PREVIOUS YEAR PAPER

SSC CGL 2024 Tier II — Statistics — 19 January 2025

SSC CGL · 19 January 2025 · 9:00 AM - 11:00 AM

81 of the paper's 100 questions · marks per question not printed on the response sheet · 120 minutes

Left out of the original paper: 19 (any question that needs a figure or formatting we cannot show, has no answer in the response sheet, or could not be checked against a second copy of the paper).

Questions from the Staff Selection Commission's paper of 19 January 2025, 9:00 AM - 11:00 AM. Each question is followed by its answer, and the answer key is repeated on the last page.

Take it as a timed practice test: exambharo.com/ssc-cgl/previous-year-papers/ssc-cgl-2024-tier-2-statistics-19-jan/

Statistics

1.

For the bivariate random variable (X,Y), let the joint probability density function be $f(x,y) = \frac{9(1+x+y)}{2(1+x)^4(1+y)^4}$ for $0 < x < \infty, 0 < y < \infty$. The marginal pdf of X is:

(a) $\frac{3(2x+3)}{2(1+x)}$

(b) $\frac{3(2x+1)}{4(1+x)^4}$

(c) $\frac{3(2x+3)}{(1+x)^4}$

(d) $\frac{3(2x+3)}{4(1+x)^4}$

Answer: (d)

2. Monthly sales data (in units) shows the following trend-adjusted ratios for three months: January (1.1), February (0.9), and March (1.0). What is the average seasonal index for this quarter?

(a) 0.95

(b) 0.9

(c) 1.0

(d) 1.1

Answer: (c)

3. Duncan's Multiple Range Test makes use of which statistical measure?

(a) Standard Error of the Means

(b) Regression Coefficient

(c) Range Statistic (R)

(d) F-statistic

Answer: (c)

4.

For three random variables X_1 , X_2 and X_3 , the correlation coefficients between pairs of random variables are $r_{12} = r_{13} = r_{23} = r \neq 1$.

For $R_{1.23}$ (multiple correlation coefficient), $1 - R^2_{1.23}$ is written as:

(a)

$$\frac{(1+r)(1+2r)}{1-r}$$

(b)

$$\frac{(1+2r)}{1+r}$$

(c)

$$\frac{(1-r)(1+2r)}{1+r}$$

(d)

$$\frac{(1+r)(1-2r)}{1+r}$$

Answer: (c)

6. If the critical region is evenly distributed, then the test is referred to as:

(a) Three tailed

(b) Zero tailed

(c) One tailed

(d) Two tailed

Answer: (d)

7.

Which of the following is NOT true for seasonal variation?

(a)

Caused by public holidays

(b)

Caused by rainfall

(c)

Repeated irregularly

(d)

Variation in a time series within one year

Answer: (c)

8. In a two-way ANOVA, how many hypotheses are tested?

(a) Three

(b) One

(c) Four

(d) Two

Answer: (a)

9. In ANCOVA, what happens when the covariate is not linearly related to the dependent variable?

(a) The results of ANCOVA may be biased.

(b) The covariate becomes irrelevant.

(c) All assumptions of ANCOVA are met.

(d) The F-statistic becomes insignificant.

Answer: (a)

10. Let X and Y be two independent Poisson variates with rate 5 and 10, respectively, then the E(XY=2) is equal to:

(a)

0.5

(b)

5

(c)

10

(d)

2

Answer: (b)

11.

The mean of a residual error in a one way classified data analysis is:

(a)

2

(b)

0

(c)

-1

(d)

1

Answer: (b)

12.

If the angle between two lines of regression is 90°, then correlation coefficient is:

(a)

1

(b)

$\frac{1}{2}$

(c)

0

(d)

-1

Answer: (c)

13.

For a monthly data, the link relative for any month is given by:

(a)

$$\frac{\text{Current month's Value} - \text{Previous month value}}{2} \times 100$$

(b)

$$\frac{\text{Current month's Value} + \text{Previous month value}}{2} \times 100$$

(c)

$$\frac{\text{Previous month's Value}}{\text{Current month's value}} \times 100$$

(d)

$$\frac{\text{Current month's Value}}{\text{Previous month's value}} \times 100$$

Answer: (d)

14.

On fitting of a trend line $Y = a + bt$ on a time series (with year as a unit of time), the monthly increment/decrement is given by

(a)

$b/12$

(b)

$a/12$

(c)

a

(d)

b

Answer: (a)

15.

If M: Mean, Md: Median, Mo: Mode, Q_1: First Quartile and Q_3: Third Quartile, then which of the following is an absolute measure of skewness?

(a)

$Q_1 - Q_3/Md$

(b)

$M - Md$

(c)

$M + Mo$

(d)

$\frac{Q_3 + Q_1 - 2Md}{Q_3 - Q_1}$

Answer: (b)

17.

For a two-way classification with p treatments, q blocks and r observations per cell, the degrees of freedom for error and total, respectively, are:

(a)

pq-1 and pq (r-1)

(b)

(p-1)(q-1) and pqr-1

(c)

pq (r-1) and pqr-1

(d)

p-1 and pq (r-1)

Answer: (c)

18.

Let X and Y be two independent Poisson variates with rate 5 and 10, respectively, then the distribution of Z=X+Y is:

(a)

Poisson distribution with rate 15

(b)

Exponential distribution with rate 15

(c)

Normal distribution with mean 15 and variance 1

(d)

Gamma distribution with rate 5 and shape 10

Answer: (a)

20.

10−15 is the model class with 25 as its frequency. Also if the frequency of the class preceding and succeeding the model class is 10 and 15, respectively, then the value of mode is:

(a)

12

(b)

13

(c)

10

(d)

15

Answer: (b)

22.

What does the third moment measure?

(a)

Variance

(b)

Mean

(c)

Skewness

(d)

Kurtosis

Answer: (c)

23. For testing whether two independent Normal populations (with unknown and equal variances) have same mean, one uses:

(a) t distribution

(b) Standard Normal Distribution

(c) Chi Square Distribution

(d) F distribution

Answer: (a)

24. The following data represents a time series. Period : 1 2 3 4 5 Observed values : 150 140 160 170 180 Compute the first-order and second-order differences for period 3.

(a) First-Order: 20, Second-Order: −30

(b) First-Order: −10, Second-Order: −10

(c) First-Order: −10, Second-Order: 20

(d) First-Order: 20, Second-Order: 10

Answer: (a)

26.

Let (X, Y) have the probability density function (pdf) as

$$f(x,y) = \begin{cases} c(x+2y) \text{ if } 0 < x < 2,\ 0 < y < 1 \\ 0 \text{ , otherwise} \end{cases}.$$

The value of c is:

(a)

$\frac{1}{2}$

(b)

$\frac{3}{4}$

(c)

$\frac{1}{4}$

(d)

1

Answer: (c)

27. A model being fitted is said to be adequate if the residual plot:

(a) is quadratic

(b) is non-linear

(c) is U-shaped

(d) displays random pattern

Answer: (d)

28.

For a normal distribution, the mean deviation is minimum when deviations are taken from:

(a)

mode

(b)

median

(c)

Geometric mean

(d)

mean

Answer: (b)

29.

Which definition of probability is NOT applicable if the events of a random experiment are not equally likely?

(a)

Empirical definition

(b)

Axiomatic definition

(c)

Classical definition

(d)

Bayesian definition

Answer: (c)

30.

If the joint distribution of two random variables X_1 and X_2 is

$f(x_1, x_2) = \begin{cases} x_1 + x_2; 0 < x_1, x_2 < 1 \\ 0, \text{otherwise} \end{cases}$, then $P(0 < X_2 < 0.5)$ is equal to:

(a)

3/8

(b)

1/2

(c)

3/4

(d)

1/4

Answer: (a)

32.

For two random variables X and Y, how many lines of regression are possible?

(a)
1

(b)
3

(c)
2

(d)
0

Answer: (c)

33.

Out of 100 numbers, 20 are 4's, 40 are 5's, 30 are 6's and the remaining are 7's. The arithmetic mean of the numbers is:

(a)
5.8

(b)
4.6

(c)
5.3

(d)
1.9

Answer: (c)

34. Level of significance is:

(a) Probability of Type I Error

(b) 1 – Probability of Type I Error

(c) 1 – Probability of Type II Error

(d) Probability of Type II Error

Answer: (a)

35.

Let X follow Poisson distribution with mean λ. If

$P(X = 2) = \frac{1}{2} P(X = 3)$, then the value of λ is:

(a)
4
(b)
6
(c)
7
(d)
2

Answer: (b)

36.

Which of the following is the relative measure of skewness?

(a)
β_2
(b)
β_1
(c)
$(X - \mu)/\sigma$
(d)
$\frac{Q_3 - 2Q_2 + Q_1}{Q_3 - Q_1}$

Answer: (d)

37.

The mean absolute deviation of 25, 30, 27, 40 and 35 is:

(a)
3.58
(b)
4.88
(c)
5.28
(d)
4.67

Answer: (b)

38. Before using secondary data, one need NOT verify:

(a) reliability of data

(b) suitability of data

(c) expenditure involved at time of collection of data

(d) adequacy of data

Answer: (c)

39.

25 books are placed at random on a shelf. The probability that a particular pair of books shall be always together is:

(a)

3/25

(b)

2/25

(c)

1/25

(d)

5/25

Answer: (b)

41.

With usual notations, the 95% confidence limits for the difference of tv :oportions is:

(a)

$$(p_1 - p_2) \pm 1.96\sqrt{\frac{p_1q_1}{n_1} + \frac{p_2q_2}{n_2}}$$

(b)

$$(p_1 + p_2) \pm 1.96\sqrt{\frac{p_1q_1}{n_1} + \frac{p_2q_2}{n_2}}$$

(c)

$$(p_1 + p_2) \pm 1.96\sqrt{\frac{p_1q_1}{n_1} - \frac{p_2q_2}{n_2}}$$

(d)

$$(p_1 - p_2) \pm 1.96\sqrt{\frac{p_1q_1}{n_1} - \frac{p_2q_2}{n_2}}$$

Answer: (a)

42.

Find the coefficient of skewness from the following information:

Mode = 11, median = 8, $Q_3 - Q_1 = 8$, $Q_3 + Q_1 = 22$.

(a)

1/3

(b)

1/4

(c)

3/4

(d)

1/5

Answer: (c)

43.

On rolling of a die, the events E1 (getting an even number) and E2 (getting an odd number) are:

(a)

mutually exclusive

(b)

exhaustive

(c)

neither mutually exclusive nor exhaustiv

(d)

mutually exclusive and exhaustive

Answer: (d)

44.

If $Y = \frac{X}{2} + 2$ and $X = \frac{Y}{8} - 1$ are regression lines of Y on X and X on Y, then correlation coefficient between X and Y is equal to:

(a)

$\pm\frac{1}{4}$

(b)

$\pm\frac{1}{6}$

(c)

$\frac{1}{4}$

(d)

$\frac{1}{6}$

Answer: (c)

45.

The coefficient of kurtosis (β_2) of standard normal distribution is equal to:

(a)

-3

(b)

0

(c)

3

(d)

1

Answer: (c)

46.

If a large sample of size n is taken from a normal population with mean μ and standard deviation σ, the 95% confidence interval for the unknown parameter μ is:

(a)

$$\left(\bar{x} \pm 1.96\frac{\sigma}{\sqrt{n}}\right)$$

(b)

$$\left(\bar{x}^2 \pm 1.96\frac{\sigma}{\sqrt{n}}\right)$$

(c)

$$\left(\bar{x} \pm 1.96\frac{\sigma^2}{\sqrt{n}}\right)$$

(d)

$$\left(\bar{x} \pm 1.96\frac{\sigma^2}{n}\right)$$

Answer: (a)

47. O-gives are NOT useful for locating:

(a) percentiles

(b) median

(c) quartiles

(d) mean

Answer: (d)

48.

Which of the following index numbers is the geometric mean of Laspeyre's and Paasche's Index number?

(a)

Drobish–Bowley Index

(b)

Marshall–Edgeworth Index

(c)

Irving Fisher Index

(d)

Walsch Index

Answer: (c)

49. Which component of a time series represents short-term fluctuations due to seasonal factors?

(a) Seasonal component

(b) Irregular component

(c) Cyclical component

(d) Trend

Answer: (a)

50.

Type I error occurs when:

(a)

a false null hypothesis is rejected

(b)

a true null hypothesis is rejected

(c)

a true null hypothesis is accepted

(d)

a false null hypothesis is accepted

Answer: (b)

51. Which of the following statements is FALSE?

(a) An alternative hypothesis is complementary to null hypothesis.

(b) The hypothesis for testing mu < mu0 is two sided / two tailed.

(c) The null hypothesis H0: mu = mu0 can be tested against the alternative H1: mu not equal to mu0.

(d) The hypothesis for testing mu > mu0 is one sided / right tailed.

Answer: (b)

52.

The median of the normal distribution with mean and variance μ *and* σ^2 is:

(a)

σ

(b)

$\mu/2$

(c)

$\sigma/2$

(d)

μ

Answer: (d)

53.

When two judges rank only two individuals, then value of Spearman's rank correlation coefficient is:

(a)

-1 or 1

(b)

between 0 and 1

(c)

-1 or 0

(d)

0 or 1

Answer: (a)

54.

The formula used for finding the simple aggregate index numbers is:

(a)

$$\frac{\sum p_{0j}p_{ij}}{\sum p_{0j}} \times 100$$

(b)

$$\frac{\sum p_{ij}}{\sum p_{0j}p_{ij}} \times 100$$

(c)

$$\frac{\sum p_{ij}}{\sum p_{0j}} \times 100$$

(d)

$$\frac{\sum p_{0j}}{\sum p_{ij}} \times 100$$

Answer: (c)

55. If S^2 is the sample variance of a sample of size n and s^2 is an unbiased estimator of population variance, then which of the following is true?

(a)
$n s^2 = (n-1) S^2$
(b)
$(n-1) s^2 = n S^2$
(c)
$(n+1) s^2 = n S^2$
(d)
$n s^2 = (n+1) S^2$

Answer: (b)

56.

For three random variables X_1 , X_2 and X_3 , correlation coefficients between pairs of random variables are $r_{12} = sin^2\theta,\ r_{13} = cos\theta$ and $r_{23} = sin\theta$.

The partial correlation coefficient $r_{12.3}$ is given by:

(a)
$tan\theta - 1$
(b)
$sin\theta - 1$
(c)
$cot\,\theta - 1$
(d)
$cos\theta - 1$

Answer: (a)

58.

For the set of numbers 2, 3, 7, 8 and 10, the second order moment about the origin 4 is:

(a)
13.2
(b)
12.6
(c)
15
(d)
10.5

Answer: (a)

59.

In a data set, let the first and third quartiles be 268.25 and 290.75, respectively. The quartile deviation is equal to:

(a)

12

(b)

11.25

(c)

18.5

(d)

15

Answer: (b)

60. It has been found that 2% of the tools produced by a certain machine are defective. What is the probability that in a shipment of 400 such tools, 3% or more will be defective? (Probability that the normal variate lies between 0 and 1.43 is 0.4236.)

(a) 0.0764

(b) 0.50

(c) 0.4236

(d) 1.43

Answer: (a)

62.

Which of the following components of time series reflect the general tendency of the data to i e or decrease during a long period of time?

(a)

Trend

(b)

Seasonal

(c)

Irregular

(d)

Cyclical

Answer: (a)

63.

In a completely randomized design, with 4 treatments replicated 5 times, the following information is obtained.

SST=26234.95, SSE=11558.80, the F_{cal} is equal to:

(a)

20

(b)

12.11

(c)

14.89

(d)

15.6

Answer: (b)

64.

If a fair six-sided die is tossed twice and the tosses are independent, then probability of getting a 5 on both tosses is:

(a)

1/3

(b)

1/36

(c)

1/6

(d)

1/12

Answer: (b)

65.

The primary purpose of constructing index numbers is to:

(a)

compare relative changes in variables over time

(b)

assess purchasing power of money

(c)

calculate statistical variances

(d)

estimate population parameters

Answer: (a)

66.

Half of the difference between the 75th percentile and 25th percentile is called:

(a)
coefficient of variation

(b)
coefficient of skewness

(c)
range

(d)
quartile deviation

Answer: (d)

67.

Data sets with high kurtosis:

(a)
have no outliers

(b)
will have their distributions symmetric

(c)
tend to have heavy outliers

(d)
tend to have light outliers

Answer: (c)

68.

Let a continuous random variable X have pdf

$$f(x) = \begin{cases} -0.75\,x^2 + 1.5x \text{ for } 0 < x < 2 \\ 0\text{ , otherwise} \end{cases}$$

The mode of X is:

(a)
2

(b)
1.8

(c)
2.6

(d)
1

Answer: (d)

69.

At what value of $R_{1.23}$ are all regression residuals zero?

(a)

-1

(b)

1

(c)

Both 1 and -1

(d)

0

Answer: (b)

70.

If the standard deviation of a population is 100, then based on a sample of size 100, the standard deviation of sample mean is equal to:

(a)

10

(b)

80

(c)

100

(d)

50

Answer: (a)

74.

Die I has 4 red and 2 white faces and die II has 2 red and 4 white faces. A coin is flipped once. If head appears, the game continues by flipping die I, and if tail appears, then die II is used. The probability of getting a red face at any throw is:

(a)

1/4

(b)

1/8

(c)

1/3

(d)

1/2

Answer: (d)

75.

The mean and variance of a Binomial distribution are 8 and 4 respectively, then the value of n is:

(a)

32

(b)

64

(c)

8

(d)

16

Answer: (d)

76.

Let X follows normal distribution with mean μ and median $\tilde{\mu}$, then $P(\mu < X < \tilde{\mu})$ is equal to:

(a)

0.50

(b)

0

(c)

0.10

(d)

0.25

Answer: (b)

77.

For a completely randomised design with k treatments, let

x_{ij} = i^{th} observation corresponding to j^{th} treatment,

$i = 1,2,\ldots,n_j, \qquad j = 1,2,\ldots,k$

T = total of all observations,

$\bar{x}_j$ = mean of jth treatment,

$\bar{x} = \frac{T}{N}$ where $N = \sum_{j=1}^{k} n_j$.

The formula for finding the sum of squares due to error (SSE) is:

(a)

$\sum_{j=1}^{k} (\bar{x}_j - \bar{x})$

(b)

$\sum_{j=1}^{k} n_j(\bar{x}_j - \bar{x})^2$

(c)

$\sum_{j=1}^{k}\sum_{i=1}^{n_j}(x_{ij} - \bar{x}_j)^2$

(d)

$\sum_{j=1}^{k}\sum_{i=1}^{n_j}(x_{ij} - \bar{x})^2$

Answer: (c)

78. If (X, Y) has a bivariate normal distribution, then X, Y are independent if and only if X, Y are:

(a)

$\rho(X, Y) \neq 0$

(b)

Uncorrelated

(c)

Correlated

(d)

$\text{cov}(X, Y) \neq 0$

Answer: (b)

80. Let X_1 , X_2 , . . . , X_{10} be 10 independent and identically distributed (i.i.d) random variables taking the values 0, 1 with corresponding probabilities q, p. Then $X = X_1 + X_2 + \ldots + X_{10}$ is/has:

(a) a binomial variate

(b) Poisson distribution

(c) a normal variate

(d) a geometric variate

Answer: (a)

82.

The mean and variance of a binomially distributed random variable X are 4 and 2, respectively. P(X = 2)is equal to:

(a)

$\frac{1}{2^8}$

(b)

$\frac{7}{2^6}$

(c)

$\frac{1}{2^6}$

(d)

$\frac{7}{2^8}$

Answer: (b)

83.

As the sample size increases, empirical probability:

(a)

becomes less accurate

(b)

becomes more subjective

(c)

decreases

(d)

approaches the true probability of an event

Answer: (d)

84. Which of the following is NOT true about collecting data through structured interviews?

(a) They involve the use of highly standardised techniques of recording.

(b) The interviewer follows a rigid laid down procedure.

(c) They involve the use of a set of predetermined questions.

(d) The sequence of asked questions can be changed.

Answer: (d)

85.

Which of the following is NOT considered as a property of a good estimator?

(a)

Consistency

(b)

Unbiasedness

(c)

Efficiency

(d)

Correlation

Answer: (d)

86.

Suppose a sample of size 36 is drawn from a population with mean 2 and variance 25 using simple random sampling with replacement. The standard error of $\bar{x}$ is:

(a)

$\frac{3}{5}$

(b)

$\frac{5}{8}$

(c)

$\frac{5}{6}$

(d)

1

Answer: (c)

88. In a one-way ANOVA, which of the following would indicate a violation of the normality assumption?

(a) Equal variances across groups

(b) Residuals showing a skewed distribution

(c) Residuals randomly distributed

(d) Independent observations

Answer: (b)

89. What is the main assumption of the ratio-to-moving-averages method?

(a) Seasonal effects are multiplicative.

(b) Random components dominate the time series.

(c) The trend is constant over time.

(d) The seasonal component is additive.

Answer: (d)

92.

The points of inflection of a normal distribution N (5, 1) that exist at x is equal to:

(a)

2, 8

(b)

5, 1

(c)

1, 9

(d)

4, 6

Answer: (d)

93. From a population of a large number of workers with a standard deviation 5, a sample is drawn and the standard error is found to be 0.5. What is the sample size?

(a) 50

(b) 1000

(c) 10

(d) 100

Answer: (d)

94.

If the arithmetic mean is 25 and geometric mean is 15, then the value of the Harmonic mean is equal to:

(a)

15

(b)

9

(c)

12

(d)

10

Answer: (b)

95.

If $\bar{x}$ is the mean of a sample from $N(\mu, 1)$, then the maximu

(a)

$n\bar{x}^2$

(b)

$\bar{x}^2 + \frac{1}{n}$

(c)

$\bar{x}^2 + 1$

(d)

x^2

Answer: (d)

97.

The coefficient of variation and standard deviation for a dataset are 23 and 11, then the mean is approximately equal to:

(a)

23.876

(b)

33.564

(c)

45.825

(d)

47.826

Answer: (d)

99.

Karl Pearson's correlation coefficient is also called:

(a)

Product moment correlation coefficient

(b)

Likelihood coefficient

(c)

Spearman's correlation coefficient

(d)

Simplex correlation coefficient

Answer: (a)

100.

Usually the formula to determine the number of classes is given by:

(a)

$2 + 3.322 \times \log 100N$

(b)

$3 + 3.322 \times \log 1000\ N$

(c)

$1 + 3.322 \times \log 10\ N$

(d)

None of the above

Answer: (c)

Answer key

Answer key as marked in the Staff Selection Commission's response sheet. "—" means the sheet did not show it clearly.

Statistics

1	**(d)**	2	**(c)**	3	**(c)**	4	**(c)**	6	**(d)**	7	**(c)**	8	**(a)**	9	**(a)**
10	**(b)**	11	**(b)**	12	**(c)**	13	**(d)**	14	**(a)**	15	**(b)**	17	**(c)**	18	**(a)**
20	**(b)**	22	**(c)**	23	**(a)**	24	**(a)**	26	**(c)**	27	**(d)**	28	**(b)**	29	**(c)**
30	**(a)**	32	**(c)**	33	**(c)**	34	**(a)**	35	**(b)**	36	**(d)**	37	**(b)**	38	**(c)**
39	**(b)**	41	**(a)**	42	**(c)**	43	**(d)**	44	**(c)**	45	**(c)**	46	**(a)**	47	**(d)**
48	**(c)**	49	**(a)**	50	**(b)**	51	**(b)**	52	**(d)**	53	**(a)**	54	**(c)**	55	**(b)**
56	**(a)**	58	**(a)**	59	**(b)**	60	**(a)**	62	**(a)**	63	**(b)**	64	**(b)**	65	**(a)**
66	**(d)**	67	**(c)**	68	**(d)**	69	**(b)**	70	**(a)**	74	**(d)**	75	**(d)**	76	**(b)**
77	**(c)**	78	**(b)**	80	**(a)**	82	**(b)**	83	**(d)**	84	**(d)**	85	**(d)**	86	**(c)**
88	**(b)**	89	**(d)**	92	**(d)**	93	**(d)**	94	**(b)**	95	**(d)**	97	**(d)**	99	**(a)**
100	**(c)**														