



PAN AFRICA CHRISTIAN UNIVESHITY

DOCTOR OF PHILOSOPHY IN MARRIAGE & FAMILY THERAPHY

END OF TERM EXAMINATION

DEPARTMENT:

COUSHE CODE: PMFT 711

COUSHE TITLE: STATISTICS 1

EXAM DATE: APRIL 2021

TIME: 3 HRS

INSTRUCTIONS

- Read all questions carefully before attempting.
- Answer **QUESTION ONE AND ANY OTHER THREE**
- Write your **student number** on the answer booklet provided.

QUESTION ONE [COMPULSORY] – 10 MARKS

Provide the most accurate choice in each of the following questions

- i. The binomial distribution depends on which of the following?
 - A. Mean and standard deviation
 - B. Sample size and probability of success
 - C. Standard deviation and number of successes
 - D. Mean and probability of success
- ii. The z-score is?
 - A. the number of standard errors between the mean and some observation.
 - B. the difference between the sample mean and population mean.
 - C. the width of the 95% confidence interval.
 - D. the number of standard deviations an observation is from the mean.
- iii. Which of the following is not a characteristic of a binomial probability distribution?
 - A. Each trial has a finite number of possible outcomes.
 - B. There is a fixed number of identical trials.
 - C. The process must be consistent in generating successes and failures.
 - D. The trials must be independent of each other.
- iv. The number of arrivals of delivery trucks per hour at a loading station is an example of which of the following processes?
 - A. Binomial
 - B. Hypergeometric
 - C. Poisson
 - D. Uniform
- v. The shape of the Normal Curve is _____
 - A. Bell Shaped
 - B. Flat
 - C. Circular
 - D. Spiked
- vi. Normal Distribution is also known as _____
 - A. Cauchy's Distribution
 - B. Laplacian Distribution
 - C. Gaussian Distribution
 - D. Lagrangian Distribution
- vii. The number of students in a class is an example of:
 - A. Continuous Variable
 - B. Definite Variable
 - C. Discrete Variable
 - D. None

- viii. What is the smallest sample size required to provide a 95% confidence interval for a mean, if it is important that the interval be no longer than 1cm? You may assume that the population is normal with a standard deviation of 3cm².
- A. $n = 1245$
 - B. $n = 34$.
 - C. $n = 95$
 - D. $n = 139$.
- ix. A random sample of 100 preschool children in Camperdown revealed that only 60 had been vaccinated. Provide an approximate 95% confidence interval for the proportion vaccinated in that suburb.
- A. $0.6 \pm 1.96(0.6 \times 0.4) \times 100$
 - B. $0.6 \pm 1.645(0.6 \times 0.4) \times 100$
 - C. 0.6 ± 1.96
 - D. $0.6 \pm (1.96 \times 1) \times 400$
- x. The p-value in hypothesis testing represents which of the following:
- A. The probability of failing to reject the null hypothesis, given the observed results
 - B. The probability that the null hypothesis is true, given the observed results
 - C. The probability that the observed results are statistically significant, given that the null hypothesis is true
 - D. The probability of observing results as extreme or more extreme than currently observed, given that the null hypothesis is true

QUESTION TWO

In a certain school, the mean performance was 500 marks and the standard deviation was 100 marks. You are further informed that the performance was normally distributed.

- a) Suppose that a student scored 465 marks in the exam, what is the Z score that corresponds to these raw marks? **[2 marks]**
- b) Use the standard normal tables to determine the percentage of the students scored above 465 marks. **[3 marks]**
- c) Determine the percentage of students who took the exam scored between a 465 and 500? **[2 marks]**
- d) Assume for the moment that the student who scored 465 marks retook the exam and posted a Z score of +0.35, representing a marked improvement over his previous score,

Calculate the marks scored in the retaken examination.

[3 marks]

QUESTION THREE

- a) Highlight any 2 characteristics of a Binomial probability distribution **[2 marks]**
- b) A factory produces components of which 1% are defective. The components are packaged in boxes of 10. A box I selected at random: Find the probability that:
 - i. The box contains exactly one defective component **[2 marks]**
 - ii. There are at least 2 defective components in the box **[3 marks]**
- c) The number of industrial injuries per week in a particular factory is known to follow Poisson distribution with a mean of 0.5. Find the probability that in a 3- week period there will be no injury **[3 marks]**

QUESTION FOUR

- a) Describe the meaning and application of snowballing statistical sampling technique **[4 marks]**
- b) An online retailer claims that 90% of all orders are shipped within 12 hours of being received. A consumer group placed 121 orders of different sizes and at different times of day; 102 orders were shipped within 12 hours.
 - i. Compute the sample proportion of items shipped within 12 hours **[1 mark]**
 - ii. Compute the sample standard deviation of the items shipped within 12 hours **[2 marks]**
 - iii. Assuming the retailer's claim is true, find the probability that a sample of size 121 would produce a sample proportion so low as was observed in this sample. **[3 marks]**

QUESTION FIVE

- a) Illustrate the meaning of the term confidence interval estimation as used in statistical analysis **[2 marks]**
- b) The operations manager at a light emitting diode (LED) light bulb factory needs to estimate the mean life of a large shipment of LEDs. The manufacturer's specifications are

that the standard deviation of the population is 1,500 hours. A random sample of 64 LEDs provided a sample mean life of 49,875 hours.

- i. Construct a 95% confidence interval estimate for the population mean life of LED light bulbs in this shipment **[3 marks]**
- ii. Do you think that the manufacturer has the right to claim that the LED light bulbs have a mean life of 50,000 hours? Explain. **[2 marks]**
- iii. Assuming that the company wants to estimate, with 95% confidence, the mean life of light emitting diode (LED) light bulbs to within ± 400 hours. Determine the required sample size (n) given the population standard deviation is 1,500 hours **[3 marks]**

QUESTION SIX

- a) By way of an illustration, differentiate between Null and Alternative hypotheses **[4 marks]**
- b) The following shows the amount of money (in \$) that each person from a sample of 15 customers spent for lunch at a fast-food restaurant:
7.42, 6.29, 5.83, 6.50, 8.34, 9.51, 7.10, 6.80, 5.90, 4.89, 6.50, 5.52, 7.90, 8.30, 9.60
Required:
 - i. At the 5% significance level, determine if there is evidence that the mean amount spent for lunch is significantly different from \$6.50 **[4 marks]**
 - ii. Determine the p-value in (i) above and interpret its meaning **[2 marks]**