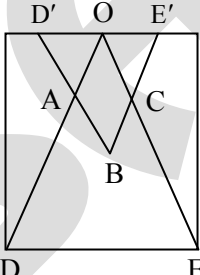


1. If period of  $f(x)$  is  $m$  and that of  $g(x)$  is  $n$ , the period of  $f[g(x)]$  is  
(a)  $\leq m$  (b)  $\leq n$  (c)  $\leq m+n$  (d) none
2.  $S_1$  and  $S_2$  are two sets of parallel lines. They intersect at 12 points. The number of parallelograms that  $S_1$  and  $S_2$  may form is  
(a) 12 or 6 (b) 8 or 4 (c) 18 (d) 18 or 15
3. The minimum value of 'n' such that expansion of  $(x^2 - 1/x)^n$  has a term independent of  $x$   
(a) 3 (b) 6 (c) 1 (d) none
4. Given  $x + y + z = 2$ , the least value of  $x^2 + y^2 + z^2$  is  
(a)  $\sqrt{2}$  (b) 2 (c)  $2\sqrt{2}$  (d)  $4/3$
5. The sum of the series  $\sum_{n=1}^{\infty} \frac{n^2}{n!}$  converges to  
(a)  $e$  (b)  $2e$  (c)  $2e - 1$  (d)  $5e$
6. One cone of height = diameter =  $1/2$  and another cone of height = diameter = 1 are cut from the opposite sides of a unit cube with axes at the centre. The surface area (excluding the base) of a cone is  $\frac{\pi ld}{2}$ , where  $d$  is the base diameter and  $l$  is the lateral height
- 
- The surface area of the resultant cavity is  
(a)  $35\sqrt{5} \frac{\pi}{192}$  (b)  $19\sqrt{5} \frac{\pi}{64}$  (c)  $9\sqrt{5} \frac{\pi}{16}$  (d) none
7. Given matrices  $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$  and  $B = \begin{pmatrix} e & f \\ g & h \end{pmatrix}$  whose elements are non-zero reals. If  $BA = I$ , where  $I$  is the identity matrix and  $D$  is the value of determinant of  $B$  then what is the value of  $D$   
(a)  $e/a$  (b)  $d/e$  (c)  $h/a$  (d) none
8. There are three temples A, B, C and a pond near the temples. A priest brings some flowers and offers a part of them to the deity in A and put the remaining flowers into the pond. The flowers get doubled. The priest offers a part of the flowers to the deity on B and puts the remaining flowers into the pond. Again the flowers get doubled. The priest offers all the flowers to the deity in temple C. Then he had no flowers to put into the pond. Given that he offered equal number of flowers to each deity, the number of flowers that he brought is  
(a) 2 (b) 7 (c) 4 (d) 1
9. Given  $U_n = 1+2+\dots+n$ . Find the value of  $U_1+U_2+\dots+U_{10}$   
(a) 550 (b) 220 (c) 330 (d) 440
10.  $a$ ,  $b$  and  $c$  are sides of a triangle. Equations  $ax^2+bx+c=0$  and  $3x^2+4x+5=0$  have a common root. Then angle  $c$  is equal to  
(a)  $60^\circ$  (b)  $90^\circ$  (c)  $120^\circ$  (d) none
11. If  $z$  be a complex number such that  $|z-2+2i|=1$ . Then the largest value of  $|z|$  is  
(a)  $2\sqrt{2}-1$  (b)  $2\sqrt{2}+1$  (c)  $2\sqrt{2}$  (d) none
12. The altitude of cylinder of the greatest possible volume which can be inscribed in a sphere of radius  $R$  is  
(a)  $R/3$  (b)  $2/3 R$  (c)  $2/\sqrt{3} R$  (d) none
13. The characteristic roots of  $\begin{pmatrix} 1 & a & b \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$   
(a) 1, 2, 3 (b) 1, 1, 3 (c) 3,  $a$ ,  $b$  (d)  $a$ ,  $b$ ,  $c$
14. The area bounded by the curves  $x+2|y|=1$  and  $x=0$  is  
(a)  $1/4$  (b)  $1/2$  (c) 1 (d) 2
15. The volume of the solid generated by the revolution of an ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  around its minor axis is  
(a)  $\frac{4}{3} \pi a^2 b$  (b)  $\frac{4}{3} \pi ab^2$  (c)  $\frac{4}{3} \pi a^3$  (d) none

16. The number of times the digit 3 will be written when listing the integers from 1 to 1000 is

- (a) 270 (b) 271 (c) 272 (d) none

17. Given  $z + \bar{z} = i(z - \bar{z})$  then  $z$  will be represented by a point in the

- (a) second quadrant alone (b) third quadrant alone  
(c) First and third quadrants (d) Second and fourth quadrant

18. The least number which leaves the same remainder 1 when it is divided by  $2^5$  or  $5^2$  or 7 is

- (a) 5601 (b) 2801 (c) 1401 (d) 3201

19. The plane  $2x + y + z = 12$  meets the  $x$ ,  $y$ ,  $z$  axes at A, B, C. find the volume of the tetrahedron OABC ? (O is the origin).

- (a) 144 cubic units (b) 664 cubic units  
(c) 288 cubic units (d) 423 cubic units

20. Are the polynomials  $f_1(x) = x^2 + 2$ ,  $f_2(x) = 2x - 6$  and  $f_3(x) = 5$  are linearly dependent?

- (a) yes (b) no  
(c) depends on the value of  $x$  (d) none

21. The number of terms in the expansion of  $(1+x)^{2n}$  is 5.

Therefore the number of terms in the expansion  $f(1+x)^{4n}$  is

- (a) 10 (b) 8 (c) 9 (d) 11

22. Given  $x_1, x_2, \dots, x_n$  are  $n$  real numbers. Then the value

of  $S = (x_1 - x)^2 + (x_2 - x)^2 + \dots + (x_n - x)^2$  will be least if

- (a)  $x_1 = x_2 = \dots = x_n$  (b)  $nx = x_1 + \dots + x_n$   
(c)  $x$  is zero (d)  $x = x_1 + \dots + x_n$

23. The curve  $y = a^x$  and  $y = b^x$  intersect at  $\tan^{-1} \frac{\log(a/b)}{k}$ ,

where  $k$  is

- (a)  $\log a \log b$  (b)  $1 + \log a \log b$   
(c)  $1 - \log a \log b$  (d) none of these

24. How many integers lie between 300 and 1000 which are exactly divisible by 13 but not divisible by 14 ?

- (a) 50 (b) 49 (c) 53 (d) 47

25. Let  $f(x) = x(x+1)(x+2)$ ;  $x = 1, 2, 3, \dots$  then

$S = f(1) + f(2) + \dots + f(10)$  is

- (a) 4200 (b) 4290 (c) 4490 (d) 4590

26. The elements of a  $2 \times 2$  matrix are either 1 or zero. How many of such matrices are singular matrices?

- (a) 10 (b) 6 (c) 16 (d) 12

27. A boy remarked that he had twice as many sisters as he had brothers. One of his sisters remarked 'that is funny; I have as many sisters as brothers only'. How many boys and girls were there in that family?

- (a) 2 boys, 3 girls (b) 2 boys, 2 girls  
(c) 3 boys, 4 girls (d) 3 boys, 3 girls

28.  $\cos 20^\circ \cos 40^\circ \cos 80^\circ$  is equal to

- (a)  $\cos 60^\circ$  (b)  $\cos 30^\circ$  (c)  $1/4$  (d)  $1/8$

29. The minimum value of ' $n$ ' such that expansion of

$\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^n$  has a term independent of  $x$

- (a) 3 (b) 6 (c) 1 (d) none

30. The point P represents  $z + iz$  in the argand diagram and its distance from the origin is 8 units. Therefore the distance of the point Q which represents  $z^2$  in the argand diagram from the origin is

- (a) 64 (b)  $4\sqrt{2}$  (c) 32 (d) 8

31. There are nine distinct numbers of which five are positive and four are negative. Three numbers are chosen at random and the product of the numbers is formed. How many different products can be formed which are positive in nature?

- (a) 48 (b) 50 (c) 40 (d) 90

32. The planes  $x + y + z = 3$ ,  $2x + y + z = 4$  and  $3x + 2y + z = 6$

- (a) will form a prism (b) will have a line of intersection  
(c) will have a common point of intersection  
(d) will not have a common point of intersection

33.  $z$  is a complex variable. Then  $az + b\bar{z} + c = 0$  represents a straight line if and only if

- (a)  $a, b, c$  are real (b)  $a = \bar{b}$   
(c)  $a = \bar{b}, c$  real (d)  $c$  is real

34. ABCDEF is a regular hexagon of area  $\frac{6\sqrt{3}}{4}a^2$ . P is a

point inside the hexagon. If PG, PH, PI, PJ, PK, PL are drawn perpendicular to the sides AB, BC, CD, DE, EF, FA then the value of PG + PH + PI + PJ + PK + PL is equal to

- (a)  $6\sqrt{3}a$  (b)  $3\sqrt{3}a$  (c)  $3a$  (d) none

**Direction (Q35 – 37):** In the following questions read the two given statement and tick the conclusion valid on the basis of these statement

35. I: only graduates are eligible for scholarship

II: Vinay is a graduate

- (a) Vinay is eligible for scholarship  
(b) Vinay is not eligible for scholarship  
(c) Only Vinay is eligible for scholarship  
(d) none of these

36. I: All apples are plants

II: Plants use chlorophyll

- (a) Apples use chlorophyll  
(b) Either apples or plants use chlorophyll  
(c) If a species uses chlorophyll, it must be apple  
(d) none of these

37. I: only X is Y

II: no Y is Z

- (a) Some X is not Y (b) Some X is not Z  
(c) Some X is Z (d) No Z is X

38. Write the missing term 1, 100, 1001, 10000 ?

- (a) 11100001 (b) 1110011 (c) 1101001 (d) none

**Direction (Q39 – 43):** Choose the word closest in meaning to the given word

39. INVETERATE

- (a) habitual (b) invest (c) venerate (d) enervate

40. ABYSMAL

- (a) absurd (b) abnormal (c) massive (d) dismal

41. RUMINATE

(a) browse (b) investigate (c) brood (d) convention

42. FRIABLE

(a) oily (b) easily breakable (c) edible (d) humid

43. MANDLIN

(a) euphoric (b) rhythm (c) sentimental (d) none

44. Two cars P and Q are moving uniformly on two straight roads at right angles to each other at 30 km/hr and 25 km/hr respectively P passes the intersection of the road while Q has still to move 50 kms to reach it. What is the shortest distance between then

(a) 20 (b) 40/5 (c)  $10/\sqrt{5}$  (d)  $20/\sqrt{5}$

45. The length of the conjugate axis of the hyperbola  $xy=16$  is

(a) 8 (b) 2 (c) 4 (d) 16

46. Points  $P_1, P_2, P_3, P_4, Q_1, Q_2, Q_3, Q_4$  and  $R_1, R_2, R_3, R_4$  are marked on the sides BC, CA, AB of  $\triangle ABC$ . How many  $\Delta$ s can be formed by considering the points ( $P_1, P_2, \dots, R_3, R_4$ ) as vertices?

(a) 64 (b) 36 (c) 108 (d) 208

47. Period of  $f(x) = x - [x]$  is

(a) 1 (b) 1/2 (c) 0 (d) none

48. When  $(629)^{24}$  is divided by 21, the remainder is

(a) 1 (b) 2 (c) 5 (d) 11

49. What is the number of non congruent rectangles that can be formed on a chess board ? (non congruent squares are also included)

(a) 40 (b) 64 (c) 36 (d) 48

50. The value of  $\sin^2 18^\circ + \sin^2 \theta + \sin^2 72^\circ = 2$ . Therefore the value of  $\theta$  is

(a)  $30^\circ$  (b)  $45^\circ$  (c)  $90^\circ$  (d)  $60^\circ$

51. A, B are two sets.  $O(A) = n^2$ ,  $O(B) = 6n$  and  $O(A \cap B) = 2n$ , where n is a positive integer. Therefore the minimum value of n which satisfies the above condition is

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

52. A sequence of odd numbers

1, 3, 3, 3, 5, 5, 5, 5, 7, 7, 7, 7, 7, 7, 7, ... what is the number in the 200<sup>th</sup> place

(a) 27 (b) 28 (c) 29 (d) 31

53. If  $\log_a bc = x$ ,  $\log_b ca = y$ ,  $\log_c ab = z$  then

$\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}$  is equal to

(a) 0 (b) 1 (c)  $xyz$  (d)  $1/xyz$

54.  $\sqrt{3} \cos ec 20^\circ - \sec 20^\circ$  is equal to

(a) 2 (b)  $2 \frac{\sin 20^\circ}{\sin 40^\circ}$  (c) 4 (d) none

55. The smallest integer for which  $\left(\frac{1+i}{1-i}\right)^n = -1$  is

(a) 1 (b) 2 (c) 4 (d) none

56. The coefficient of  $x^5$  in the expansion of  $(1+x^2)^5 (1+x)^4$  is

(a) 20 (b) 68 (c) 60 (d) none

57. Number of primes between 10 and 100 is

(a) 20 (b) 21 (c) 22 (d) none

58. The perimeter of a sector of a circle is 40cms. Find its central angle, given its area is maximum

(a)  $2^\circ$  (b) 1 radian (c)  $\pi$  radian (d) 2 radians

**Direction (59 – 62):** Using the following clues Place the letter A to I inclusive into the grid

(1) G is above I and to the right of B

(2) C is to the right of H and above I which is to the left of D

(3) B is to the left of E

(4) A is above E

(5) H is above F and B

59. The letter at the bottom right corner is

(a) F (b) I (c) D (d) none

60. The letter at the bottom left corner is

(a) F (b) I (c) D (d) none

61. The letter at the top left corner is

(a) H (b) A (c) F (d) none

62. The letter at the top right corner is

(a) F (b) A (c) H (d) none

63. O, T, T, F, F, S, S, E, N, —

(a) T, T (b) T, E (c) E, E (d) N, D

64. 942256 is coded as 624529 then the code for 869112 is

(a) 218119 (b) 198611 (c) 216198 (d) none

65. If the rate of change of volume of a sphere is equal to the rate of change of its radius, then its radius is

(a)  $\frac{1}{\sqrt{2\pi}}$  (b)  $\sqrt{2\pi}$  (c)  $\frac{1}{2\sqrt{\pi}}$  (d)  $2\sqrt{\pi}$

66. On a set of n elements, a Boolean algebra is defined. Then n can be

(a) 5 (b) 6 (c) 7 (d) 8

67. In a meeting of n people each one shake hands with all the others. In all there were 66 handshakes. Then n is

(a) 33 (b) 22 (c) 12 (d) 11

68. A tower of height h stands at the centre of a park in the form of a square of side a. If  $\alpha$  is the angle of elevation of the top, of the tower from each corner of the park, then  $\tan^2 \alpha =$

(a)  $\frac{2h^2}{a^2}$  (b)  $\frac{h^2}{a^2}$  (c)  $\frac{2a^2}{h^2}$  (d)  $\frac{a^2}{2h^2}$

69. From a cylinder of height 20 cms and base radius 5 cms, a cone of height 12 cms and base radius 5 cms is scooped out. What is the total surface area of the remaining solid ?

(a)  $280 \pi \text{ cm}^2$  (b)  $290 \pi \text{ cm}^2$  (c)  $265 \pi \text{ cm}^2$  (d)  $150 \pi \text{ cm}^2$

70. The function  $\int_0^x \frac{\cos t}{t} dt$  ( $x > 0$ ) has

(a) minimum when  $n = 1, 3, 5, 7, \dots$

(b) minimum when  $n = 0, 2, 4$

(c) maxima when  $n = 1, 3, 5, \dots$

(d) maxima  $n = -2, -4, -6, \dots$  in  $(2n+1)\frac{\pi}{2}$ ,  $n \in \mathbb{Z}$

71. Given  $a^2 + b^2 + c^2 = 0$ , the value of  $a^n + b^n + c^n$  is

(a) zero if n is even (b) 0 if n is odd

(c)  $0 \forall n$  (d) depends on a, b, c

**Directions (72 – 76):** Each of the following problems has a question and two statements which are labeled (1) and (2). Use

the data given in (1) and (2) together with other available information (such as the number of hours in a day, the definition of clockwise, mathematical facts etc.) to decide whether the statements are sufficient to answer the question. Then fill in space

- (a) if you can get the answer from (1) alone but not from (2) alone.  
 (b) if you can get the answer from (2) alone but not from (1) alone.  
 (c) if you can get the answer from (1) and (2) together, although neither statement by itself suffices  
 (d) if you cannot get the answer from statement (1) and (2) together, but need even more data.

72. How much wood will it take to make a rectangular box with a top?

- (1) The area of the bottom is 4 square feet  
 (2) The area of one side is 6 square feet

73. A group of 49 consumers were offered a chance to subscribe to 3 magazines A, B and C. 38 of the consumers subscribed to at least one of the magazine. How many of the 49 consumers subscribed to exactly two of the magazine

- (1) Twelve of the 49 consumers subscribed to all three of the magazines.  
 (2) Twenty of the 49 consumers subscribed to magazine A.

74. Is  $k$  an odd integer?

- (1)  $k$  is divisible by 3  
 (2) The square root of  $k$  is an integer divisible by 3.

75. How many books are on the bookshelf?

- (1) The bookshelf is 12 feet long  
 (2) The average weight of each book is 1.2 pounds

76. Which number is the largest  $a$ ,  $b$  or  $c$ ?

- (1)  $ab$  is greater than  $ac$   
 (2)  $ba$  is greater than  $bc$

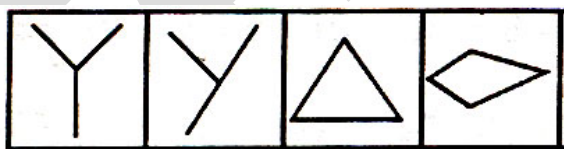
Directions (77 – 79): Find odd man out

77.



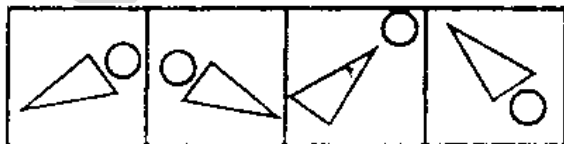
- (a) (b) (c) (d)

78.



- (a) (b) (c) (d)

79.



- (a) (b) (c) (d)

Directions (80 – 82): These are analogies

80. RETIREMENT: SERVICE ::

- (a) EMPLOYMENT: SALARY  
 (b) ARRANGEMENT: FLOWERS  
 (c) CONTRACT: AGREEMENT  
 (d) GRADUATION: STUDIES

81. URGE: INSIST ::

- (a) PURSUE: HOUND (b) REFUSE: DENY  
 (c) EXPUNGE: PURGE (d) REQUEST: DEMAND

82. TAKE: FUBL :: PLAY: \_\_\_\_\_

- (a) KXZO (b) KZXO (c) ZQMB (d) ZMQB

Direction (83 – 85): Find odd man out

83. (a) Cooper (b) Silver (c) Mercury (d) Iron

84. (a) A (b) H (c) T (d) D

85. (a) mnoTuV (b) zabGHI (c) hijOpQ (d) rstYza

Directions (86 – 90): A number arrangement machine, when given a particular input, rearranges it following a particular rule. The following is the illustration of the input and the steps of arrangement:

input	23	18	32	46	57	84
Step I	24	22	41	62	82	120
step II	22	24	41	62	82	120
step III	480	572	1677	3840	6720	14396
step IV	460	552	1657	3820	6700	14376
step V	14376	6700	3820	460	552	165

This is the final arrangement and step v is the last step for this input

86. If 18 10 21 30 33 45 is the first step of an input, which of the following steps will be 76 300 417 876 1065 200?

- (a) V (b) II (c) III (d) IV

87. The fourth step of an input is 520, 638, 732, 642, 341, 840, 291 what will be the first step of same input

- (a) 24, 26, 28 18 38 40 17

- (b) 25 30 37 34 63 76 66

- (c) 76 66 63 37 34 30 25

- (d) cannot be determined

88. Which of the following is the 4<sup>th</sup> step for the following input?

input: 20, 14, 6, 18, 17, 21

- (a) 231, 340, 417, 1132, 1760, 3245

- (b) 201, 300, 417, 1132, 1740, 3225

- (c) cannot be determined

- (d) none of these

89. Which of the following is the second step for the following input? 46, 32, 49, 55, 18

- (a) 71, 58, 47, 43, 36

- (b) 18, 32, 46, 49, 55

- (c) 36, 43, 47, 58, 71

- (d) none of these

90. What will be the fifth step for the following input?

19, 7, 20, 11, 9, 22

- (a) 97, 376, 706, 817, 1132, 3340

- (b) 3340, 1132, 817, 97, 376, 705

- (c) data inadequate

- (d) none of these