

Section C – Quantitative Ability

53. Consider the formula, $S = \frac{\alpha * \omega}{\tau + \rho * \omega}$, where all the parameters are positive integers. If ω is increased and α , τ and ρ are kept constant, then S:

- A. increases
- B. decreases
- C. increases and then decreases
- D. decreases and then increases
- E. cannot be determined

54. Prof. Suman takes a number of quizzes for a course. All the quizzes are out of 100. A student can get an A grade in the course if the average of her scores is more than or equal to 90. Grade B is awarded to a student if the average of her scores is between 87 and 89 (both included). If the average is below 87, the student gets a C grade. Ramesh is preparing for the last quiz and he realizes that he must score a minimum of 97 to get an A grade. After the quiz, he realizes that he will score 70, and he will just manage a B. How many quizzes did Prof. Suman take?

- A. 6
- B. 7
- C. 8
- D. 9
- E. None of these

55. A polynomial " $ax^3 + bx^2 + cx + d$ " intersects x-axis at 1 and -1, and y-axis at 2. The value of b is:

- A. -2
- B. 0
- C. 1
- D. 2
- E. Cannot be determined

56. Consider four natural numbers: x , y , $x + y$, and $x - y$. Two statements are provided below:

- I. All four numbers are prime numbers.
- II. The arithmetic mean of the numbers is greater than 4.

Which of the following statements would be sufficient to determine the sum of the four numbers?

- A. Statement I.
- B. Statement II.
- C. Statement I and Statement II.
- D. Neither Statement I nor Statement II.
- E. Either Statement I or Statement II.

57. Triangle ABC is a right angled triangle. D and E are mid points of AB and BC respectively.

Read the following statements.

- I. $AE = 19$
- II. $CD = 22$
- III. Angle B is a right angle.

Which of the following statements would be sufficient to determine the length of AC?

- A. Statement I and Statement II.
- B. Statement I and Statement III.
- C. Statement II and III.
- D. Statement III alone.
- E. All three statements.

58. There are two circles C_1 and C_2 of radii 3 and 8 units respectively. The common internal tangent, T, touches the circles at points P_1 and P_2 respectively. The line joining the centers of the circles intersects T at X. The distance of X from the center of the smaller circle is 5 units. What is the length of the line segment P_1P_2 ?

- A. ≤ 13
- B. > 13 and ≤ 14
- C. > 14 and ≤ 15
- D. > 15 and ≤ 16
- E. > 16

59. x , 17 , $3x - y^2 - 2$, and $3x + y^2 - 30$, are four consecutive terms of an increasing arithmetic sequence. The sum of the four numbers is divisible by:

- A. 2
- B. 3
- C. 5
- D. 7
- E. 11

60. In quadrilateral PQRS, $PQ = 5$ units, $QR = 17$ units, $RS = 5$ units, and $PS = 9$ units. The length of the diagonal QS can be:

- A. > 10 and < 12
- B. < 12 and < 14
- C. > 14 and < 16
- D. > 16 and < 18
- E. cannot be determined

61. The sum of the possible values of X in the equation $|X + 7| + |X - 8| = 16$ is:

- A. 0
 B. 1
C. 2
D. 3
E. None of the above

62. There are two windows on the wall of a building that need repairs. A ladder 30 m long is placed against a wall such that it just reaches the first window which is 26 m high. The foot of the ladder is at point A. After the first window is fixed, the foot of the ladder is pushed backwards to point B so that the ladder can reach the second window. The angle made by the ladder with the ground is reduced by half, as a result of pushing the ladder. The distance between points A and B is

- A. < 9 m
B. ≥ 9 m and < 9.5 m
C. ≥ 9.5 m and < 10 m
D. ≥ 10 m and < 10.5 m
 E. ≥ 10.5 m

63. Amitabh picks a random integer between 1 and 999, doubles it and gives the result to Sashi. Each time Sashi gets a number from Amitabh, he adds 50 to the number, and gives the result back to Amitabh, who doubles the number again. The first person, whose result is more than 1000, loses the game. Let 'x' be the smallest initial number that results in a win for Amitabh. The sum of the digits of 'x' is:

- A. 3
B. 5
 C. 7
D. 9
E. None of these

64. There are two squares S_1 and S_2 with areas 8 and 9 units, respectively. S_1 is inscribed within S_2 , with one corner of S_1 on each side of S_2 . The corners of the smaller square divides the sides of the bigger square into two segments, one of length 'a' and the other of length 'b', where, $b > a$. A possible value of 'b/a', is:

- A. ≥ 5 and < 8
B. ≥ 8 and < 11
C. ≥ 11 and < 14
 D. ≥ 14 and < 17
E. > 17

65. Diameter of the base of a water-filled inverted right circular cone is 26 cm. A cylindrical pipe, 5 mm in radius, is attached to the surface of the cone at a point. The perpendicular distance between the point and the base (the top) is 15 cm. The distance from the edge of the base to the

point is 17 cm, along the surface. If water flows at the rate of 10 meters per minute through the pipe, how much time would elapse before water stops coming out of the pipe?

- A. < 4.5 minutes
- B. ≥ 4.5 minutes but < 4.8 minutes
- C. ≥ 4.8 minutes but < 5 minutes
- D. ≥ 5 minutes but < 5.2 minutes
- E. ≥ 5.2 minutes

66. Aditya has a total of 18 red and blue marbles in two bags (each bag has marbles of both colors). A marble is randomly drawn from the first bag followed by another randomly drawn from the second bag, the probability of both being red is $\frac{5}{16}$. What is the probability of both marbles being blue?

- A. $\frac{1}{16}$
- B. $\frac{2}{16}$
- C. $\frac{3}{16}$
- D. $\frac{4}{16}$
- E. None of the above.

67. Read the following instruction carefully and answer the question that follows:

Expression $\sum_{n=1}^{13} \frac{1}{n}$ can also be written as $\frac{x}{13!}$

What would be the remainder if x is divided by 11?

- A. 2
- B. 4
- C. 7
- D. 9
- E. None of the above

68. A rectangular swimming pool is 48 m long and 20 m wide. The shallow edge of the pool is 1 m deep. For every 2.6 m that one walks up the inclined base of the swimming pool, one gains an elevation of 1 m. What is the volume of water (in cubic meters), in the swimming pool? Assume that the pool is filled up to the brim.

- A. 528
- B. 960
- C. 6790
- D. 10560
- E. 12960

69. The value of the expression:

$$\sum_{i=2}^{100} \frac{1}{\log_i 100!} \text{ is:}$$

- A. 0.01
- B. 0.1
- C. 1
- D. 10
- E. 100

70. The probability that a randomly chosen positive divisor of 10^{29} is an integer multiple of 10^{23} is: a^2/b^2 , then 'b - a' would be:

- A. 8
- B. 15
- C. 21
- D. 23
- E. 45

71. Circle C_1 has a radius of 3 units. The line segment PQ is the only diameter of the circle which is parallel to the X axis. P and Q are points on curves given by the equations $y = a^x$ and $y = 2a^x$ respectively, where $a < 1$. The value of a is:

- A. $1/\sqrt[3]{2}$
- B. $1/\sqrt[3]{3}$
- C. $1/\sqrt[3]{6}$
- D. $1/\sqrt[3]{6}$
- E. None of the above

72. Consider a rectangle ABCD of area 90 units. The points P and Q trisect AB, and R bisects CD. The diagonal AC intersects the line segments PR and QR at M and N respectively. What is the area of the quadrilateral PQMN?

- A. > 9.5 and ≤ 10
- B. > 10 and ≤ 10.5
- C. > 10.5 and ≤ 11
- D. > 11 and ≤ 11.5
- E. > 11.5

73. Two numbers, 297_B and 792_B , belong to base B number system. If the first number is a factor of the second number then the value of B is:

- A. 11
- B. 12

- C. 15
- D. 17
- E. 19**

74. A teacher noticed a strange distribution of marks in the exam. There were only three distinct scores: 6, 8 and 20. The mode of the distribution was 8. The sum of the scores of all the students was 504. The number of students in the most populated category was equal to the sum of the number of students with lowest score and twice the number of students with the highest score. The total number of students in the class was:

- A. 50**
- B. 51
- C. 53
- D. 56
- E. 57

Answers questions nos. 75-77 based on the following information given below.

The exhibit given below compares the countries (first column) on different economic indicators (first row), from 2000-2010. A bar represents data for one year and a missing bar indicates missing data. Within an indicator, all countries have same scale.



Table given below contains data of GDP in constant 2000 US Dollar (in billions).

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Brazil	645	653	671	678	717	740	769	816	858	855	919
China	1,198	1,298	1,416	1,558	1,715	1,909	2,151	2,457	2,693	2,940	3,246
India	475	498	518	559	603	659	720	790	821	888	973
Malaysia	94	94	99	105	112	118	125	133	140	137	147
Philippines	81	83	86	91	97	101	107	114	119	120	129
Thailand	123	125	132	141	150	157	165	174	178	174	187
United States	9,899	10,007	10,190	10,450	10,814	11,146	11,443	11,661	11,619	11,209	11,548
Vietnam	31	33	36	38	41	45	48	53	56	59	63

75. Which of the following countries, after United States, has the highest spending on military as % of GDP, in the period 2000-2010?

- A. Vietnam
- B. China
- C. India
- D. Brazil
- E. Thailand

76. Which country (and which year) has witnessed maximum year-to-year decline in "industry as percentage of GDP"? Given that the maximum value of industry as percentage of GDP is 49.7% and the minimum value of industry as percentage of GDP is 20.02%, in the chart above.

- A. United States in 2002-3
- B. Brazil in 2006-7
- C. India in 2009-10
- D. Malaysia in 2008-9
- E. China in 2008-9

77. Which of the following countries has shown maximum increase in the "services, value added as % of GDP" from year 2000 to year 2010?

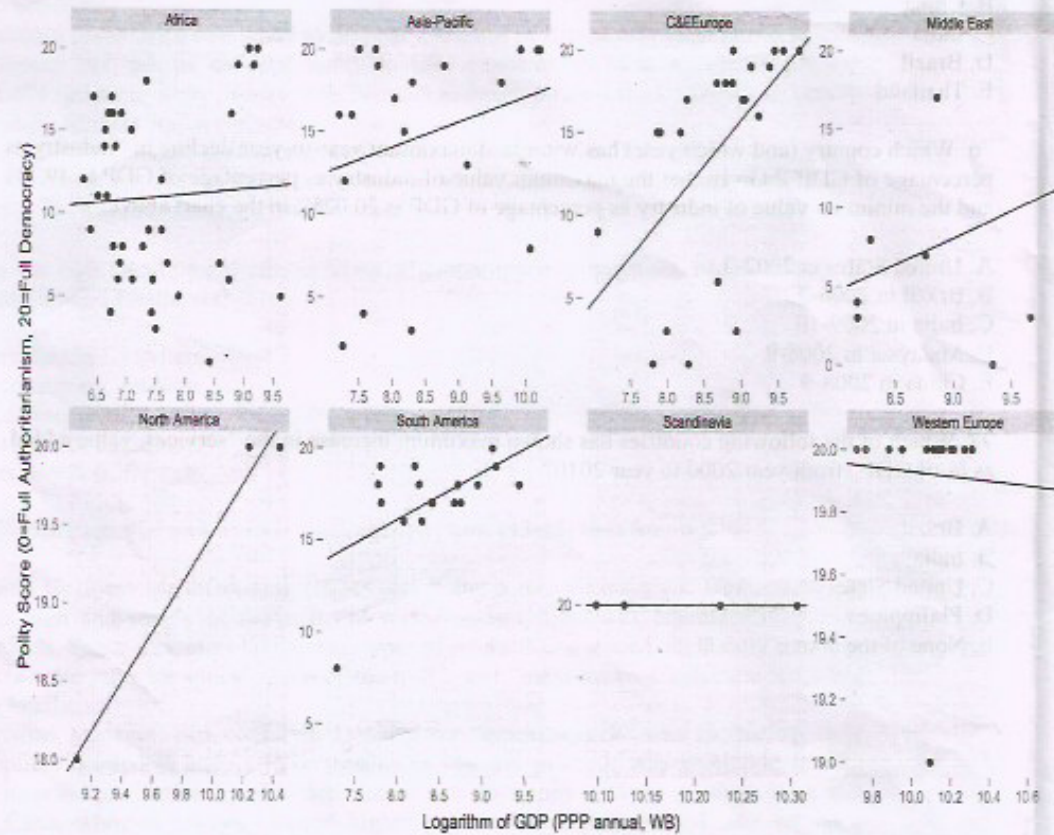
- A. Brazil
- B. India
- C. United States
- D. Philippines
- E. None of the above

C

Y

Answer question nos. 78-80 based on the trends lines from the following graphs

Note: Left side of X axis represents countries that are "poor" and right side of X axis represents countries that are "rich", for each region. GDP is based on purchasing power parity (PPP). These are World Bank (WB) estimates.



78. Which of the following could be the correct ascending order of democratic regions for poor?

- A. North America, C and E Europe, South America, Middle East, Asia Pacific
- B. Scandinavia, Western Europe, Africa, Asia Pacific, Middle East
- C. Scandinavia, Western Europe, North America, C and E Europe, Middle East
- D. C and E Europe, Africa, South America, Western Europe, Scandinavia
- E. Africa, South America, Western Europe, North America, Scandinavia

79. Which region has the highest disparity, of democratic participation, between rich and poor?

- A. North America
- B. C and E Europe
- C. Africa

- D. South America
- E. Western Europe

80. The maximum GDP of African region is higher than the maximum GDP of South American region by factor of:

- A. 10
- B. 100
- C. 2
- D. 4
- E. None of these

Answer question nos. 81-83 based on the given data on the tourism sector in India.

Year	Foreign Tourist Arrivals in India (in million)	Foreign Exchange Earnings from Tourism in India (in US \$ million)	Foreign Exchange Earnings from Tourism in India (in Rs. Crore)	Number of Indian Nationals Departures from India (in million)	Number of Domestic Tourist Visits to all States/UTs (in millions)
1997	2.37	2889	10511	3.73	159.88
1998	2.36	2948	12150	3.81	168.2
1999	2.48	3009	12951	4.11	190.67
2000	2.65	3460	15626	4.42	220.11
2001	2.54	3198	15083	4.56	236.47
2002	2.38	3103	15064	4.94	269.6
2003	2.73	4463	20729	5.35	309.04
2004	3.46	6170	27944	6.21	366.27
2005	3.92	7493	33123	7.18	392.01
2006	4.45	8634	39025	8.34	462.32
2007	5.08	10729	44360	9.78	526.56
2008	5.28	11832	51294	10.87	563.03
2009	5.17	11136	53700	11.07	668.8
2010	5.78	14193	64889	12.99	747.7
2011	6.29	16564	77591	14.21	850.86

81. In which of the following years the percentage increase in the number of Indians going abroad was greater than the percentage increase in the number of domestic tourists?

- A. 2004 and 2005
- B. 2005 and 2006
- C. 2005 and 2007
- D. 2006 and 2008
- E. 2004, 2005 and 2006

82. In which of the following years was the rupee cheapest with respect to the dollar?

- A. 2001
- B. 2002
- C. 2007
- D. 2010
- E. 2011

83. Let 'R' be the ratio of *Foreign Exchange Earnings from Tourism in India* (in US \$ million) to *Foreign Tourist Arrivals in India* (in million). Assume that R increases linearly over the years. If we draw a pie chart of R for all the years, the angle subtended by the biggest sector in the pie chart would be approximately:

- A. 24
- B. 30
- C. 36
- D. 42
- E. 48

C

Y