# JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

## SCHOOL OF BIOLOGICAL, PHYSICAL, MATHEMATICS AND ACTUARIAL SCIENCE

## UNIVERSITY EXAMINATION FOR CERTIFICATE IN COMMUNITY HEALTH

## 1ST YEAR 1ST SEMESTER 2022/2023 ACADEMIC YEAR

## MAIN CAMPUS/ KISUMU CAMPUS

**COURSE CODE: SMA 1111**

**COURSE TITLE: MATHEMATICS I**

**EXAM VENUE:**             **STREAM: CERTIFICATE IN COMMUNITY HEALTH**

**DATE: 19/07/2022**             **EXAMS SESSIONS: 9.00 – 10.30AM**

**TIME: 1 ½ HOURS**

**Instructions:**

1. **Answer question one (compulsory) and any other two questions.**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

## QUESTION ONE (30 marks)

a) Simplify: $\frac{2}{3-\sqrt{5}}$ by rationalizing the denominator  (3marks)

b) Solve the equation:

   $3^x * 9^{2y} = 27$ and $2^x * 4^{-y} = 1/8$ by finding the value x and y  (5 marks)

c) Use the remainder theorem to find the remainder in:

   $-4x^3 + 8x^2 + 12x + 16$ divided by (x+2)  (3marks)

d) Solve the equation $x^2 + (m - n)x + 10(m - n) = 0$ using the quadratic formula

   (5marks)

e) If A is a set of factors of 15
      B is the set of prime numbers less than 10
      C is the set of even numbers less than 9
   Find $(AUB)^C$ U (B-C)  (5marks)

f) Solve the equation:
   $\text{Log}_{10}(3x+2) - 2\log_{10} x = 1 - \log_{10}(5x-3)$  (4marks)

g) Use binomial theorem to determine the coefficients of $z^4$ in the expression of the form $(5+x)^8$  (5marks)

## QUESTION TWO (20 marks)

a) A travel agent surveyed 100 people to find out how many of them had visited the cities of Kisumu and Mombasa. 31 people had visited Kisumu, 26 had visited Mombasa. 12 people had visited both cities.

   (i). Draw a Venn diagram for data above  (2marks)

   (ii). Find the number of people who had visited Mombasa but not Kisumu  (3marks)

   (iii). Find the number of people who had visited only one of the two cities (3 marks)

b) Find the area of a triangle given that side $AB = 3$, $BC = 2$ and angle $B = 50^o$

   (4marks)

c) Convert the following into

i) $230^o$ into radians (2marks)

ii) $\dfrac{\pi^c}{6}$ into degrees (2marks)

d) Solve: $ax^2 - bx - c = 0$ by complete square method (4 marks)

## QUESTION THREE (20 marks)

a) Define the following terms as used in set theory
i) Sub Set (2marks)

ii) Null    set (2marks)

b) Find the power set of $S = \{1,3\}$ (3marks)

c) Let $U = \{1,2,3, ....,8,9\}$ be the universal set and $A = \{1,2,3,4\}$, $B = \{2,4,6,8\}$ and $C = \{3,4,5,6\}$.
Find

i) $A^c$ (2marks)

ii) $(A \cap C)^c$ (2marks)

iii) $(A \cup B)^c$ (2marks)

iv) $B \backslash C$ (2marks)

d) Draw the Venn diagram and shade the region corresponding to
i) $A \cap B \cap C$ (3marks)
ii) $A^c$ (2marks)

## QUESTION FOUR (20 marks)

a) The following distribution gives the finishing times in minutes for male runners in a marathon:

| Time | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 |
|---|---|---|---|---|---|---|---|
| Runners | 6 | 5 | 7 | 10 | 5 | 4 | 3 |

Use the data to compute

i) mode (1mark)

ii) mean (3marks)

iii) median (3marks)

iv) standard deviation from the above data (3marks)

b) Calculate the Geometric mean and variance of following ungrouped data:
20, 18, 15, 15, 14, 12, 11, 9, 7, 6, 4, 1 (6marks)

c) Solve $sin\theta = \frac{1}{2}$ for $0^O < \theta < 360^O$ (4marks)

## QUESTION FIVE (20 marks)

a) Below is an arithmetic progression.
$$60 + 57 + \ldots + 18$$
(i) How many terms are there in the progression? (3 marks)
(ii) What is the sum of the terms in the progression? (3 marks)

b) A progression has a second term of 48 and a fourth term of 27. Find the first term of the progression in each of the following cases:
(i) the progression is arithmetic (3 marks)
(ii) the progression is geometric with a positive common ratio. (3 marks)

c) The fifth term of a geometric progression is 24 and the ninth term is 384.
All the terms are positive.
(i) Find the common ratio. (3 marks)
(ii) Find the first term. (2 marks)
(iii) Find the sum of the first ten terms. (3 marks)