



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIOLOGICAL, PHYSICAL, MATHEMATICS AND ACTUARIAL
SCIENCES
UNIVERSITY EXAMINATION FOR DIPLOMA IN COMMUNITY HEALTH
SPECIAL RESITS DECEMBER 2022
MAIN/KISUMU CAMPUS

COURSE CODE: SMA 2111

COURSE TITLE: MATHEMATICS I

EXAM VENUE

STREAM: Diploma in community health /Public Health

DATE:

EXAM SESSION: ONE

TIME: 2.00 HOURS

Instructions:

- 1. Answer ONE and any other two questions only.**
- 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 (COMPULSORY) [30 marks]

a) Define the following terms as used in the set theory (4 marks)

- i) A set
- ii) Venn Diagram
- iii) Disjoint Sets
- iv) Power Set

b) If $P = \{4, 5, 6\}$, $Q = \{5, 6, 8\}$ and $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$. Show that $\overline{P \cup Q} = \overline{P} \cap \overline{Q}$ (4marks)

c) Rationalize (3 mrks)

$$\frac{3}{2-\sqrt{2}}$$

d) Find $f^{-1}(x)$ when $f(x) = x^2 + 2$. Hence find the value of $f^{-1}(11)$ (5marks)

e) Given $\sin \theta = \frac{12}{13}$, find $\tan \theta$, and $\cos \theta$ (4 marks)

f) Use binomial theorem to expand $\left(1 + \frac{x}{2}\right)^5$ Hence evaluate $(1.01)^5$ to four significant figures. (5 marks)

g) The following marks were obtained by 11 students in a mathematics test: 40, 35, 37, 50, 54, 39, 60, 57, 56, 51, 60. Calculate the mode, median and mean (3marks)

h) Convert $\frac{7\pi}{4}$ and $\frac{5\pi}{3}$ radians into degrees (2 marks)

QUESTION TWO [20 marks]

a) Simplify completely. (3marks)

$$\frac{2x^2 + x - 3}{4x^2 - 9}$$

b) Evaluate: $\log(3x + 2) + \log 4 = \log(x - 1) + \log 7$ (5marks)

c) Given that $\log 2 = 0.30103$ and $\log 7 = 0.8451$. Calculate without using tables the value of: (for (ii) solve for x) (6 marks)

- i) $\text{Log } 20$
- ii) $7 = 2^{2x}$

d) In a survey of 120 people, it was found that 65 read newsweek magazine, 42 read fortune and 45 read time. Out of the above population, it was realized that 20 people read both

newsweek and time, 25 read both newsweek and fortune, 15 read time and fortune while 8 read all three magazines.

- (i) Represent the above information using Venn diagram. (2marks)
- (ii) Find the number of people who read atleast one of the three magazines
(2 marks)
- (iii) Fill in the correct number of people in each of the regions of the venn diagram where N, T and F denote the set of people who read newsweek, time and fortune respectively. (2 marks)

QUESTION THREE [20 marks]

- a) Every week the number of absentees in a research firm was recorded. This was done for 39 weeks these observations were tabulated as shown below (9 marks)

Number of absentees	0-3	4 -7	8 -11	12 - 15	16 - 19	20 - 23
(Number of weeks)	6	9	8	11	3	2

- i. State the modal class of absentees
 - ii. Estimate the median absentee rate per week in the school
 - iii. Estimate the mean of absentees
- b) A farmer sold his cows for ksh.25000 and deposited this money in a savings account with 12% per annum compound interest. After 2 years, he withdrew all his money in the bank. What was the amount of money he withdrew after 2 years? (7marks)
- c) Prove that $\sin^2 \theta + \cos^2 \theta = 1$ (4 marks)

QUESTION FOUR [20 marks]

- a) It is known $P(X) = \frac{1}{2}$ and $P(Y) = \frac{1}{4}$. Given X and Y are mutually exclusive.
Find (7 marks)
- i. $P(X \cup Y)$
 - ii. $P(X \cap Y)$
 - iii. $P(X \cap Y)^c$

- b) The state of inspection agency announced that last semester, of all cars inspected, 20% were rejected for faulty brakes, 16% were rejected for defective tyres and 13% were faulty brakes and defective tyres. Find the percentage of cars rejected due to faulty brakes or defective tyres. (4 marks)
- c) How many different committees of seven people can be chosen from ten people if three people qualifies for chairmanship. (4 marks)
- d) Solve for θ in the equation $\cos\left(\theta + \frac{\pi}{3}\right) = \sin\left(4\theta + \frac{\pi}{9}\right)$ (5marks)

QUESTION FIVE [20 marks]

- a) The 2nd and 5th terms of an arithmetic progression are 8 and 17 respectively. The 2nd, 10th and 42nd terms of the A.P. form the first three terms of a geometric progression. Find
- the 1st term and the common difference. (3mks)
 - the first three terms of the G.P and the 10th term of the G.P. (4mks)
 - The sum of the first 10 terms of the G.P. (3mks)
- b) Given $f(x) = 2x + 3$ and $g(x) = -x^2 + 5$, find $(f \circ g)(x)$ (7marks)
- c) Simplify $\frac{6!}{2} + \frac{4!}{3}$ (3 marks)