

# Arithmetics sequences [42 marks]

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

1a. State the value of the first term,  $u_1$ . [1 mark]

1b. Given that the  $n^{\text{th}}$  term of this sequence is  $-33$ , find the value of  $n$ . [2 marks]

1c. Find the common difference,  $d$ . [2 marks]

2. Consider an arithmetic sequence where  $u_8 = S_8 = 8$ . Find the value of the first term,  $u_1$ , and the value of the common difference,  $d$ . [5 marks]

An arithmetic sequence has first term 60 and common difference  $-2.5$ .

3a. Given that the  $k^{\text{th}}$  term of the sequence is zero, find the value of  $k$ . [2 marks]

3b. Let  $S_n$  denote the sum of the first  $n$  terms of the sequence. Find the maximum value of  $S_n$ . [3 marks]

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

4a. Find the common difference. [2 marks]

4b. Find the first term. [2 marks]

4c. Find the sum of the first 20 terms. [2 marks]

Sergei is training to be a weightlifter. Each day he trains at the local gym by lifting a metal bar that has heavy weights attached. He carries out successive lifts. After each lift, the same amount of weight is **added** to the bar to increase the weight to be lifted.

The weights of each of Sergei's lifts form an arithmetic sequence.

Sergei's friend, Yuri, records the weight of each lift. Unfortunately, last Monday, Yuri misplaced all but two of the recordings of Sergei's lifts.

On that day, Sergei lifted 21 kg on the third lift and 46 kg on the eighth lift.

5a. For that day find how much weight was added after each lift. *[2 marks]*

---

5b. For that day find the weight of Sergei's first lift. *[2 marks]*

---

5c. On that day, Sergei made 12 successive lifts. Find the total combined weight of these lifts. *[2 marks]*

---

The 3rd term of an arithmetic sequence is 1407 and the 10th term is 1183.

6. Calculate the number of positive terms in the sequence. *[3 marks]*

---

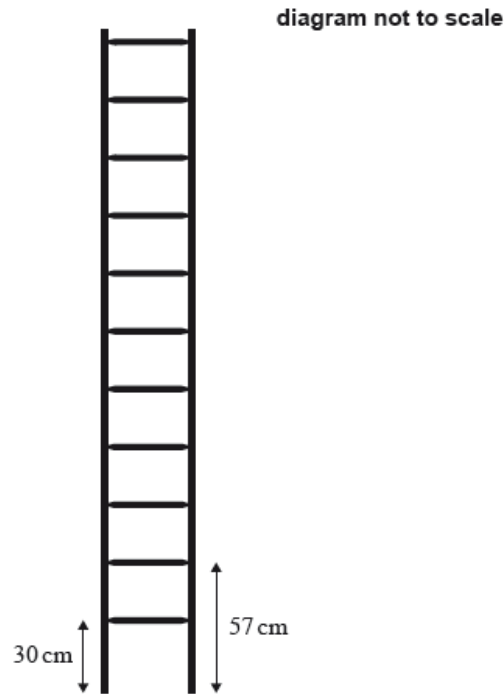
The company Snakezen's Ladders makes ladders of different lengths. All the ladders that the company makes have the same design such that:

the first rung is 30 cm from the base of the ladder,

the second rung is 57 cm from the base of the ladder,

the distance between the first and second rung is equal to the distance between all adjacent rungs on the ladder.

The ladder in the diagram was made by this company and has eleven equally spaced rungs.



7a. Find the distance from the base of this ladder to the top rung. [3 marks]

7b. The company also makes a ladder that is 1050 cm long. [3 marks]  
Find the maximum number of rungs in this 1050 cm long ladder.

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.

8a. Diagram  $n$  is formed with 52 sticks. Find the value of  $n$ . [3 marks]

Tomás forms a total of 24 diagrams.

8b. Find the total number of sticks used by Tomás for all 24 diagrams. *[3 marks]*

---

© International Baccalaureate Organization 2023

International Baccalaureate® - Baccalauréat International® - Bachillerato Internacional®



Printed for 2 SPOLECZNE LICEUM