

BONDO UNIVERSITY COLLEGE
1ST YEAR 1ST SEMESTER EXAMINATION
SMA 2111: MATHEMATICS I

INSTRUCTION: Answer question one (**compulsory**) and any other two questions only.

QUESTION ONE (COMPULSORY) [30 MARKS]

- (a). Define the following terms: Set, Subset, Equal sets. (6 marks)
- (b). Solve the quadratic equation $x^2 - 5x + 6 = 0$. (3 marks)
- (c). Given that $U = \{1, 2, 3, 4, 5\}$, $A = \{1, 3, 4\}$, $B = \{2, 3, 5\}$ and $C = \{1, 4\}$. Find A^c , $A \cup B^c$ and $B \cap C$. (6 marks)
- (d). In triangle ABC, AB=5 cm, $\angle BAC = 90^\circ$ and CB=13 cm. Find the length of AC and $\angle ACB$. (3 marks)
- (e). Show that $\cos^2\theta + \sin^2\theta = 1$. (4 marks)
- (f). Simplify: (i) $\frac{3}{2-\sqrt{2}}$ and (ii) $\frac{(xy)^3z^4}{(xz)^2}$. (5 marks)
- (g). Given the set of numbers: 2, 2, 3, 5, 5, 7, 8. Find the mean and median of this set. (3 marks)

QUESTION TWO [20 MARKS]

- (a). Define: Function, Codomain and Range. (6 marks)
- (b). A research conducted on the disease attacks habits among 112 Bondo district people gave the following data in respect of two types of diseases:
Malaria.....53
Typhoid.....99
Both Malaria and Typhoid.....41
- (i). Present this information diagrammatically. (4 marks)
- (ii). Find the number of people who were attacked by malaria only. (3 marks)
- (iii). Find the number of people who were attacked by typhoid only. (3 marks)
- (iv) Find the number of people who were not attacked at all. (4 marks)

QUESTION THREE [20 MARKS]

- (a). Expand $(1 - x)^7$ up to the fourth term and hence use the expansion to find $(0.99)^7$. (6 marks)
- (b) Find the mean and the variance of 6, 7, 10, 11, 11, 13, 16, 18, 25.
(5 marks)
- (c) Distinguish between a sequence and series. (4 marks)
- (d) Find the fourth term and the sum of the first five terms of the geometric series $20+10+5+\dots$ (5 marks)

QUESTION FOUR [20 MARKS]

- (a). The three sides of a right triangle form three consecutive even numbers. Find the length of the hypotenuse in centimeters. (6 marks)
- (b). Differentiate between Permutation and Combination. (4 marks)
- (c). How many different ways can we arrange the letters of the word MATHEMATICS (4 marks)
- (d). Simplify $\frac{5+2i}{4-2i}$ leaving your answer in the form $a + bi$. (6 marks)

QUESTION FIVE [20 MARKS]

- (a). Derive the general quadratic formula. (10 marks)
- (b). Use the formula in (a) above to solve $x^2 + 2x + 1 = 0$. (5 marks)
- (c). Solve for the unknowns in the system of simultaneous equations below using substitution method (5 marks)

$$7x - 2y = 47$$

$$2x + 5y = 19.$$