

CHUKA

UNIVERSITY



UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF CERTIFICATE

MATH 00101: MATHEMATICS FOR SCIENCE

STREAMS: CERT.

TIME: 2 HOURS

DAY/DATE: TUESDAY 05/08/2025

2.30 P.M. – 4.30 P.M.

INSTRUCTIONS:

- Answer question ONE and any other TWO

QUESTION ONE (30 MARKS)

- a) Define the following terms:
- (i) Sample space (2 marks)
 - (ii) Independent events (2 marks)
 - (iii) Mutually exclusive events (2 marks)
- b) Slips numbered 1 through 9 are placed in a box. If 2 slips are drawn without replacement, what is the probability that:
- (i) both are odd (2 marks)
 - (ii) both are even (2 marks)
- c) Find the mean, mode, median, range, and standard deviation of the following data 30, 50, 30, 70, 20, 50, 30. (6 marks)
- d) Distinguish between classical probability and empirical probability. (4 marks)
- e) Simplify $243 \times (27)^{\frac{-4}{3}}$ (3 marks)
- f) Evaluate without use of a calculator $\log_3 27 - \log_3 9 + \log_3 81$. (3 marks)
- g) How many arrangements are there for the letters of the word **COOPERATION**. (2 marks)
- h) How many ways can first and second place be awarded to 10 people. (2 marks)

QUESTION TWO (20 MARKS)

- a) Find the value of x in $ax^2 + bx + c = 0$ using the completing square method. (6 marks)
- b) Evaluate $\lim_{n \rightarrow \infty} \frac{3n^2 - 2n - 7}{9n^2 - 7n}$ (3 marks)
- c) Find the expansion of $(-x + 3y)^4$ using the Pascal's triangle. (4 marks)
- d) Solve the following equation for $0 \leq \theta \leq 360$, $2\sin^2\theta = \sin\theta$. (4 marks)
- e) The fourth term of a geometric sequence is 8 and the 6th term is 32. Find the two possible common ratios. (3 marks)

QUESTION THREE (20 MARKS)

- a) Plot a graph of $y = \cos\theta$ for $0^\circ \leq \theta \leq 360^\circ$ at an interval of 30° . (5 marks)
- b) Find the value of x in the following log functions
- (i) $\log_2(x - 3) + \log_2(x - 1) = 3$ (3 marks)
- (ii) $\log_3(2x + 1) + \log_3(x + 8) = 3$ (3 marks)
- c) Solve the following quadratic equations using the indicated method
- (i) $2x^2 - x - 15 = 0$ (Quadratic formula) (3 marks)
- (ii) $3x^2 + 5x + 0.75 = 0$ (Factorization method) (3 marks)
- (iii) $5x^2 = -x - 2$ (Completing square method) (3 marks)

QUESTION FOUR (20 MARKS)

- a) The sum of the first eight terms of an arithmetic progression is 220. if the third term is 17, find the sum of the first six terms. (3 marks)
- b) Ann has 5 friends in her class. If she wants to invite them in her birthday party, in how many ways can she invite at least 3 of her friends to her birthday party. (4 marks)
- c) The expression $x^3 + ax^2 - 2x - 4$ is divisible exactly by $x + 1$. Find the value of a and the remainder when the expression is divided by $x + 2$. (4 marks)
- d) Solve for x given that $9 \times 81^x = \frac{1}{27^{x-2}}$ (3 marks)
- e) A bag contains 3 black balls and 5 white balls. Peter picks a ball at random from the bag and replaces it in the bag. He mixes the balls in the bag and then picks another ball at random from the bag.
- I. Construct a probability tree of the problem. (3 marks)

II. Calculate the probability that Peter picks:

- (i) two black balls. (1 mark)
- (ii) a black ball in his 2nd draw. (2 marks)

QUESTION FIVE (20 MARKS)

- a) Distinguish between inferential statistics and descriptive statistics. (2 marks)
- b) Consider the following data representing the age of 100 people randomly selected in Chuka town.

Age	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79
Frequency	5	8	7	12	28	20	10	10

Determine:

- (i) Mean (3 marks)
- (ii) Mode (3 marks)
- (iii) Median (3 marks)
- (iv) 75th percentile (3 marks)
- (v) 7th decile (3 marks)
- (vi) Standard deviation (3 marks)
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