

**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY
FACULTY OF HEALTH AND APPLIED SCIENCES**

DEPARTMENT OF MATHEMATICS AND STATISTICS

QUALIFICATION: Bachelor of science ; Bachelor of science in Applied Mathematics and Statistics	
QUALIFICATION CODE: 07BOSC; 07BAMS	LEVEL: 5
COURSE CODE: SAT501S	COURSE NAME: SETS, ALGEBRA AND TRIGONOMETRY
SESSION: JUNE 2019	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER	MRS. L. KHOA MR. G. TAPEDZESA
MODERATOR:	DR. S.N. NEOSSI NGUETCHUE

INSTRUCTIONS
<ol style="list-style-type: none">1. Answer ALL the questions in the booklet provided.2. Show clearly all the steps used in the calculations.3. All written work must be done in blue or black ink and sketches must be done in pencil.

PERMISSIBLE MATERIALS

1. Non-programmable calculator without a cover.

THIS QUESTION PAPER CONSISTS OF 4 PAGES (Including this front page)

QUESTION 1 [5 Marks]

State whether the following are true or false:

- a) $e^{\ln e} = 1$ [1]
- b) $\log_a a^a = a$ [1]
- c) $\log(a - b) = \log a - \log b$ [1]
- d) If $y = \log_a x$ then $y^x = a$ [1]
- e) $2 \log \sqrt{2} = \log 2$ [1]

QUESTION 2 [19 Marks]

Workout the following without a calculator:

- a) $\frac{2+i}{i(-1+i)}$ leave your answer in the form $a + bi$ [4]
- b) $\sqrt{243} + \sqrt{81} - \sqrt{128} - \sqrt{200} - \sqrt{300} - 2\sqrt{16}$ leave your answer in simplified root form. [3]
- c) Rationalize the denominator: $\frac{3 - \sqrt{3}}{3 + \sqrt{3}}$ [4]
- d) $\sqrt{\left[\frac{r^2 s^{\frac{3}{4}}}{r^{\frac{1}{3}} s^{-1}}\right]^{-4}}$ leave your solution with positive exponents [4]
- e) Evaluate $3\binom{6}{2} - 2\binom{8}{2}$ [4]

QUESTION 3 [29 Marks]

- a) The product of two positive consecutive odd numbers is 5183. What are the two numbers? [7]
- b) Solve $3(3x - x^2) \geq 3 - x$ give your answer in interval notation. [7]
- c) $\log_2 x > \log_2(4 - x)$ represent your solution on a number line and in interval notation. [5]
- d) Solve $2xy = -10$ and $x + y = 4$ simultaneously [6]
- e) Solve: $\frac{4}{x+1} + \frac{5}{x-1} = \frac{3}{2x^2-2}$ [4]

QUESTION 4 [13 Marks]

- a) Given the arithmetic sequence: 4, 7, 10, 13, ...
 - i) Find the 14th term [4]
 - ii) Find n if $a_n = 301$ [3]
 - iii) Find the sum of the first 100 terms [3]
- b) Find $\sum_{k=1}^{\infty} 16(0.1)^{k-1}$ [3]

QUESTION 5 [11 Marks]

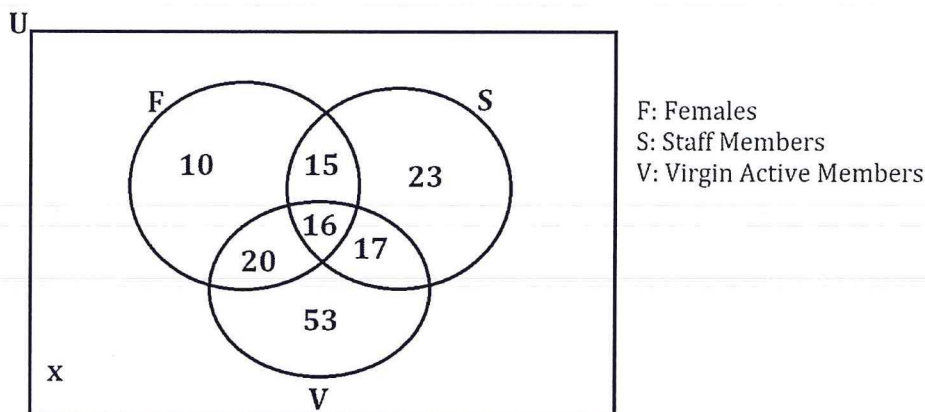
- a) Find the coefficient of the x^2 in the expansion of $(\frac{1}{x^2} + 3x)^5$ [4]
- b) Consider the sequence: 0.2, 0.02, 0.002, ...
Find:
 - i) Common ratio [2]
 - ii) A formula for the n^{th} term a_n and state whether the sequence is geometric or arithmetic [3]
 - iii) The 20^{th} term in the sequence [2]

QUESTION 6 [12 Marks]

- a) Prove the following Trigonometric identity:
 $(\sin x + \cos x)^2 = 1 + \sin(2x)$ [4]
- b) Find the exact value of $\sin 105^\circ$ and $\cos 105^\circ$ without using a calculator, leave your answer with a rational denominator [8]

QUESTION 7 [11 Marks]

Virgin Active interviewed 200 NUST Students and Staff members to find out how many of them are currently members of Virgin Active. The information was summarized in a Venn diagram as seen below:



From the Venn Diagram

- a) What is x ? [1]
- b) How many female staff members were interviewed? [1]
- c) How many male students are members of Virgin Active? [1]
- d) How many staff members are not part of Virgin Active? [1]
- e) How many Males are not Virgin Active members? [1]
- f) How many staff members are Virgin Active members? [1]
- g) From those interviewed, how many members does Virgin Active have? [1]
- h) How many female students are part of Virgin Active? [1]

- i) From those interviewed, how many are male or staff member? [1]
j) How many Female students were interviewed? [1]
k) How many male students were interviewed? [1]

TOTAL MARKS: 100

END OF PAPER