

Virtual University of Pakistan

Federal Government University



PAST PAPERS /MCQs/ MID TERM
/FINAL TERM/SOLVED QUESTIONS



MID TERM & FINAL TERM

QUIZ NO 1

QUIZ NO 2

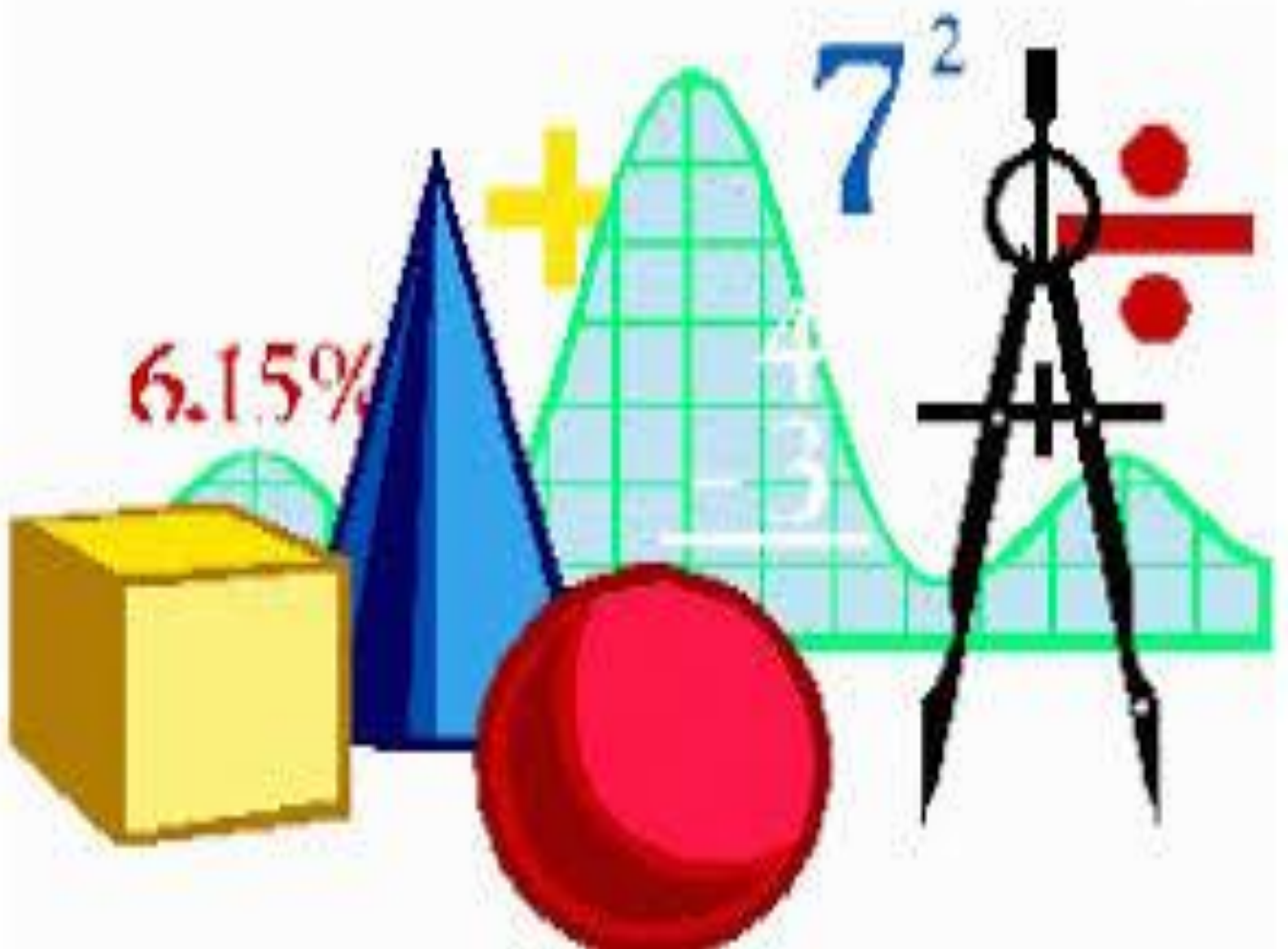
GRAND QUIZ

MID TERM

FINAL TERM

MSC-ZOOLOGY

STA-100 General Mathematics and Biostatistics



PAST PAPERS

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1. Write the set in the Roster form: The set of whole numbers less than 5. _____ **{0, 1, 2, 3, 4}**
2. We can add two matrices having real numbers A and B if their _____ **Order is same**
3. Cardinality of Set A is denoted by _____ **|A|**
4. If the order of matrix A is $m \times p$ and the order of B is $p \times n$. Then the order of matrix AB is _____ **$m \times n$**
5. The set consisting of all the first elements of each ordered pair in the relation is called _____ **Domain of relation**
6. $\tan \theta = \frac{\sin \theta}{\cos \theta}$
7. $\{x | x < 6 \text{ and } x \text{ is a counting number}\}$ is the example of _____ **Set, builder Method**
8. Set of rational numbers is denoted by _____ **Q**
9. Find the binomial coefficient of the 7th term of the expansion of $(x+y)^{10}$ _____ **210**
10. Find the binomial coefficient of the 5th term of the expansion of $(a+b)^8$ _____ **70**
11. What comes next in the sequence: 1.2.6. 22. ? _____ **86**
12. The distance of the point P(2,3) from the x - axis is _____ **3**
13. The sum of two numbers is 27 and product is 182. The numbers are: _____ **13 and 14**
14. $\cos \theta$ is negative in the _____ **Second and the third quadrant**
15. 6P_1 is equal to _____ **6**
16. Another name for a quadratic equation is _____ **2nd degree**
17. $\cos \theta = \frac{1}{\sin \theta}$ is the _____ **Reciprocal Property**
18. $f(x) = x^2 + 6$ and $g(x) = 2x - 1$ then $(f \circ g)(x)$ is equal to _____ **$4x^2 + 4x + 7$**
19. The set of vowels in English alphabet contains elements _____ **{a, e, i, o, u}**
20. if we solve $ax^2 + bx + c = 0$ by completing square method, we get _____ **quadratic formula**
21. Given $f(x) = 2x + 1$, find $f(-3)$ _____ **5**
22. 0.333333 is _____ **Rational Number**
23. $\cos(A - B) = \cos A \cos B + \sin A \sin B$
24. If determinant of a matrix is equal to zero. then it is said to be _____ **singular matrix**
25. If determinant of a matrix A is Zero then _____ **A is a Singular matrix**
26. Irrational numbers are _____ **Can't be written as fractions**
27. If a, b, c are in GP then relation between a, b, c can be _____ **$b = (ac)^{1/2}$**
28. The smallest interval for which the function repeats itself is called its _____ **period**
29. If $b^2 - 4ac < 0$ _____ **there will be no real solution**
30. Let the sequence be 1. 3.5, 7. 9. then this sequence is _____ **An Airthmetic sequence**
31. If you have an arithmetic sequence, the first number is 2 and the common difference is 4. what is the 4th number in the sequence? _____ **14**
32. Roots of $x^2 - 4 = 0$ _____ **-2, 2**
33. Number of basic techniques for solving A quadratic equation are _____ **THREE**
34. The eighth term in the series 2, 6, 18, 54, _____ is _____ **4374**
35. A quadratic equation which cannot be solved by factorization, that will be solved by _____ **Completing square**
36. $\cot \theta = \frac{1}{\tan \theta}$
37. Which is the best example of additive inverse _____ **$7 + (-7) = 0$**
38. The graph of 4 quadratic function will form _____ **parabola**
39. $\cot \theta = \frac{\cos \theta}{\sin \theta}$
40. How many Permutations of the letter of the word APPLE are there: _____ **60**
41. $\sec \theta = \frac{1}{\cos \theta}$
42. A Square matrix with ones on the diagonal and zeros elsewhere is called _____ **identity matrix**
43. The first term and common difference for the A.P. 3, 1, -1, -3 is _____ **3 and -2**

44. Write the set in the Roster form: The set of five numbers each of which is divisible by 3
_____ **{3.6. 9, 12, 15}**
45. From all the letters of the word "THURSDAY", how many different words can be formed? _____ **8!**
46. Which is not the property of Gradient **Positive gradient means line is facing upwards.**
47. In the expansion $(a + x)^n$, the sum of exponents of a and x is _____ **n**
48. $\cos \theta$ is positive in the _____ **First and the fourth quadrant**
49. The n^{th} term of an A.P. is given by $a_n = 3 + 4n$. The common difference is _____ **4**
50. The domain of $R = \{(0, 2), (2, 4), (3, 4), (4, 5)\}$ is _____ **{0.2.3.4.}**
51. If any matrix A has only one row, then it is called _____ **Row Matrix**
52. $\tan \theta =$ _____ **$\frac{\sin \theta}{\cos \theta}$**
53. Geometric Progression between - 4 and - 9 is _____ **-6**
54. In how many ways can 5 red and 4 white balls be drawn from a bag containing 10 red and 8 white balls? _____ **${}^{10}C_5 \times {}^8C_4$**
55. The 10th term from the end of the A.P. - 5, -10, -15, ; - 1000 is _____ **-950**
56. Given $f(x) = 2x + 1$. find $f(-3)$ _____ **-6**
57. Which of the following relations is a function _____ **{(0,0), (1,2), (2,3)}**
58. Graph is symmetric with respect to the origin is the graph of an _____ **Odd Function function**
59. The horizontal lines of numbers in a matrix is called _____ **Rows**
60. Next term of the sequence 0.02, 0.006, 0.0018... is _____ **0.0054**
61. What is the 31st term of the sequence: 1, 4, 7, 10, ? _____ **91**
62. If the number of columns and rows are not equal in a matrix. then it is said to be a _____
_____ **rectangular matrix**
63. Equations having same solution are called _____ **Simultaneous equations**
64. Look at this series: 22, 21, 23, 22, 24, 23, .. What number should come next? _____ **25**
65. A list of numbers in which each term is obtained by adding a fixed number to the preceding term except the first term is called an... _____ **An Arithmetic Progression**
66. $(a + bi) + (c + di)$ _____ **$(a+c) + (b+d)i$**
67. Write the set in the Roster form: The set of first seven natural numbers _____ **{1, 2, 3, 4, 5, 6, 7}**
68. In the given AP series the term at position 11 would be 5, 8, 11, 14, 17, 20, 50. _____ **35**
69. In quadratic equation, When a is positive then _____ **Graph concaves downward**
70. There are 30 people in a group. If all shake hands with one another. how many handshakes are possible? _____ **435**
71. In quadratic equation, if $b = 0$ then it is called _____ **Pure quadratic equation**
72. An unordered collection of distinct objects: _____ **SET**
73. The value of ${}^{10}C_9$ _____ **10**
74. 4, 7, 12, 19, 28, 7 _____ **39**
75. Which of the following two sets are disjoint? _____ **{1, 3, 5} and {2, 4, 6}**
76. $Z = a + ib$, its conjugate is defined as _____ **$Z^* = a - ib$**
77. If a function is to have an inverse which is also a function then it must be _____
_____ **One to One Function**
78. A relation is a set of _____ **Ordered pairs**
79. How many three letter words are formed using the letters of the word TIME? _____ **24**
80. Mappings where two or more members of the pre-image are mapped to exactly one member of the image. _____ **Many -One Relations**
81. $\csc \theta = \frac{1}{\sin \theta}$ is the _____ **Reciprocal Property**
82. $\sec \theta =$ _____ **$\frac{1}{\cos \theta}$**
83. $\sin \theta$ is negative in the _____ **Third and the fourth quadrant**
84. Which relation is true _____ **$N \subset Z \subset Q \subset R$**
85. If 2 sets A and B are given then the set consisting of all the elements which are either in A and B or in both is called _____ **Union of A and B**
86. Which of the following property of matrix multiplication is correct _____ **All of the mentioned**

87. The set $P_c x$ is an odd number between 10 and 18 _____ (11, 13, 15, 17)
88. If every element of set A is an element of set B is denoted by _____ $A \subseteq B$
89. A diagonal matrix having equal elements is called a _____ **Scalar matrix**
90. The nth term of an A.P. 5, 2, -1, -4, -7 is _____ $2n+5$
91. The range of $R = \{(0, 2), (2, 4), (3, 4), (4, 5)\}$ is _____ (2, 4, 5)
92. Find the next term of this sequence 11, 13, 17, 19, 23, _____ 27
93. Set are generally represented by _____ **Capital letters**
94. $(a+ bi) + (c+ di)$ _____ $(a+ b) + (b + d)i$
95. If $f(-x) = f(x)$ for every number x in domain of f, then f is _____ **Even function**
96. The number of ways in which four books can be arranged on a shelf are: _____ 24
97. The vertical lines of numbers in a matrix are called _____ **Columns**
98. If any matrix A has only one column, then it is called _____ **Column Matrix**
99. Roots of $x^2 + 8x + 12$ are _____ -2, -6
100. $\tan \theta$ is negative in the _____ **Second and the fourth**
101. $(A \cap B) \cap C = B \cap (A \cap C)$ _____ **Associative Property of Intersection**
102. The solutions of the quadratic equation are also called its _____ **Roots**
103. The objects in a set are called _____ **Elements**
104. If p, q, r and s are in AP, then r-q is _____ **S-p**
105. The quadratic formula for $ax^2 + bx + c + 0$ _____ $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
106. $10!$ equals to: _____ **3628800**
107. If 2 sets A and B are given, then the set consisting of all the common elements of A and B, then it is called _____ **Intersection of A and B**
108. In how many ways can the letters of the word 'LEADER' be arranged? _____ 360
109. The number of terms in the expansion of $(a + 6)^n$ are _____ n
110. In how many different ways can the letters of the word 'CORPORATION' be arranged so that the vowels always come together? _____ 50400
111. $i(3i + 2)$ _____ -3
112. Range of $R = \{(0, 2), (2, 4), (3, 4), (4, 5)\}$ is _____ {2, 4, 5}
113. The set consisting of all the second elements of each ordered pair in the relation is called _____ **Range of relation**
114. Insert the missing number 5, 17, 14, 26, 23, 35, 32 _____ 34
115. The set consisting of members of the pre-image or inputs of a function is called _____ **Domain**
116. Number in form $z = a + bi$ where $a, b \in \mathbb{R}$ and $i = \sqrt{-1}$ is called a _____ **Complex number**
117. Periodic Property of Tangent is _____ $\tan(\theta \pm 180) = \tan \theta$
118. Periodic Property of Sine is _____ $\sin(\theta \pm 360) = \sin \theta$
119. Axis of symmetry in form of vertical line separates parabola into _____ **Two equal halves**
120. 11, 33, 55, 77 _____ 99
121. Common difference of sequence 5, 8, 11, 14, ... is _____ 3
122. $\tan \theta$ is positive in the _____ **First and the third quadrant**
123. $A = \begin{bmatrix} 0 & 1 & 0 & 0 \end{bmatrix} A^{-1}$ is equal to _____ **does not exist**
124. $\cos \theta$ is negative in the _____ **Second and the third quadrant**
125. The general term of the Binomial expansion $(a + x)^n$ is _____ $({}^n C_r) a x^{n-r}$
126. Consider the set A = all integers that are strictly greater than 20 and strictly less than 25}. Write this set in roster form _____ $A = \{21, 22, 23, 24\}$
127. If $A = \{1, 2, 3, 4\}$ and $B = \{4, 5, 6, 7\}$ then $A \cup B$ should be _____ (1, 2, 3, 4, 5, 6, 7)
128. Find the missing term: K2, I4, _____, E16, C32 _____ **g8**
129. In an Arithmetic Progression, if $a=28$, $d=-4$, $n=7$, then a_n is _____ 4
130. The set $N = \{2, 3, 5, 7, 11, 13, 17, \dots\}$ is known as _____ **Set of prime numbers**
131. $i(3i + 2)$ _____ -3
132. Maximum number of roots of a quadratic equation are _____ **two**
133. A set containing only one element is said to be _____ **Singleton set**

134. In the series 7, 10, 13 20th term is _____ **59**
135. In how many ways can we arrange the word "FUZZTONE" so that all the vowels come together _____ **1440**
136. A set with no elements in it is known as _____ **Empty set**
137. 10! equal to _____ **362880**
138. How many solutions do you get when you solve by completing the square? _____ **2**
139. We can subtract two matrices A and B if their _____ **Order is same**
140. In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together? _____ **720**
141. A set with no element in it is known as _____ **Empty set**
142. Factorize $x^2 + 8x + 12$ _____ **(x+2)(x+6)**
143. The set O of odd positive integers less than 10 can be expressed by _____ **{1,3,5,7,9}**
144. The set consisting of all the elements of each ordered pair in the relation is called _____ **Domain of relation**
145. If A and B matrices are of same order and $A+B = B+A$ this law is known as _____ **Distributive law**
146. An equation which contains the square of the unknown variable quantity, but no higher power is called _____ **Quadratic equation**
147. The eight term of the series 2, 6, 18, 54, Is _____ **4374**
148. If discriminant > 0 then _____ **There will be no real solution**
149. In cricket league, in first round every team plays a match with every other team 9 teams participated in the cricket league. How many matches were played in first round? _____ **9!**
150. Find the next number 98,96,92,90, _____ **86**
151. Any matrix of order $1 \times n$ is called _____ **row m**
152. Sine function is also periodic with period 360 degrees and range between _____ **-1 to 1**
153. The set $N = \{1,2,3,4,5, \dots\}$ is known as _____ **Set of natural numbers**
154. Find the missing number : 2,5,9,14, _____, 27 _____ **19**
155. The distance of the point P(1,4) and Q (4,0) is _____ **5**
156. Find the missing number: 41,40,38, 35, 31? _____ **28**
157. In Quadratic equation if $b=0$ then it is called _____ **Pure quadratic equation**
158. The quadratic equation has degree _____ **2**
159. The solutions of the quadratic equation are also called its _____ **Roots**
160. The matrix has equal number of rows and columns then it is Called _____ **Square matrix**
161. What is the cardinality of the set of odd positive integers less than 10? _____ **5**
162. If $a=10$ and $d=10$, then first four terms will be: _____ **10,30,50,60**
163. What is the cardinality of the set of odd positive integers less than 12? _____ **3v**
164. If 2 sets A and B are given, then set consisting of all elements which are either in A or in B or in both is called _____ **Union of A and B**
165. The determinant of identity matrix is? _____ **1**
166. An empty set is a subset of _____ **Every set**
167. The graph of a quadratic function will form _____ **Parabola**
168. Factorize $x^2 + 8x + 12$ _____ **(x+2)(x+6)**
169. If the nth term of an AP is $3n-4$, the 10th term of AP is _____ **22**
170. If $A = \{2, 3, 4, 5, 6\}$ and $B = \{4, 5, 6, 7\}$ then $A \cap B$ should be _____ **{4, 5, 6}**
171. An empty set having elements _____ **No element**
172. Find the missing number: 2, 5, 9, 14, _____, 27 _____ **20**
173. Find the missing number: 4, 18, 48, ?, 180 _____ **100**
174. Find the missing number. 54, 54, 46, 46, 38, 38, ? _____ **30**
175. The Inverse exist only for _____ **Non-singular matrices.**
176. The number of non zero rows in echelon form is called _____ **Rank of a matrix**
177. If A and B are matrices, then which from the following is true _____ **(A)t#A**
178. In how many ways number of 2 digits can be formed out of the four digits 1,2,3 and 4? _____ **12**
179. $A = \{a, e, i, o, u\}$ is an example of? _____ **Roster Form**
180. The intersection of the sets $\{1, 2, 5\}$ and $\{1, 2, 6\}$ is the set _____ **{1, 2}**
181. $x^2 - x - 6 = 0$, then x is _____ **-2 or 3**
182. The set $N = \{1, 2, 3, 4, 5, \dots\}$ is known as _____ **Set of natural numbers**

183. What is the cardinality of the set of odd positive integers less than 12 ? _____ **3**
184. 4,7,12,19,28,? _____ **39**
185. Look at this series: 4, 9, 17, 35, ____ .What number should come next? _____ **69**
186. Look at this series: 3, 2, 11, 14, 27, _____ **34**
187. An empty set having elements _____ **No element**
188. In how many ways can we select 6 people out of 10, of which a particular person is not included? _____ **9C_6**
189. Find the number of ways of arranging the letters of the words DANGER, so that no vowel occupies odd place. _____ **144**
190. In the given AP series find the number of terms? 5, 8, 11, 14, 17, 20.....50. _____ **None of the mentioned**
191. The value of $10C_9$ _____ **10**
192. How many different words can be formed with the letters of the word MISSISSIPPI ? _____ **34650**
193. The set O of odd positive integers less than 9 can be expressed by _____ **{1, 3, 5, 7}**
194. If $A = \{1, 2, 3, 4\}$ and $B = \{4, 5, 6, 7\}$ then $A \cup B$ should be _____ **{1, 2, 3, 4, 5, 6, 7}**
195. Two functions f and g are said to be ----- if $f(x) = g(x)$ for every value of x for which both functions are defined _____ **Unequal**
196. Two matrices A and B are multiplied to get AB if _____ **No of rows of A is equal to no of columns of B**
197. Which of the following is Arithmetic Sequence? _____
- 198.

FINAL TERM

1. If A and B are any two matrices of order $m \times n$ and $p \times q$ respectively and $m > n$ and $p > q$ what must be the conditions on m n p q r for the AB to hold? _____ **$N=p$**
2. If matrix A has an order 3×3 and matrix b has order 3×2 then the order of matrix $A \times B$ is _____ **3×2**
3. Consider $B = -3$ be a matrix then which of the following is the dimension of matrix B ? _____ **2×1**
4. FOR APPLING the binomial theorem $(1.025)^{10}$ can be written as _____ **$(1+0.025)^{10}$**
5. In the equation of the line $y = 8x - \frac{3}{4}$ the y-intercept is _____ **$\frac{3}{4}$**
6. In which quadrant $\cos \theta$ is positive _____ **first and forth**
7. The amplitude of a function is the height from the _____ of the function to its maximum of minimum value _____ **mean**
8. The inverse sine function is defined by $y = \arcsin x$ if and only if _____ **$\sin y = x$**
9. Quantitative variable is further divided into _____ **continuous and discrete variables**
10. IQs of all children in a school is an example of _____ **finite population**
11. During the current population census what type of the data was collected? _____ **secondary data**
12. The graph of cumulative frequency distribution is called _____ **ogive**
13. Data arranged in ascending or descending order is called _____ **arrayed data**
14. If an observation in the data set is negative then the geometric mean is _____ **underterminend**
15. If the first and third quartiles are 22.16 and 56.36 respectively then the quartile deviation is _____ **17.1**
16. What is the standard deviation of the following values? 7'7'7'7'7'7'7 _____ **7**
17. Pearson "s coefficient of skewness is not possible if standard deviation _____ **0**

18. If all the value fall on the same straight line and the line has a positive slope than what will be the value off the correlation coefficient: , r , _____ $0 \leq r \leq 1$
19. If $A=\{1,2,3,4,5,10\}$ and $B=\{1,3,5\}$ then $B \subset A$ means _____ **B is contained in A**
20. When each outcomes of a sample space has equal chance to occur as any other the outcomes are called _____ **Equally likely**
21. In normal distribution the mean deviation M.D _____ **0.5σ**
22. In which of the following situations would $\sigma_x = \frac{\sigma}{\sqrt{n}}$ be the correct formula for computing σ_x _____ **probability sampling**
-
23. When sampling is done with or without replacement ,E(p) is equal to _____ **μ**
24. How many parameter (s) are in t-distribution? _____ **1**
25. For degree of freedom $v > 2$ the variance of t-distribution is always _____ **greater than one**
26. The degrees of freedom for a t-test with sample size 14 is _____ **13**
27. The degrees of freedom for a t-test with sample size 6 is _____ **5**
28. The parameter of the chi- square distribution is _____ **v**
29. The value of χ^2 can never be _____ **zero**
30. The f-distribution always ranges from _____ **0 to +x**
31. The f-distribution has parameter _____ **two**
32. Analysis of variance is a procedure that enables us to test the equality of several _____ **means**
33. In a one-way ANOVA _____ **an interaction term is given**
34. In statistics LSD is the abbreviations of _____ **least significant difference**
35. In statistics we have MSE which is abbreviations of _____ **mean square error**
36. For a particular problem if we have $\alpha = 0.02$ and obtained the p- value equal to 0.0008 then we _____ **reject Ho**
37. As a rule if p-value in the level significance then we should reject Ho _____ **Less then**
38. Mapping where each member of the pre-image is mapped to exactly one member of the image _____ **one-one relation**
39. The sample variance $S^2 = \frac{\sum(x-\bar{x})^2}{n}$ is _____ **unbiased estimator of μ**
40. For $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ there will be exactly one real root if _____ **$b^2 - 4ac < 0$**
41. What is the mode in the word statistics _____ **S and T**
42. The first and third quarbles are 22 16 56 36 respectively quirdic deviation is _____ **17.1**
43. The variables plotted on the horizontal or x-axis in a scatter diagram is called is _____ **dependent variables**
-
44. All possible samples from one population calculate the mean for each of the sample and construct the probability distribution of the sample _____ **a sampling distribution**
45. The normal distribution A- _____ **0**
46. The domain of $f(x) = \sqrt{3x - 2}$ is _____ **$x \geq \frac{2}{3}$**
47. Which type of data is collected in population census _____ **secondary data**
48. According to the property of parameter it is _____ **variable**
49. If x represent the number of units having the specified character and n is the size of the sample proportion p is equal to _____ **x/n**
50. Degree of freedom $v/2$ the variance of t-distribution is always _____ **greater then one**
51. Which one is the formula for calculating the variance of the t - distribution _____ **$\sigma^2 = \frac{v}{v-2}$**
52. The degree of freedom for a t-test with simple size 10 is _____ **9**
53. The degree of freedom for a t-test with simple size 6 is _____ **5**
54. The value of χ^2 can never be _____ **zero**
55. The f distribution has ...parameter _____ **two**
56. Mean deviation is always _____ **greater or equal to standard deviation**

57. The probability of observing a sample value as extreme as or extreme then observed given that _____ **p-value**
58. If a player well shuffles the pack of 52 playing card the probability of a black card for _____ **13/52**
59. The range of the series -1, -4, -9, -6, 0 will be _____ **-9**
60. Which of the following scale has true zero point _____ **ratio scale**
61. $10! =$ _____ **3628800**
62. The player well shuffles the pack of 52 playing card, then the probability of a black card from 52 playing cards is: _____ **13/52**
63. The probability of drawing a 'jack card' from 52 playing cards is: _____ **4/52**
64. Which dispersion is used to compare variation of two series? _____ **Q.D**
65. All the values fall on the same straight line and the line has a positive slope then what will be the value of the correlation coefficient 'r': _____ **r = +1**
66. Regression line $Y = a + bX$, the value of the correlation coefficient will be zero if: _____ **Intercept a = 0**
67. When two coins are tossed the probability of at least one head is: _____ **3/4**
68. curve has a longer tail to the right, it is called : _____ **standard deviations**
69. the model $Y = mX + a$, Y is also known as the: _____ **Predicted variable**
70. According to empirical rule approximately 95% of the measurements will fall under which interval? _____ **X=2S**
71. Which one of the following is written at the top of the table? _____ **Title**
72. 12. The curve has a longer tail to the right, it is called: _____ **Positively skewed**
73. 13. Which one of the following is the class frequency? _____ **The number of observations in each class**
74. If X f(x) is a discrete random variable, then the function: _____ **A distribution function**
75. Which one of the following graphs is used for a time series data? _____ **Histogram**
76. If you connect the mid-points of rectangles in a histogram by a series of lines that also touches the x-axis from both ends, what will you gets? _____ **Frequency curve**
77. If mean of the two observations is 10.5, then median of these two observations will be: _____ **10.5**
78. Which one is the formula of mid range: _____ **$\frac{x_0 + x_m}{2}$**
79. Which one of the following is not included in measures of central tendency: _____ **Quartile deviation**
80. For the given data 2, 3, 7, 0, -8 G. M will be: _____ **Undefined**
81. For a particular data the value of Pearson's coefficient of skewness is greater than zero. What will be the shape of distribution? _____ **Positively skewed**
82. In measures of relative dispersion unit of measurement is: _____ **Vanish**
83. The F-distribution always ranges from: _____ **0 to $+\infty$**
84. In chi-square test of independence the degrees of freedom are: _____ **n - p**
85. The Chi- Square distribution is continuous distribution ranging from: _____ **$0 \leq \chi^2 \leq \infty$**
86. If X and Y are random variables, then $E(X + Y)$ is equal to: _____ **$E(X) + E(Y)$**
87. If \hat{y} is the predicted value for a given x-value and b is the y-intercept then the equation of a regression line for an independent variable x and a dependent variable y is: _____ **$\hat{y} = mx + b$, where m = slope**
88. The location of the critical region depends upon: _____ **Alternative hypothesis**
89. The t-Distribution is... Spread out than the standard normal Distribution. _____ **More**
90. To find the confidence interval for the ratio of two variances we use: _____ **F- Distribution**
91. How many percent of values are less than 4th deciles in a symmetric distribution? _____ **40**
92. The combined distribution of more than two random variables is: _____ **Joint Distribution**
93. The degrees of freedom for a T-test with sample size 14 is: _____ **13**

94. Which of the following is true for the binomial distribution $b(x; n, p)$: Mean > Variance
95. What is m_f in the formula of mode? highest frequency
96. The parameters of the binomial distribution $b(x; n, p)$ are: n & p
97. Which of the following is true for the Poisson distribution: mean = variance
98. If a significance level of 1% is used rather than 5%, the null hypothesis is: Less likely to be rejected
99. The variance of the chi-square distribution is: $2v$
100. The degrees of freedom for a t-test with sample size 10 is: 9
101. The value of χ^2 can never be: Negative
102. The total number of samples when sampling is done with replacement: Nn
103. ANOVA was introduced by: R.A Fisher
104. The test statistic used in analysis of variance procedure follows the... distribution.: F
105. For testing of hypothesis about population proportion, we use: Z-test
106. A die is rolled. What is the probability that the number rolled is greater than 2 and even: $\frac{1}{3}$
107. The probability of drawing a king of spade from a pack of 52 cards is: $\frac{1}{52}$
108. An estimator T is said to be unbiased estimator of θ if $E(T) = \theta$
109. From point estimation, we always get: Single value
110. The best unbiased estimator for population variance: Sample variance
111. When c is a constant, then $E(c)$ is: c
112. $Var(4X + 5) =$ $16 Var(X) + 5$
113. When $f(x)$ is continuous probability function, then $P(X = 1)$ is: 0
114. The hyper geometric random variable is a(an): Discrete variable
115. From a sample of 200 people were asked whether they like a particular product. Fifty said 'yes' and remain said 'no', assuming 'yes' means a success, which of the following is correct? Sample proportion $p=0.25$
116. In any data set, what percent of values fall in the interval Median Q.D? 50 per cent
117. The height of a student is 60 inches. This is an example of? Continuous data
118. In Statistics, we have MSE which is abbreviation of? Mean square error
119. The deviation of a distribution from symmetry is called: Skewness
120. If E is an impossible event, then $P(E)$ is: 0
121. If a data set has the even number of observations, the median: Is the average value of the two middle items when all items are arranged in ascending order
122. In testing of hypothesis, we always begin it with assuming that: Null hypothesis is true
123. If a continuous probability distribution has peakedness of the distribution? Platykurtic
124. When each outcome of a sample space has equal chance to occur as any other, the outcomes are called: Equally likely
125. The LSD test is applied only if the null hypothesis is: Rejected
126. Analysis of variance is a procedure that enables us to test the equality of several: Means
127. If a random variable X denotes the number of heads when three distinct coins are tossed, the X assumed the values: 0,1,2,3
128. If X and Y are independent variables, then $E(XY)$ is: $E(X).E(Y)$
129. The parameters of the binomial distribution $b(x; n, p)$ are: n & p
130. If $P(E)$ is the probability that an event will occur, which of the following must be false: $P(E) = -1$
131. The analysis of variance technique is a method for: Comparing three or more means
132. The continuity correction factor is used when: A continuous distribution is used to approximate a discrete distribution
133. Stem and leaf is more informative when data is: Less than 100

134. The branch of Statistics that is concerned with the procedures and methodology for obtaining valid conclusions is called: _____ **Inferential Statistics**
135. Which of the following is a systematic arrangement of data into rows and columns: _____ **Tabulation**
136. In normal distribution Q.D = _____ **0.6745**
137. If you connect the mid-points of rectangles in a histogram by a series of lines that also touches the x-axis from both ends, what will you get? _____ **Frequency curve**
138. Which one of the following statements is true regarding a population? _____ **It**
139. The degrees of freedom for a t-test with sample size 10 is: _____ **9**
140. Which dispersion is calculated from all the observations? _____ **Standard deviation**
141. Standard deviation of the data 7, 7, 7, 7, 7, 7, 7 is: _____ **0 Standard deviation will always be zero if all the values in data are same**
142. Which one is the poor measure of dispersion in open-end distribution? _____ **Range**
143. Men tend to marry women who are slightly younger than themselves. Suppose that every man married a woman who was exactly 5 years younger than themselves. Which of the following is correct: _____ **The correlation is 1**
144. Sum of absolute deviations of the values is least when deviations are taken from: _____ **Mean**
145. Which of the following measures of central location is affected most by extreme values: _____ **Mean**
146. Which of the following is a critical value of Z when 1 - 95% for one tailed test: _____ **1.96**
147. The difference between expected value of statistic and parameter is called: _____ **Bias**
148. The F-distribution has parameter. _____ **Two**
149. The degrees of freedom for a t-test with sample size 6 is: _____ **5**
150. In testing of hypothesis, we always begin it with assuming that _____ **Null hypothesis is true**
151. Mean deviation is always: _____ **Less or equal to S.D**
152. Which formula represents the probability of the complement of event A: _____ **1- P (A)**
153. Ideally the width of confidence interval should be: _____ **0**
154. The probability distribution of a statistic is called the: _____ **Sampling distribution**
155. Two sets A and B are equal if **$A \subseteq B$ and $B \subseteq A$** If two sets A and B are equal we write A = B to designate that relationship.
156. expression $b^2 - 4ac$ under the square root – called the _____ **discriminant**
157. What will be the shape of distribution? _____ **Positivelyskewed.**
158. The F-distribution always ranges from: _____ **0 to +∞**
159. The location of the critical region depends upon: _____ **Alternative hypothesis .**
160. To find the confidence interval for the ratio of two variances we use: _____ **F-Distribution**
161. The degrees of freedom for a T-test with sample size 14 is _____ **3 .**
162. The variance of the chi-square distribution is: _____ **-v 2.**
163. The degrees of freedom for a t-test with sample size 10 is: _____ **9.**
164. The value of χ^2 can never be : _____ **Negative.**
165. .For testing of hypothesis about population proportion , we use: _____ **Z-test.**
166. Analysis of variance is a procedure that enables us to test the equality of several: _____ **Means.**
167. The classical definition of probability assumes: _____ **Equally likely evens.**
168. MSE stand for mean _____ **square error.**
169. LSD stand for _____ **least significance difference.**

MTH100 midterm

dtQ

Which of the following is Arithmetic Sequence?

- a) $x + a, x + 3a, x + 5a, \dots$
- b) $(x + a) + (x + 3a) + (x + 5a) + \dots$
- c) $(x + a), 2(x + 3a), 4(x + 5a), \dots$
- d) $(x + a) + 2(x + 3a) + 4(x + 5a) + \dots$
- e) Ans:aaa

Q

$$\begin{bmatrix} 9 & -2 & 4 \\ 5 & 0 & 6 \\ 1 & 3 & 8 \end{bmatrix} - \begin{bmatrix} 4 & 0 & 7 \\ 1 & 5 & -4 \\ -2 & 3 & 2 \end{bmatrix}$$

=

1) $\begin{bmatrix} 5 & -2 & -3 \\ 4 & -5 & 10 \\ 3 & 0 & 6 \end{bmatrix}$

2) $\begin{bmatrix} 5 & 2 & -3 \\ 4 & -5 & 10 \\ 3 & 0 & 6 \end{bmatrix}$

3) $\begin{bmatrix} 5 & -2 & -3 \\ 4 & 5 & 10 \\ 3 & 0 & 6 \end{bmatrix}$

4) ans1111

Q

A line AB has coordinates as A (5, 8) and B (3, 6). The midpoint of AB has coordinates

bbbb

- a) (1, 1)
- b) (4, 7)
- c) (6.5, 4.5)

MTH100 midterm

d) $(-1.5, -1.5)$

Q4

Let $z_1 = 3 - 5i$ and $z_2 = -4 - 2i$ be two complex numbers, then which of the following is

the value of $z_1 \cdot z_2$?

- a) $-22 + 14i$
- b) $-12 + 10i$
- c) $-6 + 20i$
- d) $14 - 22i$
- e) Ans bbb

Q

Let $z_1 = 2 + 3i$ and $z_2 = 5 + 9i$ be two complex numbers, then which of the following is

the value of $z_1 + z_2$?

- a) $7 - 12i$
- b) $7 + 12i$
- c) $10 + 27i$
- d) $18 + 15i$
- e) Ans bbbb

Q

$$A = \{x \mid x \in \mathbb{Z} \wedge -3 < x \leq 3\} ?$$

What is roster method to show the set

- a) $A = \{-3, -2, -1, 0, 1, 2, 3\}$
- b) $A = \{-2, -1, 0, 1, 2, 3\}$
- c) $A = \{-3, -2, -1, 0, 1, 2\}$
- d) $A = \{-3, -2, -1, 1, 2, 3\}$
- e) bbb

Q

5.45235452365845125... is a/an

- a) rational number
- b) irrational number
- c) integer
- d) natural number
- e) bbbb

Q

MTH100 midterm

$$A = \begin{bmatrix} -1 & 2 \\ -3 & -4 \end{bmatrix}$$

Determinant of _____ is

- a) 12
- b) 10
- c) 14
- d) 8
- e) bbbb

Q

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

Let

The Minor of a_{23} is

a) $\begin{vmatrix} a_{12} & a_{22} \\ a_{31} & a_{32} \end{vmatrix}$

b) $\begin{vmatrix} a_{11} & a_{12} \\ a_{31} & a_{32} \end{vmatrix}$

c) $\begin{vmatrix} a_{11} & a_{12} \\ a_{31} & a_{23} \end{vmatrix}$

d) $\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix}$

bbbb

Q

$$a_n = a + (n-1)d$$

For an arithmetic sequence _____, which of the following is the best option for 'd' ?

- a) First term
- b) Last term
- c) Constant
- d) Common difference

MTH100 midterm

e) ddd

Q

Which of the following is the common ratio ' r ' of an geometric sequence 5, 10, 20, 40, ...?

a) -5

b) $\frac{1}{2}$

c) 2

d) 5

e) ccccc

Q

If $f(x) = 2x + 1$, $g(x) = x^2 - 1$ then $f \circ g(x) =$

a) $2x^2$

b) $2x^2 - 1$

c) $2x^2 + 1$

d) $2x - 1$

e) bbb

Q

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For _____, there will be exactly one real root if

a) $b^2 - 4ac > 0$

b) $b^2 - 4ac \leq 0$

c) $b^2 - 4ac = 0$

d) $b^2 - 4ac > 0$

e) cccc

Q

If A is a matrix whose determinant is zero then its inverse

a) will be zero

b) cannot be determined

c) will be negative

d) will be positive

Q

Which of the following is true for the list $2 + 4 + 6 + 8 + 10$?

a) This is an arithmetic sequence.

b) This is a geometric sequence.

c) This is an arithmetic series.

MTH100 midterm

- d) This is a geometric series.
- e) cccc

Q

A Square matrix with ones on the diagonal and zeros elsewhere is called an **....ddd....** matrix

- a) rectangular
- b) adjoint
- c) determinant
- d) identity

Q

If the order does matter in a set of objects, it is a _____.

- a) sequence
- b) combination
- c) permutation
- d) sample
- e) cccc

Q

The Minor of an element in a third-order determinant is abb..... determinant obtained by deleting the row and column that contains the element.

- a) third order
- b) second order
- c) fourth order
- d) fifth order

Q

$$A = 2 \begin{bmatrix} -2 & 0 & 1 \\ 4 & -1 & 3 \end{bmatrix}$$

Consider _____ be a scalar matrix then which of the following is the dimension of the matrix A ?ddd

- a) 3 x 2
- b) 2 x 1
- c) 2 x 2
- d) 2 x 3

Q

Which of these equations has two roots?

- a) Quadratic
- b) Linear
- c) Cubic
- d) None of these
- e) aaa

MTH100 midterm

Q

If $C_n = n(n+1)$ for all integers $n \geq 2$, then which of the following is the first three terms of a sequence?

- a) 0, 2, 6, ...
- b) 2, 6, 12, ...
- c) 6, 12, 20, ...
- d) 12, 20, 30, ...
- e) ccc

Q

If a sequence of numbers approaches to a finite number, then which of the following is true?

- a) The sequence is infinite
- b) The sequence is divergent.
- c) The sequence is convergent.
- d) None of them is true.
- e) cccc

Q

A function of the type $y = ax^2 + bx + c$ where a , b and c are real coefficients, is called a

- a) Quadratic function
- b) Linear Function
- c) Constant function
- d) Cubic Function

Q

If the slopes of two lines are same then these lines are

- a) Parallel
- b) Perpendicular
- c) Not parallel
- d) None of these
- e) aaa

Q

Determine the inverse of the function $f(x) = 4x^2 - 4$.

- a) $f^{-1}(x) = \frac{\sqrt{x+4}}{4}$
- b) $f^{-1}(x) = \frac{\sqrt{x-4}}{4}$

MTH100 midterm

e) ccc

Q

Which of the following is identity matrix

a) $I = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

b) $I = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$

c) $I = \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$

d) $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

e) ddd

Q

Let $z_1 = (3 + 5i)$ and $z_2 = (-9 - 6i)$ be two complex numbers, then which of the following is the value of $z_1 + z_2$?

- a) $-6-i$
- b) $-6+i$
- c) $6-i$
- d) $6+i$
- e) aaaa

Q

A sequence, in which each term after the first is found by multiplying the previous term by a constant value, is called a (an) _____.

- a) Arithmetic series
- b) Arithmetic progression
- c) Geometric series
- d) Geometric progression
- e) dddd

Q

Which of these relations is function?

MTH100 midterm

- a) One-many relation
- b) Many-one relation
- c) Many-many relation
- d) None of these
- e) bbbb

Q

The range of $f(x) = (x-2)^2 + 3$ is...aaaa.....

- a) $f(x) > 3$
- b) $f(x) < 3$
- c) $f(x) \leq 3$
- d) $f(x) \geq 3$

Q

If a scalar k is multiplied with the matrix then which one of the following statement is correct?

- a) k will be multiplied with all elements of the matrix
- b) k will be multiplied with first column in the matrix
- c) k will be multiplied with first row in the matrix
- d) k will be multiplied with the diagonal elements
- e) aaa

Q

Let ' a ' be the first term and ' d ' be the common difference of an arithmetic series . Then

which of the following is the sum (S_n) of the first ' n ' terms of an arithmetic series?

- a) $a + (n-1)d$
- b) $2a + (n-1)d$
- c) $\frac{n}{2}[a + (n-1)d]$
- d) $\frac{n}{2}[2a + (n-1)d]$
- e) dddd

Q

A Square matrix with ones on the diagonal and zeros elsewhere is called an**dddd**..... matrix rectangular

MTH100 midterm

adjoint
determinant
identity

Q

Which of the following is true for ${}^n C_r$?

a) ${}^n C_r = \frac{{}^n P_r}{r!}$

b) ${}^n C_r = \frac{{}^n P_r}{(n-r)!}$

c) ${}^n C_r = \frac{{}^n P_r}{(n-r)!r!}$

d) ${}^n C_r = {}^n P_r (n-r)!$

e) aaaa

Q

$\det \begin{bmatrix} -1 & 2 \\ -3 & -4 \end{bmatrix} = \dots\dots\dots$

- a) -10
- b) 10
- c) -2
- d) +2
- e) bbb

Q

An Arithmetic Sequence is a sequence in which each term after the first term is found by .aaa..... a constant called common difference.

- a) Adding
- b) Subtracting
- c) Dividing
- d) Multiplying

Q

To multiply a matrix by a scalar, we multiply each _cc_____ in the matrix by that scalar.

- a) Row
- b) Column
- c) Entry
- d) Vector

MTH100 midterm

Q

Write the domain and range of $f(x) = 5x + 2$

Q

List all the missing terms in the arithmetic series: $7 + 12 + 17 + \dots + 37$.

Q

Solve the equation $x^2 + 6x + 5 = 0$ by factorization method.

Q

There are five juniors and three seniors in the Service Club. The club is to send four representatives to the State Conference. If the members of the club decide to send two juniors and two seniors, how many different groupings are possible?

Q

$$A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}, I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

If

then find $A^2 - 5I$.

Q

Find the 10th term of the geometric sequence with $a = 3000$ and a common ratio $r = \frac{1}{2}$.

Q

Let $f(x) = 3x + 1$ and $g(x) = 2x + 3$. Find the product of f & g i.e. $(f \cdot g)(x)$.

Q

If $a_0 = 2$, $a_1 = 3$, $a_2 = -2$, and $a_3 = 1$, then compute the summation: $\sum_{i=0}^2 2a_i$?

Q

The local Family Restaurant has a daily breakfast special in which the customer may choose one item from each of the following groups:

MTH100 midterm

Breakfast Sandwich	Accompaniments	Juice
egg and chicken egg and beef egg and cheese	breakfast potatoes apple slices fresh fruit cup pastry	orange cranberry tomato apple grape

How many different breakfast specials are possible?

Q

$$A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 2 \\ 3 & 1 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 2 & 2 & 3 \\ 2 & 1 & 1 \end{bmatrix}$$

Check whether the matrix A and B can be multiplied? Justify your answer.

Q

Solve the following system of equations:

$$2x_1 + x_2 + 3x_3 = 11$$

$$4x_1 - x_2 + 2x_3 = 5$$

$$3x_2 + 2x_3 = 13$$

Q1: Define Null set.

A set that contains no elements is called null set. It is denoted by $\{\}$ or ϕ .

Q2: Differentiate between constant and variable with examples?

A characteristic that varies with an individual or an object is called a **variable**. For example, age is a variable as it varies from person to person. **Constants** do not change over time. Constants are simply written as numbers.

Q3: Find A+2B from following matrices?

$$A = \begin{bmatrix} 2 & 1 \\ 3 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$$

Ans:

$$\begin{aligned} A+2B &= \begin{bmatrix} 2 & 1 \\ 3 & 1 \end{bmatrix} + 2 \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix} \\ &= \begin{bmatrix} 2 & 1 \\ 3 & 1 \end{bmatrix} + \begin{bmatrix} 2 & 4 \\ 4 & 6 \end{bmatrix} = \begin{bmatrix} 4 & 5 \\ 7 & 7 \end{bmatrix} \end{aligned}$$

Q4: Describe the following set builder notation: $\{x / x \in N \wedge x \leq 50\}$

Set of natural numbers which are less than equal to 50. It is same as $\{1,2,3,\dots,50\}$

Q5: Formulate the hypothesis in case of goodness of fit test.

Ho: The fit is good

H1: The fit is not good.

Q6: Prove that $\frac{\tan y}{\sin y} = \sec y$

$$\frac{\tan y}{\sin y} = \frac{\sin y}{\cos y} \cdot \frac{1}{\sin y} = \frac{1}{\cos y} = \sec y$$

Q7: Calculate 98% confidence interval for $\frac{\sigma_1^2}{\sigma_2^2}$ and

$$F_{0.01(n_1-1, n_2-1)} = 5.1, F_{0.01(n_2-1, n_1-1)} = 4.8, S_1^2 = 5, S_2^2 = 3.5$$

Ans:

$$\begin{aligned} 98\% C.I &= \left[\frac{S_1^2}{S_2^2} \cdot \frac{1}{F_{0.01(n_1-1, n_2-1)}}, \frac{S_1^2}{S_2^2} \cdot F_{0.01(n_2-1, n_1-1)} \right] \\ &= \left[\frac{5}{3.5} \cdot \frac{1}{5.1}, \frac{5}{3.5} \cdot 4.8 \right] \\ &= \left[\frac{5}{17.85}, \frac{24}{3.5} \right] \\ &= [0.28, 6.86] \end{aligned}$$

Q8: Define statistics?

That science which enables us to draw conclusions about various phenomena on the basis of real data collected on sample-basis.

Q9: Diff. b/w discrete & continuous variable.

A **discrete variable** is one that can take only a discrete set of integers or whole numbers. For example number of person in a family. **Continuous variable** can take on any value-fractional or integral within a given interval. For example weight, height, temperature etc.

Q10: Write two names of measurement scales?

- 1. Nominal scale
- 2. Ordinal or ranking scale

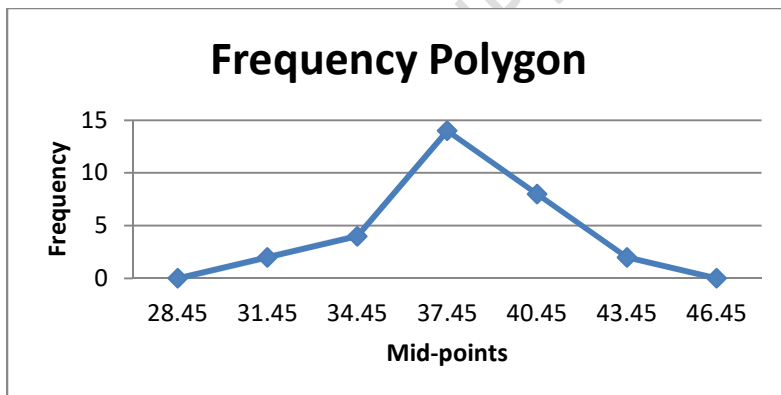
Q11: Differentiate b/w primary and secondary data?

Data that have been originally collected (raw data) and have not undergone any sort of statistical treatment, are called **PRIMARY data**. Data that have undergone any sort of treatment by statistical methods at least ONCE are called **SECONDARY data**.

Q12: Draw frequency polygon from the following data?

Class Boundaries	Frequency (f)	Mid-Point (X)
26.95 – 29.95	0	28.45
29.95 – 32.95	2	31.45
32.95 – 35.95	4	34.45
35.95 – 38.95	14	37.45
38.95 – 41.95	8	40.45
41.95 – 44.95	2	43.45
44.95 – 47.95	0	46.45

Frequency Polygon



Q13: Mean=7, Median=5, Standard deviation=2 find Pearson coefficient of skewness & interpret the results.

$$\text{Pearson's Coefficient of Skewness} = \frac{3(\text{mean} - \text{median})}{\text{standard deviation}}$$

$$= \frac{3(7-5)}{2} = \frac{3(2)}{2} = \frac{6}{2} = 3$$

As our answer is positive so distribution is skewed to RIGHT.

Q14: Define absolute measure of dispersion?

An absolute measure of dispersion is one that measures the dispersion in terms of the same units or in the square of units, as the units of the data.

Q15: Write three Pythagorean identities?

$$\cos^2 \theta + \sin^2 \theta = 1$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

$$1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$$

Q16: Write down the significance of experimental design? (2 marks)

By an experimental design, we mean a plan used to collect the data relevant to the problem under study in such a way as to provide a basis for valid and objective inference about the stated problem.

The plan usually includes:

- the selection of treatments whose effects are to be studied,
- the specification of the experimental layout, and
- the assignment of treatments to the experimental units.

All these steps are accomplished before any experiment is performed.

Q17: Write formula of range.

$$\text{Range} = X_m - X_o$$

Q18: Write the formula of combined or pooled proportion of two samples.

$$\hat{p}_c = \frac{n_1 \hat{p}_1 + n_2 \hat{p}_2}{n_1 + n_2}$$

Q19: Use decimal parts in each value as the leaf and rest of the digits as stem to construct the stem and leaf table for the following 10 values:

7.3, 6.1, 5.2, 3.5, 4.8, 4.6, 4.4, 4.2, 5.1, 4.9

Arrange data in ascending order: 3.5, 4.2, 4.4, 4.6, 4.8, 4.9, 5.1, 5.2, 6.1, 7.3

Stem	Leaf
3	5
4	2,4,6,8,9
5	1,2
6	1
7	3

Q20: A marble is drawn at random from a box containing 10 red, 30 white, 20 blue, 15 orange. Find the probability that drawn marble is

a. Blue

b. Red

$$n(S) = \text{Total marbles} = 75$$

$$n(\text{Blue}) = 20$$

$$n(\text{Red}) = 10$$

$$P(\text{blue}) = 20/75$$

$$P(\text{Red}) = 10/75$$

Q21: Range of data is 24 and no. of classes 8. Calculate class interval.

$$\text{Class interval } h = \text{RANGE/No. of classes} = 24/8 = 3$$

Q22: Differentiate between qualitative data and quantitative data.

Quantitative data is information about quantities. It is measurable and made with instruments such as height.

Qualitative data is descriptive. It is a phenomenon which can be observed but not measured such as hair color.

Q23: A fair coin is tossed 3 times. What is probability of at least 2 tails?

$$S = \text{Sample space} = \{ \text{HHH, HTH, HHT, THH, TTH, THT, HTT, TTT} \}$$

$$n(S) = 8$$

$$\text{Let } A = \text{at least 2 tails} = \{ \text{TTH, THT, HTT, TTT} \}$$

$$P(A) = n(A)/n(S) = 4/8 = 1/2$$

Q24: Define Geometric mean?

The geometric mean, G, of a set of n positive values X1, X2, ..., Xn is defined as the positive nth root of their product.

Q25: Define Probability?

Probability is the measure of the likelihood that an event will occur in a Random Experiment. Symbolically we write it as $P(A) = n(A)/n(S)$

Q26: If $A = \begin{bmatrix} -1 & 9 \\ -8 & -2 \end{bmatrix}$ find $\det[A]$?

$$\det[A] = \begin{vmatrix} -1 & 9 \\ -8 & -2 \end{vmatrix} = (-1)(-2) - (9)(-8) = 2 + 72 = 74$$

Q27: Find Harmonic Mean if values are 10, 20, 30.

X	1/X
10	0.1
20	0.05
30	0.0333
Total	0.1833

$$H.M = \frac{n}{\sum \frac{1}{X}} = \frac{3}{0.1833} = 16.36$$

Q28: Why statistics is called science of decision making? Justify.

Statistics are useful when they are applied to improve decision making. Statistics also aid the decision making process by enabling us to establish numerical benchmarks.

Q29: Write 2 properties χ^2 of distribution.

1. It is a continuous distribution ranging from 0 to $+\infty$. The number of degrees of freedom determines the shape of the chi-square distribution.
2. The curve of a chi-square distribution is positively skewed. The skewness decreases as v increases.

Q30: Write formula of mid-range?

$$\text{mid - range} = \frac{X_0 + X_m}{2}$$

Q31: Write formula of LSD?

LEAST SIGNIFICANT DIFFERENCE (LSD):

$$LSD = t_{\alpha/2, (v)} \sqrt{\frac{2(MSE)}{r}}$$

Q32: Write linear regression equation for y on x?

$Y = a + bx$, where Y is dependent variable, X is independent variable, b is slope of line and a is y-intercept.

Q33: Define correlation?

Correlation is a measure of the strength or the degree of relationship between two RANDOM variables.

Q34: A fair coin is tested what is the probability of getting number of tails?

S = Sample space = { H, T }

n(S) = 2

P(No. of tails) = 1/2

Q35: How many parameters are associated with F-distribution and what is the range of the distribution?

This distribution has two parameters v_1 and v_2 , which are known as the degrees of freedom of the F-distribution.

Range: The F-distribution is a continuous distribution ranging from zero to plus infinity.

Q36: Write down any two statistical software widely used for statistically sampling.

SPSS, Minitab

Q37: For the given data mean=25, variance=16 & median=22. Calculate Pearson's coefficient of skewness.

$$\text{Standard deviation} = \sqrt{\text{variance}} = \sqrt{16} = 4$$

$$\text{Coefficient of skewness} = \frac{3(\text{mean} - \text{median})}{\text{standard deviation}}$$

$$\begin{aligned} \text{Coefficient of skewness} &= \frac{3(25 - 22)}{4} \\ &= \frac{3(3)}{4} \\ &= 9/4 \end{aligned}$$

Q38: A single card is drawn from a deck of 52 playing cards, what is the probability of

a. An Ace

b. A Jack

$$n(\text{Ace}) = 4$$

$$n(\text{Jack}) = 4$$

$$P(\text{Ace}) = 4/52$$

$$P(\text{Jack}) = 4/52$$

Q39: If $Q_1=65$ and $Q_3=85$. Find Quartile deviation (Q.D) & coefficient of Quartile deviation.

$$Q.D. = \frac{Q_3 - Q_1}{2}$$

$$Q.D = \frac{85 - 65}{2} = 20/2 = 10$$

Q40: Two sets $A = \begin{bmatrix} 2 & 3 & 4 \\ 1 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 4 & 9 \\ 6 & 5 & 2 \end{bmatrix}$ are multiplied or not? Justify.

These matrix cannot be multiplied because the number of columns in the first **matrix** is not same as the number of rows in the second **matrix**.

Q41: Find the range and coefficient of range of following values:

57, 11, 39, 56, 82, 11, 64, 18, 37, 15

$$X_o = 11, X_m = 82$$

$$\text{Range} = X_m - X_o = 82 - 11 = 71$$

$$\text{Coefficient} = \frac{X_m - X_0}{X_m + X_0} = \frac{82 - 11}{82 + 11} = \frac{71}{93}$$

Q42: Calculate mid-points which are used for frequency polygon.

Class Boundaries	Frequency (f)	Mid-Point (X)
26.95 – 29.95	0	28.45
29.95 – 32.95	2	31.45
32.95 – 35.95	4	34.45
35.95 – 38.95	14	37.45
38.95 – 41.95	8	40.45
41.95 – 44.95	2	43.45
44.95 – 47.95	0	46.45

Q43: Average Height of the students in a school is 5.2 inches. A sample of 12 students showed the following heights.

5.0, 5.3, 5.2, 4.9, 4.11, 5.0, 5.5, 5.4, 5.1, 5.0, 5.2, 4.10

Calculated the sampling error? (5 marks)

$$\text{Here } \mu = 5.2, \bar{X} = \frac{\sum X}{n} = \frac{59.81}{12} = 4.98$$

$$\text{Sampling Error} = \bar{X} - \mu = 4.98 - 5.2 = -0.22$$

Q44: Find the center and radius of the given equation of circle

$$(x+2)^2 + (y-3)^2 = 9 \quad (3 \text{ marks})$$

$$(x - (-2))^2 + (y - 3)^2 = 3^2$$

The center (-2,3) and radius is 3

Q45: Write down the formula for finding the sum of the first n terms of a geometric sequence. (2 marks)

$$G = \sqrt[n]{X_1 X_2 \dots X_n}$$

Q46: Name the measures of dispersion that are NOT based on all the values. (2 marks)

Range

Quartile Deviation

Q47: Define set?

A set is an unordered collection of distinct objects. Objects in the collection are called elements of the set.

Q48: Write two disadvantages of range?

1. It ignores all the INFORMATION available from the intermediate observations.
2. It might give a MISLEADING picture of the spread in the data.

Q49: Find the mode from the given data 50, 60, 80, 100, 90, 80.

Most repeated value is 80. Mode=80

Q50: Find the geometric mean of numbers: 45, 32, 37, 46, 39, 36, 41, 48, 36.

X	log X
45	1.6532
32	1.5052
37	1.5682
46	1.6628
39	1.5911
36	1.5563
41	1.6128
48	1.6812
36	1.5563
	14.3870

$$\log G = \frac{\sum \log X}{n}$$

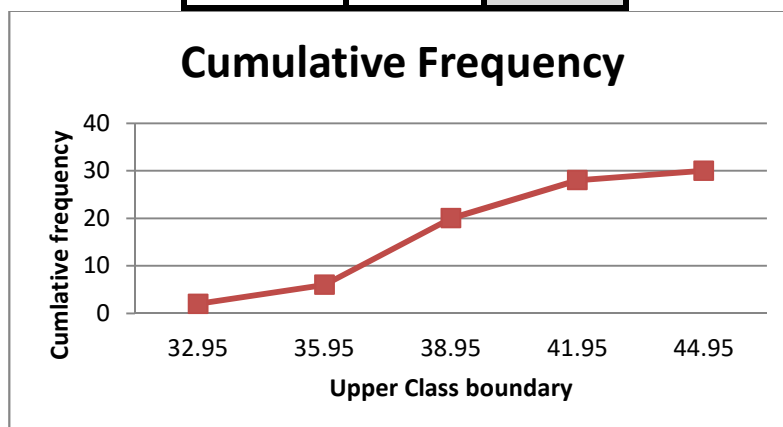
$$= \frac{14.3870}{9} = 1.5986$$

$$\text{Hence } G = \text{antilog } 1.5986$$

$$= 39.68$$

Q51: Draw cumulative frequency polygon from the given data.

Class Boundaries	Frequency	Cumulative Frequency
29.95 – 32.95	2	2
32.95 – 35.95	4	6
35.95 – 38.95	14	20
38.95 – 41.95	8	28
41.95 – 44.95	2	30



Q52: Question: The sample mean (\bar{X}) is 135 and population (μ) is 129. Calculate sampling error:

$$\text{Sampling error} = \bar{X} - \mu = 135 - 129 = 6$$

Q53: If $\sum X^2 = 0.729$, $\sum X = 0.701$, $\bar{X} = 0.140$, $n = 5$ then find coefficient of variation?

$$S = \sqrt{\frac{\sum X^2}{n} - \left(\frac{\sum X}{n}\right)^2}, S = \sqrt{\frac{0.729}{5} - \left(\frac{0.701}{5}\right)^2} = 0.36$$

$$CV = \frac{S}{\bar{X}} \times 100 = \frac{0.36}{0.140} \times 100 = 253.69$$

Q54: Find $(5 + 4i)(-9 - 7i)$

$$(5 + 4i)(-9 - 7i) = -45 - 35i - 36i - 28i^2 = -45 - 71i - 28(-1) = -45 - 71i + 28 = -17 - 71i$$

Q55: Find $z.z^*$ **when** $z=(3-7i)$

$$z^* = (3+7i)$$

$$z.z^* = (3-7i)(3+7i) = 9 + 21i - 21i - 49i^2 = 9 - 49(-1) = 9 + 49 = 58$$

Q56: If F-value is 1.13 and error mean square is 24.13, find the value of mean square of treatment.

$$F = \frac{M.S.Treatment}{M.S.Error}$$

$$1.13 = \frac{M.S.Treatment}{24.13}$$

$$M.S.Treatment = 1.13 \times 24.13 = 27.33$$

Q57: Find 95% confidence interval of normal distribution or of population mean μ ?

the 95% C.I. for μ is given by

$$\bar{X} \pm 1.96 \frac{\sigma}{\sqrt{n}}$$

Q58: Write assumptions of chi square test of goodness of fit.

1. The total number of observations (i.e. the sample size) should be at least 50.
2. The expected number e_i in any of the categories should not be less than 5.
3. The frequencies of the categories should be independent

Q59: Define P-value?

The probability of observing a sample value as extreme as, or more extreme than, the value observed, given that the null hypothesis is true.

Q60: Write χ^2 test statistics for goodness of fit?

$$\chi^2 = \sum_i \sum_j (O_{ij} - e_{ij})^2 / e_{ij}$$

Q61: Why Venn diagrams are used in set theory?

The Venn diagrams are used to represent sets and subsets in a pictorial way and to verify the relationship among sets and subsets.

Q62: Why stem and leaf table is preferred over frequency distribution?

In identity of individual observations is lost in grouping process. That's why we use stem and leaf table.

Q63: Differentiate between ratio and interval scale.

Ratio scale is an interval scale where the scale of measurement has a true zero point as its origin. The ratio scale is used to measure weight, volume, distance, money, etc.

Interval scale is a measurement scale possessing a constant interval size (distance) but not a true zero point, for example temperature.

Q64: A fair coin is tested what is the probability of getting head?

S=Sample space={ H,T }

n(S)=2

P(head)=1/2

Q65: In how many ways can 5 people be seated on 7 chairs a round table if only their positions relative to each other count (that is, the arrangements obtained from each other by rotation of all people are considered to be the same).

7 places to seat person #1, leaving

6 places to seat person #2, leaving

5 places to seat person #3, leaving

4 places to seat person #4, leaving

3 places to seat person #5

That's $7 \times 6 \times 5 \times 4 \times 3 = 2520$

Then we divide that by 5 rotations and get 504 ways.

Q66: Find the slope of the line given $3x + 2y = 9$

Writing the equation in the slope-intercept form, we get:

$$3x + 2y = 9$$

$$2y = 9 - 3x$$

$$Y = \frac{9}{2} - \frac{3x}{2}$$

Comparing it with $Y = a + bX$ where b is slope of line

Therefore, slope = $-3/2$

Q67: Find out mean deviation and $(X - \bar{X}) = 4, 2, 1, 1, 2, 4$.

$$M.D = \frac{\sum (X - \bar{X})}{n} = \frac{4 + 2 + 1 + 1 + 2 + 4}{6} = \frac{14}{6} = 2.33$$

Q68: Evaluate/Solve the polynomial $x^2 + 6x + 5$ Complete in square form.

$$x^2 + 6x + 5 = 0$$

$$x^2 + 2(x)(3) + 9 - 9 + 5 = 0$$

$$(x + 3)^2 - 4 = 0$$

$$(x + 3)^2 = 4$$

$$x + 3 = \pm\sqrt{4}$$

$$x = \pm 2 - 3$$

$$x = -2 - 3, x = 2 - 3$$

$$x = -5, \quad x = -1$$

Q69: If $A = \{\text{dog, horse, bird, rabbit, cat}\}$ and $B = \{\text{cat, rabbit}\}$ and $C = \{\text{lion, monkey}\}$ then find $A \cup B$ and?

$$A \cup B = \{\text{dog, horse, bird, rabbit, cat}\}$$

Q70: From the set $A = \{3, 4, 6\}$ and $B = \{1, 2, 3, 5, 6\}$ then find $A \cap B$?

$$A \cap B = \{3, 6\}$$

Q71: Given, $n_1 = n_2 = 16$, $S_1^2 = 50$, $S_2^2 = 16$. Construct a 90% confidence interval for the

variance ratio $\frac{\sigma_1^2}{\sigma_2^2}$

The 90% confidence interval for $\frac{\sigma_1^2}{\sigma_2^2}$ is given by

$$\left[\frac{S_1^2}{S_2^2} \cdot \frac{1}{F_{0.05(n_1-1, n_2-1)}}, \frac{S_1^2}{S_2^2} \cdot F_{0.05(n_2-1, n_1-1)} \right]$$
$$= \left[\frac{50}{16} \cdot \frac{1}{F_{0.05(15, 15)}}, \frac{50}{16} \cdot F_{0.05(15, 15)} \right] = \left[\frac{50}{16} \cdot \frac{1}{2.40}, \frac{50}{16} \cdot 2.40 \right]$$
$$= (1.31, 7.47)$$

Q72: Write a probability function $f(x)$ normal distribution?

The probability density function is given by

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left[\frac{x-\mu}{\sigma}\right]^2}, \quad -\infty < x < \infty$$

Q73: Define negatively skewed curve?

The negatively skewed frequency curve is the one for which the left tail is longer than the right tail.

Q74: For a certain distribution mean is 141, mode is 122.3 and S=50. Calculate Pearson coefficient of skewness.

Mean =141, Mode=122.3, S=50

$$\text{Pearson's Coefficient of Skewness} = \frac{\text{mean} - \text{mode}}{S.D} = \frac{141 - 122.3}{50} = \frac{18.7}{50} = 0.374$$

Q75: A random sample of size 24 is drawn from normal population with mean=44 and σ^2 . If S=15, \bar{X} =40.4 then calculate t-statistics.

$$t = \frac{\bar{X} - \mu}{s / \sqrt{n}}$$

$$t = \frac{40.4 - 44}{15 / \sqrt{24}} = \frac{-3.6}{3.06} = -1.176$$

Q76: In normal distribution $\mu = 20$ and $\sigma = 4$. What percentage of cases will fall between 16 and 24?

$$\text{Z score for 16 cases} = \frac{X - \mu}{\sigma} = \frac{16 - 20}{4} = -\frac{4}{4} = -1$$

$$\text{Z score for 24 cases} = \frac{X - \mu}{\sigma} = \frac{24 - 20}{4} = \frac{4}{4} = 1$$

Cases will fall between mean and $+ 1\sigma$.

Q77: A certain type of storage battery lasts on the average 3.0 years, with a standard deviation of 0.5 year. Assuming the battery lives are normally distributed, find the probability that a given battery will last less than 2.3 years.

- We want to find $P(X < 2.3)$ to find this area or probability by computing z as

$$z = \frac{X - \mu}{\sigma} = \frac{2.3 - 3}{0.5} = -1.4$$

$$P(X < 2.3) = P(z < -1.4)$$

From the normal distribution table we can conclude that the probability is 0.0808

Q78: Find the probability of drawing a white ball from a bag containing 4 red, 8 black, and 3 white balls. (3 marks)

$$n(S) = 4 + 8 + 3 = 15$$

$$P(\text{White ball}) = \frac{n(\text{white balls})}{n(s)}$$

$$= \frac{3}{15}$$

Q79: What are the mean and variance of binomial distribution?

The mean of the distribution $\mu_x = np$.

The variance $\sigma^2_x = npq$.

Q80: If we have $n = 15$ and $\sum_{i=1}^n (X_i - \bar{X})^2 = 56$. Then, find the 90% confidence interval for population variance (σ^2).

The 90% confidence interval for σ^2 is given by

$$\frac{\sum (X_i - \bar{X})^2}{\chi^2_{0.05(n-1)}} < \sigma^2 < \frac{\sum (X_i - \bar{X})^2}{\chi^2_{0.95(n-1)}}$$

$$\frac{56}{\chi^2_{0.05(14)}} < \sigma^2 < \frac{56}{\chi^2_{0.95(14)}}$$

$$\frac{56}{23.68} < \sigma^2 < \frac{56}{6.57}$$

$$0.0358 < \sigma^2 < 8.5236$$

Q81: Write a short note on quota sampling.

In Quota sampling, a sampling frame is not used at all, and the choice of the actual sample units to be interviewed is left to the discretion of the interviewer. However, the interviewer is restricted by quota controls.

Q82: Write down the testing procedure in case of goodness of fit test. (2 Marks)

HYPOTHESIS-TESTING PROCEDURE

Step-1:

H_0 : The fit is good

H_A : The fit is not good

Step-2:

Level of Significance: $\alpha = 0.05$

Step-3: Test-Statistic:

$$\chi^2 = \sum_i \frac{(o_i - e_i)^2}{e_i}$$

which, if H_0 is true, follows the chi-square distribution having $k - 1 - r$ degrees of freedom (where k = No. of x -values (after having carried out the necessary mergers), and r = number of parameters that we estimate from the sample data).

Step-4: Computations:

Step5: Critical region

Step6: Conclusion

Q83: What does quartile deviation measure in a distribution?

The quartile deviation is defined as half of the difference between the third and first quartiles.

Q84: 62% of students get passed in a particular test. This time 500 students appear in the exam using the normal approximation to the binomial distribution. Find the mean and variance of this distribution.

$n = 500$

Student passed as probability of success= $p=62\%=0.62$

Student failed as probability of failure= $q=1-p=1-0.62=0.38$

Mean= $np=500 \times 0.62=310$

Variance= $npq=500 \times 0.62 \times 0.38=117.8$

Q85: Find cumulative frequency from the following table

Size of shoes	No. of pairs
5	2
6	1
7	4
8	6
9	5

Ans:

Size of shoes	No. of pairs	Cumulative frequency
5	2	2
6	1	3
7	4	7
8	6	13
9	5	18
Total	18	

Q86: Given are the ages of first year student of a particular college. Calculate the Harmonic mean.

X	1/X
13	0.076923
14	0.071429
15	0.066667
16	0.0625
17	0.058824
Total	0.3363

$$H.M = \frac{n}{\sum \frac{1}{X}} = \frac{5}{0.3363} = 14.87$$

Q87: Multiple the given matrices.

$$\begin{bmatrix} 3 & 12 & 4 \\ 5 & 6 & 8 \\ 1 & 0 & 2 \end{bmatrix} \begin{bmatrix} 7 & 3 & 8 \\ 11 & 9 & 5 \\ 6 & 8 & 4 \end{bmatrix} \\
 = \begin{bmatrix} 3*7+12*11+4*6 & 3*3+12*9+4*8 & 3*8+12*5+4*4 \\ 5*7+6*11+8*6 & 5*3+6*9+8*8 & 5*8+6*5+8*4 \\ 1*7+0*11+2*6 & 1*3+0*9+2*8 & 1*8+0*5+2*4 \end{bmatrix} \\
 = \begin{bmatrix} 177 & 149 & 100 \\ 149 & 133 & 102 \\ 19 & 19 & 16 \end{bmatrix}$$

Q89: Find the coefficient of standard deviation from the following data. Life in Hours (X): 130, 150, 180, 250, 345.

$$\bar{X} = \frac{\sum X}{n} = \frac{1055}{5} = 211$$

x	$X - \bar{X}$	$(X - \bar{X})^2$
130	-81	6561
150	-61	3721
180	-31	961
250	39	1521
345	134	17956
1055	0	30720

$$S = \sqrt{\frac{\sum (X - \bar{X})^2}{n}} = \sqrt{\frac{30720}{5}} = 78.38$$

$$\text{Coefficient of S.D} = \frac{S}{\bar{X}} = \frac{78.38}{211} = 0.37$$

Q90: For the 10 values, we are given $\sum |X_1 - \bar{X}| = 20$. Find mean deviation.

$$M.D = \frac{\sum |X_1 - \bar{X}|}{n} = \frac{20}{10} = 2$$

Q91: When we apply finite population correction (fpc) easily?

In sampling from a finite population, we apply the fpc only if the sample size is greater than 5% of the population size.

Q92: Make Stem and leaf table for the given data: 59, 46, 50, 54, 47, 39

Arrange data in ascending order: 39, 46, 47, 50, 54, 59

Stem	Leaf
3	9
4	6 7
5	0 4 9

Q93: Apply LSD test on the following data:

ANOVA-TABLE

Source of Variation	d.f.	Sum of Squares	Mean Square	F
Between Treatments (i.e. Between Rations)	3	134.45	44.82	$F_1 = 20.47$
Between Blocks (i.e. Between Groups)	4	21.46	5.36	$F_2 = 2.45$
Error	12	26.26	2.19	--
Total	19	182.17	--	--

Solution:

$$\begin{aligned}
 \text{LSD} &= t_{\alpha/2, (v)} \sqrt{\frac{2(\text{MSE})}{r}} \\
 &= t_{0.025(12)} \sqrt{\frac{2(2.19)}{5}} \\
 &= 2.179 \sqrt{\frac{2(2.19)}{5}} \\
 &= 2.179 \times 0.936 \\
 &= 2.04.
 \end{aligned}$$

Q94: Find the 10th term of the geometric sequence with $a = 2000$ and a common ratio of $1/2$.

$$\begin{aligned}
 a_{10} &= 2000 \cdot (1/2)^9 \\
 &= 2000 \cdot 1/512 \\
 &= 2000/512 = 500/128 = 250/64 = 125/32
 \end{aligned}$$

Q95: Given the sequence, 1500, 3000, 4500, 6000, ..., find the 16th term.

Solution: $a = 1500$, $d = 1500$, $n - 1 = 16 - 1 = 15$.

$$\text{So } a_{16} = 1500 + 1500(15) = 24000$$

Q96: Write Quadratic formula?

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Q97: Evaluate: $|-2 + 5i|$

$$|-2 + 5i| = \sqrt{(-2)^2 + (5)^2} = \sqrt{4 + 25} = \sqrt{29}$$

Q99: Solve using quadratic formula.

$$x^2 + 6x + 3 = 0, \quad a=1, \quad b=6, \quad c=3$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-6 \pm \sqrt{6^2 - 4(1)(3)}}{2(1)} = \frac{-6 \pm \sqrt{24}}{2} = -3 \pm \sqrt{6}$$

Q: 100: - A sample of size $n=3$ drawn without replacement experiment from a population $N=5$ items whose values 0, 2, 3, 6, 7 draw possible samples

Sample without replacement = ${}^N C_n = {}^5 C_3 = 10$

(0,2,3), (0,2,6), (0,2,7), (0,3,6), (0,3,7), (0,6,7), (2,3,6), (2,3,7), (2,6,7), (3,6,7).

Q101: Describe about significance level.

The significance level is the criterion used for rejecting the null hypothesis. It show you how likely a result is due to chance. The most frequently used values of α , the significance level, are 0.05 and 0.01, i.e. 5 percent and 1 percent.

Q102: Which of the following statement represents continuous data and discrete data? (5)

- i.
- ii. Number of shops in a plaza. **Discrete data**
- iii. Hourly temperature recorded by whether bureau. **Continuous data**
- iv. Inches of rainfall in a city. **Continuous data**
- v. Number of passengers carried by rail every year. **Discrete data**
- vi. Height measurements of boys studying in a college. **Discrete data**

Q103: Complete the ANOVA Table

Source of variation	Sum of squares	Degree of freedom	Mean Square	F
Between treatments		4	19.86	6.9
Error				
Total	137.04	24		

Solution:

Source of variation	Sum of squares	Degree of freedom	Mean Square	F
Between treatments	79.44	4	19.86	6.9
Error	57.6	20	2.88	
Total	137.04	24		

Explanation:

Source of variation	Sum of squares	Degree of freedom	Mean Square	F
Between treatments	$19.85 \times 4 = 79.44$	4	19.86	6.9
Error	$137.04 - 79.44 = 57.6$	$24 - 4 = 20$	$57.8 / 20 = 2.88$	

Total	137.04	24		
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Q104: Let T1 and T2 are two unbiased estimators. The variances of both estimators are given below: $V(T_1) = \frac{\sigma^2}{3}$ and $V(T_2) = \frac{3\sigma^2}{2}$

Solution:

As $1/3 < 3/2$

Hence $\text{Var}(T_1) < \text{Var}(T_2)$,

Therefore, T1 is more efficient than T2

Efficiency is given below

$$E_f = \frac{V(T_2)}{V(T_1)}$$

$$= \frac{\frac{3\sigma^2}{2}}{\frac{\sigma^2}{3}} = \frac{3\sigma^2}{2} \times \frac{3}{\sigma^2} = \frac{9}{2}$$

Q105: Find value of sin 120 without using calculator

$$\sin(120) = \sin(180-120) = \sin(60) = \frac{\sqrt{3}}{2}$$

Q106: Find value of COS 135 without using calculator

$$\cos(135) = \cos(180-45) = -\cos 45 = -\frac{1}{\sqrt{2}}$$

Note: to solve without calculator question use following table

	30°	45°	60°
Sin	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$
Cos	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$
Tan	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$

Q107: There are two populations A and B, have means 8 and 7 respectively. Calculate the mean sampling distribution of $\bar{X}_A - \bar{X}_B$

The mean of sampling distribution of $\bar{X}_A - \bar{X}_B$ is denoted by $\mu_{\bar{X}_A - \bar{X}_B}$ is equal to the difference between populations mean that is

$$\mu_A - \mu_B = 8 - 7 = 1$$

$$\mu_{\bar{X}_A - \bar{X}_B} = \mu_A - \mu_B = 1$$

Q108: For given values, calculate Pearson coefficient of skewness using mode of the data.

The Standard deviation is 1.36. Data: 5,3,4,4,2,1

Mode=4

$$\text{Mean} = \frac{\sum X}{n} = \frac{19}{5} = 3.8$$

$$\text{Coefficient of skewness} = \frac{\text{mean} - \text{mode}}{S.D} = \frac{3.8 - 4}{1.36} = -0.147$$

Q109: Random samples of size n=2 is drawn with replacement from population consisting of three number 0, 2, 5. Draw all possible samples and sample mean.

Sample	Mean
0,0	$0+0/2=0$
0,2	$0+2/2=1$
0,5	2.5
2,0	1
2,2	2
2,5	3.5
5,0	2.5
5,2	3.5
5,5	5

Q110: Why t distribution is whole family of distribution?

The number of degrees of freedom determines the shape of the t-distribution. Thus there is a different t-distribution for each number of degrees of freedom. That's why, it is called a whole family of distributions.

Q111: The 1st and 3rd quartile of a data are Q1=67, and Q3=83. Find the values of mid-quartile range.

$$\text{Mid - quartile range} = \frac{Q_1 + Q_3}{2}$$

$$\text{Mid - quartile range} = \frac{67 + 83}{2} = \frac{150}{2} = 75$$

Q112: Evaluate $\frac{2+6i}{3+5i}$

$$\begin{aligned} \frac{2+6i}{3+5i} &= \frac{2+6i}{3+5i} \times \frac{3-5i}{3-5i} \\ &= \frac{(2+6i)(3-5i)}{(3)^2 - (5i)^2} = \frac{6-10i+18i-30i^2}{9-25i^2} = \frac{6+8i-30(-1)}{9-25(-1)} \\ &= \frac{6+8i+30}{9+25} = \frac{36+8i}{34} \end{aligned}$$

Q113: Write disadvantages of range.

1. It ignores all the INFORMATION available from the intermediate observations.
2. It might give a MISLEADING picture of the spread in the data.

Q114: Write properties of echelon form of matrix.

A matrix is in echelon form if it has the following properties

- Every non-zero row begins with a 1 (called a leading 1)
- Every leading one in a lower row is further to the right of the leading one above it.
- If there are zero rows, they are at the end of the matrix

Q115: Write names of different types of correlation in graph?

- Positive linear correlation
- Perfect Positive Linear Correlation
- Completely Random
- Extreme Of Dissociation

Q116: Find the first two expressions of $(2-x)^6$ in as ascending power of x.

First expression: $(2-x)^1=2-x$

Second Expression: $(2-x)^2=4-4x+x^2$

Q117: Find out mean deviation and $(X - \bar{X}) = +3, -3, -4, -1, +1, +4$.

$$|X - \bar{X}| = +3, +3, +4, +1, +1, +4$$

$$M.D = \frac{\sum |X - \bar{X}|}{n} = \frac{3+3+4+1+1+4}{6} = \frac{16}{6} = 2.67$$

Q118: A random variable X is normally distributed with $\mu = 50$ and $\sigma^2 = 25.5$ find the probability of X larger than 54.

Applying z-test

$$z = \frac{x - \mu}{\sqrt{\sigma^2}} = \frac{54 - 50}{\sqrt{25.5}} = \frac{-4}{5.05} = -1.07$$

Now we need to find the area under the normal curve from $z = -\infty$ to $Z = -1.07$. Looking at

The area table of the standard normal distribution, we find that Area from 0 to 1.07=0.3577

$$P(X > 54) = P(Z > -1.07) = 0.5 - 0.3577 = 0.1423$$

Q119: $\cos \theta = \frac{1}{2}$, find all values of θ giving all the roots in $(0 \leq \theta \leq 360)$.

$$\cos^{-1}\left(\frac{1}{2}\right) = 60$$

One solution is 60

To find all intervals we use periodic property of cos

$$\cos(60-360) = \cos(-300) = \cos(300)$$

Q120: $\frac{10}{1}$ and $\frac{21}{7}$ are rational or irrational numbers.

Both are rational numbers because they can be written in p/q form

Q121: How many 2 permutations for {A, B, C}

$${}^3P_2 = \frac{3!}{(3-2)!} = 3! = 3 \cdot 2 \cdot 1 = 6$$

Q122: Write the geometric sequence formula

$$a_n = ar^{n-1}$$

Q123: If $A=\{1,2,3\}$, $B=\{1,3,5\}$ and $C=\{2,4,6\}$ then show that $(A \cup B) \cup C = A \cup (B \cup C)$.

$$(A \cup B) \cup C = A \cup (B \cup C)$$

$$(A \cup B) \cup C = (\{1,2,3\} \cup \{1,3,5\}) \cup \{2,4,6\}$$

$$\text{L.H.S} = \{1,2,3,5\} \cup \{2,4,6\} = \{1,2,3,4,5,6\}$$

$$\text{R.H.S} = A \cup (B \cup C) = \{1,2,3\} \cup (\{1,3,5\} \cup \{2,4,6\})$$

$$= \{1,2,3\} \cup \{1,2,3,4,5,6\} = \{1,2,3,4,5,6\}$$

Q124: If the function f is defined by $f(x) = \frac{3}{x}$, $0 < x \leq 3$ Then find the domain and range of f.

Domain of $X = R - \{3\}$

Range of $X = R$

Q125: Write properties of reduced echelon form of matrix.

- Every non-zero row begins with a 1 (called a leading 1)
- Every leading one in a lower row is further to the right of the leading one above it.
- If there are zero rows, they are at the end of the matrix

Q126: Suppose that $X = \{a, b\}$ are two possible values for combination of X. Find the value of $C(2,2)$.

$$C(2,2) = \frac{n!}{r!(n-r)!} = \frac{2!}{2!} = 1$$

Q127: If $A = \{2,4,6,8,10,12,14,19\}$ and $B = \{12,13,14,15,16\}$ then find $A \cup B$.

$$A \cup B = \{2,4,6,8,10,12,14,19\} \cup \{12,13,14,15,16\}$$

$$A \cup B = \{2,4,6,8,10,12,13,14,15,16,19\}$$

Q128: Let $f(x) = 5x^3 + 3x - 9$ and $g(x) = x^2$ then find $f \circ g(x)$.

$$f \circ g(x) = f(g(x)) = 5(x^2)^3 + 3(x^2) - 9 = 5x^6 + 3x^2 - 9$$

Q129: What will be the probability of one card out of 52 playing cards?

$$P(\text{one card}) = 1/52$$

Q130: For the normal distribution with $\mu = 55$ and $\sigma = 10$. How much area will be found under the curve?

Applying z-test

$$z = \frac{x - \mu}{\sigma} = \frac{1 - 55}{10} = \frac{-54}{10} = -5.4$$

Now we need to find the area under the normal curve from $z = -\infty$ to $Z = -2.5$. Looking at

The area table of the standard normal distribution, we find that Area from 0 to 2.5 =

0.4938

So required area is $0.5 - 0.3577 = 0.1423$

Q131: If $A = \{0, 1, 2, \dots, 100\}$ and $B = \{0, 1, 2, \dots, 1000\}$ write them in set builder notation.

$A = \{x \mid x < 100 \text{ and } x \text{ is a whole number}\}$

$B = \{x \mid x < 6 \text{ and } x \text{ is a whole number}\}$

Q132: Which Scale of measurement is used in

- **Temperature** (Interval Scale)
- **Weight** (Ratio Scale)
- **Money** (Ratio Scale)
- **Marital status** (Nominal Scale)
- **Performance of student** (Ordinal Scale)

Q133: If $A = \begin{bmatrix} 0 & -1 \\ 1 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 2 \\ 2 & 1 \end{bmatrix}$ then prove that $3B - 3A = -3(A - B)$

$$3B - 3A = 3 \begin{bmatrix} 3 & 2 \\ 2 & 1 \end{bmatrix} - 3 \begin{bmatrix} 0 & -1 \\ 1 & 3 \end{bmatrix} = \begin{bmatrix} 9 & 6 \\ 6 & 3 \end{bmatrix} - \begin{bmatrix} 0 & -3 \\ 3 & 9 \end{bmatrix} = \begin{bmatrix} 9-0 & 6-(-3) \\ 6-3 & 3-9 \end{bmatrix} = \begin{bmatrix} 9 & 9 \\ 3 & -6 \end{bmatrix}$$

$$-3(A - B) = -3 \left(\begin{bmatrix} 0 & -1 \\ 1 & 3 \end{bmatrix} - \begin{bmatrix} 3 & 2 \\ 2 & 1 \end{bmatrix} \right) = -3 \begin{bmatrix} 0-3 & -1-2 \\ 1-2 & 3-1 \end{bmatrix} = -3 \begin{bmatrix} -3 & -3 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 9 & 9 \\ 3 & -6 \end{bmatrix}$$

Visit our YouTube channel for video lecture:

<https://www.youtube.com/channel/UCfQB0nFXMIE9EuCAWYoUGTA>

STA100 (Current Final) 2020

1. Draw Cumulative Frequency polygon from the given data...5 marks
2. write any two names of Statistical software packages. 2 marks.

Ans: These include SPSS, SAS, Statistica, Statgraph, Minitab, Stata, S-Plus, etc.

3. properties of sampling distribution $\bar{X}_1 - \bar{X}_2$. 5 marks

Ans:

PROPERTIES OF THE SAMPLING DISTRIBUTION OF $\bar{X}_1 - \bar{X}_2$

Property No. 1:

The mean of the sampling distribution of $\bar{X}_1 - \bar{X}_2$, denoted by $\mu_{\bar{X}_1 - \bar{X}_2}$, is equal to the difference between population means, that is

$$\mu_{\bar{X}_1 - \bar{X}_2} = \mu_1 - \mu_2$$

Property No. 2:

In case of sampling with or without replacement from two *infinite* populations, the standard deviation of the sampling distribution of $\bar{X}_1 - \bar{X}_2$ (i.e. *standard error* of $\bar{X}_1 - \bar{X}_2$), denoted by $\sigma_{\bar{X}_1 - \bar{X}_2}$, is given by

$$\sigma_{\bar{X}_1 - \bar{X}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

Property No. 3:

Shape of the distribution:

a) If the POPULATIONS are normally distributed, the sampling distribution of $\bar{X}_1 - \bar{X}_2$, regardless of sample sizes, will be *normal* with mean $\mu_1 - \mu_2$ and variance $\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}$.

In other words, the variable

$$Z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

is normally distributed with zero mean and unit variance.

b) If the POPULATIONS are *non-normal* and if *both* sample sizes are *large*, (i.e., greater than or equal to 30), then the sampling distribution of the differences between means is approximately a *normal* distribution by the Central Limit Theorem.

In this case too, the variable

$$Z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

will be approximately *normally* distributed with mean zero and variance one.

4. find the Mode - value from the given data. 2 marks
5. find the Mid-value of the given data. 2 marks
6. Write regression equation. 2 marks

$$Y = a + bX$$

7. Write Random samples... 5 marks
8. Disadvantages of range?

it has two serious disadvantages.

1. It *ignores* all the INFORMATION available from the intermediate observations.
2. It might give a MISLEADING picture of the spread in the data.

9. Types of measurement scale?

By *measurement*, we usually mean the assigning of number to observations or objects and scaling is a process of measuring.

The four scales of measurements are briefly mentioned below:

- i. **NOMINAL SCALE:**
- ii. **ORDINAL OR RANKING SCALE:**
- iii. **INTERVAL SCALE:**
- iv. **RATIO SCALE:**

10. Sampling distribution?

The probability distribution of any statistic (such as the mean, the standard deviation, the proportion of successes in a sample, etc.) is known as its sampling distribution

11. Primary and secondary data?

PRIMARY AND SECONDARY DATA:

Data that have been originally collected (raw data) and have not undergone any sort of statistical treatment, are called PRIMARY data. Data that have undergone any sort of treatment by statistical methods at least ONCE, i.e. the data that have been collected, classified, tabulated or presented in some form for a certain purpose, are called SECONDARY data.

12. Frequency polygon?

FREQUENCY POLYGON:

A frequency polygon is obtained by plotting the class frequencies against the mid-points of the classes, and connecting the points so obtained by straight line segments.

13. Find covariance?

14. Regression?

15. Find mode

16. Set

A set is an unordered collection of distinct objects. Objects in the collection are called elements of the set.

17. experimental design

EXPERIMENTAL DESIGN

By an experimental design, we mean a plan used to collect the data relevant to the problem under study in such a way as to provide a basis for valid and objective inference about the stated problem. The plan usually includes:

- the selection of treatments whose effects are to be studied,
- the specification of the experimental layout, and
- the assignment of treatments to the experimental units.

18. scales

19. sample error

1. Sampling Error:

The difference between the estimate derived from the sample (i.e. the statistic) and the true population value (i.e. the parameter) is technically called the sampling error. For example,

Sampling error = $X - \mu$

Non-Sampling Error:

Besides sampling errors, there are certain errors which are not attributable to sampling but arise in the process of data collection, even if a complete count is carried out.

20. regression line

21. Mst measure

22. confidence difference upto 95%

23. Measure mean