

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE
OF BACHELOR OF SCIENCE (BIOLOGY), BACHELOR OF EDUCATION (PHYSICS
& BIOLOGY), BACHELOR OF EDUCATION (CHEMISTRY BIOLOGY)

MATH 101: FOUNDATION MATHEMATICS

STREAMS: BSC (BIO), BED (PHYS & BIO), BED (CHEM BIO)

TIME: 2 HOURS

DAY/DATE: MONDAY 17/12/2018

2.30 P.M. – 4.30 P.M.

INSTRUCTIONS: Answer question ONE and any other TWO

QUESTION ONE

- (a) Find a monic quadratic equation that has the roots $\left(\frac{3}{2}, 4\right)$ [3

marks]

- (b) Distinguish between rational and irrational numbers. Give two examples of each

[2

marks]

- (c) Simplify $\frac{4}{\sqrt{7}+\sqrt{3}}$ [2 marks]

- (d) Show that $\sqrt{\frac{y}{x}} \times \sqrt{\frac{z}{y}} \times \sqrt{\frac{x}{z}} = 1$ [2 marks]

- (e) Solve the exponential equation $2^{2x+3} + 2^{x+3} = 1 + 2^x$ [4 marks]

- (f) Given that $\log_{10} 4 + 2 \log_{10} P = 2$, find the value of P [3 marks]

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(g) Find the equation of a line passing through the points $A(-1, 6), B(3, -9)$ [3 marks]

(h) Find the quadratic approximation of $\sqrt{25+x}$ upto the term x^3 [4 marks]

(i) The second term of a GP is 2 and fourth term 18. Find the possible values of the first terms and the corresponding common ratio. [3 marks]

(j) Given the following distribution of marks scored by some students in a mathematics CAT 7.5, 9, 13, 12.5, 10, 5

Determine

- (i) The range of the marks
- (ii) Standard deviations [4 marks]

QUESTION TWO

(a) A group of young people decided to raise 480,000 to start a business. Before the actual payment was made, four of the members pulled out and each of those remaining had to pay an additional 20,000. Determine the original number of members. [5 marks]

(b) If $3^x \times 9^{2y} = 27$ and $2^x \times 4^{-y} = \frac{1}{8}$ calculate the values of x and y [5 marks]

(c) Find the radius and centre of the circle that passes through the points $(7, 1)$, $(0, 0)$, $(-1, 7)$ [6 marks]

(d) Mary invested \$ 2000 compounded semi-annually for 3 years at 4% p.a. Calculate the value of her investment and total interest earned at the end of 3 years. [4 marks]

QUESTION THREE

(a) Consider the right angle-triangle below

Show that $1 + \tan^2 \theta = \sec^2 \theta$ [5 marks]

(b) Solve the equation $2 \tan^2 \theta = \tan \theta + 1$ [5 marks]

(c) Suppose the population of gray wolves in Yellowstone is approximated by

$P(t) = P_0 e^{0.3t}$ whose t is measured in years after the first mating pair were re-

introduced in 1995. What is the population in

(i) 1995 [1 mark]

(ii) 1998 [2 marks]

(iii) 2010 [2 marks]

(iv) 2025 [2 marks]

(d) A coin is tossed three times

(i) Draw a tree diagram to show all the possible outcomes

(ii) Find the probability of getting atleast one head [3 marks]

QUESTION FOUR

(a) Using mathematical induction, prove that $2 \cdot 2 + 3 \cdot 2^2 + \dots + (n+1) \cdot 2^n = n \cdot 2^{n+1}$ for all

positive integers n [5 marks]

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- (b) There are 7 men and 3 ladies. Find the number of ways in which the committee of 6 people can be formed if the committee is to have atleast 2 ladies [5 marks]
- (c) How many arrangements are there of the letters of the word CORPORATION so that the vowels always come together? [5 marks]
- (d) Find the quotient and the remainder when x^5+1 is divisible by $(x-1)$ [5 marks]

QUESTION FIVE

- (a) The table below shows marks scored by a statistics class of Chuka University

Marks	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
No. of students	4	10	12	18	16	9	7	3	1

Calculate the

- (i) Mean mark [3 marks]
(ii) Mode mark [2 marks]
(iii) Median mark [2 marks]
(iv) Standard deviation [3 marks]
- (b) Differentiate the following functions
- (i) $y = \frac{x^2+3}{x-4}$ [4 marks]
- (ii) $y = \sqrt{x^2+4x-3}$ [2 marks]
- (iii) $y = (x-2)(x+1)$ [2 marks]

- (c) Evaluate $\int_{-1}^3 (x^2 - 2x^3) dx$ [4 marks]

