan A+1-\tan A-\tan B$

$= 2$

65. (2)

$i^4 = 1$

$i^{4m} = (i^4)^m = 1$

Now

$i^{4m+3} = i^{4m} i^3$

$= i^3 = -i$

66. (1)

Let $f(x) = x^3+5x^2-2$

Formula:

If f(x) is divided by ax+b then

$\text{Remainder} = f\left(-\frac{b}{a}\right)$

$\therefore$ when f(x) is divided by x-1

Remainder = f(1)

$= 1^3+5(1)^2-2 = 4$

67. (4)

Given straight line is $ax+by+c = 0$ …(1)

a,b,c are in A.P.

$b = \frac{a+c}{2}$

$2b = a+c$

$a-2b+c = 0$

$a.1+b(-2)+c = 0$ …(2)

In equation (1) if we take x=1 and y=-2

We get equation (2)

$\therefore$(1, -2) is a point on the line ax+by+c = 0

68. (*)

Formula : ${}^nC_r = {}^nC_{n-r}$

${}^nC_{12} = {}^nC_8$

$\therefore 12 = n-8$

$\Rightarrow n = 20$

Now ${}^{22}C_n = {}^{22}C_{20}$

$= {}^{22}C_{22-20} = {}^{22}C_2$

$= \frac{22*21}{1*2}$

$= 231$

69. (4)

$\left(x+\frac{1}{x}\right)^3 = x^3+\frac{1}{x^3}+3x\frac{1}{x}\left(x+\frac{1}{x}\right)$

$= x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)$

$\therefore x^3+\frac{1}{x^3} = \left(x+\frac{1}{x}\right)^3 - 3\left(x+\frac{1}{x}\right)$

$= 2^3-3(2)$

$= 8-6 = 2$

70. (1)

First n terms

1+3+5+ …..n terms

$= n^2$

71. (4)

Red, Green, White, Blue, Yellow

White appears in = 5x+3

From given choices

68 = 5*13+3

Only 68 is in the form 5x+3

$\therefore$ Required answer = 68

72. (4)

Let the average be A

Then 60+(A+3) = 7A

$\Rightarrow A = \frac{63}{6}$

Total amount = 7A

$= \frac{7*63}{6}$

= Rs. 73.50

73. (3)

Suppose the policeaman catch the thief
When the thief covered x metres
∴ Time taken to cover (x+100)m by the policeman
Time taken by the thief to cover x m

$$\Rightarrow \frac{x+100}{10*\frac{5}{18}} = \frac{x}{8*\frac{5}{18}}$$

$$\Rightarrow 8x+800 = 10x$$
$$\therefore x = 400 \text{ m}$$

Time taken by the policeman to catch the thief

$$= \frac{x+100}{10*\frac{5}{18}} = \frac{400+100}{10*\frac{5}{18}}$$
$$= 180 \text{ sec}$$
$$= 3 \text{ minutes}$$

74. (*)

$a_1 = 97$

$$a_2 = \frac{2}{a_1} = \frac{2}{97}$$
$$a_3 = \frac{3}{a_2} = \frac{3*97}{2}$$
$$a_4 = \frac{4}{a_3} = \frac{4*2}{3*97}$$
$$a_5 = \frac{5}{a_4} = \frac{5*3*97}{4*2}$$
$$a_6 = \frac{6}{a_5} = \frac{6*4*2}{5*3*97}$$
$$a_7 = \frac{7}{a_6} = \frac{7*5*3*97}{6*4*2}$$
$$a_8 = \frac{8}{a_7} = \frac{8*6*4*2}{7*5*3*97}$$

$\therefore a_1, a_2, \ldots..a_8$

$$= 97*\frac{2}{97} * \frac{3*97}{2} * \frac{4*2}{3*97} * \frac{5*3*97}{4*2} * \frac{6*4*2}{5*3*97} * \frac{7*5*3*97}{6*4*2} * \frac{8*6*4*2}{7*5*3*97}$$

$$= 8*6*4*2$$
$$= 384$$

75. (4)

$1+1(1)! = 2 = 2!$
$1+1(1)!+2(2)! = 1+1+4 = 6 = 3!$
$1+1(1)!+2(2)!+3(3)! = 1+1+4+18$
$= 24 = 4!$
$\therefore 1+1(1)!+2(2)!+3(3)!+\ldots.999(999)!$
$= 1000!$

78. (3)

$x = 4+25\% \text{ of } 8+35\% \text{ of } 400$
$= 4+\frac{25}{100} * 8 + \frac{35}{100} * 400$
$= 4+2+140$
$= 146$

Now $x+\frac{1}{5}$ th of x
$= 146 + \frac{146}{5}$
$= 146+29.2$
$= 175.2$

91. (1)

If M, persons can do W_1 work in D_1 days working T_1 hours a day and M_2 persons can do W_2 works in D_2 time working T_2 hours a day then $M_1D_1T_1W_2 = M_2D_2T_2W_1$
In this problem
$M_1 = 12$; $D_1 = 10$; $T_1 = 2$ hrs
$M_2 = 8$; $T_2 = 6$
$W_1 = W_2 = W$
$\therefore 12*10*2*W = 8*D_2*6*W$
$\Rightarrow D_2 = \frac{12*10*2}{8*6}$ 5 days