SECTION II

Number of Questions: 50

51. The harmonic mean of two positive real numbers is 4. Their arithmetic mean A and their geometric mean G satisfy the relation $2A + G^2 = 27$. Find the two numbers.

1. 4 and 4 2. 2 and 6 3. 3 and 6 4. 5 and $\frac{10}{3}$

DIRECTIONS for Questions 52 and 53: Every morning Rishi and Jayanta start walking from A and B respectively towards each other. They meet at C. Rishi always starts at 5 : 30 am and Jayanta starts at 4 : 45 am. Rishi's speed is 6 km/hr whereas Jayanta's is 5 Km/hr.

52. One fine morning, Jayanta started late by a few minutes and hence met Rishi who started on time at D in between CB. CD = 2.5 Km. By how many minutes was Jayanta late in starting, on that day?

1. 25 min 2. 30 min 3. 55 min 4. Data insufficient

53. One morning Rishi got delayed but Jayanta was on time and that day the two met at 7:00 a.m at E which was 2.5 Km away from C. What is the distance between A and B ?

1. 20.25 km 2. 17.25 km 3. 14.75 km 4. Data insufficient

54. Thirteen pirates put their treasure in a safe. They decide that the safe should be able to be opened if any majority of pirates agree but not be able to be opened if any minority agree. The pirates don't trust each other so they consult a locksmith. The locksmith puts a specific number of locks on the safe such that every lock must be opened to open the safe. Then he distributes keys to the pirates such that every pirate has some but not all of the keys. Any given lock can have multiple keys but any given key can only open one lock. What is the least number of locks required?

1. ${}^{13}C_6 \times 7!$ 2. ${}^{13}C_7 \times 6!$ 3. ${}^{13}C_7$ 4. None of these

55. Find the sum of the 37^{th} bracket of the following series.

$(1) + (7 + 7^2 + 7^3) + (7^4 + 7^5 + 7^6 + 7^7 + 7^8) + (7^9 + 7^{10} + \cdots + 7^{15}) \cdots$

1. $\frac{7^{37}}{6}(7^{73} - 1)$ 2. $\frac{(7^{73} - 1)}{6}$ 3. $\frac{7^{71}}{6}(7^{73} - 1)$ 4. None of these

56. $f(x) = 2x^3 + px^2 + qx - 4$ and $f(2) = 0$. Find the value of p + q, where p and q are non zero. If $f(x) = 0$ has three real roots, all of them being integers and further two of three roots are equal.

1. –6 2. 2 3. Either (2) or (3) 4. Cannot be determined

57. The area of the triangle with vertices at the point (a, b + c), (b, c+ a), (c, a + b) is $[a \neq b \neq c]$

1. 0 2. a + b + c 3. ab + bc + ca 4. $a^2 + b^2 + c^2$

58. If a, b and c are distinct positive integers, then find the product of (a + b) (b + c) (c + a).

1. > 8abc 2. < 8abc 3. = 8abc 4. None of these

DIRECTIONS for Questions 59 and 60: These questions are based on following data.
A, B,C,D,E are 5 points on a plane. AE = 19.5, BC = 15, CE = 5, AB = 15, BD = 6.5, DC = 8.5, BE = 19.5.

59. How many triangles can be formed using the 5 points ?

1. 10 2. 9 3. 8 4. Data Insufficient.

60. What is the area of the triangle formed by the vertices B,C,D ? (in sq cm)

1. 30 2. 60 3. 0 4. None of these

61. An infinite GP has first term 'X' and sum '5' , then X belongs to

1. $X < -10$ 2. $-10 < X < 0$ 3. $0 < X < 10$ 4 .$X > 10$

DIRECTIONS for Questions 62 and 63: There are two identical solid blocks of iron. When the first block is melted and cast into spheres of equal radii, then 14 cc of lead was left, while when the second block was melted and cast into spheres, each of radius twice that of the spheres cast from the first block, then 40 cc of lead was left. The volumes of the solid blocks and the smaller spheres are all integers.

62. What is the volume of each of the smaller spheres into which the second block was cast?

1. 196 cc 2. 208 cc 3. 232 cc 4. 254 cc

63. If the volume of each solid block is greater than 1000 cc, then what is the least possible volume of each solid block?

1. 1024 cc 2. 1032 cc 3. 1080 cc 4. 1089 cc

64. A man decided to plant trees along one straight side of his rectangular house. For this, he planned to plant trees at 8 m intervals, with trees planted at both the extremes. After he bought the trees he found that the number of trees he had bought was six less than required. However, he discovered that the number of trees he had bought would be just sufficient if he spaced them 10 m apart. What is the length of the side of his house and how many trees did he buy?

1. 240, 20 2. 200, 25 3. 240, 25 4. 100, 5

65. ABCD is a rhombus with side 10 cm and $\angle A = 60°$. A circle is drawn using point A and C as diameter, another circle is drawn using B and D as diameter. Difference between the areas of 2 circles is

1. 10π cm^2 2. 75π cm^2 3. 25π cm^2 4. 50π cm^2

66. a + b + c + d = 28 and a, b, c, d are odd positive integers. How many solutions are possible ?

1. 545 2. 455 3. 445 4. 395

67. Saurabh had Rs. 65 and he wanted to buy 40 fruits, some peaches and some apricots. But he spent Rs. 30 on the way. With the money left , he bought as many apricots as the number of peaches that he initially wanted to buy and as many peaches as the number of apricots that he wanted to buy. How much does one apricot and one peach together cost?

1. Rs. 2.00 2. Rs. 2.50 3. Rs. 3.50 4. Rs. 4.00

68. A B C D is a rectangular sheet of paper. It is folded along C E where E is a point on A D . Given A B = 12 cms, CE = 13 cms and A E = 5 cms, the Area of the paper is

1. 60 sq. cms 2. 100 sq. cms 3. 120. sq cms 4. 156. sq cms

69. Find the coefficient of x^{49} in the expression $(x-1)(x-2)(x-3)...(x-50)$.

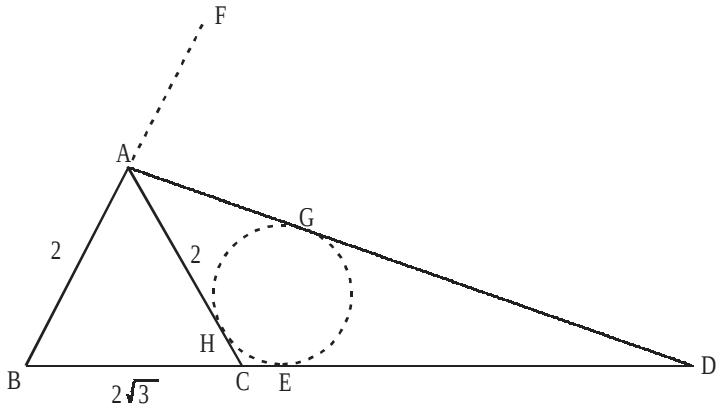
1. –1275 2. 1275 3. 25 4. –25

70. Solve for x

$$\left(5+2\sqrt{6}\right)^{x-8} + \left(5-2\sqrt{6}\right)^{x-8} = 10$$

1. 7 2. 8 3. 9 4. Either (1) or (3)

71.



In ΔABC AB = AC = 2, BC = $2\sqrt{3}$. BA is extended upto F. Angular Bisector of $\angle CAF$ meets extended BC at D. A circle CHGEC is inscribed in ΔACD . Find CE.

1. $2+\sqrt{3}$ 2. $2-\sqrt{3}$ 3. $\frac{\sqrt{3}}{2}$ 4. Figure not possible

72. [x] is defined as the greatest integer less than or equal to x and {x} is defined as the least integer greater than or equal to x, for all real values of x. Consider the four statements.

I. $[x]+[-x]=-1$

II. $\{x\}+[-x]=0$

III. $\{[x]\}-[\{x\}]=-1$

IV. $[2x]+\{3x\} \leq 5x$

How many of the above statements are always true for all real values of x ?

1. 4 2. 3 3. 2 4. 1

73. Find the remainder if 13^{19} is divided by 21.

1. 1 2. 13 3. 20 4. None of these

74. Probability of three events are $P(A)=\frac{1-3k}{2}, P(B)=\frac{1+4k}{3}$ and $P(C)=\frac{1+k}{6}$. Events A, B and C are mutually exclusive and exhaustive. Then k belongs to

1. [0, 1] 2. $\left[-\frac{1}{4},\frac{1}{3}\right]$ 3. $\left[-\frac{1}{3},\frac{1}{3}\right]$ 4. $[0,\infty]$

75. t_a, t_b and t_c are three terms of a Geometric Progression, where a, b and c are in an Arithmetic Progression. If x, y and z are in an Arithmetic progression, then the value of $t_a^{y-x} \times t_b^{x-z} \times t_c^{z-y}$ is

1. $\frac{t_a+t_c}{t_b}$ 2. $\frac{a+c}{b}$ 3. $\frac{x+z}{2y}$ 4. 1

76. A king wanted to build a circular amphitheater on a site, which had been the ruins of an old fortress. On this site, only three pillars had remained. The king wanted to preserve those three pillars. He asked his royal architects to design a circular amphitheater so that these pillars would be along the circumference of the amphitheater. The distances between the pillars from each other were 125 , 35 m, 120 m . What would be the radius of the amphitheater to be built?

1. 62.5 m 2. 125 m 3. 120 m 4. None of these

DIRECTIONS for Questions 77 to 79: Answer the questions based on the following information.
A film festival was held over N consecutive weeks. Amitabh, a film buff, made it a point to attend a certain number of movies every week. The number of movies Amitabh watched in a particular week was directly proportional to the product of the number of weeks since the start of the festival (including the week under consideration) and the number of weeks remaining for the festival to end (including the week under consideration).

Amitabh saw 6, 5 and 3 movies in three consecutive weeks.

77. For how many weeks was the film festival held
1. 3 weeks 2. 4 weeks 3. 5 weeks 4. 6 weeks

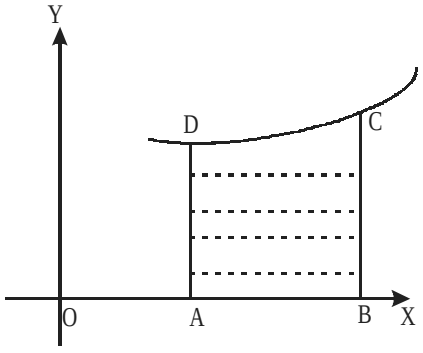
78. How many movies did Amitabh watch in the entire film festival?
1. 20 2. 24 3. 28 4. 32

79. In which week did Amitabh watch the maximum number of movies?
1. 2nd week 2. 3rd week 3. 4th week 4. both (2) and (3)

80. For what value of 'a' will the sum of the squares of the roots of the equation $x^2 + x + a(a + 1) = 0$ assume the maximum possible value?
1. –1 2. 0 3. 1 4. None of these

81. $t_1, t_2, t_3, \ldots$.are infinite terms of a series defined as follows:
$t_1 = 1$
$t_n = x \times t_{n-1}$ for all $n \geq 2$ and n being even
$t_n = y \times t_{n-1}$ for all $n \geq 2$ and n being odd
Where x and y are constants such that $|x| < 1$ and $|y| < 1$.
What is the sum to infinite terms ?
1. $\frac{1+x}{1-xy}$ 2. $\frac{1+xy}{1-xy+x+y}$ 3. $\frac{1-xy}{1+xy-x-y}$ 4. None of these

82.



In the above diagram, the points A, B, C and D have coordinates as A(5, 0), B(7, 0), C (7, 9) and D(5, 4). Which of the following is closest to the area of the shaded region?
1. 12 sq. units 2. 18 sq. units
3. 17 sq. units 4. 14 sq. units

83. Several goods wagons were commissioned to transport animals. At station Q_1, 12 animals were placed in each wagon. At station Q_2, some animals were taken out and 2 wagons detached. All the animals were now equally distributed among the remaining wagons. It was noted that the number of animals in each wagon was a prime number, and the number of wagons was now 14 less than the number of animals in each wagon. How many animals were in the Wagons that left from station Q_1?
1. 80 2. 60 3. 90 4. 72

84. What are the total number of sets (p, q, r) such that $p < q < r$, where $p, q, r \in N \leq 10$?
1. 90 2. 120 3. 240 4. None of these

85. The total profit per trip made by running a train between Kolkata & Haldia consist of two parts, one of which is a constant amount of Rs. 24 lakh per trip and the other varies as the square of the number of wagons attached to the engine and amounts to Rs. $7n^2$, where n is the number of wagons attached to the engine in the trip. If the average profit per wagon per trip should not fall below Rs.169 lakh, then what is the minimum number of wagons that have to be attached to the engine?
1. 23 2. 24 3. 25 4. None of these

86. There are 5 identical triangular pyramids. Four of these pyramids are attached one on each face of the fifth pyramid. What is the ratio of the total surface area of the solid such formed to that of one pyramid?
1. 3 : 1 2. 4 : 1 3. 5 : 3 4. Cannot be determined

DIRECTIONS for Questions 87 to 89: Answer the questions based on the following information.
Gautam while driving from his home to office has to cross two traffic signals, one at A and other at B (in this order). The traffic signal at A is green for 1 minute and red for 3 minutes whereas the signal at B is green for 1 minute and red for 5 minutes. Both signal start working from 8 am by turning green at 8 am.
Gautam takes 5 minute and 10 minutes to go from home to signal at A and from signal at A to signal at B respectively. Assume that traffic condition is ideal for Gautam, i.e. he is not delayed because of other traffic on road.

87. Which of the following cannot be a waiting time at signal at B?
1. 0 minutes 2. 2 minutes 3. 5 minutes 4. 3.5 minutes

88. The least and the highest time taken by Gautam from home to cross the signal at B is
1. 15 minutes, 23 minutes 2. 16 minutes, 23 minutes
3. 15 minutes, 22 minutes 4. 16 minutes, 22 minutes

89. Gautam has synchonised his time of leaving home such that he just manages to catch both signals green. On a particular day if he gets late and misses the time he usually leaves, earliest after how much more time should he leave his home to catch both the signals green?
1. 4 minutes 2. 10 minutes 3. 12 minutes 4. 24 minutes

90. The smallest positive integer x with 24 divisors is
1. 420 2. 360 3. 480 4. None of these

91. A group of men, all of equal capacities, were hired to work for Rs.10, 000/-. From this group one man started the work, second day one more man joined him and like this every day one more man joined the group. If every man worked at half of their own efficiency then the work was completed in exactly 15 days. Find the maximum amount earned by any man in the group.
1. Rs. 750 2. Rs. 1250 3. Rs. 1500 4. None of these

92. If a × b × c = 455 and aaa × b × c = a0a0a , find the values of that b and c will take if they are co- prime to each other ? (1< b <c)

1. 3, 11 2. 5, 11 3. 3, 13 4. 7, 13

93. In ΔABC, the points P, Q and R divide the side AB, BC and CA in the ratio 1 : 2, 3 : 1 and 2 : 3 respectively. Find the ratio of the areas of ΔPQR and ΔABC.

1. $\frac{2}{5}$ 2. $\frac{3}{10}$ 3. $\frac{4}{5}$ 4. $\frac{1}{5}$

DIRECTIONS for Questions 94 and 95: Two boats A & B start simultaneously towards each other from two ports DK and DH respectively, which are 80 km apart on the bank of a straight stretch of river G and port DH is nearer to the sea. Boat A takes 5 hours to reach port DH and it turns back towards port DK. Similarly, boat B upon reaching DK, turns back towards port DH and it takes 4 hours and 6 minutes for its second leg of journey from DK to DH. Both the boats are capable of running at 24 Km/ph in still water. Initially, when they started, it was a high tide (water flowing from sea towards upstream), and as soon as boat A reached DH, the tide changed to low tide. Answer the following questions:

94. What is the velocity of stream during Low Tide?

1. 2.5 Kmph 2. 1 Kmph 3. 1.5 Kmph 4. 2 Kmph

95. Where will the boats meet during the second leg of the journey?

1. 19.2 Km from DK 2. 60.8 from DH 3. 60.8 Km from DK 4. None of these

96. A hare and a tortoise start running simultaneously clockwise around an oval lake. First time they meet at an apple tree, next time at a mango tree and third time at a banyan tree and fourth time again at the apple tree. Which of the following is not a possible ratio of their speed?

1. 4 : 10 2. 10 : 4 3. 8 : 14 4. 4 : 8

97. If $a_1, a_2, a_3, \ldots a_n (n \geq 3)$ are in A.P. then $\left(\frac{1}{a_1 a_2} + \frac{1}{a_2 a_3} + \cdots + \frac{1}{a_{n-1} a_n} \right)$ will be equal to

1. $\frac{n^2}{a_1 a_n}$ 2. $\frac{(n-1)}{a_1 a_n}$ 3. $\frac{2n}{a_1 a_n}$ 4. None of these

98. A spider eats 3 flies a day. Until the spider fills his quota a fly has a 50% chance of survival if he attempts to pass the web. Assuming 5 flies have already made the attempt to pass, what is the probability that the 6th fly will survive the attempt?

1. 0.5 2. 0.25 3. 0.75 4. None of these

99. If a, b, c are in GP (a, b , c > 0) and $\log\left(\frac{5c}{a}\right)$, $\log\left(\frac{3b}{5c}\right)$ and $\log\left(\frac{a}{3b}\right)$ are in AP then a, b, c are sides of

1. an acute angled triangle 2. an equilateral triangle
3. a right angled triangle 4. None of these

100. Three distinct numbers x, y, z form a GP in that order and the numbers x + y , y + z , z + x form an AP in that order. Find the common ratio of the GP.

1. 1 2. –2 3. 2 4. Either (1) or (2)