



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2009/2010

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

HEH 211: BIOSTATISTICS AND BIOMETRICS I

DATE: Monday 28th December, 2009

TIME: 2.00 p.m. – 4.00 p.m.

INSTRUCTIONS

This paper contains two sections A and B. Attempt all the questions in Section A. In section B attempt question ONE and any other TWO questions.

SECTION A - Attempt ALL the questions.

Q1. Counts of white blood cells in blood were done for 30 blood samples. The number of white blood cells (in thousands) per cubic millimeter in each sample was:

3.8 4.9 5.0 7.3 6.1 7.7 5.8 8.1 8.2 7.6
5.7 5.2 9.5 10.1 10.0 9.6 8.7 7.5 4.9 8.9
6.3 7.2 8.1 9.2 5.7 8.4 6.9 4.2 7.1 4.9

- a) Using a lower class of 3.5 – 4.9 organize the data into a grouped frequency distribution and use it to estimate
- i) The mean [3 marks]
 - ii) The median [2 marks]
 - iii) The standard deviation [4 marks]
- Q2. Define the term discrete random variable. [2 marks]
- Q3. List four main properties of a binomial distribution. [4 marks]

- Q4. Among females in Kenya between 18 and 74 years of age, diastolic blood pressure is normally distributed with mean $\mu = 77$ mm Hg and standard deviation $\sigma = 11.6$ mm Hg. What is the probability that a randomly selected woman has a diastolic blood pressure between 60 and 90 mm Hg? [5 marks]

SECTION B – Answer Question ONE and any other TWO questions from this Section.

- Q1. a) Describe the two types of errors associated with hypothesis testing while outlining the mechanisms of hypothesis testing. [5 marks]
- b) At the end of a crash-dieting program administered to 50 men and 40 women, the following information was obtained about the loss of weight (in pounds).

	Men	Women
Mean Loss of Weight	$\bar{X} = 16.5$	$\bar{Y} = 13.2$
Sample Variance	$S_1^2 = 25$	$S_2^2 = 16$

Suppose μ_1 and μ_2 represent, respectively, the mean losses for men and women. Obtain an approximate 98% confidence interval for the difference in the mean losses, $\mu_1 - \mu_2$. [15 marks]

- Q2. A single-dose study to compare drugs was conducted over a four-hour period. The experiment involved 180 patients who were all suffering from one of the following conditions: sprain, dislocation, fracture or post-surgical pain. Each drug was tested on 60 patients allotted to it at random. The figures below give the number of patients reporting effective pain relief and those requesting additional medication.

	Drug A	Drug B	Drug C
Relief	46	33	40
No relief	14	27	20

At the 5% level of significance, are the true proportions of patients getting relief different from the three drugs. [15 marks]

- Q3. a) Explain the different scales of measurement in environmental health Research. [8 marks]
- b) A researcher set out to establish the number of people who have suffered cholera in the last twelve months in 60 locations of Western Province. The results are presented below for all the locations:

46 31 74 68 42 54 14 61 83 48 37 26 8 64 57
93 72 53 59 38 16 88 75 56 46 66 45 61 54 27
27 44 63 58 43 81 64 67 36 49 50 76 38 47 55
77 62 53 40 71 60 58 45 42 34 46 40 59 42 29

Draw a frequency distribution table using classes 0 -9, 10 – 19 use it to calculate

- i. Mode [2 marks]
- ii. Karl Pearson's coefficient of skewness [11 marks]
- iii. Coefficient of Variation [2 marks]
- Q4. a) Explain the advantages and disadvantages of quantitative data over qualitative data in environmental Health. [8 marks]
- b) Explain how knowledge of probability is useful to an environmental health scientist. [7 marks]

- Q5. A team of Heart Surgeons at Kenyatta National hospitals knows that many patients who undergo corrective heart surgery have a dangerous build up of anxiety before their scheduled operations. The staff psychiatrists at the hospital have started a new counseling program intended to reduce this anxiety. A test of anxiety is given to the patients who know they must undergo surgery. Then each patient participates in a series of counseling sessions with the staff psychiatrist.

At the end of the counseling session, each patient is retested to determine the anxiety level. The results are recorded in the table below. Higher scores means higher level of anxiety.

Patient		1	2	3	4	5	6	7	8	9
Score before counseling		121	93	105	115	130	98	142	118	127
Score after counseling		76	93	64	117	82	80	79	67	89

Test the hypothesis that counseling sessions reduce anxiety and make appropriate conclusions. [15 marks]

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