

**IB Math Studies 1 BELL WORK**

1) Find the first term of the geometric sequence  
2, 6, 18, 54, .... which exceeds 10 000.

2) Find the first term of the geometric sequence  
4,  $4\sqrt{3}$ , 12,  $12\sqrt{3}$ , .... which exceeds 4800.

**Chapter**

# 5

## **Sequences and series**

- A** Number sequences
- B** The general term of a number sequence
- C** Arithmetic sequences
- D** Geometric sequences
- E** Series
- F** Compound interest
- G** Depreciation

**Syllabus reference: 1.7, 1.8, 1.9**

**E****SERIES**

A **series** is the addition of the terms of a sequence.

21, 23, 25, 27, ..., 49 is an arithmetic sequence.

$21 + 23 + 25 + 27 + \dots + 49$  is an arithmetic series.

For the sequence  $\{u_n\}$  the corresponding series is  $u_1 + u_2 + u_3 + \dots$

The **sum** of a series is the result when we perform the addition.

Given a series which includes the first  $n$  terms of a sequence, its sum is  
$$S_n = u_1 + u_2 + u_3 + \dots + u_n .$$

## SUM OF AN ARITHMETIC SERIES

Find the sum of the series:

$$4 + 6 + 8 + \dots + 26$$

$$= 180 = S_n$$

$$\begin{array}{cccccccccccccccc} 4, & 6, & 8, & 10, & 12, & 14, & 16, & 18, & 20, & 22, & 24, & 26 \\ 26, & 24, & 22, & 20, & 18, & 16, & 14, & 12, & 10, & 8, & 6, & 4 \end{array} = 180$$

$$\frac{30 \ 30 \ 30 \ 30 \ 30 \ 30 \ 30 \ 30 \ 30 \ 30 \ 30 \ 30 \ 30}{12} = 2 S_n$$

$$2 S_n = 12 (4 + 26)$$

$$S_n = \frac{12}{2} (4 + 26)$$

$$S_n = \frac{n}{2} (u_1 + u_n)$$

The sum is referred to as  $S_n$ .

For this series, list  $u_1$ ,  $d$ ,  $n$ , and  $u_n$ .

$$4 + 6 + 8 + \dots + 26$$

You try it. Find the sum of the series.

$$9 + 12 + 15 + \dots + 30$$

$$S_n = \frac{8}{2} (9 + 30) \\ = 156$$

$$d = 3$$

$$u_1 = 9$$

$$u_n = 30$$

$$n = 8$$

The sum of an arithmetic series with  $n$  terms is

$$S_n = \frac{n}{2}(u_1 + u_n) \quad \text{or} \quad S_n = \frac{n}{2}(2u_1 + (n - 1)d).$$



Find the sum of  $4 + 7 + 10 + 13 + \dots$  to 50 terms.

$$d = 3$$

$$u_1 = 4$$

$$n = 50$$

$$S_n = \frac{50}{2} (2(4) + (50-1)3)$$

$$S_n = 25(8 + 49(3))$$

$$25(8 + 147)$$

$$25(155)$$

$$S_n = 3875$$

Find the sum of  $-6 + 1 + 8 + 15 + \dots + 141$ .

$$d = 7$$

$$n = 21$$

$$u_1 = -6$$

$$u_n = 141$$

$$\frac{141}{7} = 21 \text{ jumps} \Rightarrow n = 22$$

$$S_n = \frac{22}{2} (-6 + 141)$$

Assignment:

5 E.1 # 4, 7