CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF CERTIFICATE IN

MATH 00101: MATHEMATICS FOR SCIENCE

STREAMS: CERT. **TIME: 2 HOURS**

DAY/DATE: MONDAY 22/03/2021 **2.30 P.M. – 4.30 P.M.**

INSTRUCTIONS:
Answer ALL questions in section A and any other TWO in section B.

SECTION A

QUESTION ONE (30 MARKS)

(a) Solve the following equation using completing square method $-3x^2 + 6x - 48 = 0$ (3 marks)

(b) The rabbit population in a Victorian town was estimated to be 320,000 in 2012. Scientists believe that this will increase by 2% each year.

(i) What will be the rabbit population in 2015? (3 marks)

(ii) In which year will the rabbit population reach 400,000? (3 marks)

(c) Peter has five friends. In how many ways can he invite at least 3 of his friends to his birthday party? (3 marks)

(d) Use the remainder theorem to solve the following problem $p(x) = x^3 - 7x - 6$ divided by $x - 4$. (3 marks)

(e) Differentiate between conditional probability and empirical probability. (3 marks)

(f) Given the following data

Seconds	Frequency
51 – 55	2
56 – 60	7
61 – 65	8
66 – 70	4

Find mean, median and mode (6 marks)

(g) Simplify $125^{\frac{2}{3}}$ (2 marks)

(h) Simplify the following expression

$\frac{cos^2\theta}{1+\sin\theta} + \frac{cos^2\theta}{1-sin\theta}$ (4 marks)

SECTION B

QUESTION TWO (20 MARKS)

(a) Solve the following methods using the stated method

$3x^2 = 27$ (factorization)

$x^2 - 3x - 2 = 0$ (using quadratic formula)

$3x^2 = 6x - 1$ (completing square method) (9 marks)

(b) An AP has 4th term 8 and 7th term 17. Find the sum of the first 20 terms. (7 marks)

(c) Write out the expansion of the following $(x + y)^6$. (4 marks)

QUESTION THREE (20 MARKS)

(a) A bag contains 3 black balls and 5 white balls. Paul picks a ball at random from the bag and replaces it back in the bag. He mixes the balls in the bag and then picks a ball at random from the bag.

(a) Construct a probability tree diagram of the problem.

(b) Calculate the probability that Paul picks.

(i) Two black balls
(ii) A black ball in his second draw (6 marks)

(b) Differentiate between primary data and secondary data and state two methods of collecting each. (6 marks)

(c) Given $\log 3 = 0.4771$
Evaluate $\log 3000$ (3 marks)

(d) Solve the following $p(x) = x^4 + 7x^3 + 5x^2 - 4x + 15$ divided by $x + 2$. (5 marks)

QUESTION FOUR (20 MARKS)

(a) Given the following data

Length (mm)	Frequency
150 – 154	5
155 – 159	2
160 – 164	6
165 – 169	8
170 – 174	9
175 – 179	11
180 – 184	6

Calculate mean, median and mode (10 marks)

(b) Plot a graph of $y = \sin\theta$ for $0 \leq \theta \leq 360$, at an interval of 30^0 . (4 marks)

(c) An insect population is growing in such a way that each new generation is 1.5 times as large as the previous generation. Suppose there are 100 insects in the first generation.

(i) How many will be there in the fifth generation? (3 marks)

(ii) What will be the total number of insects in the five generations? (3 marks)

QUESTION FIVE (20 MARKS)

(a) Find the expansion of $(2x - 3y)^5$ (5 marks)

(b) If the 2nd term of a GP is 6 and the 5th term is 48. Find the sum of the first 10 terms. (7 marks)

(c) Prove that $\frac{1+\cos\theta}{\sin\theta} = \frac{\sin\theta}{1-\cos\theta}$ (3 marks)

(d) Suppose a bag has 4 red balls and 6 blue balls. What is the probability of choosing 2 blue balls at random? (3 marks)

(e) Apply the laws of logarithms to solve the following $\log\frac{abc^2}{d^3}$ (2 marks)
