Section – II

51. S_1 and S_2 are two sets of parallel lines. The number of lines in S_1 is greater than the number of lines in S_2. 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

52. If $3^p = 4^q = 12^r$, then (p + q) r is equal to

a. pq b. qr c. pr d. None of these

53. An army code consists of 4 letters, the first two of which are numbers and the last two are alphabets. Find the total number of codes that can be generated.

a. 84656 b. 60840 c. 56346 d. 67600

54. When the air-conditioner is on, a typist can type X pages per hour. However, when the air-conditioner is off, she can type at 65 % of the earlier efficiency (when the air-conditioner is on). How many hours would she take to type out 575 pages when the air-conditioner is off?

a. 375.4 X b. 884.6 X^{-1} c. 36.5 X d. 454.3 X^{-1}

55. Value of the following summation $\frac{1}{\log_2 x} + \frac{1}{\log_3 x} + ... + \frac{1}{\log_{43} x}$ is equal to

a. $\frac{1}{\log_e x}$ b. $\frac{1}{e}$ c. $\frac{1}{\log_{(43!)} x}$ d. $\frac{43!}{\log_x e}$

56. The perimeter of an isosceles triangle is A cm and each of the two equal sides is B cm longer than the third unequal side. Which of the following is the length of the equal sides?

a. $\frac{(A-B)}{3}$ b. $A + \frac{A}{B}$ c. $\frac{(A+B)}{3}$ d. $\frac{A}{3} + B$

57. In an automated plant assembly line, the rate of rejection of components was 10% on July 1st and 6% on July 2nd. The combined rate of rejection for the two days was 9%. The ratio of production volumes on July 1st and on July 2nd is

a. 2 : 1 b. 3 : 2 c. 3 : 1 d. 2 : 5

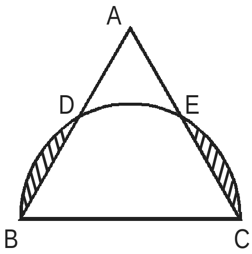
58. There are nine distinct numbers of which five numbers are positive and four numbers are negative. Three numbers are chosen at random and the product of these numbers is found. How many of these products are positive?

a. 48 b. 300 c. 40 d. 90

59. ABCDEF is a regular hexagon of side a. 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, respectively, 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 of these

60. ΔABC is an equilateral triangle of side 14 cm. A semi circle on BC as diameter is drawn to meet AB at D, and AC at E. Find the area of the shaded region.



a. $49\left(\frac{\pi}{2}-\sqrt{3}\right)\text{cm}^2$ b. $49\left(\frac{\pi}{3}-\frac{\sqrt{3}}{2}\right)\text{cm}^2$ c. 49 cm^2 d. None of these

61. Let a, b and c be the sides of a triangle ABC. Given (a + b + c) (b + c – a) = kbc, then k will lie between.

a. –1 and 1 b. –4 and 4 c. 0 and 4 d. 4 and 6

62. Find the possible coordinates of the vertices of a triangle if the coordinates of the centroid are

$X=\frac{(7+3-5)}{12}$ and $Y=\frac{(1+9-8)}{6}$

a. $\left(\frac{7}{3},1\right),\left(1,\frac{9}{3}\right),\left(-\frac{5}{3},-\frac{8}{3}\right)$ b. (7, 1), (3, 9), (–5, –8)

c. $\left(\frac{7}{4},\frac{1}{2}\right),\left(\frac{3}{4},\frac{9}{2}\right),\left(-\frac{5}{4},-\frac{8}{2}\right)$ d. $\left(\frac{7}{4},\frac{1}{2}\right),\left(\frac{3}{4},\frac{9}{2}\right),\left(-5,-\frac{8}{2}\right)$

63. The product of two real numbers is 1. Therefore their sum is

a. >2 b. ≥ 2 c. < – 2 d. ≥ 2 or ≤ -2

64. If (x, y, z) $\in$ R and $x \neq 0$, $y \neq 0$ and $z \neq 0$, then which of the following statements is necessarily true ?

I. If x > y then $\frac{1}{x}<\frac{1}{y}$

II. If x > y and z > 0 than $\frac{x}{z}>\frac{y}{z}$

a. Only statement I b. Only statement II

c. Both the statements I and II d. Neither of the statements I, II

65. If the integers m and n are chosen at random from integers 1 to 100 with replacement, then the probability that a number of the form $7^m + 7^n$ is divisible by 5 equals

a. $\frac{1}{4}$ b. $\frac{1}{7}$ c. $\frac{1}{8}$ d. $\frac{1}{49}$

66. The probabilities that a student pass in Mathematics, Physics and Chemistry are m, p, c respectively. Of these subjects the student has a 75 % chance of passing in at least one, a 50% chance of passing in at least two and 40 % chance of passing in exactly two. Which of the following relations are true ?

a. $p + m + c = \frac{19}{20}$ b. $p + m + c = \frac{27}{20}$ c. $pmc = \frac{1}{10}$ d. $pmc = \frac{1}{4}$

67. If 16 oranges are distributed among 4 children such that each gets at least 3 oranges, the number of ways of distributing them is

a. 30 b. 210 c. 15 d. 35

68. When $((32)^{32})^{32}$ is divided by 7, the remainder is

a. 1 b. 2 c.4 d.5

69. $f(x) = \frac{ax + d}{cx + b}$, $x \neq -\frac{b}{c}$ and $f[f(x)] = x$ for all real values of x. If c, d are positive real numbers which of the following conditions is true?

a. $cx^2 + x(b - c) - d = 0$ b. a + b = 0

c. at least one of (a) and (b) d. c + d = 0

70. The number of solutions for the equation in $\log_e x + x - 1 = 0$ is

a. 1 b. 2 c. 4 d. None of the above

71. The sum of the first 100 common terms of the two series 17, 21, 25 ... and 16, 21, 26 ... is

a. 101100 b. 101010 c. 46650 d. None of these

72. If p, q and r are distinct numbers in geometric progression, then $\frac{q+p}{q-p} + \frac{q+r}{q-r}$ is equal to

a. 1 b. 3 c. 2 d. 0

73. In a heptagon not more than two diagonals intersect at any point other than the vertices, then the number of points of intersection of the diagonals is (excluding the vertices of this heptagon)

a. 35 b. 70 c. 49 d. 91

74. Four students of class X, five students of class XI and six students of class XII sit in a row. The number of ways they can sit in a row, so that students belonging to the same class are together is

a. 3! 4! 5! 6! b. 3. 4! 5! 6! c. 4! 5! 6! d. $\frac{15!}{4!\,5!\,6!}$

75. A positive integer N is selected such that 100 < N < 200. The probability that it is divisible neither by 4 nor by 7 is

a. $\frac{34}{99}$ b. $\frac{65}{99}$ c. $\frac{31}{50}$ d. $\frac{17}{50}$

76. If a, b, c are the sides of a triangle, then $\frac{a^2 + b^2}{c^2} > k,$ where k is

a. 1 b. 2 c. $\frac{1}{2}$ d. $\frac{1}{3}$

77. If p, q, r and s are distinct integers in the range 10 to 15 (both inclusive), the greatest value of (p + q)(r + s) is

a. 750 b. 731 c. 729 d. 700

78. If f (x) = $\sum_{n=0}^{\infty} x^n = a, -1 < x < 1$ then f(–x) is

a. $\frac{a}{2a+1}$ b. a c. $\frac{a}{2a-1}$ d. None of the above

79. If a, b, and c are real numbers such that no two are equal. If $a + \frac{1}{b} = b + \frac{1}{c} = c + \frac{1}{a}$ then $a \times b \times c =$

a. +1 b. –1 c. $\pm$ 1 d. 2

80. If a, b, c, d > 0 and a + b + c + d = 1, then $\sqrt{4a+1} + \sqrt{4b+1} + \sqrt{4c+1} + \sqrt{4d+1} \leq$ k. What is the minimum value of k for this inequality to be universally true?

a. 6 b. 5 c. 4 d. 8

81. A man has 7 relatives, 4 of them are ladies and 3 gentlemen. His wife has also 7 relatives, 3 of them are ladies and 4 gentlemen. In how many ways can they invite a dinner party of 3 ladies and 3 gentlemen so than there are 3 of the man's relatives and 3 of the wife's relatives ?

a. 485 b. 497 c. 625 d. None of above

82. [x] stands for the greatest integer less than or equal to x. f(x) = 2[x] + 3 and g (x) = 2[x – 2] + 5. Then for all integer values of x, f(x) + g(x) is equal to

a. 4(x + 1) b. 2(x –1) c. 4x + 1 d. None of the above

83. A bunch of keys containing 10 keys of which only one key can open a door. A key is chosen at random. If at each trial the wrong key is discarded, the probability that the door is opened on the fifth trial is

a. $\frac{1}{10}$ b. $\frac{2}{10}$ c. $\frac{3}{10}$ d. None of the above

84. The coefficient x^{28} in the expansion of $(2 - x^3 + x^6)^{30}$ is

a. 0 b. 1 c. 14 d. 28

85. In how many ways can we select a pair of co-prime numbers a and b (not necessarily distinct) from {1, 2, 3, 4, 5, 6} ? (a, b) being different from (b, a).

a. 23 b. 24 c. 25 d. 26

86. If a, b, c, d, e and f are non negative real numbers such that a + b + c + d + e + f = 1, then the maximum value of ab + bc + cd + de + ef is

a. $\frac{1}{6}$ b. 1 c. 6 d. $\frac{1}{4}$

87. If max [a, b, c] = largest of a, b, c and min [a, b, c] = smallest of a, b, c, then max [min [3, 2, 5], max [–3, –5, –1], 3] =

a. 2 b. 1 c. –1 d. 3

88. Two guys A and B are walking down an escalator in the direction of the motion of the escalator. A takes two steps on the same time when B takes one step. When A covers 60 steps he gets out of the escalator while B takes 40 steps to get out of the escalator. Find the number of steps in the escalator when it is stationary?

a. 80 b. 90 c. 120 d. 150

89. If all the binary numbers from 100 to 1000000 are written, find the total number of 1s in it?

a. 128 b. 129 c. 189 d. 65

Directions for questions 90 and 91: A starts from home for his office. He travels downhill, then on flat ground and then uphill to reach his office. It takes him 3 hrs to reach the office. On the way back home A takes 3 hrs 10 min to reach home along the same route. The speeds downhill is 60 km/hr, on flat ground is 48 km/hr and uphill is 40 km/hr.

90. What is the distance between A's home and his office?

a. 144 km b. 148 km c. 154 km d. Data insufficient

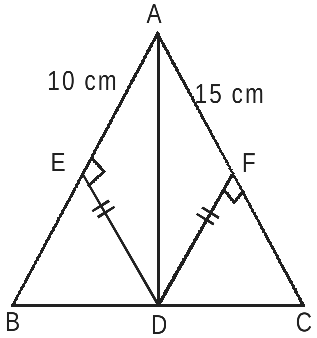
91. By what distance should his office be shifted so that the time taken to go to the office is same as time taken to reach home from the office?

a. 20 km b. 30 km c. 40 km d. Data insufficient.

92. What is the sum of all numbers from 1 to 200, which are divisible by at least one of 5, 15, 45 and 75?

a. 8200 b. 4100 c. 2000 d. None of these

93. Two runners P and Q start from A, P along AB in the anticlockwise direction and Q along AC in the clockwise direction. They meet at a point D. What is the ratio of the speeds of P and Q in that order? AB = 10 cm, AC = 15 cm and DE = DF.



a. 3 : 2 b. 2 : 3 c. 3 : 4 d. Data insufficient

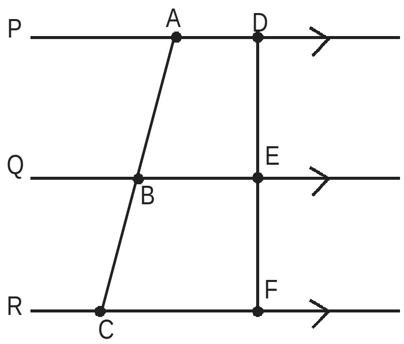
94. What is the area enclosed by the graphs $y = |x + a|$ and $y = 5$?

a. 25 sq. units b. 50 sq. units c. 75 sq.units d. Data insufficient.

95. What are the common roots of the expressions
$y = x^3 + x^2 + 4x + 5$ and $y = x^3 + 9x - 1$?

a. 3 b. 2 c. Both 3 and 2 d. No common root exists

96. P, Q, R are three parallel lines. AC and DF are transversals. If AB : BC = 2 : 1. Find the ratio of DE : EF.



a. 2 : 1 b. 4 : 1 c. None of these d. Data insufficient

Directions for questions 97 and 98: abcd is a 4-digit number in base of 7 such that 2(abcd) = bcda $(a, b \neq 0)$

97. Find the value of a.

a. 1 b. 2 c. 3 d. Data insufficient

98. Find the value of abcd x 3 in base 7 system.

a. 3642 b. 25134 c. 11253 d. Data insufficient

99. If the roots of $\frac{1}{x+a} + \frac{1}{x+b} = \frac{1}{c}$ are equal in magnitude but opposite in sign, then the product of the roots is

a. 1 b. $\frac{a+b}{2}$ c. $-(a^2 + b^2)$ d. $-\frac{1}{2}(a^2 + b^2)$

100. If $a^p = b^q = c^r = d^s$, then $\log_a(bcd)$ is equal to

a. $p(\frac{1}{q} + \frac{1}{r} + \frac{1}{s})$ b. 1 c. $\frac{1}{q} + \frac{1}{r} + \frac{1}{s}$ d. 0