STATISTICS

1. If $P(A \cup B) = \frac{5}{6}$, $P(A \cap B) = \frac{1}{3}$ and $P(\bar{B}) = \frac{1}{2}$, then $P(\bar{A})$ is :

   (A) $\frac{1}{6}$

   (B) $\frac{2}{3}$

   (C) $\frac{1}{2}$

   (D) $\frac{1}{3}$

2. The event $\overline{A \cup B}$ is equivalent to the event :

   (A) $\overline{A \cap B}$

   (B) $\bar{A} \cap B$

   (C) $A \cap \bar{B}$

   (D) $\bar{A} \cap \bar{B}$

3. If $P(A) = 0.5$, $P(B) = 0.3$ and $P(A \cap B) = 0.1$, then $P(A \cup B)$ is :

   (A) 0.7

   (B) 0.15

   (C) 0.8

   (D) 0.9

4. If $f(x)$ has probability density function kx^2, $0 < x < 1$, then k is :

(A) Zero

(B) $\frac{1}{2}$

(C) 3

(D) 1

5. A random variable X takes values 1, 2 and 4 with probabilities $\frac{1}{4}, \frac{1}{2}$ and $\frac{1}{4}$, then the mathematical expectation of $\frac{1}{X^2}$ is :

(A) $\frac{17}{64}$

(B) $\frac{25}{64}$

(C) $\frac{27}{64}$

(D) $\frac{39}{64}$

6. The moment generating function of a normal variate X is :

$$M_x(t) = \exp(2t + 32t^2)$$

then $E(X^2)$ is :

(A) 32

(B) 20

(C) 15

(D) 68

7. If X and Y are two independent Poisson variates such that

$$P(X = 0) = P(X = 1)$$

and $P(Y = 1) = P(Y = 2)$

Then variance of $3X - Y$ is :

(A) 10

(B) 11

(C) 36

(D) None of the above

8. The mean of a Binomial distribution is 20 and the standard deviation is 4.

Then n is :

(A) 200

(B) 75

(C) 100

(D) 150

9. The mean of beta distribution of first kind $\beta_1(\alpha, \beta)$ is :

(A) $\frac{1}{\alpha + \beta}$

(B) $\alpha + \beta$

(C) $\frac{\beta}{\alpha + \beta}$

(D) $\frac{\alpha}{\alpha + \beta}$

10. If X is uniformly distributed in $-2 \leq x \leq 2$, then $P(X < 1)$ is :

(A) $\frac{3}{4}$

(B) $\frac{1}{4}$

(C) $\frac{1}{2}$

(D) Zero

11. Which of the following is a non-dimensional diagram ?

(A) Bar diagram

(B) Pie diagram

(C) Cylinder

(D) A graph

12. Ogives for 'more than' type and 'less than' type distributions interesect at :

(A) mean

(B) median

(C) mode

(D) origin

13. The correct relationship between A.M., G.M., and H.M. is :

(A) A.M. = G.M. = H.M.

(B) G.M. $\geq$ A.M. $\geq$ H.M.

(C) H.M. $\geq$ G.M. $\geq$ A.M.

(D) A.M. $\geq$ G.M. $\geq$ H.M.

14. The average of the 7 numbers 7, 9, 12, x, 5, 4, 11, is 9. The missing number x is :

(A) 13

(B) 14

(C) 15

(D) 8

15. If correlation coefficient between the variables X and Y is ρ, the correlation coefficient X^2 and Y^2 is :

(A) ρ

(B) ρ^2

(C) Zero

(D) One

16. The value of the correlation ratio varies from :

(A) -1 to $+1$

(B) -1 to zero

(C) Zero to one

(D) Zero to infinity

17. Given the two lines of regression as $3X - 4Y + 8 = 0$ and $4X - 3Y = 1$, the means of X and Y is :

(A) $\bar{X} = 4, \bar{Y} = 5$

(B) $\bar{X} = 3, \bar{Y} = 4$

(C) $\bar{X} = \frac{4}{3}, \bar{Y} = \frac{5}{4}$

(D) None of the above

18. The range of multiple correlation coefficient R is :

(A) Zero to one

(B) Zero to infinity

(C) -1 to $+1$

(D) $-\infty$ to $+\infty$

19. Given (A) = 95, (Ab) = 35, (B) = 150, N = 200 and (AB) = 60, then class frequency (ab) is equal to :

(A) 35

(B) 90

(C) 15

(D) 105

20. The class frequencies (A) = 90, N = 100, (B) = 70 and (Ab) = 40 reveal that the data are :

(A) consistent

(B) inconsistent

(C) insufficient

(D) None of the above

21. Degree of freedom for chi-square in one of the contingency table of order (4 × 3) is :

(A) 12

(B) 9

(C) 8

(D) 6

22. If all the frequencies of classes are same, the value of chi-square is :

(A) 1

(B) ∞

(C) Zero

(D) None of the above

23. The mean difference between 9 paired observations is 15 and the standard deviation of differences is 5. The value of statistic t is :

(A) 27

(B) 9

(C) 3

(D) Zero

24. The degree of freedom for statistic t for paired t-test based on pairs of observations is :

(A) $2(n - 1)$

(B) $n - 1$

(C) $2n - 1$

(D) None of the above

25. A sample of 12 specimens taken from a normal population is expected to have a mean 50 gm/cc. The sample has a mean 64 mg/cc with a variance of 25. To test $H_0 : \mu = 50$ against $H_1 : \mu \neq 50$, you will use :

(A) Z-test

(B) χ^2-test

(C) F-test

(D) t-test

26. To test a hypothesis about proportion of items in a class, the usual test is :

(A) t-test

(B) F-test

(C) Z-test

(D) None of the above

27. Level of significance is the probability of :

(A) type I error

(B) type II error

(C) not committing error

(D) any of the above

28. Let $x_1, x_2, \ldots, x_n$ be a random sample from a distribution which is continuous in the vicinity of the median θ. Then to test the hypothesis that $\theta = \theta_0$ (some specified value) against alternative hypothesis may be two sided, one can use :

(A) Sign test

(B) Run test

(C) Mood's test

(D) Mann-Whitney U-test

29. Which one of the following tests uses information on signs as well as magnitudes for testing for the median of a distribution ?

(A) Sign test

(B) Wilcoxon Signed rank test

(C) Mood's test

(D) Sukhatme's test

30. Given the frequency function $f(x) = \frac{1}{\theta}, 0 \leq x \leq \theta$, we are testing the hypothesis $H_0 : \theta = 1$ against $H_1 : \theta = 2$ by means of a single observation. We reject the hypothesis if $x \geq 0.5$, then probability of type first error is :

(A) 0.5

(B) 0.75

(C) 0.25

(D) 0.6

31. If the sample values be 1, 3, 5, 7, 9 the standard error of the sample mean is :

(A) $\sqrt{2}$

(B) $1/\sqrt{2}$

(C) 2

(D) $\frac{1}{2}$

32. In which one of the following procedures, the allocation is based on the stratum size and the stratum variation ?

(A) Neyman allocation

(B) Proportional allocation

(C) Equal allocation

(D) Optimum allocation

33. Let N be the number of units in a population and n be the number of units to be selected for a sample, then with simple random sampling with replacement one can get :

(A) ${}^{N}C_{n}$ possible samples

(B) nN possible samples

(C) N^{n} possible samples

(D) ${}^{N}P_{n}$ possible samples

34. If N = nk, then the sampling procedure thus emerges is precisely known as :

(A) Systematic random sampling

(B) Linear systematic sampling

(C) Circular systematic sampling

(D) Two-dimensional systematic sampling

35. If the regression of Y on X is perfectly linear then the variance of regression estimate is :

(A) Zero

(B) One

(C) Between zero and one

(D) Greater than one

36. In one-way classification, the test statistic F is :

(A) $\frac{\text{S.S. Treatments}}{\text{S.S. Errors}}$

(B) $\frac{\text{M.S.S. Treatments}}{\text{M.S.S. Errors}}$

(C) $\frac{\text{S.S. Errors}}{\text{S.S. Total}}$

(D) $\frac{\text{M.S.S. Errors}}{\text{M.S.S. Total}}$

37. In a randomized block of t treatments and b blocks, the degree of freedom for experimental error is :

(A) $(b - 1)\ (t - 1)$

(B) $(bt - 1)$

(C) bt

(D) $b(t - 1)$

38. When the variability of the strata is equal then the allocation is :

(A) Proportional

(B) Optimal

(C) Minimal

(D) Equal

39. The total number of possible arrangement in 4 × 4 Latin square is :

(A) 96

(B) 144

(C) 576

(D) 288

40. Estimate the missing value in the following least square design :

A	C	B	D
12	19	10	8
C	B	D	A
18	12	6	...
B	D	A	C
22	10	5	2
D	A	C	B
12	7	27	17

(A) 3

(B) 12

(C) 6

(D) 2

41. If X and Y are a random sample from a population $N(\mu, \sigma^2)$, then efficiency of $T = \frac{X + 2Y}{3}$ with respect to $\bar{x}$ is :

(A) $\frac{5}{9}$

(B) $\frac{9}{10}$

(C) $\frac{3}{5}$

(D) $\frac{1}{3}$

42. Let X, Y and Z are three random samples from a normal population with known mean μ. If $T = 3X + Y + \lambda Z$ is an unbiased estimator of μ, then λ is :

(A) -3

(B) -1

(C) 1

(D) 3

43. The maximum likelihood estimator of θ for the population $f(x) = \frac{1}{\theta}, 0 \leq x \leq \theta$ is :

(A) $\bar{x}$

(B) Median of x_i

(C) Minimum x_i

(D) Maximum x_i

44. The minimum variance unbiased estimator (MVUE) for θ in the distribution with pdf $f(x, \theta) = \frac{1}{\theta} \exp(-x/\theta), x > 0$ is :

(A) $\bar{x}$

(B) $\frac{\sum x_i^2}{n}$

(C) $x_{(1)}$

(D) $x_{(n)}$

45. Type II error is associated with the :

(A) rejection of null hypothesis when it is true

(B) rejection of null hypothesis when it is false

(C) acceptance of null hypothesis when it is false

(D) acceptance of null hypothesis when it is true

46. Power of the test is related to :

(A) type I error

(B) type II error

(C) type I and II errors both

(D) None of the above

47. In sequential probability ratio test (SPRT), the sample size is :

(A) fixed

(B) fixed but small

(C) fixed but large

(D) A random variable

48. Sequential probability ratio test (SPRT) initiated by :

(A) R.A. Fisher

(B) A. Wald

(C) G.W. Snedecor

(D) Thomas Bayes

49. Nonparametric methods are based on :

(A) mild assumption

(B) stringent assumption

(C) no assumption

(D) None of the above

50. Ordinary Sign test considers the difference of observed values from the hypothetical median value in terms of :

(A) Sign only

(B) Magnitude only

(C) Sign and magnitude both

(D) None of the above

51. A time series consists of :

(A) two components

(B) three components

(C) four components

(D) five components

52. For the given values 15, 24, 18, 33, 42, the three years moving average are :

(A) 19, 22, 33

(B) 19, 25, 31

(C) 19, 30, 31

(D) None of the above

53. Marshal and Edgeworth price index number formula utilizes the weights as :

(A) quantities of base year

(B) quantities of given year

(C) combined quantities of base and given year

(D) any of the above

54. Index numbers are expressed :

(A) in percentages

(B) in ratios

(C) in terms of absolute value

(D) all the above

55. Registration of vital statistics is organized at the apex by :

(A) Director General

(B) Registrar General

(C) Census Commissioner

(D) All the above

56. The age specific death rate for the babies of age less than one year is specifically called :

(A) neonatal

(B) infant mortality rate

(C) material mortality rate

(D) foetal death rate

57. If μ and σ are the process mean and S.D. then control limits $\mu \neq 3\sigma$ are known as :

(A) modified central limits

(B) natural central limits

(C) specified central limits

(D) None of the above

58. The probability of accepting a lot with fraction defective P_t is known as :

(A) consumer's risk

(B) type I error

(C) producer's risk

(D) None of the above

59. For the following linear programming problem (LPP)

Max. $Z = 2x_1 + 3x_2$

s.t. $x_1 + x_2 \leq 1$

$3x_1 + x_2 \leq 4$

$x_1, x_2 \geq 0$

The basic feasible solution is :

(A) $x_1 = 1, x_2 = 1$

(B) $x_1 = 0, x_2 = 1$

(C) $x_1 = 0, x_2 = 0$

(D) None of the above

60. To determine the optimum levels of advertising, sales force and price for maximizing profits, we shall use :

(A) Inventory model

(B) Multiple regressions analysis

(C) Linear programming

(D) Waiting time theory