DIRECTIONS *for questions 51 and 52:* Choose the correct alternative from the given choices.

51. Horizontal and vertical lines are drawn on a wooden plank of dimensions 80 cm x 80 cm such that 64 small but identical squares, each of dimensions 10 cm x 10 cm, are formed. If two of the small squares are chosen, what is the probability that they have a side in common with each other?

    (1) 1/6   (2) 1/9   (3) 1/18   (4) None of these

52. In how many ways can 16200 be written as a product of two factors which are relatively prime?

    (1) 3   (2) 4   (3) 7   (4) 8

DIRECTIONS *for questions 53 and 54:* These questions are based on the following data.

A and B run around a circular track running in the same direction. They started at the same point and at the same time. A's speed is four times B's speed. Both of them have different number of tokens with them. Whenever one of them overtakes the other, the former gives the latter as many tokens as the latter already had, so that the number of tokens with the latter doubles. However, if a person overtakes the other at the starting point, then the latter gives half the number of tokens with him to the former. It is known that B started with one token, and A finished with 70 tokens after a certain number of rounds.

53. Which of the following could be the number of tokens A started with?

    (1) 101   (2) 122   (3) 130   (4) 180

54. After the transfer of tokens at the end of $3K^{th}$ meeting point (where K is a positive integer), B has 16 tokens with him. How many tokens would B have had after the transfer of tokens at the end of $(3K - 2)^{th}$ meeting point?

    (1) 8   (2) 16   (3) 3K + 2   (4) 3K + 5

DIRECTIONS *for questions 55 to 64:* Choose the correct alternative from the given choices.

55. Starting with 1, positive integers are written one after the other. What is the $40,000^{th}$ digit that will be written?

    (1) 1   (2) 2   (3) 4   (4) 5

56. Ram Lal invested a certain amount for three years, under compound interest compounded annually and received Rs.32,940. If he had invested the same amount for six years at the same rate of interest compounded annually, he would have received Rs.49,410. What amount did he invest?

    (1) Rs.30,000   (2) Rs.24,220   (3) Rs.21,960   (4) Rs.26,490

57. Find the circumference of the circle circumscribing the triangle formed by x-axis, y-axis and the line $3x + 4y - 12 = 0$.

    (1) 3π units   (2) 6.25π units   (3) 5π units   (4) None of these

58. If the co-efficients p, q and r of the equation $px^2 + qx + r = 0$ are related as $q^3 + p^2r + pr^2 - 3pqr = 0$, how are the roots of the equation related to each other?

(1) One of the roots is the square of the other.
(2) One of the roots is the cube of the other.
(3) One of the roots is twice the other.
(4) None of these

59. P, Q and R can complete a piece of work in 20, 40 and 50 days respectively. They work on a rotational basis such that on the first day P and Q worked. On the second day Q and R worked and on the third day R and P worked, and the work was completed following this pattern. In how many days was the work completed?

(1) $14^{17}/_{19}$ days
(2) $14^{18}/_{49}$ days
(3) $15^2/_3$ days
(4) $16^1/_2$ days

60. Which of the following would always divide a six digit number of the form ababab?

(1) 10,101
(2) 11,111
(3) 10,001
(4) None of these

61. Three cars started from the same point at the same time in three different directions. The first two cars move in a straight line in opposite directions. It is noticed that after 2 hours, all the cars are at the same distance from the starting point. If the distance between the two cars which travelled in the opposite directions is 170 km, how far from the second car is the third car, if the distance between the first and the third cars is 136 km?

(1) 102 km
(2) 124 km
(3) 152 km
(4) Cannot be determined

62. The average of a set of seven consecutive integers is $(x + 1)$ and that of a different set of seven consecutive integers is $(x - 1)$. Find the average of all the integers in both the sets considering all the common integers only once.

(1) x
(2) x + 2
(3) x − 1/2
(4) x + 1

63. A wild buffalo can graze a certain field completely in four days. A sheep can do the same in five days and a cow in six days. How long does it take for a herd of 4 buffaloes, 10 sheep and 18 cows to graze a field six times as large as the original field?

(1) 6 days
(2) 3 days
(3) 1 day
(4) None of these

64. If in the number system of a particular country, 25 means 5 tens and 2 units, 467 means 7 hundreds, 6 tens and 4 units, then find the value of 173 x 425.

(1) 4,04,491
(2) 7,35,255
(3) 6,22,744
(4) 5,25,376

DIRECTIONS *for questions 65 to 67.* These questions are based on the following data.

I had some money with me on Monday morning. Everyday, I spent half of the money I had at the beginning of the day on food and donated Rs.200 out of the remaining to one child from my locality. On Saturday evening, after my spending and the donation, I was left with Rs.25.

65. How much money did I spend on Wednesday on food?

(1) Rs.1,800
(2) Rs.2,200
(3) Rs.2,550
(4) Rs.3,200

66. With what amount did I start on Monday?

    (1) Rs.10,400   (2) Rs.17,600   (3) Rs.26,800   (4) None of these

67. What was my total expenditure for the entire week (including the amount I donated)?

    (1) Rs.13,425   (2) Rs.26,775   (3) Rs.28,825   (4) Rs.13,375

DIRECTIONS *for questions 68 to 85:* Choose the correct alternative from the given choices.

68. If $f(x) = \left(1 + \dfrac{1}{x}\right)\left(1 + \dfrac{1}{x+1}\right)\left(1 + \dfrac{1}{x+2}\right) \cdots \left(1 + \dfrac{1}{x+n}\right)$ and

    $g(x) = \left(1 - \dfrac{1}{x}\right)\left(1 - \dfrac{1}{x-1}\right)\left(1 - \dfrac{1}{x-2}\right) \cdots \left(1 - \dfrac{1}{x-n}\right)$,

    find $f(x) + g(x)$.

    (1) 0   (2) 1   (3) 2   (4) $\dfrac{x+n+1}{x-n-1}$

69. The sum of the first '*n*' natural numbers was obtained as 2,500. However, it was found that three consecutive numbers were added twice while calculating the sum. Which of the following is the smallest of those three numbers?

    (1) 5   (2) 4   (3) 9   (4) 11

70. If a, b are both of the same sign ($a \neq 0$, $b \neq 0$), then which of the following is true about p, where $p = (a+b)\left(\dfrac{1}{a} + \dfrac{1}{b}\right)$?

    (1) $p \geq 8$ (2) $p \geq 4$ (3) $p \leq 2$ (4) $p \leq 1$

71. If $x^3 - 6x^2 + 6x - 2 = 0$, then which of the following could be a value of x?

    (1) $2^{2/3} + 2^{1/3}$ (2) $2 + 2^{2/3} + 2^{1/3}$ (3) $3^{2/3} + 3^{1/3}$ (4) $1 + 3^{2/3} + 3^{1/3}$

72. If $\left(x^{n^2}\right)^n = \left(x^{3^n}\right)^3$; $x \neq 0$ and $n > 0$, then find the value of $\sqrt[2n]{n^{21}}$.

    (1) 3   (2) 27   (3) 216   (4) None of these

73. A group of persons went on a trip to Mysore. In the group, the youngest member was just a year old and the oldest member was 67 years old. The second member was 1 year older than the youngest member, the third 2 years older than the second and so on. How many members were there in the group?

    (1) 12   (2) 11   (3) 8   (4) None of these

74. Two trains P and Q started from two stations A and B at 3 a.m. and 8 a.m. respectively towards each other. They meet at 12.00 noon. After the two trains meet, train P reaches B and train Q reaches A at the same time. If the distance between the two stations is 400 km, at what time do they complete the journey?

    (1) 5 p.m.   (2) 6 p.m.   (3) 8 p.m.   (4) Data insufficient

75. Seven planets orbit the star called MoronX34. The times taken by the seven planets, i.e. planet 1 to planet 7, to complete one orbit each are called monon, duon, trion, quadron, penton, hexon and septon respectively. Planet 1 is in the innermost orbit and planet 7 in the outermost orbit. Also, the radius of the orbit of any planet is equal to the sum of the radii of the orbits of two planets immediately before it, except for the radius of the orbit of the second planet which is twice that of the first planet. If it is known that the time taken by any planet to complete one revolution is proportional only to the radius of its orbit, then all the planets will align themselves once in

    (1) 5,040 septons   (2) 13,104 quadrons   (3) 840 hexons   (4) 1,820 pentons

76. On the New Delhi to Mumbai Rajdhani Express, there are, among others, three passengers named Sardesai, Bedi and Pandey. It so happens that the engineer, the conductor and the waiter in the dinning car also have the same last names Sardesai, Bedi and Pandey (though not necessarily in that order). We also know the following:
    (a) Passenger Sardesai lives in New Delhi.
    (b) The conductor lives exactly halfway between New Delhi and Mumbai.
    (c) The passenger with the same last name as the conductor lives in Mumbai.
    (d) The passenger who lives nearest to where the conductor lives earns twice as much as the passenger Bedi does.
    (e) Crewman Pandey recently beat the waiter at tennis.

    What is the last name of the engineer?

    (1) Sardesai   (2) Pandey
    (3) Bedi   (4) Cannot be determined

77. If the two equations $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ have a common root, which of the following conditions can be true?

    (1) The common root is 1.   (2) The co-efficients a and b are equal.
    (3) The sum of the co-efficients a and b is −1   (4) All of the above.

78. Find the remainder when $\left[(6!)^{7!}\right]^{13333}$ is divided by 13.

    (1) 1   (2) 5   (3) 8   (4) None of these

79. There is a regular hexagon of side 10 cm. Another regular hexagon is made by joining the mid-points of each side of this hexagon and then another hexagon is made by joining the mid-points of the second hexagon and this process is continued indefinitely. Find the sum of the areas of all these hexagons.

    (1) $600\sqrt{3}$ sq.cm   (2) $900\sqrt{3}$ sq.cm   (3) $1200\sqrt{3}$ sq.cm   (4) None of these

80. If 200 gm of silver is beaten out to form a leaf of area 40 sq.m., find the number of leaves required for a stack of 0.5 cm thickness to be made of such silver leaves. Silver weights 25 gm per cc.

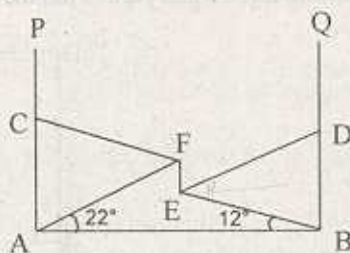   (1) 20,000   (2) 25,000   (3) 40,000   (4) None of these

81. A cube of the greatest possible volume is inserted completely inside a right circular cone of height 10 cm and radius of the base 5 cm. Find the total surface area of the cube.

    (1) $600\left(3-2\sqrt{2}\right)$sq.cm   (2) $800\left(\sqrt{2}-1\right)$sq.cm
    (3) 150 sq.cm   (4) Cannot be determined

In the given figure AP $\perp$ AB, AP II EF II BQ and AF II DE. Find $\angle$DEB.

(1) 20°
(2) 22°
(3) 26°
(4) 34°

Let R be the remainder when $3^{5^n}+1$ is divided by 7. Which of the following is/are true?

I.   R = 4, when n is even.
II. R = 5, when n is even.
III. R = 6, when n is odd.
IV. R = 3, when n is odd.

(1) I and III   (2) II and III   (3) II and IV   (4) I and IV

Find the value of $\dfrac{2^{\log_3 4}}{4^{\log_9 2}} \times \dfrac{5^{\log_2 3}}{3^{\log_2 5}}$.

(1) 0   (2) 1
(3) 2   (4) Cannot be determined

How many numbers are there below 2,100 such that the HCF of 2,100 and the number is not greater than 1?

(1) 480   (2) 729   (3) 512   (4) 360

DIRECTIONS for questions 86 and 87: These questions are based on the following data.

man spends a third of his salary on food, a fourth of the remaining on rent, a fifth of the remaining clothing, a sixth of the remaining on books and two-fifths of the remaining on medicines. He has w Rs.3,000 left with him.

What is the salary of the man?

(1) Rs.12,000   (2) Rs.14,400   (3) Rs.15,000   (4) Rs.24,000

How much money does the man spend on clothing?

(1) Rs.1,000   (2) Rs.1,200   (3) Rs.1,500   (4) Rs.2,000

DIRECTIONS for questions 88 to 94: Choose the correct alternative from the given choices.

The price of a certain commodity increased by 25%. A family was consuming 25 kg of the commodity before the increase in the price. By what percentage should the consumption be reduced so that there is an increase of only 10% in the expenditure?

(1) 10%   (2) 12%   (3) 20%   (4) 25%

89. In the given figure, ABCD is a rectangle. Points P, Q and R divide CD into four equal parts and points S and T divide AB into three equal parts. Find the ratio of the areas of the triangles PQX and STX.
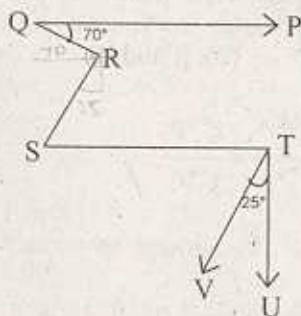
(1) 1 : 4
(2) 9 : 16
(3) 16 : 25
(4) 8 : 27
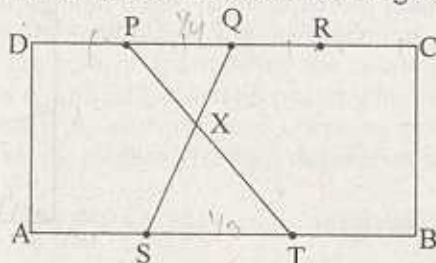
90. N, the set of natural numbers is partitioned into subsets $S_1 = \{1\}$, $S_2 = \{2, 3\}$, $S_3 = \{4, 5, 6\}$, $S_4 = \{7, 8, 9, 10\}$ and so on. The sum of the numbers in subset S_{50} is
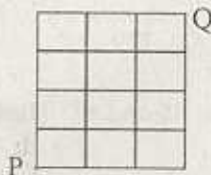
(1) 61,250
(2) 65,525
(3) 42,455
(4) 62,525

91. In the given figure, PQ ‖ ST and TV ‖ RS, TU ⊥ ST. Find ∠QRS.

(1) 120°
(2) 125°
(3) 135°
(4) None of these

92. Consider a rectangular grid of size 4 x 3 as shown in the firuge. How many different paths drawn along the grid are there from the lower left corner, P, to the upper right corner, Q (where only upward and rightward motion is allowed)?

(1) 21
(2) 35
(3) 42
(4) 31

93. In what proportion must water be added to pure milk such that a profit of $16^2/_3\%$ can be made by selling the mixture at the cost price of pure milk?

(1) 1 : 5
(2) 1 : 6
(3) 1 : 7
(4) 1 : 8

94. Six years hence, a father's age will be six years more than twice the son's age. Eighteen years hence, the father's age will be six years less than twice the son's age. After how many years would the age of the father be twice the son's age?

(1) 18 years
(2) 15 years
(3) 12 years
(4) Cannot be determined

DIRECTIONS *for questions 95 and 96:* These questions are based on the following data.

A charity organisation has bought a total of 134 items consisting of school bags, compass boxes and lunch boxes for poor students for a total amount of Rs.9,475. Each school bag costs Rs.120, each compass box, Rs.65 and each lunch box, Rs.35.

95. In how many different combinations of the three items could the purchases have been made?

(1) 135
(2) 9
(3) 7
(4) None of these

6. How many lunch boxes have been bought by the organisation given that the number of compass boxes bought is an even perfect square?

(1) 24
(3) 46

(2) 13
(4) Cannot be determined

DIRECTIONS *for questions 97 to 100:* Choose the correct alternative from the given choices.

7. Amar, David, Jayesh and Tony were plucking-mangoes from a grove to earn some pocket money during summer holidays. Their earnings were directly related to the number of mangoes plucked and had the following relationships. Jayesh got less money than Tony. Jayesh and Tony together got the same amount as Amar and David taken together. Amar and Tony taken together got less than David and Jayesh taken together. Who got the maximum earnings and who plucked the least number of mangoes (respectively)?

(1) David, Jayesh   (2) David, Amar   (3) Jayesh, Tony   (4) Jayesh, Amar

8. Charan has 12 marbles all of which are identical. However, a certain number of them are made of glass and a certain number are made of quartz. The glass marbles are heavier. All the glass marbles weigh the same and all the quartz marbles weigh the same. How many weighings using a balance scale would be required to determine the number of glass marbles and the number of quartz marbles?

(1) 11   (2) 7   (3) 6   (4) 5

9. There were 150 questions in CAT 2003, where 1 mark is awarded for every correct answer and $1/3^{rd}$ mark is deducted for every wrong answer. A certain number of students, whose total number of attempts were all different, get the same mark of 50. Find the maximum number of such students possible?

(1) 26   (2) 60   (3) 35   (4) None of these

100. A is the set of first 10 consecutive natural numbers. Find the maximum number of ways in which a subset B can be formed out of set A such that the sum of all the elements in B is odd, given that the number of odd elements in set B is 3.

(1) 352   (2) 507   (3) 320   (4) 512