



## **MASENO UNIVERSITY**

### **UNIVERSITY EXAMINATIONS 2013/2014**

FIRST YEAR FIRST SEMESTER EXAMINATIONS FOR THE  
DEGREE OF MASTER OF SCIENCE IN BIOMEDICAL SCIENCES

(CITY CAMPUS)

#### **PMT 810: BIostatISTICS AND BIOMETRICS**

*Date: 27<sup>th</sup> November, 2013,*

*Time: 2.00 - 4.00 p.m.*

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#### **INSTRUCTIONS:**

- **Answer ALL questions in Section A and any other TWO in Section B.**
- **Observe further instructions on the answer booklet.**

**SECTION A (COMPULSORY Questions)**

**[20 Marks]**

1. Define the term "variable" and compare the following types of variables:

- (i) Qualitative and quantitative variables
- (ii) Discrete versus continuous

(4 Marks)

2. Define the following terms as used in hypothesis testing;

- (i) Simple hypothesis
- (ii) Null hypothesis
- (iii) Size of a test
- (iv) power of a test
- (v) critical region

(10 Marks)

3. The following are the masses in grams to the nearest gram, of a sample of 10 eggs;

46,51,48,62,54,56,58,60,71,75

Calculate the standard deviation of the masses of this sample.

(6 Marks)

## SECTION B (Optional Questions)

1. Assume that the test scores for a large class are normally distributed with a mean of 74 and a standard deviation of 10.

- (a) Suppose that you receive a score of 88. What percent of the class received scores higher than yours?
- (b) Suppose that the teacher wants to limit the number of A grades in the class to no more than 20%. What would be the lowest score for an A?

(20 Marks)

2. Use probabilistic reasoning to answer the following questions;

- (a) A bag contains 2 black and 3 white balls. Two balls are drawn at random one after the other without replacement. Obtain the probability that
  - (i) The second ball is black given that the first is white,
  - (ii) The first ball is white given that the second is black.
- (b) A machine produces an average of 20% defective bolts. A batch is accepted if a sample of 5 bolts taken from the batch contains no defective and rejected if the sample contains 3 or more defectives. In other cases, a second sample is taken. What is the probability that the second sample is required?

(20 Marks)

3. A study was conducted to investigate the effectiveness of bicycle safety helmets in preventing head injury. The data consists of a random sample of 793 persons who were involved in bicycle accidents during a one-year period.

Head Injury	Wearing Helmet		Total
	yes	no	
yes	17	218	235
no	130	428	558
Total	147	646	793

- (a) Compute and compare the proportions of head injury for the group with helmets versus the group without helmets. What would be your conclusion?
- (b) Calculate the odds-ratio associated with not using a helmet. Does this result support your earlier conclusion?

(20 Marks)

4. In the following question, you are provided with an output arising from an experiment involving testing of some hypotheses. Write down the relevant null and alternative hypotheses, and interpret the given output.

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One-sample t-Test
data: y
t = -2.6539, df = 19, p-value = 0.0157
alternative hypothesis: true mean is not
equal to 55
95 percent confidence interval:
42.70933 53.54789
sample estimates:
mean of x
48.12861
```

(20 Marks)