STA301- Statistics and Probability

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1- 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

Answer:-

Sample without replacement = $\binom{N}{n} = \binom{5}{3} = 10$

(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).

2- Calculate sampling error if sample mean is 102 and population mean is 100

Answer:- (Page 14)

Sampling error $= \overline{X} - \mu$

$= 102 - 100$

$= 2$

3- Define Unbiased estimator

Answer:- (Page 258)

An estimator is defined to be unbiased if the statistic used as an estimator has its expected value equal to the true value of the population parameter being estimated. $E\left(\hat{\theta}\right) = \theta$

4- Quartile deviation

Answer:- (Page 84)

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

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

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Q1.decribe about significance level

Answer:

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.

Q2 .discuss about center limit theorem

Answer:- (Page 243)

"If a variable X from a population has mean μ and finite variance σ/2, then the sampling distribution of the sample mean−X approaches a normal distribution with mean μ and variance σ2/n as the sample size n approaches infinity.**"**

Q3. What is difference between constant and random variable

Answer:

A variable whose value cannot be changed once it has been assigned a value while those variable whose values changes when we assign value to it.

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Q: Define an Un-Biased estimator? 2 Marks

Answer: Rep

Q: Briefly Explain an experiment design? 2 Marks

Answer:- (Page 320)

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.

Q: Define an independent and dependent variable in regression? 2 Marks

Answer:- (Page 121)

In regression Y represents the dependent variable and X represents the independent variable

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Find the mean and variance for the sampling distribution given below. 5 Marks

$(\hat{p})$	No. of Samples	Probability $f(\hat{p})$
0	1	1/20
1/3	9	9/20
2/3	9	9/20
1	1	1/20
Σ	20	1

Answer:- (Page 247)

$\hat{p}$	No. of samples	$f(\hat{p})$	$\hat{p}.f(\hat{p})$	$\hat{p}^2.f(\hat{p})$
0	1	$\frac{1}{20}$	0	0
$\frac{1}{3}$	9	$\frac{9}{20}$	$\frac{3}{20}$	$\frac{1}{20}$
$\frac{2}{3}$	9	$\frac{9}{20}$	$\frac{3}{10}$	$\frac{1}{5}$
1	1	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$
$\sum$	20	1	$\sum \hat{p}.f(\hat{p}) = \frac{1}{2}$	$\sum \hat{p}^2.f(\hat{p}) = \frac{3}{10}$

$$\mu_{\hat{p}} = \sum \hat{p}.f(\hat{p}) = \frac{1}{2} = 0.5$$

$$\sigma^2_{\hat{p}} = \sum \hat{p}^2.f(\hat{p}) - \left[\sum \hat{p}.f(\hat{p})\right]^2$$

$$= \frac{3}{10} - \left[\frac{1}{2}\right]^2$$

$$= \frac{3}{10} - \frac{1}{4}$$

$$= \frac{1}{20} = 0.05$$

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What is the difference between an outcome and an event? (2)

Answer:- (Page 145)

An outcome is a result of a single trial of an experiment while an event is an individual outcome or any number of outcomes.

The mean of a Poisson distribution is 5 while its standard deviation is 4. Comment on it (2)

Answer:- (Page 223)

In Poisson distribution mean and variance are always equal but this statement is not satisfying this property of Poisson distribution.

If an automobile is driven on the average no more than 16000 Km per year, then formulate the null and alternative hypothesis. (2)

Answer:

$H \leq 16000$

$H1 > 16000$

Q: Discuss three properties of normal distribution? 3 Marks

Answer:- (Page 227)

Normal distribution is absolutely symmetrical, hence , μ_3 the third moment about the mean is zero

The normal curve is asymptotic to the x-axis as $x \rightarrow \pm \infty$.

For the normal distribution, it can be mathematically proved that $\mu_4 = 3\sigma_4$

Q: The 90% confidence interval for the population mean is 11 to 20, interpret this result? 3 Marks

Answer: - We are 90% sure that our Population mean lie between 11 – 20.

Q: Define LSD test? 3 Marks

Answer:- (Page 330)

According to this procedure, we compute the smallest difference that would be judged significant, and compare the absolute values of all differences of means with it. This smallest difference is called the least significant difference or

LSD. And is given by

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

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How many parameters are associated with F- distribution and what is the range of the distribution? (3)
Answer:- (Page 312)
It has two parameters v1 and v2 which are known as the degrees of freedom and it ranging from zero to plus infinity.

Which of the following statement represents continuous data and discrete data? (5)
i) Number of shopes in a plaza. **Discrete data**
ii) Hourly temperature recorded by whether bureau. **Continuous data**
iii) Inches of rainfall in a city. **Continuous data**
iv) Number of passengers carried by rail every year. **Discrete data**
v) Height measurements of boys studying in a college. **Discrete data**

If the population proportions are gives as: P1 = 0.4, P2 = 0.20
find sigma^2 P-hat 1 - P-hat 2 , where n = 12.
Answer:- (Page 256)

$$\sigma_{\hat{p}1-\hat{p}2} = \frac{p_1 q_1}{n_1} + \frac{p_2 q_2}{n_2}$$

$$q_1 = 1 - p_1 \Rightarrow 1 - 0.40 = 0.6$$

$$q_2 = 1 - p_2 \Rightarrow 1 - 0.20 = 0.8$$

$$\sigma_{\hat{p}1-\hat{p}2} = \frac{(0.4)(0.6)}{10} + \frac{(0.20)(0.80)}{10}$$

$$= 0.024 + 0.016$$

$$= 0.04$$

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what are steps involved in statistical research
Answer: (Page 11)
STEPS INVOLVED IN ANY STATISTICAL RESEARCH
• Topic and significance of the study
• Objective of your study
• Methodology for data-collection
 Source of your data
 Sampling methodology
 Instrument for collecting data

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Q. (Marks 5)Two different dice are thrown. Make the sample space and also find the number of sample points in an even A that the sum is 7.

Answer:-

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

$$A = \{(1,6) \quad (2,5) \quad (3,4) \quad (4,3) \quad (5,2) \quad (6,1)\}$$

Q. (Marks 2) Define the error sample and also write its formula.

Answer:- (Page 13)

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

Sampling error $= \overline{X} - \mu$

Q. (Marks 2) Properties of hyper geometric distribution.

Answer:- (Page 218)

- The outcomes of each trial may be classified into one of two categories, success and failure.
- The probability of success changes on each trial.
- The successive trials are not independent.
- The experiment is repeated a fixed number of times

5 number summery

Answer:- (Page 97)

A five-number summary consists of X0,Q1, Median, Q3, and Xm ; It provides us quite a good idea about the shape of the distribution.

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1.what s bias?(2)

Answer:- (Page 258)

$E(\hat{\theta}) \neq \theta$, the statistic is said to be a biased estimator

2.advantages and disadvantages of median?(3)

Answer:- Click here for detail

Advantages

(1) It is very simple to understand and easy to calculate. In some cases it is obtained simply by inspection.
(2) Median lies at the middle part of the series and hence it is not affected by the extreme values.
(3) In grouped frequency distribution it can be graphically located by drawing ogives.
(4) It is especially useful in open-ended distributions.

Disadvantages

(1) In simple series, the item values have to be arranged. If the series contains large number of items, then the process becomes tedious.
(2) It is a less representative average because it does not depend on all the items in the series.

3. Mathematical expectation of discrete random variable?(3)

Answer:- (Page 179)

In probability theory the expected value (or mathematical expectation) of a random variable is the sum of the product of the values within the range of the discrete random variable and their respective probabilities of occurrence.

$$E(X) = \sum_{i=1}^{n} x_i f(x_i)$$

4.any two properties of mathematical expectation?(2)

Answer:- (Page 202)

The important properties of the expected values of a random variable are as follows:

• If c is a constant, then E(c) = c. Thus the expected value of a constant is constant itself. This point can be understood easily by considering the following interesting example: Suppose that a very difficult test was given to students by a professor, and that every student obtained 2 marks out of 20! It is obvious that the mean mark is also 2. Since the variable 'marks' was a constant, therefore its expected value was equal to itself.

• If X is a discrete random variable and if a and b are constants, then E(aX + b) = a E(X) + b.

5.what s statistical test?(2)

Answer:- (Page 279)

A statistic, which provides a basis for testing a null hypothesis, is called a test-statistic. Every test-statistic has a probability distribution (i.e. sampling distribution) which gives the probability that our test-statistic will assume a value greater than or equal to a specified value OR a value less than or equal to a specified value when the null hypothesis is true.

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6. Decide a small sample and large sample?(2)

Answer:-

If the sample size 'n' is less than or equal to 30 (<=30) then it is said to be small sample, and it the sample size is larger than 30 then it is said to be large population.

10.tell the null and alternative hypothesis of 150?(2)

Answer:-

$H_0 = \mu = 150$

$H_1 = \mu \neq 150$

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35. In which condition, Poisson distribution is used to approximate the hyper geometric distribution?

Answer:- (Page 224)

The Poisson distribution can be used to approximate the hyper geometric distribution when n < 0.05N, n > 20, and p < 0.05

36. Elaborate the Least Significant Difference (LSD) test.

Answer:- Rep

37. Write down the formula of combined or pooled proportion of two samples.

Answer:- (Page 290)

$$\overbrace{p_c} = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}$$

38. If approximate value of class interval is 2.96 and range = 14.8 then find the number of classes.

Answer:- (Page 29)

$$Class\ interval = \frac{range}{number\ of\ classes}$$

$$2.96 = \frac{14.8}{number\ of\ classes}$$

$$number\ of\ classes = \frac{14.8}{2.96} = 5$$

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40. Find the coefficient of variation (C.V) for the following price of a commodity.
Price (X): 8, 13, 18, 23, 30

Answer:-

X	**X^2**
8	**64**
13	**169**
18	**324**
23	**529**
30	**900**
$\sum X = 92$	$\sum X^2 = 1986$

$$\overline{X} = \frac{\sum X}{n} = \frac{92}{5} = 18.4$$

$$S = \sqrt{\frac{\sum X^2}{n} - \left(\frac{\sum X}{n}\right)^2}$$

$$S = \sqrt{\frac{1986}{5} - \left(\frac{92}{5}\right)^2}$$

$$S = \sqrt{397.2 - 338.56} = \sqrt{58.64} = 7.66$$

$$C.V = \frac{S}{\overline{X}} \times 100$$

$$C.V = \frac{7.66}{18.4} \times 100 = 41.63\%$$

41. Flaws in plywood occur at random with an average of one flaw per 50 square feet. What is the probability that 32 square feet will have no flaws?

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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)

$p = 0.01$

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

$$P(X = 2) = \binom{400}{2}(0.01)^2 (0.99)^{400-2}$$

$$= 79800 * 0.0001 * 0.02$$

$$= 0.1596$$

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

Answer:-

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

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

$$= \frac{3}{36} = \frac{1}{12} = 0.83$$

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

Answer:- (Page 214)

$S.D(X) = \sqrt{npq}$

$$= \sqrt{5 \times 0.5 \times 0.5} = \sqrt{1.25}$$

$$= 1.12$$

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6- n=24, Mean=33, s=15, 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:-

$$Cov(X,Y) = E(XY) - E(X)E(Y)$$
$$= 421 - (42)(15)$$
$$= -209$$

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:-

$$= E(10.5 + 2Y)$$
$$= 10.5 + 2E(Y)$$
$$= 10.5 + 2 * 0.5$$
$$= 11.5$$

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 cab 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 A1, A2… Ak form a PARTITION of a sample space S (that is, the events Ai 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 Ai 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". Interrupt 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)=045 E(X)=0.50 and E(Y)=0.90 then X and Y are independent?(3)

Answer:

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

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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, β2 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)

$$\left(\overline{X} - kS, \overline{X} + kS\right)$$

$$\left(0.925 - 2(0.132), 0.925 + 2(0.132)\right)$$

$$\left(0.925 - 0.264, 0.925 + 0.264\right)$$

$$\left(0.661, 1.189\right)$$

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:-

$$Cov(X,Y) = E(XY) - E(X)E(Y)$$
$$= 7.5 - (2.4)(4.3)$$
$$= 7.5 - 10.32$$
$$= -2.82$$

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

Answer:- (Page 241)

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

Property 2: In case of sampling with replacement:

$$\sigma_X = \frac{\sigma}{n}$$

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 X0,Q1, Median, Q3, and Xm ; 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 Q1 to the median would be equal to the distance from the median to Q3
The distance from X0 to Q1 would be equal to the distance from Q3 to Xm.
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 Q3 to Xm greatly exceeds the distance from X0 to Q1
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

Obvervation Frequency Oij	Expected Frequency Eij
120	100
130	150
80	100
170	150

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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 passion 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= 255, n=634, Po=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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Describe the formula for hypergeometric distribution? 2 marks

Answer:- Rep

What is graphical representation? 2 marks

Answer:-
The plot of the points in the plane which constitute the graph of a given real function or a pictorial diagram depicting interdependence of variables.

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What is the t formula for paired distribution? 3marks.

Answer:- (Page 302)

$$t = \frac{\bar{d} - \mu_d}{s_d / \sqrt{n}}$$

What is the probability that at least one head occurs if a coin tossed 6 times successively? 5 marks

Answer:-

$$P(X = 1) = \binom{6}{1} \cdot \left(\frac{1}{2}\right)^1 \cdot \left(\frac{1}{2}\right)^{6-1}$$

$$= \binom{6}{1} \cdot \left(\frac{1}{2}\right)^1 \cdot \left(\frac{1}{2}\right)^5$$

$$= 3.03$$

Find first 2 moments for function with respect to mean? 5 marks

Answer:- (Page 192)

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

Obervation Frequency Oij	**Expected Frequency Eij**
120	**100**
130	**150**
80	**100**
170	150

Answer:- Rep

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Q no 5

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

Answer: Rep

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

$$n = \left(\frac{Z_{\alpha/2}}{e} \right)$$

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Question No: 31 (Marks: 2)
What is the mean and variance of Poisson distribution?
Answer:- (Page 233)
If the random variable X has a Poisson distribution with parameter μ, then its mean and variance are given by E(X) = μ and Var(X) = μ.

Question No: 32 (Marks: 2)
Explain the Chi-square test of goodness of fit.
Answer:- (Page 332)
The chi-square test of goodness-of-fit is a test of hypothesis concerned with the comparison of observed frequencies of a sample, and the corresponding expected frequencies based on a theoretical distribution.

Question No: 33 (Marks: 2)
Define level of significance?
Answer:- Rep

Question No: 34 (Marks: 3)
Find the value of F(table value), when $n_1 = 7$, $n_2 = 10$ and $\alpha = 0.05$
Answer:- (Page 316)

Question No: 35 (Marks: 3)
Define Null and Alternative hypothesis.
Answer:- Rep

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Question No: 36 (Marks: 3)
A random sample of 100 is taken from a population with mean 30 and standard deviation 5. The probability distribution of the parent population is unknown, find the mean and standard error of the sampling distribution of $\bar{X}$.

Question No: 37 (Marks: 5)
What is the probability that a poker hand of 5 cards contain exactly 2 aces (hypergeometric distribution)?
Answer:- Rep

Question No: 38 (Marks: 5)
A random sample of size n is drawn from normal population with mean 5 and variance σ^2.
If n=25, s=10 and t=2, what is the values of $\bar{x}$?

Question No: 39 (Marks: 5)
Describe the main steps of General Procedure for Testing Hypothesis.
Answer:- (Page 281)
Step-1:
Formulation of the Null and Alternative Hypotheses:
Step-2:
Decision Regarding the Level of Significance
Step-3:
Test Statistic (that statistic that will enable us to test our hypothesis):
Step-4:
Calculations:
Step-5:
Critical Region (that portion of the X-axis which compels us to reject the null hypothesis):
Step-6:
Conclusion:

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Question No: 31 (Marks: 2)
How many parameters are involved in hyper geometric distribution?
Answer:- (Page 291)
The hyper geometric probability distribution has three parameters N, n and k.

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Question No: 32 (Marks: 2)
If an automobile is driven on the average no more than 16000 Km per year, then formulate the null and alternative hypothesis.
Answer:- Rep

Question No: 33 (Marks: 2)
Write down the test statistic when chi- square goodness of fit test is performed.
Answer:- (Page 334)

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

Question No: 34 (Marks: 3)

Find the value of F(table value), when $n_1 = 7$, $n_2 = 10$ and $\alpha = 0.05$
Answer:- (Page 316)
F0.05(n1-1, n2-1) = (6,9) =3.37
F0.05(n2-1, n1-1) = (9,6)
V2=6 , v1=8 => 4.15,
V2=6, v1=12 => 4.00
Mean = (4.15+4)/2 = 4.075
Hence value of F0.05(9,6) = 4.075

Question No: 35 (Marks: 3)

If X = 327, n = 634, $p_0 =$ 0.50 then find the z-test statistic for proportion.
Answer:- (Page 289)

$$Z = \frac{X \pm \frac{1}{2} - np_o}{\sqrt{np_o(1-p_o)}}$$

$$np_o = 634 * 0.50 = 317$$

$$here\ X > np_o\ therefore\ we\ use\ X - \frac{1}{2}$$

$$Z = \frac{X - \frac{1}{2} - np_o}{\sqrt{np_o(1-p_o)}}$$

$$Z = \frac{327 - \frac{1}{2} - 317}{\sqrt{317(1-0.50)}}$$

$$Z = \frac{9.5}{12.58}$$

$$Z = 0.75$$

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Question No: 36 (Marks: 3)
If population proportions are given as:

$$P_1 = 0.30,\ P_2 = 0.20.$$

Find $\sigma^2_{\hat{p}_1 - \hat{p}_2}$,where n = 10

Answer:- (Page 256)

$$\sigma_{\hat{p}1-\hat{p}2} = \frac{p_1 q_1}{n_1} + \frac{p_2 q_2}{n_2}$$

$$q_1 = 1 - p_1 \Rightarrow 1 - 0.30 = 0.7$$

$$q_2 = 1 - p_2 \Rightarrow 1 - 0.20 = 0.8$$

$$\sigma_{\hat{p}1-\hat{p}2} = \frac{(0.30)(0.7)}{10} + \frac{(0.20)(0.80)}{10}$$

$$= 0.021 + 0.016$$

$$= 0.037$$

Question No: 37 (Marks: 5)
A candidate for mayor in a large city believes that he appeals to at least 10 per cent more of the educated voters than the uneducated voters. He hires the services of a poll-taking organization, and they find that 62 of 100 educated voters interviewed support the candidate, and 69 of 150 uneducated voters support him at the 0.05 significance level.
Answer:- (Page 292)
Step-1:
The null and alternative hypothesis is
H0 : p1 – p2 > 0.10, and
H1 : p1 – p2 < 0.10, where p1 = proportion of educated voters, and p2 = proportion of uneducated voters.

Step-2:
Level of Significance:
α = 0.05.

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Step-3:

Test Statistic:

$$Z = \frac{(\hat{p}_1 - \hat{p}_2) - 0.10}{\sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}}$$

which for large sample sizes, is approximately standard normal.

Step-4:

Computation:

Here $\hat{p}_1 = \frac{62}{100} = 0.62$, so that $\hat{q}_1 = 0.38$,

$\hat{p}_2 = \frac{69}{150} = 0.46$, so that $\hat{q}_2 = 0.54$.

Thus $$z = \frac{(0.62 - 0.46) - 0.10}{\sqrt{\frac{(0.62)(0.38)}{100} + \frac{(0.46)(0.54)}{150}}}$$

$$= \frac{0.06}{\sqrt{0.002356 + 0.001656}} = \frac{0.06}{0.063} = 0.95.$$

Step-5:
Critical Region:
As this is a one-tailed test, therefore the critical region is given by
Z < -z0.05 = -1.645

Step-6:
Conclusion:
Since the calculated value z = 0.95 does not fall in the critical region, so we accept the null hypothesis H0 : p1 – p2 > 0.10.The data seems to support the candidate's view.
Until now, we have discussed in considerable detail interval estimation and hypothesis-testing based on the standard normal distribution and the Z-statistic.
Next, we begin the discussion of interval estimation hypothesis-testing based on the t-distribution.

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Question No: 38 (Marks: 5)
If we have RCBD with MSE=3.19, no.of.treatments = 4, no.of.blocks = 5; then find the value of LSD (least significant difference) for treatments by using α=0.05 and error degrees of freedom is 12.
Answer:- Rep

Question No: 39 (Marks: 5)
Find the mean and variance for the sampling distribution given below.

$(\hat{p})$	No. of Samples	Probability $f(\hat{p})$
0	1	1/20
1/3	9	9/20
2/3	9	9/20
1	1	1/20
Σ	20	1

Answer:- Rep

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Question No: 31 (Marks: 2)
Define normal distribution.
Answer:- (Page 226)
A continuous random variable is said to be normally distributed with mean μ and standard deviation σ if its probability
density function is given by

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

Question No: 32 (Marks: 2)
Fill up the missing values in the formula.

$$n=\frac{(\quad_{\alpha/2})^2\ \hat{p}\hat{q}}{\quad}$$

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Answer:- (Page 277)

$$n = \frac{\left(z_{\alpha/2}\right)^2 \hat{p}\,\hat{q}}{e^2}$$

Question No: 33 (Marks: 2)
Explain the Chi-square test of goodness of fit.
Answer:- Rep

Question No: 34 (Marks: 3)
What is natural pairing in observations? Also give an example.
Answer:- Rep

Question No: 35 (Marks: 3)
If population proportions are given as:

$$P_1 = 0.30,\ P_2 = 0.20.$$

Find $\sigma^2_{\hat{p}_1 - \hat{p}_2}$,where n = 10

Answer:- Rep

Question No: 36 (Marks: 3)
Explain the method of Maximum Likelihood in Point Estimation?
Answer:- Page 263
The method of maximum likelihood is regarded as the *MOST important* method of estimation, and is the *most* widely used method. This method was introduced in 1922 by Sir Ronald A. Fisher (1890-1962).The mathematical technique of finding Maximum Likelihood Estimators is a bit *advanced*, and involves the concept of the Likelihood Function.

Question No: 37 (Marks: 5)
The following data was obtained for a randomized block design involving five treatments and three blocks SST=430, SSTR=310, SSB=85, Setup the ANOVA table.
Answer:- (Page 332)

Source	d.f	SS	MS
Between treatments	4	430	107.5
Between Blocks	2	85	42.5
Error	8	310	38.75
Total	14	825	188.75

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Question No: 38 (Marks: 5)
In a Standard Normal Distribution, find:
Mean and Standard Deviation
Lower Quartile
Upper quartile
Inter-quartile range
Mean Deviation

Answer:-
In normal distribution

i. Mean and Standard Deviation
Mean is 0 and S.D is 1

ii. Lower Quartile:
$Q_1 = \mu - 0.6745\sigma$
=0-0.6745(1)
Q_1 **= -0.6745**

iii. Upper Quartile:
$Q_3 = \mu + 0.6745\sigma$
=0.6745

iv. Inter-quartile range
Q_3 - $Q_1/2$ **= 0.6745 - (-0.6745)/2 = 0.6745**

v. Mean Deviation
= 0.7979 σ
= 0.7979(1)
= 0.7979

Question No: 39 (Marks: 5)
$n = 13, \bar{x} = 34, \sigma^2 = 70, \alpha = 0.10$
If
Test the hypothesis $\mu > 31$

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Answer:-

$H_0 = \mu = 30$

$H_1 = \mu > 30$

Level of significance α =0.10

α /2=0.05

Critical region=z>1.645

$$z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$Z = \frac{34 - 31}{2.32}$$

Z=1.29

Conclusion: Since the value Z=1.29 is less than the value of critical region so we accepted H_0 at 0.10 Level of significance.

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Question No: 21 (Marks: 1)
Write down the formula for binomial distribution.

Answer:- (Page 212)

$$P(X = x) = \binom{n}{x} p^x q^{n-x}$$

Question No: 22 (Marks: 2)
Write down the formula for testing the equality of two population proportions.

Answer:- (Page 290)

$$Z = \frac{\left(\hat{p}_1 - \hat{p}_2\right) - 0}{\sqrt{\hat{p}_c \hat{q}_c \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

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Question No: 23 (Marks: 3)
Define moment ratios. In which unit they are expressed?

Answer:- (Page 119)

$$b_1 = \frac{(m_3)^2}{(m_2)^3} \quad and \quad b_2 = \frac{m_4}{(m_2)^2}$$

They are independent of origin and units of measurement, i.e. they are pure numbers.

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