



Arithmetic sequence

Objectives:

- Define arithmetic sequences and series.
- Use of the formulae for the n th term and the sum of the first n terms of the sequence.
- Use of sigma notation for sums of arithmetic sequences.

Exercise 1.

A sequence is defined by $u_n = 25 - 3n$

- a. Write down the first three terms of the sequence.

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- b. Calculate the 30th term of the sequence

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- c. Calculate the sum of the first 25 terms of the sequence

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Exercise 2.

A sequence is defined by $u_n = \frac{5n+3}{2}$

- a. Write down the first term u_1 and the common difference, d .

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- b. Write down the formula for the sum of the first n terms of this sequence

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- c. Calculate down the sum of the first 31 terms of the sequence.

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Exercise 3.

a. An arithmetic sequence has the first 3 terms $k - 1, 3k - 8, 2k$.

Find the value of k and hence find the sum of the first 25 terms of the sequence.

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b. An arithmetic sequence has the first terms $5, k^2 - 1, 4k - 1$.

Find two possible solutions for the sum of the first 10 terms of this sequence

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Exercise 4.

Find the formula for the n th term an arithmetic sequence given that $u_{20} = 88$ and $u_{25} = 108$.

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Exercise 5.

By first calculating the number of terms find the sum of

$$\frac{3}{11} + \frac{7}{22} + \frac{4}{11} + \dots + \frac{23}{11}.$$

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Exercise 6.

The sum of the first 3 terms of an arithmetic sequence is 69 and the sum of the first 5 terms is 130.

Find the first term and the common difference of the sequence.

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Exercise 7.

An arithmetic sequence is define as 4, 15, 26, 37, ...

Calculate the first term to exceed 500

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Exercise 8.

The sequence shown below is arithmetic

5, ... , ... , ... , ... , 26.

Find the missing numbers in the sequence

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Exercise 9.

Find the smallest value of n such that sum of the arithmetic sequence define by

$$u_n = \frac{4n+1}{3} \text{ exceeds } 100.$$

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Exercise 10.

The 5th term of an arithmetic sequence is 30, while the 13th term is 70.

a. Find the first term u_1 and the common difference d .

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b. Find the general term u_n in terms of n .

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c. Find the sum of the first n terms in terms of n

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d. Find the 20th term of the sequence and the sum of the first 20 terms.

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Exercise 11.

In an arithmetic sequence, let $S_1 = 10$, and $S_2 = 25$

a. Write down u_1 and u_2 .

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b. Find the common difference d .

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c. Find S_3 and S_4 .

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d. Find S_n in terms of n

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Exercise 12.

Calculate the following sums

a. $\sum_{r=1}^3 2r + 1$

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b. $\sum_{r=1}^{200} 2r + 1$

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c. $\sum_{r=4}^{200} 2r + 1$

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d. $\sum_{r=100}^{200} 2r + 1$

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Exercise 13.

Arturo goes swimming every week. He swims 200 metres in the first week. Each week he swims 30 metres more than the previous week. He continues for one year (52 weeks).

a. How far does Arturo swim in the final week?

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b. How far does he swim altogether?

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Exercise 14.

A theatre has 20 rows of seats. There are 15 seats in the first row, 17 seats in the second row, and each successive row of seats has two more seats in it than the previous row.

a. Calculate the number of seats in the 20th row.

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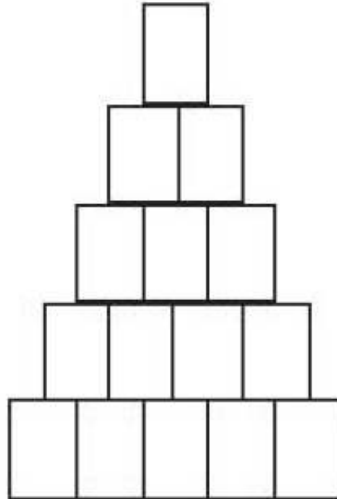
b. Calculate the **total** number of seats.

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Exercise 15.

Clara organizes cans in triangular piles, where each row has one less can than the row below.

For example, the pile of 15 cans shown has 5 cans in the bottom row and 4 cans in the row above it.



- a. A pile has 20 cans in the bottom row. Show that the pile contains 210 cans.

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- b. There are 3240 cans in a pile. How many cans are in the bottom row?

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- c. (i) There are S cans and they are organized in a triangular pile with n cans in the bottom row. Show that $n^2 + n - 2S = 0$.

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- (ii) Clara has 2100 cans. Explain why she cannot organize them in a triangular pile.

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