



**TECHNICAL UNIVERSITY OF MOMBASA**  
**Faculty of Applied & Health**  
**Sciences**

DEPARTMENT OF MATHEMATICS & PHYSICS

UPGRADING MATHEMATICS

AMA 1004: COMMERCIAL ARITHMETICS & STATISTICS

**END OF SEMESTER EXAMINATION**

**SERIES: DECEMBER 2014**

**TIME ALLOWED: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

(i) *Answer Booklet*

This paper consist of **FIVE** questions

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown  
This paper consists of **FOUR** printed pages

### Question One (Compulsory)

- a) Find the rate at which a certain amount doubles after being invested for a period of 5 years compounded annually. **(4 marks)**
- b) The following table shows bank rates for changing dollars to shillings.

	Buying	Selling
1 US\$	78.43	79.25

An American tourist changed 1500 dollars to shillings but then had to return to U.S.A immediately therefore changed the shillings back to dollars. What loss did he make? **(3 marks)**

- c) Kimani bought a car at kshs 120,000. Its value depreciated by 8% p.a. for the first 2 years and 12% p.a. for the subsequent years. Find the value after 6 years. **(4 marks)**
- d) A bag contains 6 black balls and some brown ones. If a ball is picked at random, the probability it is black is 0.25. Find the number of brown balls. **(4 marks)**
- e) Find the median and quartile deviation of this set of data. **(3 marks)**

32, 30, 28, 35, 33, 37, 33, 34, 32

- f) Write down the inequalities that satisfy the unshaded region. **(3 marks)**
- g) The table below shows the marks scored in a test by 40 pupils in a class.

Marks	10 – 19	20 – 24	25 – 29	30 – 34	35 – 39	40 – 49
Frequency	3	4	7	10	9	7

Draw a frequency polygon to represent this data. **(4 marks)**

- h) Differentiate between discrete and continuous data. **(2 marks)**
- i) Solve for x and y: **(3 marks)**
- $$3x + 2y = 12$$
- $$4x - y = 5$$

### Question Two

- a) Solve the following set of equations: **(5 marks)**
- $$3x_1 + 4x_2 - 3x_3 = 5$$
- $$3x_1 - 2x_2 + 4x_3 = 7$$
- $$3x_1 + 2x_2 - x_3 = 3$$

$$T = \begin{pmatrix} k+5 & -2 \\ 3 & k \end{pmatrix}$$

- b) Given that matrix  $T$  is a singular matrix, find possible values of K. **(3 marks)**

- c) A shopkeeper stores 2 types of cleaning fluid, type A and B. Type A comes in packets of 6kg, shs 150 each. Type B comes in packets of 12kg costing shs 100 each. The greatest weight the shopkeeper can transport in his van is 1800kg and he does not wish to spend more than shs 22,500. He decides that he will require more than 80 packets of type A.:
- Write down the inequalities which satisfy the conditions. **(5 marks)**
  - Draw the graph and shade unwanted region. **(4 marks)**
  - Given that the profit of type A is ksh 20 per packet and shs 30 per packet B. use your graph to estimate the number of packets of A and B which must be sold for maximum profit. Calculate the profit. **(3 marks)**

### Question Three

- a) The table below shows Kenya's tax rates in a certain year:

Monthly Income Ksh	Tax Rate %
1 – 9860	10
9861 – 18980	15
18981 – 28100	20
28101 – 37220	35
37221 and over	40

Kibet's basic salary was 20,600 and is entitled to entertainment, medical and transport allowance of 4,000, 2880 and 1040 p.m respectively. He is also entitled to monthly tax relief of 1056 and is housed by the employer calculate:

- His monthly taxable income **(2 marks)**
  - His PAYE **(5 marks)**
  - Find his net pay if he pays 2000 towards HELB 150 to WCPS and 300 to NHIF. **(3 marks)**
- b) Job secured a bank loan in which the interest rate was 4.5% p.a. compounded quarterly. He cleared the loan after 2  $\frac{1}{4}$  years by paying ksh. 85,000.
- Determine the amount of loan if he obtained the loan on.
    - Simple interest **(4 marks)**
    - Compound interest **(3 marks)**
  - Obtain the difference in simple and compound interest from the above transaction. **(3 marks)**

### Question Four

- a) The table below shows marks of 50 from 4 students in a Mathematics exam.

Marks	1- 10	11 – 20	21 – 30	31 – 40	41 – 50	51 – 60	61 – 70	71 - 80	81 – 90	91 - 100
f	2	4	7	6	X	10	2	8	5	3

- Find the value of x **(2 marks)**
  - Using assumed mean of 55.5 calculate mean and standard deviation. **(6 marks)**
  - Calculate quartile deviation **(3 marks)**
- b) A laboratory is testing the growth rate of certain bacteria accordingly, the total surface areas of a number of cultures are measured for 2 days and the results are tabulated below.

Surface Area	1.0 - 1.4	1.5 - 1.9	2.0 - 2.4	2.5 - 3.4	3.5 - 3.9	4.0 - 4.4
f	6	10	11	15	6	3

Draw a histogram to represent the data. **(5 marks)**

c) State THREE methods of data representation apart from histogram **(3 marks)**

d) State TWO measures of dispersion. **(2 marks)**

**Question Five**

a) Distinguish between independent and mutually exclusive events: **(2 marks)**

b) Two identical baskets A and B contain white and red balls. Basket A contains 7 white balls and 3 red balls while B contains 5 white and 5 red balls. A bag is chosen at random and 2 balls are picked from it one after another without replacement.

(i) Illustrate this information using a tree diagram **(3 marks)**

(ii) Find probability that 2 balls picked are of same colour **(3 marks)**

(iii) Probability that the balls are of different colours **(3 marks)**

(iv) Probability of picking at least one white ball **(3 marks)**

(v) Probability that only one of the balls picked is red **(3 marks)**

c) If events A, B and C are mutually exclusive. Write an expression for  $P(A \cup B \cup C)$  **(3 marks)**