

නව නිර්දේශය / புதிய பாடத்திட்டம் / New Syllabus

NEW

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2020
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2020
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ව්‍යාපාර සංඛ්‍යාය I
வணிகப் புள்ளிவிவரவியல் I
Business Statistics I

31 E I

පැය දෙකයි
இரண்டு மணித்தியாலம்
Two hours

Instructions:

- * Answer all questions.
- * Write your **Index Number** in the space provided in the answer sheet.
- * Statistical tables will be provided. Use of calculator is **not allowed**.
- * Instructions are given on the back of the answer sheet. Follow those carefully.
- * In each of the questions 1 to 50, pick one of the alternatives from (1), (2), (3), (4), (5) which is correct or most appropriate and mark your response on the answer sheet with a cross (×) on the number of the correct option in accordance with the instructions given at the back of the answer sheet.

1. Which of the following statements is true?

- (1) Making a statistical conclusion with probable error is an example for misusing of statistics.
- (2) The difference between the population parameter and the estimate for the parameter is called the sampling error.
- (3) Non-response error is an example for non-sampling errors.
- (4) If in a study answers are needed to many complicated questions, self-enumeration method is the most suitable method.
- (5) In focus group interviews, participants have to answer questions included in a pre-prepared document.

2. Consider the following statements.

- A - Pie diagram is a circular representation of the data which can also be represented by a single bar of a percentage component bar-chart.
- B - A Lorenz curve can not be constructed when the income is given in the form of a frequency distribution.
- C - If the Gini coefficient is zero, it indicates that everyone in a population receives the same amount of income.

The true statement/s from the above is/are,

- (1) only A
- (2) only C
- (3) only A and B
- (4) only A and C
- (5) all A, B and C

3. Consider the following statements regarding scales of measurements.

- A - Categorising of social classes as upper class, middle class and lower class is an example for nominal scale.
- B - The main difference between ordinal scale and interval scale is that interval scale uses unit of measurements.
- C - The class interval in a frequency distribution is an example for interval scale.

The true statement/s from the above is/are,

- (1) only B
- (2) only A and B
- (3) only A and C
- (4) only B and C
- (5) all A, B and C

11. In a distribution Pearson's coefficient of skewness is 0.5, the coefficient of variation is 40% and the mode is 80. The mean of the distribution is,
 (1) 40 (2) 100 (3) 160 (4) 200 (5) 320
12. Bowley's coefficient of skewness for a certain distribution is -0.8 . If the sum of the lower and upper quartiles is 100 and the median is 58, find the lower and upper quartiles.
 (1) $Q_1 = 20, Q_3 = 80$ (2) $Q_1 = 25, Q_3 = 75$
 (3) $Q_1 = 30, Q_3 = 70$ (4) $Q_1 = 35, Q_3 = 65$
 (5) $Q_1 = 40, Q_3 = 60$
13. Which of the following statements is true about regression and correlation?
 (1) High correlation between X and Y implies that X causes change in Y and Y causes change in X .
 (2) If an additional independent variable is included in a simple linear regression equation, the error term will increase.
 (3) If a constant is subtracted from all the values of X , the regression coefficient of Y on X will change.
 (4) Spearman's rank correlation coefficient cannot be calculated for quantitative data.
 (5) Spearman's rank correlation coefficient is equal to the Karl Pearson's product moment correlation coefficient between ranks.

14. Consider the following statements regarding the regression.

A - If the regression of Y on X is simple linear, the expected value of Y vary exactly on a straight line when X vary.

B - If the regression equation of Y on X is $\hat{Y} = -10 + 5x$, then the regression equation of X on Y is $\hat{X} = 0.2y - 2$.

C - If the estimated regression equation is $\hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2$, the coefficient $\hat{\beta}_2$ represent the change of \hat{Y} for a unit change of x_2 if x_1 is kept constant.

The true statement/s from the above is/are,

- (1) only A (2) only B
 (3) only A and B (4) only A and C
 (5) all A, B and C

15. The fitted regression equation for paddy yield (Y) on fertilizer (X) is given below.

$$\hat{Y} = 36.4 + 0.05x$$

The true statement with respect to the above equation is,

- (1) \hat{Y} is the paddy yield when fertilizer level is x .
 (2) \hat{Y} is the expected value of paddy yield when fertilizer level is x .
 (3) \hat{Y} is the estimate of the expected value of paddy yield when fertilizer level is x .
 (4) If the fertilizer level is increased by one unit, the paddy yield will increase by 36.45 units.
 (5) If the fertilizer level is increased by one unit, the paddy yield will increase by 36.4 units.

16. Consider the following statements about the approaches to probability.

A - Subjective probability approach is more appropriate when the experiment cannot be repeated.

B - If the random experiment is to select an item at random from a lot, the probability of an event can be obtained without performing the experiment.

C - The probability of an event obtained under the relative frequency approach may be different from the true probability of the event.

The true statement/s from the above is/are,

- (1) only B (2) only A and B
 (3) only A and C (4) only B and C
 (5) all A, B and C

17. In a group there are 3 boys and 2 girls. If 3 are selected at random from this group, find the probability that there are 2 boys and 1 girl or 1 boy and 2 girls.

- (1) $\frac{1}{5}$ (2) $\frac{3}{10}$ (3) $\frac{1}{2}$ (4) $\frac{3}{5}$ (5) $\frac{9}{10}$

18. Suppose A and B are two independent events. The probability that both A and B occur is $\frac{1}{8}$ and the probability that neither of them occur is $\frac{3}{8}$. If $P(A) > P(B)$, the probability of the occurrence of A is,

- (1) $\frac{1}{5}$ (2) $\frac{1}{4}$ (3) $\frac{1}{3}$ (4) $\frac{1}{2}$ (5) $\frac{3}{4}$

19. Suppose that A and B are any two events. The probability that both A and B occur, the probability that A occurs and B does not occur, and the probability that B occurs and A does not occur are all equal to k . The probability that at least one event occurs from the events A and B is,

- (1) k (2) $2k$ (3) $3k$ (4) $3k^2$ (5) k^3

20. If A and B are any two events with $P(A) = p_1$, $P(B) = p_2$ and $P(A \cap B) = p_3$ then $P(A \setminus B)$ is,

- (1) $\frac{p_1 + p_2 - p_3}{1 - p_1}$ (2) $\frac{p_1 + p_2 - p_3}{1 - p_2}$
 (3) $\frac{1 - p_1 - p_2 + p_3}{1 - p_2}$ (4) $\frac{1 - p_1 - p_2 + p_3}{1 - p_1}$
 (5) $\frac{1 - p_1 - p_2 - p_3}{1 - p_2}$

21. Consider the following statements.

A - The expected value of a random variable X is a weighted average with weights being the probabilities of possible values of X .

B - The expected value of a random variable is the value which occurs with maximum probability.

C - If X is a random variable and c and d are constants $Var(cX \pm d) = cVar(X) \pm d$.

The true statement/s from the above is/are,

- (1) only A (2) only A and B
 (3) only A and C (4) only B and C
 (5) all A, B and C

22. The manufacturer of nails says that on the average 2.5% of his product is defective. A buyer accepts a box of 100 nails if it contains not more than 4 defective nails. Find the approximate probability that a box of nails will be accepted by the buyer.

- (1) 0.1088 (2) 0.2424 (3) 0.5438 (4) 0.7576 (5) 0.8912

23. A student sit for a test consists of 10 multiple choice questions with 5 answers to each question. The student answers each question by selecting one answer randomly as the correct answer. To pass the exam he must get at least 60% correct answers. What is the probability that the student passes the exam?

- (1) 0.0064 (2) 0.0328 (3) 0.9672 (4) 0.9936 (5) 0.9991

24. The yield of Potato in 10000 plots of land has a normal distribution with mean 650kg and standard deviation 30kg. The lowest yield of the best 1000 plots is,

- (1) 578kg (2) 612kg (3) 688kg (4) 719kg (5) 962kg

25. In an area 50% of the persons favour a certain development proposal. If random sample of 100 persons selected from this area, what is the approximate probability that at least 55 persons favour the proposal?

- (1) 0.1587 (2) 0.1841 (3) 0.3159 (4) 0.3413 (5) 0.3682

26. Consider the following statements about the cluster sampling.

- A - If the variation among clusters is small cluster sampling is more suitable.
 B - Cluster sampling can be used even when a complete sampling frame is not available.
 C - If the intra-cluster correlation coefficient is close to 1 cluster sampling is as efficient as simple random sampling.

The true statement/s from the above is/are,

- (1) only A (2) only A and B
 (3) only A and C (4) only B and C
 (5) all A, B and C

27. Consider the following statements about sampling.

A - The results of a sample survey may be more reliable than the results of a whole population survey.

B - Method of systematic sampling can be used only when $\frac{N}{n}$ is an integer.

C - In systematic sampling the standard error cannot be calculated using a single sample.

The true statement/s from the above is/are,

- (1) only A (2) only A and B
 (3) only A and C (4) only B and C
 (5) all A, B and C

28. In simple random sampling with replacement from a population with the population proportion π the standard error of the sample proportion of sample size n is,

- (1) $\sqrt{\left(\frac{N-n}{N-1}\right) \frac{\pi(1-\pi)}{n}}$ (2) $\frac{\pi(1-\pi)}{\sqrt{n}}$ (3) $\frac{\sqrt{\pi(1-\pi)}}{\sqrt{n}}$
 (4) $\sqrt{\left(\frac{N-n}{N}\right) \frac{\pi(1-\pi)}{n}}$ (5) $\frac{\sqrt{\pi(1-\pi)}}{n}$

29. Which of the following statements is true?

- (1) If the sample size n is small t -distribution depends on the mean of the normal distribution.
 (2) The standard deviation of a sampling distribution of an estimator is called the standard error of the estimator.
 (3) When degrees of freedom increases χ^2 -distribution becomes more skewed.
 (4) If the sample size is small the sampling distribution of the sample proportion is unknown.
 (5) The central limit theorem can be used only for deciding the sampling distribution of the sample mean.

30. Which of the following statements is true?

- (1) If $\hat{\theta}_1$ and $\hat{\theta}_2$ are two unbiased estimators for the parameter θ , the efficiency of $\hat{\theta}_1$ relative to $\hat{\theta}_2$ is defined as $\frac{Var(\hat{\theta}_2)}{Var(\hat{\theta}_1)}$
 (2) A biased estimator cannot be a consistent estimator.
 (3) If the population mean μ is known, $\frac{1}{n} \sum (x_i - \mu)^2$ is an unbiased estimator for population variance σ^2 .
 (4) The difference between the population parameter and the estimate for the parameter is called bias of the estimator.
 (5) Any function of a random sample is called a statistic.

31. It is required to estimate population proportion π from the sample proportion p with maximum probable error within the range $\pi \pm 0.02$ with probability 0.9544. What is the sample size required to satisfy this requirement?

- (1) 900 (2) 1681 (3) 1785 (4) 2401 (5) 2500

32. In a random sample of size 25 from a normal population with mean μ and unknown variance σ^2 , the sample mean was $\bar{x} = 60$ and the sample variance $s^2 = 16$. If the calculated confidence interval for μ is (57.76, 62.24), what is the confidence level?

- (1) 80% (2) 90% (3) 95% (4) 98% (5) 99%

33. Which of the following statements is false?

- (1) The variable which is used to construct confidence intervals for a population parameter contains the parameter and a point estimator for the parameter.
 (2) The confidence interval with 99% confidence level is better than confidence interval with 95% confidence level.
 (3) A confidence interval for the difference of population means $\mu_1 - \mu_2$ is obtained by adjusting the point estimator $\bar{X}_1 - \bar{X}_2$ for its probable error.
 (4) For the mean of a normal population there can be more than one 95% confidence intervals.
 (5) The 95% confidence interval for the mean of a normal population with unknown variance is wider than 95% confidence interval with known variance.

34. Consider the following statements about testing hypotheses.

- A - The hypothesis test with the minimum probability of type II error for a given value of probability of type I error is called the most powerful test.
 B - The probability of accepting H_1 hypothesis when H_0 hypothesis is false is called the power of the test.
 C - The sampling distribution of a test statistic depends on the population parameter being tested.

The true statement/s from the above is/are,

- (1) only A (2) only A and B
 (3) only A and C (4) only B and C
 (5) all A, B and C

35. For testing the population proportion $H_0: \pi = 0.1$ against $H_1: \pi \neq 0.1$ at 5% significance level a random sample of size 100 was obtained. If the sample proportion is $p = 0.16$, the conclusion is,

- (1) reject H_0 since p -value = 0.0228 < 0.05
 (2) reject H_0 since p -value = 0.0456 < 0.05
 (3) do not reject H_0 since p -value = 0.0526 > 0.05
 (4) do not reject H_0 since p -value = 0.2104 > 0.05
 (5) reject H_0 since $Z = 1.62 < 1.96$

36. The mean and variance of the life time of type A bulbs of a random sample of size 120 were $\bar{x} = 945$ and $s_1^2 = 240$ and the mean and variance of the life time of type B bulbs of a random sample of 100 were $\bar{y} = 940$ and $s_2^2 = 200$. If the critical region for testing the equality of population means $H_0: \mu_1 = \mu_2$ against $H_1: \mu_1 > \mu_2$ is given by $\bar{X} - \bar{Y} > 4$, the probability of type I error is

- (1) 0.0228 (2) 0.0250 (3) 0.1103 (4) 0.3897 (5) 0.4772

37. The critical region for testing mean of a normal population $H_0: \mu = 120$ against $H_1: \mu = 122$ by taking a random sample of size 60 is given by $\bar{X} > 121.4$. If the population variance is $\sigma^2 = 240$ the power of the test is

- (1) 0.1179 (2) 0.2420 (3) 0.3821 (4) 0.6179 (5) 0.8821

38. The number of deaths occurred in 50 days in a certain hospital are given in the following table.

No. of deaths	0	1	2	3	4	5	6	7
No. of days	2	8	12	13	8	4	2	1
Expected frequency	3	8	11	11	8	5	3	1

The critical value for testing at 5% significance level whether the poisson distribution with mean 3 is the relevant distribution for this data is,

- (1) 7.82 (2) 9.50 (3) 11.10 (4) 12.60 (5) 14.10

46. Consider the following statements about *OC*-curve.

- A - *OC*-curve shows the ability of an acceptance sampling plan to distinguish between good lots and bad lots.
 B - If the *OC*-curve for a product is not satisfactory it can be improved by changing the sample size and acceptance number.
 C - *OC*-curve represents the probability of rejecting the lot for variations in the fraction defective in the lot.

The true statement/s from the above is/are,

- (1) only A (2) only A and B
 (3) only A and C (4) only B and C
 (5) all A, B and C

47. Consider an accepting sampling plan with $N=1000$, $n=100$ and acceptance number $c=1$. If $AQL = 0.01$ and $LTPD = 0.07$, the respective consumer's risk and producer's risk are,

- (1) 26.42%, 0.73% (2) 26.42%, 99.27%
 (3) 36.79%, 0.09% (4) 63.21%, 0.09%
 (5) 73.58%, 0.73%

48. A certain firm expects its sale for an item to increase by 50% in next year. If the aim of the firm is to double the gross income, by what percentage should it increase the selling price?

- (1) 30% (2) $33\frac{1}{3}\%$ (3) 50% (4) 100% (5) 150%

49. Consider the following statements about index numbers.

- A - Marshall-Edgeworth index satisfies the time reversal test but it does not satisfy the factor reversal test.
 B - In a situation where prices are increasing Laspeyres's price index tends to be smaller than Paasche's price index.
 C - The simple aggregate price index does not take into account the relative importance of various commodities.

The true statement/s from the above is/are,

- (1) only A (2) only C
 (3) only A and B (4) only A and C
 (5) all A, B and C

50. Two raw materials (I and II) are used in different proportions for the production of goods A and B, but the price of each raw material is equal for both products.

	Product A	Product B
Weight for raw material I (w_1)	60	70
Weight for raw material II (w_2)	40	30
Index of production Cost	170	165

The price indices for raw material I and II are respectively,

- (1) 15, 20 (2) 50, 45 (3) 64.5, 187.5 (4) 150, 200 (5) 285, 235

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