



MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS 2021/2022 ACADEMIC YEAR FIRST YEAR FIRST SEMESTER

SCHOOL OF SCIENCE PURE, APPLIED AND HEALTH SCIENCES BACHELOR OF SCIENCE & EDUCATION

COURSE CODE: STA 1103-1

COURSE TITLE: PROBABILITY AND STATISTICS I

DATE:

TIME:

INSTRUCTIONS TO CANDIDATES

1. Answer **Question ONE** and any other **Two** questions.
2. Show all the workings clearly
3. Do not write on the question paper
4. All Examination Rules Apply.

Question One (30 Marks)

- a) Explain the difference between the following terms
- Regression analysis and correlation analysis **(2 Marks)**
 - A population and a sample **(2 Marks)**
- b) The results for some ungrouped frequency distribution of positive observations are given as $\sum f_i = 60$ and $\sum f_i x_i^2 = 875$. Determine the mean given that the variance is $s^2 = \frac{2095}{708}$ **(3 Marks)**
- c) Distinguish between census and sampling and give the advantages of sampling over census method. **(3 Marks)**
- d) Find the values of x and y given that the mean of the following frequency distribution is 3.2 and the total frequency is 50.

| | | | | | | |
|----------------|---|----|--------|--------|--------|----------|
| X | 1 | 2 | 3 | 4 | 5 | 6 |
| Cum. Frequency | 7 | 22 | $22+x$ | $25+x$ | $34+x$ | $34+x+y$ |

Hence determine the median of the distribution **(5 Marks)**

- e) Suppose that x_1, x_2, \dots, x_k occur with frequencies f_1, f_2, \dots, f_k , respectively. Let $d_j = x_j - A$ denote the deviation of the j^{th} observation x_j , $j = 1, 2, \dots, k$ from a number A . Prove that
- $\bar{x} = A + \bar{d}$ **(2 Marks)**
 - $s^2 = \frac{\sum_{j=1}^k f_j d_j^2 - n\bar{d}^2}{n-1}$ where $n = \sum_{j=1}^k f_j$ and $\bar{d} = \frac{1}{n} \sum_{j=1}^k f_j d_j$. **(3 Marks)**

Question Two (15 Marks)

- a) The mean of five observations is 4.4 and variance is 10.3. If three of the five observations are 1, 2 and 6, find the other two. **(3 Marks)**
- b) The four parts of a distribution are as follows:

| Part | Frequency | Mean |
|------|-----------|------|
| 1 | 50 | 61 |
| 2 | 100 | 70 |
| 3 | n_3 | 80 |
| 4 | 30 | 83 |

If the mean of the distribution is 73.8, find the frequency of the third part of the distribution, n_3 **(3 Marks)**

- c) The marks x obtained by students in a statistics exam had a mean of 42 and a standard deviation of 16. The marks were then scaled by means of the formula $Y = 26 + \frac{2}{3}x$ where Y is the new mark. Find the mean and the standard deviation of Y . **(2 Marks)**
- d) The mean of the following frequency distribution is 4.

| | | | | |
|------|-----|-------|-------|-------|
| X | 3 | 4 | 5 | 6 |
| Freq | k | $k+5$ | $k-2$ | $k-3$ |

- i) Find the value of k **(2 Marks)**

Hence compute

- ii) The Mean Absolute Deviation (MAD) **(2 Marks)**

- iii) Quartile Deviation (QD) **(3 Marks)**

Question Three (15 Marks)

- a) The following data are the number of hours that 10 persons studied for a statistics exam and their scores on the exam.

| | | | | | | | | | | |
|-----------------------|----|----|----|----|----|----|----|----|----|----|
| Hours studied (x) | 4 | 9 | 10 | 14 | 4 | 7 | 12 | 22 | 1 | 17 |
| Test score (y) | 31 | 58 | 65 | 73 | 37 | 44 | 60 | 91 | 21 | 84 |

- i) Find the equation of the least squares line that approximates the regression of the test scores on the number of hours studied **(8 Marks)**
- ii) Predict the average test score of a person who studied 14 hours for the test **(3 Marks)**

- iii) Calculate the correlation coefficient between the number of hours studied and the test scores and interpret the result.
(4 Marks)

Question Four (15 Marks)

The following are the weight in pounds of 40 male students at Maasai Mara University.

| | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 138 | 164 | 150 | 132 | 144 | 125 | 149 | 157 |
| 146 | 158 | 140 | 147 | 136 | 148 | 152 | 144 |
| 168 | 126 | 138 | 176 | 163 | 119 | 154 | 165 |
| 146 | 173 | 142 | 147 | 135 | 153 | 140 | 135 |
| 161 | 145 | 135 | 142 | 150 | 156 | 145 | 128 |

- i) Construct a grouped frequency distribution using class intervals of width 9 units and taking the lowest class interval starting at 118.
(3 Marks)
- ii) Construct a stem and leaf display of the distribution and comment on any important feature that you can observe. (3 Marks)
Determine the following for the frequency distribution constructed in (i) above
- iii) Construct a histogram and a frequency polygon on the same graph
(4 Marks)
- iv) From the above data above, calculate
- a) Median (3 Marks)
- b) Mode (2 Marks)