

## Sequences and series / HL [68 marks]

1. [Maximum mark: 5] 22N.2.SL.TZ0.4  
geometric sequence has a first term of 50 and a fourth term of 86. 4.

The sum of the first  $n$  terms of the sequence is  $S_n$ .

Find the smallest value of  $n$  such that  $S_n > 33\,500$ . [5]

2. [Maximum mark: 6] EXN.1.SL.TZ0.4  
The first three terms of an arithmetic sequence are  $u_1$ ,  $5u_1 - 8$  and  $3u_1 + 8$ .

(a) Show that  $u_1 = 4$ . [2]

(b) Prove that the sum of the first  $n$  terms of this arithmetic sequence is a square number. [4]

3. [Maximum mark: 5] 20N.1.AHL.TZ0.H\_5  
The first term in an arithmetic sequence is 4 and the fifth term is  $\log_2 625$ .

Find the common difference of the sequence, expressing your answer in the form  $\log_2 p$ , where  $p \in \mathbb{Q}$ . [5]

4. [Maximum mark: 5]

22M.1.SL.TZ2.2

The  $n^{\text{th}}$  term of an arithmetic sequence is given by  $u_n = 15 - 3n$ .

- (a) State the value of the first term,  $u_1$ . [1]
- (b) Given that the  $n^{\text{th}}$  term of this sequence is  $-33$ , find the value of  $n$ . [2]
- (c) Find the common difference,  $d$ . [2]

5. [Maximum mark: 5]

21M.2.SL.TZ2.3

An arithmetic sequence has first term 60 and common difference  $-2$ . 5.

- (a) Given that the  $k^{\text{th}}$  term of the sequence is zero, find the value of  $k$ . [2]
- (b) Let  $S_n$  denote the sum of the first  $n$  terms of the sequence.  
Find the maximum value of  $S_n$ . [3]

6. [Maximum mark: 6]

19N.1.SL.TZ0.S\_1

In an arithmetic sequence,  $u_2 = 5$  and  $u_3 = 11$ .

- (a) Find the common difference. [2]
- (b) Find the first term. [2]
- (c) Find the sum of the first 20 terms. [2]

7. [Maximum mark: 7]

19N.2.SL.TZ0.S\_5

The first two terms of a geometric sequence are  $u_1 = 2.1$  and  $u_2 = 2.226$ .

- (a) Find the value of  $r$ . [2]
- (b) Find the value of  $u_{10}$ . [2]
- (c) Find the least value of  $n$  such that  $S_n > 5543$ . [3]

8. [Maximum mark: 7]

18M.2.SL.TZ2.S\_4

The first term of an infinite geometric sequence is 4. The sum of the infinite sequence is 200.

- (a) Find the common ratio. [2]
- (b) Find the sum of the first 8 terms. [2]
- (c) Find the least value of  $n$  for which  $S_n > 163$ . [3]

9. [Maximum mark: 5]

17M.1.AHL.TZ2.H\_3

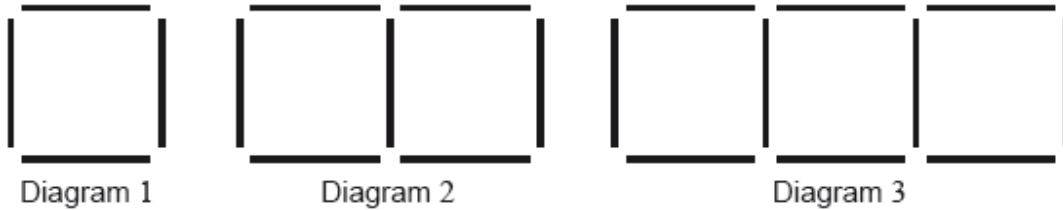
The 1st, 4th and 8th terms of an arithmetic sequence, with common difference  $d$ ,  $d \neq 0$ , are the first three terms of a geometric sequence, with common ratio  $r$ .  
Given that the 1st term of both sequences is 9 find

- (a) the value of  $d$ ; [4]
- (b) the value of  $r$ ; [1]

10. [Maximum mark: 6]

17M.1.SL.TZ2.T\_5

Tomás is playing with sticks and he forms the first three diagrams of a pattern.  
These diagrams are shown below.



Tomás continues forming diagrams following this pattern.

Tomás forms a total of 24 diagrams.

- (a) Diagram  $n$  is formed with 52 sticks. Find the value of  $n$ . [3]
- (b) Find the total number of sticks used by Tomás for all 24 diagrams. [3]

11. [Maximum mark: 5]

18N.2.AHL.TZ0.H\_1

Consider a geometric sequence with a first term of 4 and a fourth term of  $-2.916$ .

- (a) Find the common ratio of this sequence. [3]
- (b) Find the sum to infinity of this sequence. [2]

12. [Maximum mark: 6]

16N.1.SL.TZ0.T\_10

A hydraulic hammer drives a metal post vertically into the ground by striking the top of the post. The distance that the post is driven into the ground, by the  $n$ th strike of the hammer, is  $d_n$ .

The distances  $d_1, d_2, d_3 \dots, d_n$  form a geometric sequence.

The distance that the post is driven into the ground by the first strike of the hammer,  $d_1$ , is 64 cm.

The distance that the post is driven into the ground by the second strike of the hammer,  $d_2$ , is 48 cm.

- (a) Find the value of the common ratio for this sequence. [2]
- (b) Find the distance that the post is driven into the ground by the eighth strike of the hammer. [2]
- (c) Find the **total depth** that the post has been driven into the ground after 10 strikes of the hammer. [2]