

2- Probability of one electric device failure is 0.01. If a sample is chosen of 400, what is probability that exactly 2 are defective (Marks 5)

Answer:- (Page 218)

$$p = 0.01$$

$$q = 1 - p \Rightarrow q = 1 - 0.01 \Rightarrow q = 0.99$$

$$\begin{aligned} P(X = 2) &= \binom{400}{2} (0.01)^2 (0.99)^{400-2} \\ &= 79800 * 0.0001 * 0.02 \\ &= 0.1596 \end{aligned}$$

4- Two dices are rolled. Find probability that outcome is equal or more than 11. (Marks 5)

Answer:-

$$S = \begin{pmatrix} (1,1) & (2,1) & (3,1) & (4,1) & (5,1) & (6,1) \\ (1,2) & (2,2) & (3,2) & (4,2) & (5,2) & (6,2) \\ (1,3) & (2,3) & (3,3) & (4,3) & (5,3) & (6,3) \\ (1,4) & (2,4) & (3,4) & (4,4) & (5,4) & (6,4) \\ (1,5) & (2,5) & (3,5) & (4,5) & (5,5) & (6,5) \\ (1,6) & (2,6) & (3,6) & (4,6) & (5,6) & (6,6) \end{pmatrix}$$

$$P = (5,6), (6,5), (6,6)$$

$$= \frac{3}{36} = \frac{1}{12} = 0.083$$

5- If X is binomial distribution $n=5$, $p=0.5$, $q=0.5$ then find $SD(X)$ (Marks 3)

Answer:- (Page 214)

$$\begin{aligned} S.D(X) &= \sqrt{npq} \\ &= \sqrt{5 \times 0.5 \times 0.5} = \sqrt{1.25} \\ &= 1.12 \end{aligned}$$

خود کو تمہیں سے بڑھ کر کوئی اچھا مشورہ نہیں دے سکتا

6- $n=24$, Mean=33, $s=15$, $\bar{x}=40.4$. Compute t statistic (Marks 3)

7- 90% confidence interval of population mean is 11 to 20. Interpret result (Marks 3)

Answer:- Rep

8- $E(XY)=421$, $E(X)=42$, $E(Y)=15$. Check independence (Marks 3)

Answer:-

$$\begin{aligned} \text{Cov}(X, Y) &= E(XY) - E(X)E(Y) \\ &= 421 - (42)(15) \\ &= -209 \end{aligned}$$

It is not independent.

9- Difference between statistics and statistic (Marks 3)

Answer:-

Statistics is the plural of statistic, the science that deals with the collection, classification, analysis, and interpretation of numerical facts or data. While the statistic is a single value or piece of data.

10- Why we call standard deviation the standard error (Marks 2)

Answer:- (Page 240)

The square root of the variance is the standard deviation, and the standard deviation of a sampling distribution is termed as its standard error.

11- If $E(Y)=0.5$ then find $E(10.5+2Y)$... (Marks 2)

Answer:-

$$\begin{aligned} &= E(10.5 + 2Y) \\ &= 10.5 + 2E(Y) \\ &= 10.5 + 2 \times 0.5 \\ &= 11.5 \end{aligned}$$

12- What is the meaning of 'b' in $Y=a+bX$ (Marks 2)

Answer:- (Page 121)

b represents the slope of the line

13- Explain level of significance (Marks 2)

Answer:- rep

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Q# 28: can all deciles be expressed as percentile? Explain (2)

Answer: Yes all deciles can be expressed as percentiles

As the D1 is 10 percent of data and P10 is 10% of data.

D2 is 20% of data whereas in percentile it is P20 and so on ...

Q# 29: what is meant by sampling distribution? (2)

Answer: Page 237

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.

Q# 30: The department claims that the exceeds Rs. 2500 at the 0.05 level, then formulate null alternative hypothesis?(2)

Answer: Page 283

$$H_0: \mu < 2500$$

$$H_1: \mu > 2500$$

Q# 31: How we decide that the drawn sample is "Small Sample" or a "Large Sample"?(2)

Answer: rep

Q# 32: If $E(X)=0.7$ then find $E(2X)$? (2)

Answer:

$$E(2X) = 2E(X)$$

$$= 2 * 0.7$$

$$= 1.4$$

Q# 33: State the Baye's theorem? (3)

Answer: Page 166

If events $A_1, A_2, \dots, A_k$ form a PARTITION of a sample space S (that is, the events A_i are mutually exclusive and exhaustive (i.e. their union is S)),

and if B is any other event of S such that it can occur ONLY IF ONE OF THE A_i OCCURS, then for any i ,

$$P(A_i / B) = \frac{P(A_i)P(B / A_i)}{\sum_{i=1}^k P(A_i)P(B / A_i)}$$

Q# 35: "The 95% confidence interval for population mean is 1.3 to 4.7". Interpret this result (3)

Answer: We are 95% sure that the population mean lies between 1.3 to 4.7

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Q# 37: If $E(XY)=0.45$, $E(X)=0.50$ and $E(Y)=0.90$ then X and Y are independent?(3)

Answer:

$$\begin{aligned} \text{Cov}(X, Y) &= E(XY) - E(X)E(Y) \\ &= 0.45 - (0.50)(0.90) \\ &= 0.45 - 0.45 \\ &= 0 \text{ (Therefore it is independent)} \end{aligned}$$

2 Marks

2) If we draw a card from an ordinary deck of 52 cards. Can king and diamond be mutually exclusive events? Give reason to support your answer.

Answer:- (Page 146)

No, because If the two events *can* occur at the same time, they are not mutually exclusive, Therefore, kings and diamonds are not mutually exclusive.

3) Suppose that we toss a fair coin three times. What is its sample space?

Answer:- $\{(H,H,H), (H,T,H), (H,H,T), (T,H,H), (T,T,H), (T,H,T), (H,T,T), (T,T,T)\}$

4) Why we take $B_2 = 3$ as the criteria for measuring the kurtosis of any distribution?

Answer:- (Page 228)

For the normal distribution, β_2 comes out to be 3, this is why this value has been taken as a criterion for measuring the kurtosis of any distribution.

5) Define level of significance?

Answer:- rep

6) How we decide that the drawn sample is "Small sample" or a "large sample"?

Answer:- Rep

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3 Marks

7) If mean of a distribution is 0.925 and standard deviation is 0.132. Find out the limits by applying chebychev's inequality for $k=2$. How much fraction of data will lie between the two limits?

Answer:- (Page 95)

$$(\bar{X} - kS, \bar{X} + kS)$$

$$(0.925 - 2(0.132), 0.925 + 2(0.132))$$

$$(0.925 - 0.264, 0.925 + 0.264)$$

$$(0.661, 1.189)$$

95% of the measurements will fall within these limits.

8) If $E(XY)=7.5$, $E(X)=2.4$ and $E(Y)=4.3$, calculate covariance of X and Y.

Answer:-

$$\begin{aligned} \text{Cov}(X, Y) &= E(XY) - E(X)E(Y) \\ &= 7.5 - (2.4)(4.3) \\ &= 7.5 - 10.32 \\ &= -2.82 \end{aligned}$$

11) Write down the two properties of sampling distribution of proportion p' , when the sampling is performed with replacement?

Answer:- (Page 241)

Property 1: $\mu_{\bar{X}} = \mu$

Property 2: In case of sampling with replacement:

$$\sigma_{\bar{X}} = \frac{\sigma}{n}$$

12) What is natural pairing in observations? Give example.

Answer:- (Page 302)

Natural pairing occurs whenever measurement is taken on the same unit or individual at two different times. For example, suppose ten young recruits are given a strenuous physical training programme by the Army. Their weights are recorded before they begin and after they complete the training. The two observations obtained for each recruit i.e. the before-and-after measurement constitute natural pairing. The above is natural pairing.

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5 Marks

13) Interpret the concept of five numbers summary and also explain the purpose of five number summaries.

Answer:- (Page 97)

A five-number summary consists of X_0, Q_1 , Median, Q_3 , and X_m ; It provides us quite a good idea about the shape of the distribution

If the data were perfectly symmetrical, the following would be true:

The distance from Q_1 to the median would be equal to the distance from the median to Q_3

The distance from X_0 to Q_1 would be equal to the distance from Q_3 to X_m .

The median, the mid-quartile range, and the midrange would all be equal. All these measures would also be equal to the arithmetic mean of the data

On the other hand, for non-symmetrical distributions, the following would be true:

In right-skewed distributions the distance from Q_3 to X_m greatly exceeds the distance from X_0 to Q_1

in right-skewed distributions,

median < mid-quartile range < midrange:

THE POSITIVELY SKEWED CURVE

14) What is the probability that a poker hand of 5 cards contain exactly 2 aces (hyper geometric distribution)?

Answer:-

$$P(X=2) = \frac{\binom{4}{2} \binom{48}{3}}{\binom{52}{5}}$$

$$= \frac{6 \times 17296}{2598960} = \frac{103776}{2598960} = 0.0399$$

16) From the table given below find the value of chi square

Observation Frequency O_{ij}	Expected Frequency E_{ij}
120	100
130	150
80	100
170	150

the mean of a population is 6 a sample of size '20' is taken with replacement from this population. which one of the following is the mean of sampling distribution of mean.

- 1) 2 2) 8 3) 6 4) 3

Answer:-

6

Q no 2 Write down the significance of experimental design? marks :2

Answer:- Rep

Q No: 03 Explain the formula of hyper geometric probability distribution. marks :2

Answer:- (Page 219)

$$P(X = x) = \frac{\binom{k}{n} \binom{N-k}{n-x}}{\binom{N}{n}}$$

Where

N = number of units in the population,

n = number of units in the sample, and

k = number of successes in the population.

The hyper geometric probability distribution has three parameters N, n and k.

Q no 5

Suppose that we toss a fair coin three times. What is the sample space? marks :2

Answer:- Rep

Compute the following formula which is used to find the sample size.

Answer:- For finding sample space of coin the formula is: $2^n = 2^3 = 8$

If x is a poisson random variable with parameter value '4.5', find $p(x=1)$? Marks: 03

Answer:- (Page 222)

$$P(X=1) = \frac{e^{-4.5} (4.5)^1}{1!}$$
$$= 0.0499$$

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Q no: 09

When the value of chi-square is equal to zero? Marks : 03

Answer:- (Page 338)

If the observed frequencies are exactly equal to the expected ones, then chi-square will be exactly equal to zero.

Q no: 10 If $x=225$, $n=634$, $P_0=0.60$ then find the z-test statistics for probability. Marks: 03

Answer:- (Page 289)

$$Z = \frac{X \pm \frac{1}{2} - np_0}{\sqrt{np_0(1-p_0)}}$$

$$np_0 = 634 * 0.60 = 380.4$$

here $X < np_0$ therefore we use $X + \frac{1}{2}$

$$Z = \frac{X + \frac{1}{2} - np_0}{\sqrt{np_0(1-p_0)}}$$

$$Z = \frac{225 + \frac{1}{2} - 380.4}{\sqrt{380.4(1-0.60)}}$$

$$Z = \frac{-154.9}{12.34}$$

$$Z = -12.55$$

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