

COURSE CODE : MATH 130
COURSE TITLE : BASIC STATISTICS

INSTRUCTIONS

- *Answer Question ONE (compulsory) and any other TWO Questions*

Question 1

- a) Give definitions of the following terms as used in Statistics (4 Marks)
- (i) Population
 - (ii) Variable
 - (iii) Sample
 - (iv) Data
- b) For each of the following variables, determine whether the variable is categorical or numerical. If the variable is numerical, determine whether the variable is discrete or continuous. In addition, determine the level of measurement. (6 Marks)
- (i) The types of diseases diagnosed at Nairobi Hospital
 - (ii) Monthly salary income of Doctors at Nairobi hospital
 - (iii) The weight of a new born baby
- c) A sample of eight households is taken. The following table listed the information on their incomes and medical bill for the past one month.

Income in thousands of Ksh. (x)	Medical Bill in thousands of Ksh. (y)
35	8
49	14
21	6
39	10
15	4
28	7

25	8
20	6

(i) Calculate the Correlation Coefficient (7 Marks)

(ii) Derive the linear regression line of medical bill on income (7 Marks)

(iii) If the income of the household is Ksh. 30,000, use the regression equation in (ii) to estimate the medical bill of the household. (1 Mark)

d) Solve the quadratic equation (5 Marks)

$$\frac{1}{6} + \frac{1}{6}x - x^2 = 0$$

Question 2

a) Explain briefly four sampling techniques (8 Marks)

b) The data below shows the number of hours worked in one week by employees in a local hospital.

46.3	42.3	42.0	39.7	45.0
39.2	43.5	42.6	46.1	44.4
44.2	40.0	45.6	38.9	42.4
41.3	45.6	39.5	42.4	40.8
45.1	40.6	43.1	42.1	

(i) Construct a frequency distribution with equal class intervals, 38.9 – 40.4, 40.5 – 42.0, etc (4Marks)

- (ii) State the modal class (1 Mark)
- (iii) Compute the modal Marks) (4 Marks)
- (iv) Plot a histogram and a frequency polygon on the same graph (3 Marks)

Question 3

- a) Wanjiku is 10 years today and her mother is three times her age. In how many years' time will Wanjiku be half her mother's age? (3 Marks)

- b) Solve for x in the following expression (7 Marks)

$$\frac{2}{x-1} + \frac{1}{x-4} = \frac{3}{2}$$

- c) Solve the system of equations (4 Marks)

$$2x + 2y = 1$$

$$x - y = -\frac{1}{2}$$

- d) Plot the following linear line and label the axis (3 Marks)

$$y = x$$

- d) Simplify the following expression (3 Marks)

$$2 \log 10 + (4^2)^{\frac{1}{2}} + \left(\frac{4^2 - 2^2}{6/\sqrt{25}} \right)$$

Question 4

a) Distinguish between the following terms (6 Marks)

- (i) Measures of central tendency and measures of dispersion
- (ii) A bar graph and a histogram
- (iii) Correlation and regression

b) State four characteristics of the measures of central tendency (4 Marks)

c) The data below represent the number of patients who visited a clinic and their weights were recorded.

Weight in Kilograms	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Number of Patients	3	9	11	15	2

(i) State the median class (1 mark)

(ii) Compute the median weight (3 Marks)

(iii) Compute the standard deviation (5 Marks)

(iv) Compute the variance (1 Mark)

Formulas to use

$$Y = a + bX ; b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2}; a = \frac{\sum y}{n} - b \frac{\sum x}{n}$$

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{(n \sum x^2 - (\sum x)^2)(n \sum y^2 - (\sum y)^2)}}$$

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i};$$

$$\delta = \sqrt{\frac{\sum_{i=1}^N (x_i - \bar{x})^2}{N}} \text{ or } \delta = \sqrt{\frac{\sum_{i=1}^N f_i (x_i - \bar{x})^2}{N}}$$

$$\text{Mode} = L_1 + \left(\frac{\Delta_1}{\Delta_1 + \Delta_2} \right) c$$

$$\text{Median} = L_1 + \frac{\left| \frac{N}{2} - (\sum f)_m \right|}{f_m} c$$