



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

SMA 160: PROBABILITY AND STATISTIC I

DATE: WEDNESDAY, 4TH APRIL 2012

TIME: 11.00 A.M. – 1.00 P.M.

INSTRUCTIONS: Answer Question 1 and ANY OTHER TWO questions.

Question 1 (30 marks)

- (a) Consider the following marks by 20 students in a business statistics test.

64	89	63	61	78	87	74	72	54	88
62	81	78	73	63	56	83	86	83	93

- (i) Construct a stem-and-leaf diagram for these marks in a business class performance. [3 marks]
- (ii) Describe the shape of this data set [2 marks]
- (b) Given the set of numbers, 12, 6, 7, 9, 15, 13, 11 and 18. Find the variance [5 marks]
- (c) Suppose 80 per cent of the material received from a vendor is of exceptional quality, while only 50 per cent of the material received from vendor B is of exceptional quality. However, the manufacturing capacity of vendor A is limited and for this reason only 40 per cent of the material purchased comes from vendor A. The other 60 per cent comes from vendor B. An incoming shipment of material is inspected and it is found to be of exceptional quality. What is the probability that came from vendor A.

[6 marks]

- (d) The first four moment of a distribution about a value 5 of a variable are 2, 20, 40 and 50.
- (i) Show that the mean is 7. [3 marks]
- (ii) Find the third moment [2 marks]
- (e) A University student studying the employment situation in a certain town found out that the probabilities of males and females who are employed is as shown in the table below

	Employment	Unemployment
Males	0.40	0.10
Females	0.475	0.025

Suppose an unemployed person is chosen at random. Find the probability that the person selected is

- (i) Male [3 marks]
- (ii) Female [3 marks]
- (f) The marks obtained by candidates in an examination were as follows:

Marks	20-29	30-39	40-49	50-59	60-69	70-79
Number of Candidates	4	10	16	19	8	3

Plot a histogram and a frequency polygon to depict that data. [3 marks]

Question 2 (20 marks)

The following is the record of ages of VCT attendance in one of the centres.

15	25	35	25	28	11	55	19	19	27	22	20
61	48	42	22	38	34	40	38	22	35	60	24
24	19	22	25	58	30	39	25	40	41	46	21
43	38	34	47	23	28	21	23	30	17	20	31
40	19	20	21	29	26	25	27	35	41	30	13

- a) Classify the data above by constructing a frequency distribution, taking 10-14 as the first class. [4 marks]
- b) Calculate
- i) Arithmetic mean [3 marks]
- ii) Median [4 marks]
- iii) Mode [4 marks]
- iv) Standard deviation of the distribution. [5 marks]

Question 3 (20 marks)

- (a) Consider the following data for a group of ten students showing the number of times each was late for Mathematics lectures in a semester

6 7 5 8 14 6 5 4 6 9

- (i) Calculate the second, third and fourth central moments. [7 marks]
- (ii) Using the results in (i) above obtain the Skewness and Kurtosis of this data and comment on your results. [4 marks]
- (b) The following frequency distribution shows the weights in kilograms of a population of 100 street boys in a certain city. Each weight was recorded to the nearest 100 grams.

Weight (kg)	Number of boys
10-20	14
20-30	23
30-40	27
40-50	21
50-60	15

Estimate the quartile coefficient of Skewness and interpret the value obtained. Show your calculations correct to two decimal places. [9 marks]

Question 4 (20 marks)

- (a) Sixteen subjects were matched in pairs for their ability to perform a certain task. Then each subject in pair was given three double whiskies and asked to perform the task again a few minutes later. The other subjects were completely sober when they performed the task again. The following scores were obtained.

Pair	1	2	3	4	5	6	7	8
Sober group	340	290	270	370	330	310	320	320
Whisky group	320	360	320	540	360	300	680	1180

Calculate the Spearman's rank correlation coefficient and comment on your answer.

[6 marks]

- (b) The following table shows the body weight (in kg) and plasma volume (in litres) for eight healthy males:

Subject	1	2	3	4	5	6	7	8
Body Weight (x)	58.0	70.0	74.0	63.5	70.5	71.0	66.0	62.0
Plasma Volume (y)	2.75	2.86	3.37	2.76	2.62	3.49	3.05	3.12

- (i) Find the Pearson's correlation coefficient between body weight and plasma volume and make an appropriate conclusion. [4 marks]
- (ii) Obtain the regression line that would estimate
- (a) the body weight [4 marks]
- (b) Plasma volume [4 marks]
- (iii) Estimate the body weight of a male with a plasma volume 2.5 litres and the plasma volume of a male with body weight of 60.2 kg [2 marks]

Question 5 (20 marks)

- (a) Define the following terms [2 marks]
- (i) Stochastically independent events [2 marks]
- (ii) Mutually exclusive events [2 marks]
- (b) If A and B are any two events, Show that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ [4 marks]
- (c) For two events, A and B, $P(A) = 0.4$ and $P(B) = 0.2$
- (i) If A and B are independent, find $P(A \cap B)$, $P(A/B)$, and $P(A \cup B)$ [4 marks]
- (ii) If A and B are dependent, with $P(A/B) = 0.6$ find $P(A \cap B)$ and $P(B/A)$ [3 marks]
- (d) A firm produces pipes in two plants A and B with daily production of 500 and 1000 pipes respectively. If plant A produces 50% defective pipes and plant B produces 80% defective pipes, a defective pipe is selected at random from the total production. What is the chance that the pipe is produced by plant A or plant B? [5 marks]
