# Additional Mathematics Notes:

## Sequences and Series (WASSCE Edition)

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## 1. Introduction to Sequences and Series

A sequence is an ordered list of numbers following a definite rule or pattern. Each number in a sequence is called a term. A series is the sum of the terms of a sequence. Common types include Arithmetic Progressions (A.P.) and Geometric Progressions (G.P.).

## 2. Arithmetic Progression (A.P.)

An arithmetic progression (A.P.) is a sequence where the difference between any two consecutive terms is constant. Common difference = d. Formula for nth term: a■ = a + (n – 1)d Sum of n terms: S■ = n/2[2a + (n – 1)d] or S■ = n/2(a + l) Example: Find the 10th term of 5, 9, 13, 17,… Solution: a = 5, d = 4, n = 10 → a■■ = 5 + (10 – 1)×4 = 41

## 3. Geometric Progression (G.P.)

A geometric progression (G.P.) is a sequence where each term is obtained by multiplying the previous term by a fixed number (r). Formula for nth term: a■ = ar■■¹ Sum of n terms: S■ = a(r■ – 1)/(r – 1) Sum to infinity (if |r| < 1): S∞ = a/(1 – r) Example: Find S■ for 3, 6, 12, 24,… Solution: a = 3, r = 2, n = 5 → S■ = 3(2■ – 1)/(2 – 1) = 93

## 4. Arithmetic Mean and Geometric Mean

Arithmetic Mean (A.M.): A = (a + b)/2 Example: Between 10 and 26 → A = 18 Geometric Mean (G.M.): G = √(ab) Example: Between 4 and 9 → G = 6

## 5. Applications

Example 1: Ama saves ■50 monthly, increasing by ■20 each month. Find total in 12 months: S■■ = 6[100 + 220] = ■1,920 Example 2: Population = 2000, increases 5% yearly. After 4 years: a■ = 2000 × (1.05)³ = 2315.2

## Summary of Key Formulas

| Type | Formula | Meaning |
|---|---|---|
| nth term of A.P. | a■ = a + (n – 1)d | Find any term |
| Sum of A.P. | S■ = n/2[2a + (n – 1)d] | Add terms |
| nth term of G.P. | a■ = ar■■¹ | Multiply by r |
| Sum of G.P. | S■ = a(r■ – 1)/(r – 1) | Total up to n |
| Infinite G.P. | S∞ = a/(1 – r) | If \|r\| < 1 |

| | | |
|---|---|---|
| A.M. | A = (a + b)/2 | Average in A.P. |
| G.M. | G = √(ab) | Average in G.P. |

## Practice Questions (With Answers)

1. Find the 15th term of 7, 10, 13, 16,… → a■■ = 49 2. Sum of first 12 terms of 4, 9, 14, 19,… → S■■ = 378 3. 8th term of 2, 6, 18, 54,… → a■ = 4374 4. Sum to infinity of 10, 5, 2.5,… → S∞ = 20 5. Between which two numbers is 24 the A.M.? → 18 and 30

**Final Note:** Mastering Sequences and Series strengthens logical reasoning and forms the base for higher mathematical studies.