



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES
SCHOOL OF NATURAL AND APPLIED SCIENCES
DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

QUALIFICATION: Bachelor of science; Bachelor of science in applied mathematics and Statistics	
QUALIFICATION CODE: 07BOSC; 07BSAM	LEVEL: 5
COURSE CODE: AAT501S	COURSE NAME: ALGEBRA AND TRIGONOMETRY
SESSION: JUNE 2023	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	MRS L. KHOA Mr G. MBOKOMA
MODERATOR:	DR S.N. NEOSSI NGUETCHUE

INSTRUCTIONS
1. Answer ALL the questions in the booklet provided. 2. Write clearly and neatly. 3. All written work must be done in blue or black ink.

PERMISSIBLE MATERIALS

1. Non-programmable calculator without a cover.

THIS QUESTION PAPER CONSISTS OF 3 PAGES (Including this front page)

QUESTION 1 [12 Marks]

Workout the following without a calculator:

- (a) i^{925} [2]
- (b) Solve for x and y if $x - y + (x + y)i = 2x - 2 + (y + 5)i$ [4]
- (c) $\frac{1 - i}{1 + i} + \frac{3 - 2i}{2 - 9i}$ leave your answer in the form $a + bi$ [6]

QUESTION 2 [20 Marks]

- (a) State whether the following are true or false [5]
- i) $2^x + 2^x = 2^{x+1}$
- ii) $\log(a - b) = \frac{\log a}{\log b}$
- iii) $\log(1 + 2 + 3) = \log 1 + \log 2 + \log 3$
- iv) $a \log_a a^a = a$
- v) $(\log_a b^2)(\log_b a^3) = 6$
- (b) Solve: $\log_3 y - 2 \log_y 3 = 1$ [6]
- (c) Solve: $\log x + \log(x + 3) = 1$ [6]
- (d) Solve: $10^{2x-3} = \frac{1}{100}$ [3]

QUESTION 3 [30 Marks]

Solve:

- (a) $2 - 4x \leq |3 + 5x|$ represent the solution on a number line [5]
- (b) $cx^2 + ax = 0$ by completing the square [6]
- (c) $z^2 < 3z$ and represent your answer in interval notation as well as on a number line [8]
- (d) $\frac{1}{x} + \frac{1}{y} = -\frac{3}{10}$ and $\frac{1}{x} - \frac{1}{y} = -\frac{7}{10}$ [6]
- (e) For what value(s) of p does the equation $4x^2 - (p - 2)x + 1 = 0$ have equal roots? [5]

QUESTION 4 [11 Marks]

(a) Evaluate $\sum_{n=0}^{55} 3n$ without a calculator [5]

(b) Use the binomial theorem to find the coefficients of x in the expansion of $\left(x^2 + \frac{2}{x}\right)^8$ [6]

QUESTION 5 [11 Marks]

Decompose the following into their partial fractions:

(a) $\frac{x+3}{x(x^2-1)}$ [7]

(b) $\frac{x}{(x+1)(x-2)}$ [4]

QUESTION 6 [16 Marks]

(a) Prove the following Trigonometric identities:

i) $1 + \sin 2\theta = (\sin \theta + \cos \theta)^2$ [3]

ii) $\sin \theta = 2 \sin \frac{\theta}{2} \cos \frac{\theta}{2}$ [2]

(b) Solve the following trigonometric equations for x in the interval $[0^\circ, 360^\circ]$

i) $3 \sin x - 4 = 5 \sin x - 3$ [4]

ii) $4 \cos^2 x - 1 = 0$ [7]

TOTAL MARKS: 100

END OF PAPER