

# 1.2 Sequences & Series

## **Question Paper**

Course	DP IB Maths
Section	1. Number & Algebra
Topic	1.2 Sequences & Series
Difficulty	Medium

Time allowed: 110

Score: /86

Percentage: /100

## Question la

The second term, $u_2$ , of a geometric sequence is 44 and the third term, $u_3$ , is 55.	
(a) Find the common ratio, $r$ , of the sequence.	
	[2 marks]
Question 1b	
(b) Find the first term of the sequence, $u_1$ .	
	[2 marks]
Question 1c	
(c) Find $S_5$ , the sum of the first 5 terms of the sequence.	
	[2 marks]
Question 2a	
The sum of the first 16 terms of an arithmetic sequence is 920.	
(a) Find the common difference, $d$ , of the sequence if the first term is 27.5.	

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Question 2b	
(b) Find the first term of the sequence if the common difference, $d$ , is 11.	
	[3 marks]
Question 3a	
The sum of the first 5 terms of a geometric sequence is 461.12.	
(a) Find the common ratio, $r$ , of the sequence if the first term is 200, given that $r>$	· 0.
	[3 marks]

Question 2b

Question 3a

#### Question 3b

(b) Find the first term of the sequence if the common ratio, r, is -2. Give your answer correct to 2 decimal places.

[3 marks]

#### Question 4a

The table below shows information about the terms of four different sequences  $a_n$ ,  $b_n$ ,  $c_n$  and  $d_n$ .

	n = 1	n = 2	n = 3	n = 4
$a_n$		12	30	
$b_n$		12	30	
$c_n$	80			10
$d_n$	80			10

(a) Calculate  $a_1$ ,  $a_4$  and the common difference, d, given that  $a_n$  is an arithmetic sequence.

[2 marks]

#### **Question 4b**

(b) Calculate  $b_1$ ,  $b_4$  and the common ratio, r, given that  $b_n$  is a geometric sequence.

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[2 marks]

#### **Question 4c**

(c) Calculate  $c_2$ ,  $c_3$  and the common difference, d, given that  $c_n$  is an arithmetic sequence.

[2 marks]

## **Question 4d**

(d) Calculate  $d_2$ ,  $d_3$  and the common ratio, r, given that  $d_n$  is a geometric sequence.

[2 marks]

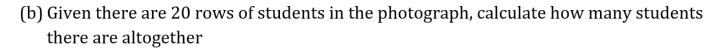
### Question 5a

Students are arranged for a graduation photograph in rows which follows an arithmetic sequence. There are 20 students in the fourth row and 44 in the 10th row.

- (a) (i) Find the common difference, d, of the arithmetic sequence.
  - (ii) Find the first term of the arithmetic sequence.

[3 marks]

#### **Question 5b**



[3 marks]

#### Question 6a

Marie is an athlete returning to running after an injury and wants to manage the number of kilometres she runs per week. She decides to run 4 km the first week and increase this by 1.5 km each week.

(a) Find the distance Marie ran in the 10th week.

[2 marks]

#### Question 6b

(b) Find the week in which Marie runs 26.5 km.



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[3 marks]

## Question 6c

Marie's coach says she can start preparing for her next race once she has run a total of 220 km.

(c) Find the week in which Marie will complete this.

[3 marks]

#### Question 7a

The eighth term,  $u_8$ , of an arithmetic sequence is 18 and the common difference, d, is 2.

- (a) (i) Find the first term of the arithmetic sequence.
  - (ii) Find the value of  $u_{17}$ .

[4 marks]

#### Question 7b

The first and 17th terms of the arithmetic sequence are the third and fifth terms respectively of a geometric sequence.

- (b) (i) Find the possible values for the common ratio, r, of the geometric sequence.
  - (ii) Find the first term of the geometric sequence.

[4 marks]

## **Question 8a**

In a geometric sequence,  $u_3 = 160$  and the common ratio, r, is  $\frac{1}{4}$ .

- (a) (i) Find the first term,  $u_1$ .
  - (ii) Find  $u_6$ .

[4 marks]

#### **Question 8b**

The first and third terms of the geometric sequence are the seventh and ninth terms respectively of an arithmetic sequence.

- (b) (i) Find the common difference, d, of the arithmetic sequence.
  - (ii) Find the first term of the arithmetic sequence.

[4 marks]

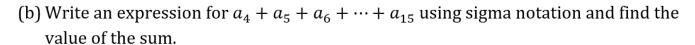
#### Question 9a

A sequence can be defined by  $a_n = 32 - 7n$ , for  $n \in \mathbb{Z}^+$ .

(a) Write an expression for  $a_1 + a_2 + a_3 + \cdots + a_{12}$  using sigma notation and find the value of the sum.

[3 marks]

#### Question 9b



[3 marks]

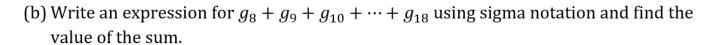
## Question 10a

A sequence can be defined by  $g_n = 4 \times 3^{n-1}$ , for  $n \in \mathbb{Z}^+$ .

(a) Write an expression for  $g_1+g_2+g_3+\cdots+g_{10}$  using sigma notation and find the value of the sum.

[3 marks]

#### **Question 10b**



[3 marks]

#### Question 11a

The kiwi is a flightless bird and is a national treasure in New Zealand. At the start of 2021 there were approximately 68 000 kiwi left, with the population decreasing by 2% every year.

(a) Find the expected population size of kiwis in 2030 assuming the rate of decrease in kiwi population remains the same.

[3 marks]

#### Question 11b

(b) Find the year in which the population of kiwis falls below 50 000 assuming the rate of decrease in kiwi population remains the same.



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[3 marks]

#### Question 12a

Aaron is working on his cycling in preparation for a triathlon event in 10 months. He cycles a total of 240 km in the first month and plans to increase this by 12.5% each month.

(a) Find the distance Aaron cycles in the fifth month of preparation.

[3 marks]

#### Question 12b

(b) Calculate the total distance Aaron cycles until the triathlon.

[3 marks]

## Question 13a

A geometric sequence has  $u_1 = 0.5$  and r = 3.

- (a) Find
  - (i)  $u_4$
  - (ii)  $S_5$ .

[2 marks]

## Question 13b

An arithmetic sequence has the same  $u_4$  and  $S_5$  as the geometric sequence above.

(b) Find  $u_1$  and d for the arithmetic sequence.

[4 marks]