



UNIVERSITY OF EMBU

2016/2017 ACADEMIC YEAR FIRST SEMESTER EXAMINATION

FIRST YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE (STATISTICS)

STA 103: PRINCIPLES OF STATISTICS

DATE: DECEMBER 8, 2016

TIME: 11:00AM-1:00PM

INSTRUCTIONS:

Answer Question ONE and ANY other TWO Questions

QUESTION ONE (30 MARKS)

- a) Define the following terms as used in statistics
- (i) Sample (1 mark)
 - (ii) Parameter (1 mark)
 - (iii) Frequency distribution (1 mark)
 - (iv) Class boundaries (1 mark)
 - (v) Class width (1 mark)
- b) The data shown here represent the number of miles per gallon (mpg) that 30 selected four-wheel-drive sports utility vehicles obtained in city driving. Construct a frequency polygon of the data 12 17 12 14 16 18 16 18 12 16 17 15 15 16 12 15 16 16 12 14 15 12 15 15 19 13 16 18 16 14 (5 marks)
- c) Find the lower and upper quartiles, the 7th decile and the 85th percentile of the following data. 3, 6, 9, 10, 7, 12, 13, 15, 6, 5, 13 (5 marks)

- d) Highlight the major points to consider when categorizing data into groups. (4 marks)
- e) Show that $P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(B \cap C) - P(A \cap B) - P(A \cap C) + P(A \cap B \cap C)$
(3 marks)
- f) Compute the Bowley's coefficient of skewness, the Kelly's coefficient of skewness and the Percentile coefficient of kurtosis for the following data and interpret the results. 9, 3, 4, 2, 9, 5, 8, 4, 7, 4
(4 marks)
- g) Distinguish between the following terms as used in statistics
- Skewness (2 marks)
 - Kurtosis (2 marks)

QUESTION TWO (20 MARKS)

- a) A financial counsellor conducts an investment seminar with each seminar limited to six attendees. For the past 20 seminars, she has Conducted, X has had the relative frequency distributed as shown below.

X	0	1	2	3	4	5	6
P(X)	0.05	0.1	0.2	0.25	0.15	0.15	0.1

- Draw a probability mass function graph of X (2 marks)
 - Calculate the mean and the standard deviation of X (5 marks)
- b) The Probability that John passes a Maths exam is $\frac{4}{5}$ and that he passes a Chemistry exam is $\frac{5}{6}$. If the probability that he passes both exams is $\frac{3}{4}$, find the probability that he will pass at least one exam. (3 marks)
- c) A fair coin is tossed 10 times. What is the probability of observing exactly 8 heads? (3 marks)
- d) The table below shows the average money spent by first-year college students.

Type of Expenses	Electronics	Dorm decor	Clothing	Shoes
Amount(KSh 00)	728	344	141	72

Draw a pie chart to represent the data. (3 marks)

- e) Find the variance and standard deviation for the data. (4 marks)

3, 6, 9, 10, 7, 12, 13, 15, 6, 5, 13

QUESTION THREE (20 MARKS)

- a) A pharmaceutical company wants to know whether an experimental drug has an effect on systolic blood pressure. Fifteen randomly selected subjects were given the drug and, after sufficient time for the drug to have an impact on their systolic blood pressures were recorded. The data appear below:

172 140 123 130 115
148 108 129 137 161
123 152 133 128 142

- i. Approximate the value of s using the range approximation. (3 marks)
 - ii. Calculate the values of \bar{y} and s for the 15 blood pressure readings. (3 marks)
 - iii. Use Tchebysheff's theorem to find values a and b such that at least 75% of the blood pressure measurements lie between a and b . (4 marks)
- b) The data below represents monthly sales of Toyota in the year 2016

Class	100-104	105-109	110-114	115-119	120-124	125-129	130-134
frequency	2	8	18	13	7	1	1

- i. Construct the less than and the more than ogive (6 marks)
- ii. Using the ogive, determine the 60th percentile and 5th decile. (4 marks)

QUESTION FOUR (20 MARKS)

- a) Define the following terminologies as used in statistics
- i. Census (2 marks)
 - ii. Survey (2 marks)
 - iii. Random Variable (2 marks)
- b) The following numbers represent ACT composite scores for 50 entering freshmen at a certain college:

93 77 67 72 52 83 66 84 59 63
75 97 84 73 81 42 61 51 91 87
34 54 71 47 79 70 65 57 90 83
58 69 82 76 71 60 38 81 74 69
68 76 85 58 45 73 75 42 93 65

- i. Construct a frequency distribution of the data. (6 marks)
- ii. Calculate the median of the data (4 marks)

- c) The *symmetric difference* between two events A and B is the set of all sample points that are in *exactly one* of the sets and is often denoted $A \cup B$. Note that $A \cup B = (A \cap B) \cup (A \cap B)$. Prove that $P(A \cup B) = P(A) + P(B) - 2P(A \cap B)$. (4 marks)

QUESTION FIVE (20 MARKS)

- a) Let $S = \{a, b, c, d, e\}$ be the sample with probability 0.2, 0.3, 0.1, 0.3 and 0.1 respectively. Let $A = \{a, b, c\}$ and $B = \{b, c, d\}$ be a subset of S . Find $P(A|B)$ (3 marks)
- b) The frequency table below presents the temperature data taken from Embu Town.

class boundaries	37.5 – 41.5	41.5 – 45.5	45.5 – 49.5	49.5 – 53.5	53.5 – 57.5	57.5 – 61.5	61.5 – 65.5	Total
f	4	10	8	15	9	3	1	50

Calculate the following

- i. The median (4 marks)
 - ii. The first quartile, (4 marks)
 - iii. The 65th percentile (4 marks)
- c) The analysis of monthly wages paid to workers in two firms A and B belong to the same industry gives the following data.

	A	B
Number of workers	100	100
Average monthly wages (Ksh)	186	175
Variance of the distribution of wages	81	100

- i. In which of the two firms is the wage bill the largest? (2 marks)
- ii. Calculate the weighted average of the wages of the firms (3 marks)

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