The Management University of Africa

MUA

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UNDERGRADUATE UNIVERSITY EXAMINATIONS

SCHOOL OF MANAGEMENT AND LEADERSHIP

DEGREE OF EDUCATION ARTS

MTH101 : BASIC MATHEMATICS

DATE: 28TH JULY 2022

DURATION: 2 HOURS

MAXIMUM MARKS: 70

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **SIX (6)** questions.
4. Question **ONE** is compulsory.
5. Answer any other **THREE** questions.
6. Question **ONE** carries **25 MARKS** and the rest carry **15 MARKS** each.
7. **Write all your answers in the Examination answer booklet provided.**

QUESTION ONE

a) Given that $H = \{g, h, t\}$, find;

i. $|H|$ **(1 mark)**

ii. 2^H **(2 marks)**

b) Explain any three sets of real numbers giving examples in each case **(3 marks)**

c) Find the sum of the first 13 terms in the following progression;

-5, 10, -20, ... **(3 marks)**

d) Use Venn diagrams to illustrate the following operations on sets;

i. Disjoint sets **(1 mark)**

ii. A^c **(2 marks)**

iii. $A \Delta B$ **(2 marks)**

e) Five committee members decided to handshake each other. If each member shook every other member's hand, evaluate the total number of handshakes. **(3 marks)**

f) An iceberg, somewhere in Iceland, loses everyday 5% of its volume at the beginning of that day by melting. Compute the number of days required for the volume be halved. **(3 marks)**

g) Express as factorials; $11 \times 10 \times 9 \times 8 \times 7 \times 6$ **(2 marks)**

h) Use binomial expansion to expand $(3 - x)^4$. Hence use your expansion to estimate 2.8^4 **(3 marks)**

QUESTION TWO

a) Solve for x in the equation; $5^x = 4$ **(3 marks)**

b) Solve for x in the equation; $2\ log_3(x-1) = log_3 9x - 3$ **(4 marks)**

c) After receiving a discount of 10%, Jack bought a shirt at KES 800. Calculate the marked price for the shirt. **(3 marks)**

d) A trader invested KES 200,000 at a compound interest rate of 5% per annum. Compute the total time required for his total interest be KES 43,101.25.

(5 marks)

QUESTION THREE

a) To arrive at work on time, Grace walks from home to work for 8minutes at a constant speed. One day she was late by 2 minutes and had to increase her speed by 10m/s. Calculate her daily constant speed when not late).

(3 marks)

b) Use a number line to represent the inequality given; $-3 \leq x < 2$ **(2 Marks)**

c) Simplify fully $2x - 4 < 3x + 1 \leq x + 5$ **(3 marks)**

d) On the graph paper provided, draw the representation of the following inequalities in one Cartesian.

i. $y \leq 12$ **(2 marks)**

ii. $x < 8$ **(2 marks)**

iii. $3x + 2y \geq 24$ **(3 marks)**

QUESTION FOUR

a) From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there in the committee. Compute the different number of ways this can be done? **(7 marks)**

b) Suppose the universal set U = {natural numbers more than 2 but less than 16} and sets A and B are subset of U. A= {multiples of 4} and B = {multiples of 3}. Formulate the members of each of the following sets;

i. U **(1 mark)**

ii. A **(1 mark)**

iii. B **(1 mark)**

iv. $A \cup B$ **(1 mark)**

v. $A \cap B$ **(1 mark)**

vi. $A \setminus B$ **(1 mark)**

vii. $A \Delta B$ **(2 marks)**

QUESTION FIVE

a) Find the twentieth term in an arithmetic progression with the first term as 3 and the common difference as 7. **(2 marks)**

b) The table below shows the population of children in a Sunday school tabulated according to their heights.

i. Identify the modal class; **(1 mark)**

ii. Calculate the median height for the data given. **(4 marks)**

iii. Find the mean height of the children using an appropriate Assumed Mean, A. **(4 marks)**

iv. Compute Variance and Standard deviation **(4 marks)**

Height (in cm)	40 – 59	60 – 79	80 -99	100 – 119	120 – 139	140 – 159
No. of kids	2	4	9	11	7	3

QUESTION SIX

a) In a certain class a student either plays volleyball, football or both games. Out of the 23 students in the class, 11 play volleyball and 16 play football. Use Venn diagrams to determine the number of students who play football only.

(3 marks)

b) Evaluate the inverse of the matrix; $\begin{pmatrix} 2 & 5 \\ 3 & -1 \end{pmatrix}$ **(2 marks)**

c) Solve for x and y in the simultaneous system $\begin{matrix} 2x + 5y = 52 \\ 3x - y = 10 \end{matrix}$ using;

i. 'inverse of a matrix' method **(3 marks)**

ii. Cramer's Rule **(4 marks)**

d) Formulate the determinant of the matrix; $\begin{pmatrix} 3 & 8 & 9 \\ 4 & 2 & 7 \\ 5 & 6 & 1 \end{pmatrix}$ **(3 marks)**