1. (a) The patients who attended a district hospital on a certain day are as follows:

	Adult	Children
Male	20	40
Female	25	75

(i) A patient is selected at random from the clinic. Determine the probability that she is a female child. (2 marks)

(ii) A male patient is selected at random from the clinic. Determine the probability that he is a child. (3 marks)

(iii) A child patient is selected at random from the clinic. Determine the probability that he is male. (3 marks)

(b) (i) Outline any **three** requirements for linear programming. (3 marks)

(ii) A career researcher claims that at most 60% of the employees in Kenya are not satisfied with their current jobs. A random sample of 512 employees showed that 64% of the employees are not satisfied with their jobs. Test whether this claim is significantly less at the 5% level of significance. (9 marks)

2. (a) Outline **four** disadvantages of *mean* as a measure of central tendency. (4 marks)

(b) (i) State **two** advantages and **two** disadvantages of the *Spearman's rank co-efficient* of correlation. (4 marks)

(ii) Differentiate between *deciles* and *percentiles* as used in statistics. (2 marks)

(c) With the aid of a sketch and in each case, differentiate between a *positively skewed* and a *negatively skewed* distribution. (4 marks)

(d) Table 1 shows details of examination results for Quantitative Methods and Data Communication subjects. Use it to answer the questions that follow.

Table 1

Grade scored		1	2	3	4	5	6	7	8
No of Students	Quantitative Methods	1	4	7	10	12	9	5	2
	Data Communication	2	8	10	12	9	5	3	1

Compute each of the following about the grades:

(i) standard deviation for Quantitative Methods;

(ii) mean absolute deviation for Data Communication. (6 marks)

3. (a) Table 2 shows details of the activities at stock exchange market for 2005 and 2010. Use it to answer the questions that follow.

Table 2

Company	2005		2010	
	Price in Ksh	No of shares	Price in Ksh	No of shares
A	10.00	1000	15.00	1500
B	20.00	2500	25.00	2000
C	25.00	1500	35.00	2500
D	40.00	500	60.00	1000

Calculate the following taking the year 2005 as the base:

(i) Laspeyre's price index;

(ii) Paasche's price index. (8 marks)

(b) A research finding showed that the weights of adult males in Muthiga Location is normally distributed with a mean of 70 kg and a standard deviation of 8 kg.

(i) Determine the proportion of the adult males with weight between 64kg and 77kg. (6 marks)

(ii) Adult males whose weights lie outside the central 95% of the population are considered as underweight and obese respectively. Determine the following:

I. upper limit for underweight;

II. lower limit for obesity. (6 marks)

4. (a) Define each of the following terms as used in business finance:

(i) annuity;

(ii) sinking fund. (4 marks)

(b) A machine costing K£25,650 depreciates to a scrap value of K£500 in ten years. Determine:

(i) the annual percentage rate of depreciation using reducing balance method;

(ii) its value at the end of the sixth year. (5 marks)

(c) Table 3 shows details of monthly salaries and their corresponding monthly savings for 10 employees. Use it to answer the questions that follow.

Table 3

Employee	A	B	C	D	E	F	G	H	J	K
Salary (Ksh '000')	20	35	45	15	20	40	32	52	15	25
Savings (Ksh '000')	6	4	8	7	5	9	7	8	5	8

(i) Using the least squares method, determine the equation of regression line for the data (9 marks)

(ii) A new employee is to be recruited with a monthly salary set at Ksh 30,000. Using the regression line obtained in c(i) above, estimate his expected amount of savings. (2 marks)

5. (a) Explain the following terms as used in statistics:

(i) hypothesis;

(ii) sample statistic;

(iii) parameter. (6 marks)

(b) Table 4 shows details of activities in a computer networking project. Use it to answer the questions that follow.

Table 4

Activity	Preceding Activity	Duration (weeks)		
		Optimistic	Most Likely	Pessimistic
A	--	4	5	12
B	--	6	10	14
C	A	5	7	15
D	B	2	4	6
E	B	10	11	18
F	A, D	10	13	22
G	C	4	7	10
H	F	4	11	12
J	G, H	10	11	18
K	E, F	3	5	7

(i) compute the expected duration for each activity; (2 marks)

(ii) draw a network diagram to represent the above information; (6 marks)

(iii) determine the expected project duration; (2 marks)

(iv) determine the critical path of the network. (4 marks)

6. (a) Outline **four** areas where *index numbers* are applied. (4 marks)

(b) Table 5 shows details of a student's fees payment (in million shillings) in a particular secondary school. Use it to answer the questions that follow.

Table 5

	Term 1	Term 2	Term 3
Year 1	3.0	2.8	2.0
Year 2	3.2	2.9	2.3
Year 3	3.5	3.3	2.5

(i) determine the 3-term moving averages;

(ii) using the additive model, determine the seasonal variation for each term;

(iii) forecast the student's fees payment for Year 4. (12 marks)

(c) A company has issued bonds worth 2.4 million shillings redeemable after 20 years. How much should the company invest in a sinking fund earning 12% compound interest in order to achieve the objective? (4 marks)

7. (a) Explain the term *Monte Carlo simulation* as used in statistics. (2 marks)

(b) Differentiate between a *census* and *sample survey* as used in statistic. (4 marks)

(c) Explain each of the following random sampling techniques:

(i) stratified;

(ii) systematic;

(iii) multi-stage. (6 marks)

(d) Table 6 shows the number of breakdowns of a machine with the corresponding probabilities in a year.

Table 6

No. of breakdowns	0	1	2	3
Probability	0.80	0.15	0.04	0.01

(i) Using the following random numbers, simulate the number of machine breakdowns.

70 88 37 12 45 99 54 71 64 93 67 80 55 34 22.

(ii) Determine the average number of breakdowns. (8 marks)

8. (a) A firm uses two raw materials of sorghum and barley as ingredients in its production. Sorghum costs Ksh 60 per kg while barley costs Ksh 90 per kg. The ingredients are used to produce three products A, B and C. The ratios of the ingredients for each product per day and the corresponding quantity produced per day are as shown in Table 7.

Table 7

	Product A	Product B	Product C
Sorghum	1	3	1
Barley	2	2	1
Minimum quantity (kg)	200	300	120

Due to a trade agreement with an established supplier, a minimum of 40 kg of sorghum is supplied and utilised per day.

(i) Formulate a linear programming (LP) model to represent the information. (5 marks)

(ii) Using the graphical method, determine the optimum daily production plan which minimises the cost of production for the firm. (6 marks)

(iii) Identify the non-binding constraint(s) in the LP. (1 mark)

(b) A vendor of greengrocer buys tomatoes at Ksh 8 each and sells them at Ksh 12 each. All the tomatoes left unsold at the end of the day are worthless. Analysis of his sales records over the last 100 days on his daily sales has a distribution as shown in Table 8.

Table 8

Tomatoes sold per day	20	21	22	23	24
No. of days	5	20	30	35	10

Determine the optimum stock level which he should hold based on expected monetary value. (8 marks)