CHUKA UNIVERSITY

INSTRUCTIONS

- *Answer all Questions in Section A and any Other two Questions in Section B.*

SECTION A

Question One (30 marks)

(a). Briefly explain the following elementary properties of real numbers giving an example in each case

     (i). Inverse Property of multiplication   (2 marks)

     (ii). Additive Identity property   (2 marks)

     (iii). Reflexive property   (2 marks)

(b). Without the help of the calculator solve the following leaving the answer in log form

     (i). $log_9 5^{5/2} - log_9 25$ (3 marks)

     (ii). $log_7 \sqrt{2} + log_7 \sqrt{8}$ (3 marks)

     (iii) $log_2(x^2 - 6x) = 3 + log_2(1 - x)$ (3 marks)

(c). Solve for the unknown in the following equations

     (i) $6x^3 = 162$ (2 marks)

     (ii) $49^z = \frac{1}{243}$ (2 marks)

     (iii) $4^x - 3 \times 2^{x+2} + 2^5 = 0$ (3 marks)

(d). Solve the following equation using completing square method

$$x^2 + 3x + 2 = 0$$ (3 marks)

(e).   Given $y = 3x^2 - x + 2$ find $\frac{dy}{dx}$ (2 marks)

(f).   Let $g(x) = 3x + 5$ and $f(x) = x^2 - 1.$ Find $(gof)(x)$ (3 marks)

SECTION B

Question Two (20 marks)

(a). Simplify the following

(i). $8 \times 512^y = \frac{1}{64^{y-3}}$ (4 marks)

(ii). $\sqrt{xy^{-1}} \times \sqrt{yz^{-1}} \times \sqrt{zx^{-1}}$ (4 marks)

(b). Martin and Morris have a weight difference that is half Cate's weight. If Martin's weight is 52 kilograms, which is 25 kilograms less Morris' weight, Find;

(i). Morris' weight   (2 marks)

(ii). Cate's weight   (3 marks)

(c). Given $f(x) = 5x + 1$ and $g(x) = x - 3,$ Determine the following,

(i). $(gof)(x)$ (2 marks)

(ii). $(fog)(x)$ (2 marks)

(iii). $(fog)^{-1}(x)$ (3 marks)

Question Three (20 marks)

(a). The following data represents the marks for 20 students picked randomly from the Math 100 class.

38	42	50	52	68	70	77	68	39	60
88	47	68	53	60	72	44	58	56	51

Calculate the following

(i)   The average number of marks among the selected students   (2 marks)

(ii)   The median   (2 marks)

(iii)   Mode   (2 mark)

(iv)   Variance   (4 marks)

(v)   Standard deviation   (2 marks)

(b). The expression $x^3 + ax^2 - 2x - 4$ can be divided by $x + 1$. Find the following from the equation

(i). The value of a   (2 marks)

(ii). All the possible values of x   (6 marks)

Question Four (20 marks)

(a) Find the value of x in $ax^2 + bx + c = 0$ using completing square method (5 marks)

(b) A Chuka Hospital doctor's fee is based on the length of time.

   Up to 6 minutes costs 50 shillings,

   Over 6 and upto 15 minutes costs 80 shillings

   Over 15 minutes costs 80 shillings plus 5 shillings per minute above 15 minutes

   Required: i) Write a piecewise function representing this information   (4 marks)

   ii) you visit for 12 minutes, what is the fee?   (3 marks)

   iii) you visit for 20 minutes, what is the fee?   (3 marks)

(c) Given $y = \frac{(x^3+4)^5}{(1-2x^2)^3}$, find y' (5 marks)

Question Five (20 marks)

(a) Describe the four levels of measurements as applied in statistics   (8 marks)

(b) Use the following data to answer the subsequent questions

Number of orders	f
10-12	4
13-15	12
16-18	20
19-21	14

Find;

i)	Mean		(2 marks)
ii)	Mode		(2 marks)
iii)	Median		(2 marks)
iv)	Variance		(3 marks)
v)	Standard Deviation		(1 marks)