

PAPER 3 : QUANTITATIVE APTITUDE

- A Polygon has 27 diagonals. Number of sides of this polygon is:
 - 12
 - 15
 - 16
 - 9
- If $f(x) = 2x+7$ and $g(x) = x^2+7$, $x \in \mathbb{R}$, then which value of x will satisfy $f(g(x)) = 25$?
 - 1, 1
 - 2, 2
 - $-\sqrt{2}, \sqrt{2}$
 - None
- If set $A = \{1,2,3\}$, then what is the power set of A ?
 - $\{\{1\}, \{2\}, \{3\}, \{1,2\}, \{1,3\}, \{2,3\}, \{1,2,3\}\}$
 - $\{\emptyset, \{1\}, \{2\}, \{3\}, \{1,2\}, \{1,3\}, \{2,3\}\}$
 - $\{\emptyset, \{1\}, \{2\}, \{3\}, \{1,2\}, \{1,3\}, \{2,3\}, \{1,2,3\}\}$
 - None
- Insert 4 GM's between 9 and 288 :-
 - 27, 54, 108, 144
 - 18, 36, 72, 144
 - 36, 72, 144, 208
 - 18, 27, 54, 108
- In a class of 120 students, 35% students can play only cricket, 45% students can play only table tennis and the remaining students can play both the games. In all how many students can play cricket?
 - 55
 - 66
 - 60
 - 70
- $\int \frac{dx}{x + \sqrt{x^2 - 1}}$
 - $\frac{x^2}{2} - \frac{x}{2} \sqrt{x^2 + 1} + \frac{1}{2} \log(x + \sqrt{x^2 - 1}) + C$
 - $x - \frac{x}{2} \sqrt{x^2 - 1} - \frac{1}{2} \log(x + \sqrt{x^2 - 1}) + C$
 - $\frac{x^2}{2} + \frac{x}{2} \sqrt{x^2 - 1} + \frac{1}{2} \log(x + \sqrt{x^2 - 1}) + C$
 - $\frac{x^2}{2} - \frac{x}{2} \sqrt{x^2 - 1} + \frac{1}{2} \log(x + \sqrt{x^2 - 1}) + C$

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7. In an organization Employer required maximum ten employees. X and Y are numbers of male and female respectively then which inequality shows right relation.
 - (a) $x + y = 10$
 - (b) $x + y \leq 10$
 - (c) $x + y \geq 10$
 - (d) $x \geq 10$
8. You are selecting a cricket team of first 11 players out of 16 including 4 bowlers and 2 wicket keepers. In how many ways you can do it, so that the team contains exactly 3 bowlers and 1 wicket keeper?
 - (a) 960
 - (b) 840
 - (c) 420
 - (d) 252
9. The Simple interest at x% for x years will be Rs. x on a sum of:
 - (a) Rs. x
 - (b) Rs. $100/x$
 - (c) Rs. $100x$
 - (d) Rs. $100/x^2$
10. $f(x) = \{(2,2), (3,3), (4,4), (5,5), (6,6)\}$ be a relation of set $A = \{2,3,4,5,6\}$ it is a:-
 - (a) Reflexive and Transitive
 - (b) Reflexive and Symmetric
 - (c) Reflexive only
 - (d) An equivalence relation
11. The value of $4\log \frac{8}{25} - 3\log \frac{16}{125} - \log 5$ is:-
 - (a) 0
 - (b) 1
 - (c) 2
 - (d) -1
12. The ratio of the prices of two houses was 16:23. Two years later when the price of the first has increased by 10% and that of the second by Rs. 477, the ratio of the prices becomes 11:20. Find the original prices of the two houses.
 - (a) Rs. 848, Rs. 1219
 - (b) Rs. 1019, Rs. 1428
 - (c) Rs. 488, Rs. 1129
 - (d) Rs. 484, Rs. 1119
13. What should be the least number of years in which the simple interest on Rs. 2600 at $6\frac{2}{3}\%$ will be an exact number of rupees?
 - (a) 2 years
 - (b) 3 years
 - (c) 4 years
 - (d) 5 years

14. Find $\frac{dx}{dy}$ for $x^2y^2 + 3xy + y = 0$

(a) $-\frac{2xy^2 + 3y}{2x^2y + 3x + 1}$

(b) $-\frac{2x^2y + 3x + 1}{2xy^2 + 3y}$

(c) $-\frac{2xy + 3y}{2xy + 3x + 1}$

(d) $\frac{2x^2y + 3x + 1}{2xy^2 + 3y}$

15. Match List I with List II:

List I	List II
(a) Mean Proportional between x^2y^2 and x^4y^6 is	(i) X^8y^2
(b) Fourth Proportional to xy^2 , x^3y , x^6y^3 is	(ii) X^5
(c) Third Proportional of xy^2 , x^3y is	(iii) x^3y^4

Choose the correct answer from the options given below:-

- (a) a-(i), b-(ii), c-(iii)
 (b) a-(iii), b-(i), c-(ii)
 (c) a-(ii), b-(iii), c-(i)
 (d) None

16. In C.I. a certain sum of money double itself in 4 years. In how much time the sum becomes 32 times of itself?

- (a) 14 years
 (b) 15 Years
 (c) 20 Years
 (d) 22 Years

17. Number of permutations of n distinct objects when a particular object is always included in any arrangement is:-

- (a) ${}^{n-1}P_{r-1}$
 (b) ${}^nP_{r-1}$
 (c) ${}^{n-1}P_r$
 (d) $r \cdot {}^{n-1}P_{r-1}$

18. Divide Rs. 8840 between A and B so that the amount received by A at the end of 8 years may be equal to the amount received by B at the end of 10 years, compound interest being at 10% per annum.

- (a) Rs. 4640, Rs. 4200
 (b) Rs. 4840, Rs. 4000
 (c) Rs. 5000, Rs. 3840
 (d) Rs. 5240, Rs. 3600

19. If the arithmetic mean of the two numbers is 5 and the geometric mean is 4, then the difference in the numbers is
 (a) 6
 (b) 2
 (c) 4
 (d) 1

20. The present value of an Annuity immediate is the same as
 (a) Annuity regular for (n - 1) year plus the initial receipt in the beginning of the period
 (b) Annuity regular for (n - 1) years
 (c) Annuity regular for (n + 1) years
 (d) Annuity regular for (n + 1) years plus the initial receipt in the beginning of the period

21. If a Car is available for Rs.5,80,000 cash payment or 80,000 cash down payment followed by Five equal annual instalments. If the rate of interest charged is 14% per annum compounded yearly, then total interest charged in the instalment plan is?
 (a) Rs. 1,45,645
 (b) Rs. 2,82,622
 (c) Rs. 2,28,209
 (d) Rs. 2,82,262

22. $\lim_{x \rightarrow 5} \frac{x^2 - 25}{x - 5}$
 (a) 8
 (b) 9
 (c) 10
 (d) 0

23. Find the compound interest on Rs.8,000 at 15% per annum for 2 years 4 months, compounded annually?
 (a) 1119
 (b) 2109
 (c) 3109
 (d) 4109

24. The roots of $x^3 + x^2 - x - 1 = 0$ are :-
 (a) -1, -1, 1
 (b) 1, 1, -1
 (c) -1, -1, -1
 (d) 1, 1, 1

25. If ${}^nP_5 = 20 {}^nP_3$ then n is equal to :-
 (a) 7
 (b) 6
 (c) 8
 (d) 5

26. Find the present value of Rs. 2000 to be received after 4 years if the interest rate is 8% per annum compounded annually ?
(a) Rs. 1170.06
(b) Rs. 1470.06
(c) Rs. 1570.06
(d) Rs. 1180.06
27. How many 3-digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9 Which are divisible by 5 and none of the digits is repeated?
(a) 5
(b) 60
(c) 100
(d) 20
28. If $x = \sqrt{1 + \sqrt{1 + \sqrt{1 + \sqrt{\dots}}}} - \infty$ then the positive value of x is
(a) $\frac{\sqrt{7}+1}{2}$
(b) $\frac{\sqrt{6}+1}{2}$
(c) $\frac{\sqrt{3}+1}{2}$
(d) $\frac{\sqrt{5}+1}{2}$
29. 5 chairs and 3 tables cost of Rs. 350. and 3 Chairs and 5 tables cost Rs. 370. What is the cost of the one table and two chairs?
(a) Rs. 130
(b) Rs. 120
(c) Rs. 150
(d) Rs. 140
30. If α, β are roots of $x^2 + x + 2 = 0$, then the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$:
(a) $\frac{-2}{3}$
(b) $\frac{-3}{4}$
(c) $\frac{-3}{2}$
(d) None of these

31. A sum of money amounts to Rs. 5,200 in 5 years and to Rs. 5,680 in 7 years at simple interest. The rate of interest per annum is :-
(a) 3%
(b) 4%
(c) 5%
(d) 6%
32. If 5th and 12th terms of an AP are 14 and 35 respectively, find the first term of AP.
(a) 4
(b) 2
(c) 1
(d) 3
33. Value of $\frac{2a^{1/2} \times a^{2/3} \times 6a^{-7/3}}{9a^{-5/3} \times a^{3/2}}$ if $a=4$
(a) $\frac{1}{3}$
(b) $\frac{1}{2}$
(c) $\frac{1}{4}$
(d) $\frac{1}{9}$
34. If the compound interest on a certain sum at $16\frac{2}{3}\%$ for 3 years is Rs. 1,270, find the simple interest on the same sum at the same rate and for the same period.
(a) 1,050
(b) 1,020
(c) 1,080
(d) None of these
35. The value of furniture depreciates by 10% a year, if the present value of the furniture in an office is Rs. 21,870, calculate the value of furniture 3 years ago:-
(a) Rs. 30,000
(b) Rs. 35,000
(c) Rs. 40,000
(d) Rs. 50,000
36. If $F:R \rightarrow R$ is a bijection function given by $f(x) = (x-1)^3 + 2$ then $f^{-1}(x)$ is
(a) $(x-2)^{1/3} + 1$
(b) $(x-2)^{-1/3} + 1$
(c) $(x+2)^{1/3} - 1$
(d) None of these

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37. An annuity consisting of equal payments at the end of each month for 2 years is to be purchased for Rs. 2000. If the interest rate is 6% compounded monthly, how much is each payment?
 (a) 78.61
 (b) 76.80
 (c) 68.70
 (d) 68.50
38. The nominal rate of interest is 10% per annum the interest is compounded quarterly. The effective rate of interest per annum will be:-
 (a) 10%
 (b) 10.10%
 (c) 10.25%
 (d) 10.38%
39. A sinking fund is created for redeeming debentures worth Rs. 5,00,000 at the end of 25 years. How much provision needs to be made out of profits each year provided sinking fund investments can earn interest at 4% p.a.?
 (a) 12006
 (b) 12040
 (c) 12039
 (d) 12035
40. Determine the present value of perpetuity of Rs. 5000 per month @ rate of interest 12% p.a. is _____
 (a) 4,50,000
 (b) 5,00,000
 (c) 5,50,000
 (d) 6,00,000
41. Find the missing value:-
 6F, 8G, 12I, 18L,
 (a) 26 K
 (b) 26 G
 (c) 26 Z
 (d) 26 P
42. A variable x have 10 values $x_1, x_2, \dots, x_5, -x_1, -x_2, \dots, -x_5$. and $\sum_{i=1}^5 x_i^2 = 80$, find the standard deviation of x
 (a) 2
 (b) 4
 (c) $2\sqrt{2}$
 (d) 16
43. If the rank coefficient between debenture price and share price is found to be 0.143 and the sum of squares of the difference in the rank is 48, what is the number of share selected for study?
 (a) 5
 (b) 7
 (c) 12
 (d) 6

44. During a certain period the cost of living Index number goes up from 110 to 200 and the salary of the worker is also raised from Rs. 325 to Rs. 500. Does the worker :
 (a) gain
 (b) loses
 (c) fully compensated
 (d) gain by 10%
45. The regression equation of y on x is $y = -3 + 0.5x$ and that of x on y is $x = -7 + By$. If the correlation co-efficient between x and y is 0.1, then B =
 (a) 0.5
 (b) -0.5
 (c) 0.02
 (d) -0.02.
46. Which of the following statements are true?
 I. Correlation coefficient is the arithmetic mean between regression coefficients.
 II. Regression coefficients are independent of the change of origin but not of scale.
 III. If one of the regression coefficient is > 1 , then the other must be less than unity.
 (a) I and II
 (b) III and I
 (c) II and III
 (d) I, II and III
47. Given the following data :
- | Commodity | P_0 | q_0 | p_1 | q_1 |
|-----------|-------|-------|-------|-------|
| A | 1 | 10 | 2 | 5 |
| B | 1 | 5 | X | 2 |
- where p and q represent price and quantity respectively and subscript for the time period. The value of X if the ratio between Laspeyres (L) and Paasche's (P) index numbers is 28 : 27 i.e., $L : P = 28 : 27$ is :
 (a) 3
 (b) 4
 (c) 5
 (d) 6
48. A pie chart is drawn to show the areas in millions of square kms. of several continents. The area 11.7 sq. km. of Africa is shown by a sector subtending an angle of 82° . If the subtended angle corresponding to North America be 66° , find its area
 (a) 9.8 km^2
 (b) 9.4 km^2
 (c) 88 km^2
 (d) 5.6 km^2
49. If two regression lines are $3x+4y-18=0$ and $5x+2y=10$. Then $\sigma_x : \sigma_y = ?$
 (a) 0.53
 (b) 0.73
 (c) 0.60
 (d) None

50. If the 1970 index with base 1965 is 200 and 1965 index with base 1960 is 150, the index 1970 on base 1960 will be:
(a) 700
(b) 300
(c) 500
(d) 600
51. A driver left his village and drove North for 20 km, after which he stopped for breakfast. Then he turned left and drove another 30 km, when he stopped for lunch. After some rest, he again turned left and drove 20 kms before stopping for evening tea. Once more he turned left and drove 30 kms to reach the town where he had supper. After evening tea in which direction did he drive?
(a) West
(b) East
(c) North
(d) South
52. Five boys A, B, C, D, E, are sitting in a park in a circle. A is facing South-West, D is facing South-East, B and E are right opposite A and D respectively and C is equidistant between D and B. Which direction is C facing?
(a) West
(b) South
(c) North
(d) East
53. Six persons M, N, O, P, Q and R are sitting in two row with three persons in each row, Both the row are in front of each other. Q is not at the end of any row. P is second the left of R. O is the neighbour of Q and diagonally opposite to P. N is the neighbour of R. Who is in front N?
(a) R
(b) Q
(c) P
(d) M
54. In a college party, 5 girls are sitting in a row. P is to the left of M and to the right of O. R is sitting to the right of N but to the left of O. Who is sitting in the middle?
(a) O
(b) R
(c) P
(d) M
55. X and Y are the children of A. A is the father of X but Y is not his son. How is Y related to A?
(a) Sister
(b) Brother
(c) Son
(d) Daughter

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56. If the median of $\frac{x}{5}, \frac{x}{3}, \frac{x}{6}, \frac{x}{2}, \frac{x}{7}$ and x is 24. Find the value of x .
- 72
 - 49
 - 90
 - 52
57. A lady travel at a speed of 120km/h and returned at quicker speed. If her average speed of the whole journey is 150km/h, find the speed of return journey (in km/h).
- 250
 - 300
 - 200
 - None
58. The G.M. of 4, 20 and 36 is
- $2\sqrt[3]{80}$
 - $8\sqrt[3]{340}$
 - $2\sqrt[3]{8}$
 - $4\sqrt[3]{45}$
59. Which measure of dispersion is best for open end classes?
- Range
 - Quartile deviation
 - Mean deviation
 - Standard deviation
60. If the standard deviation of 0, 1, 2, 3... 9 is k , then standard deviation of 10, 11, 12, 13,... 19 is
- $10k$
 - $k+10$
 - k
 - $k + \sqrt{10}$
61. If mean and variance of random variable which follows the binomial distribution are 7 & 6 respectively, then the probability of success is:
- $\frac{6}{7}$
 - $\frac{36}{49}$
 - $\frac{1}{7}$
 - $\frac{1}{49}$

62. Chain index is equal to:
- link relative of current year $\times \frac{\text{Chain index of the current year}}{100}$
 - link relative of current year $\times \frac{\text{Chain index of the previous year}}{100}$
 - link relative of previous year $\times \frac{\text{Chain index of the current year}}{100}$
 - None of these
63. $\Sigma P_1 Q_1 = 248$, $\Sigma P_0 Q_0 = 150$, Paasche's index number = 150 and Dorbish-Bowley's index number = 145. Then the Fisher's ideal index number is:
- 75
 - 144.91
 - 145.97
 - None of these
64. Spatial classification is :
- classification of units on the basis of time
 - classification of units on the basis of geographical area
 - classification of units according to the characteristic of attributes
 - classification of units according to the characteristic of variables
65. The Probability distribution of a random variable is as follows
- | | | | | | | |
|-----|----|----|----|----|----|----|
| x | 1 | 2 | 3 | 4 | 5 | 6 |
| P | 3k | 5k | 2k | 4k | 3k | 3k |
- The expected value of x is:
- 2.8
 - 12.2
 - 6.8
 - 3.4
66. The average of 17 numbers is 45. The average of first 9 of these numbers is 51 and the last 9 of these numbers is 36. Find the 9th number?
- 5
 - 14
 - 18
 - None of these
67. If $u + 5x = 6$ and $3y - 7v = 20$ and the correlation coefficient between x and y is 0.58, then what would be the correlation coefficient between u and v ?
- 0.58
 - 0.58
 - 0.84
 - 0.84

68. In the following rectangle there are numbers and alphabets, what will come in place of question mark?

2	4	6	8
C	F	I	?
D	H	L	P

- (a) K
 (b) N
 (c) L
 (d) M
69. In a certain code 256 means 'Red Colour Chalk', 589 means 'Green Colour Flower' and 245 means 'White Colour Chalk'. What digit in the code means 'White'?
- (a) 2
 (b) 4
 (c) 5
 (d) None of these
70. If water is called food, food is called tree, tree is called sky, sky is called wall, on which of the following grows a fruit?
- (a) Sky
 (b) Tree
 (c) Food
 (d) Wall
71. Arun started from point A and walked 10 km East to point B, then turned to North and walked 3 km to point C and then turned West and walked 12 kms to point D, then again turned South and walked 3 kms to point E. In which direction is he from his straight point ?
- (a) East
 (b) South
 (c) West
 (d) North
72. If + Means $\times$, - Means + and $\times$ Means $\div$, then the value of $5+4-18\times 3$ is :-
- (a) -45
 (b) $12\frac{2}{3}$
 (c) 26
 (d) 15

Directions (Q. 73-74) : Read the following information carefully and answer the questions, given below :-

- (i) ' $P \div Q$ ' means P, is Son of Q
 (ii) ' $P \times Q$ ' means P, is Sister of Q
 (iii) ' $P + Q$ ' means P, is Brother of Q
 (iv) ' $P - Q$ ' means P, is Mother of Q

73. How is T related to S in the expression?
 $'T \times R + V \div S'$?
 (a) Sister
 (b) Mother
 (c) Aunt
 (d) Daughter
74. How is T related to S in the expression?
 $'T \times R \div V - S'$?
 (a) Father
 (b) Sister
 (c) Daughter
 (d) Aunt
75. One evening, Raja started to walk toward the Sun. After walking a while, he turned to his right and again to his right. After walking a while, he again turned right. In which direction is he facing ?
 (a) South
 (b) East
 (c) West
 (d) North
76. Choose the missing term out of the given alternatives:-
 B, S, F, Q, J, O, N, M, ____, ____
 (a) R, I
 (b) P, K
 (c) P, I
 (d) R, K
77. The most appropriate diagram to represent 5 year plan outlay of India in different economic sectors is:
 (a) Pie diagram
 (b) Histogram
 (c) Line diagram
 (d) Frequency polygon
78. If the standard deviation of x is 3, what is the variance of $(5-2x)$?
 (a) 36
 (b) 6
 (c) 1
 (d) 9
79. If $P(\bar{A} \cup B) = 5/6$, $P(A) = 1/2$ and $P(\bar{B}) = 2/3$, what is $P(A \cup B)$?
 (a) $1/3$
 (b) $5/6$
 (c) $2/3$
 (d) $4/9$

80. The probability that A speaks truth is $\frac{4}{5}$, while the probability for B is $\frac{3}{4}$. The probability that they contradict each other when asked to speak on a fact is:
(a) $\frac{3}{20}$
(b) $\frac{1}{5}$
(c) $\frac{7}{20}$
(d) $\frac{4}{5}$
81. What is the probability that a leap year selected at random would contain 53 Saturdays?
(a) $\frac{1}{7}$
(b) $\frac{2}{7}$
(c) $\frac{1}{12}$
(d) $\frac{1}{4}$
82. A Binomial distribution is _____. The parameter(s) are:
(a) Biparametric, n and q
(b) Biparametric, n and p
(c) Uniparametric, p
(d) Uniparametric, q
83. In Binomial Distribution, $\mu = 4$, $\sigma^2 = 3$, then mode =
(a) 4
(b) 4.25
(c) 4.5
(d) 4.1
84. A man started walking from his house towards south. After walking 6 km, he turned to his left and walked 5 km. Then he walked further 3 km after turning left. He then turned to his left and continued his walk for 9 km. How far is he away from his house?
(a) 3 km
(b) 4 km
(c) 5 km
(d) 6 km
85. Five persons are sitting in a row. D is right to P and left to T. B is left to V and right to T. who are at the ends of the row?
(a) D, T
(b) T, B
(c) P, V
(d) D, B
86. A and B are Sisters. C and D are Brothers. Daughter of A is Sister of C, then how B is related to D?
(a) Mother
(b) Grandmother
(c) Sister
(d) Aunty

87. A girl introduced a boy as the son of the daughter of the father of her paternal uncle. The boy is related to the girl as –
- (a) Son
 - (b) Uncle
 - (c) Nephew
 - (d) Cousin

Directions (Q.N. 88-89) : Read the following instructions and answer the questions :-

- (i) Ram, Shyam, Harish, Mahesh and Rahim are five boys sitting along a circular table facing towards centre.
 - (ii) Harish is sitting immediately to the left of Rahim.
 - (iii) Ram is sitting between Mahesh and Rahim
88. Who is sitting to the immediate left side of Harish?
- (a) Rahim
 - (b) Mahesh
 - (c) Ram
 - (d) Shyam
89. Who is sitting between Shyam and Ram ?
- (a) Rahim
 - (b) Mahesh
 - (c) Harish
 - (d) Impossible to find
90. Mutually exclusive classification is usually meant for
- (a) A discrete variable
 - (b) A continuous variable
 - (c) An attribute
 - (d) None of these
91. The mean income of a group of workers is $\bar{x}$ and that of another group is $\bar{y}$. If the number of workers in the second group is 10 times the number of workers in the first group, then the mean income of the combined group is
- (a) $(\bar{x} + 10\bar{y})/5$
 - (b) $(\bar{x} + 10\bar{y})/11$
 - (c) $(10\bar{x} + \bar{y})/11$
 - (d) $(\bar{x} + 10\bar{y})/9$
92. The average of 2 number is 20 and their standard deviation 5. Find the two numbers?
- (a) 15, 25
 - (b) 30, 40
 - (c) 10, 15
 - (d) None of these

93. If events are mutually exclusive, then-
- Their probabilities are less than one
 - Their probabilities sum to one
 - Both events cannot occur at the same time
 - Both of them contain every possible outcome of an experiment.
94. In standard normal distribution
- Mean =1 SD=0
 - Mean =1 SD=1
 - Mean=0 SD=1
 - Mean=0 SD=0
95. If X & Y are two independent normal variates with means μ_1 & μ_2 and standard deviations σ_1 & σ_2 respectively, then X + Y follows_____
- Means = $\mu_1 + \mu_2$, S.D = 0
 - Means = $\mu_1 + \mu_2$, S.D = $\sigma_1^2 + \sigma_2^2$
 - Means = 0, S.D = $\sigma_1^2 + \sigma_2^2$
 - Means = $\mu_1 + \mu_2$, S.D = $\sqrt{\sigma_1^2 + \sigma_2^2}$
96. As the sample size increases, standard error
- Increases
 - Decreases
 - Remains constant
 - Decreases proportionately
97. Which sampling adds flexibility to the sampling process?
- Simple random sampling
 - Multistage sampling
 - Stratified sampling
 - Systematic sampling
98. Sample in which the number of units is less than_____is called a small sample
- 100
 - 75
 - 50
 - 30
99. In a certain manufacturing process, 5% of the tools produced turn out to be defective. Find the probability that in a sample of 40 tools, at most 2 will be defective.
 [Given : $e^{-2} = 0.135$]
- 0.555
 - 0.932
 - 0.785
 - 0.675

100. The test of shifting the base is called
- (a) Unit
 - (b) Circular
 - (c) Time reversal
 - (d) Factor reversal

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