

# E2.7 Sequences

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 11 marks

**KEY WORDS** sequence 数列 •  $n$ th term 通项 • common difference 公差  
 • second difference 二阶差分 • exponential sequence 指数数列

## Objective

Build the skills to answer Extended exam questions on **sequences** 数列 — continuing a sequence and finding the  $n$ th term 通项 of a **linear** 线性, **quadratic** 二次, **cubic** 三次 or **exponential** 指数 sequence.

**You must be able to:**

- find the  $n$ th term of a linear sequence from its common difference
- recognise a quadratic sequence from its constant second difference and find its  $n$ th term
- recognise a cubic or an exponential sequence and write down its  $n$ th term

## 1 Worked examples

■ The differences tell you which kind of sequence it is



*A constant first difference means a linear sequence*

- **Linear:** constant FIRST difference  $d$ , so the  $n$ th term is  $dn + c$ . For 5, 8, 11, 14,  $d = 3$  and the  $n$ th term is  $3n + 2$ .
- **Quadratic:** constant SECOND difference. Half of it is the coefficient of  $n^2$ , then subtract  $an^2$  from each term and the remainder is linear. For 3, 8, 15, 24 the second difference is 2, so the  $n$ th term is  $n^2 + 2n$ .
- **Cubic:** the THIRD difference is constant. 1, 8, 27, 64 is  $n^3$ .
- **Exponential:** each term is the previous one  $\times r$ . For 2, 6, 18, 54 the  $n$ th term is  $2 \times 3^{n-1}$ .

**Answer shapes** (marked by **method marks** — M1 for a correct method, A1 for the correct answer): writing the difference row down is the method mark, and it also tells you which method to use.

## 2 Practice

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**2.1** Find the  $n$ th term of the sequence 7, 12, 17, 22, ... [2]

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**2.2** Write down the next two terms of the sequence 4, 12, 36, 108, ... [2]

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**2.3** Find the  $n$ th term of the sequence 3, 12, 48, 192, ... [2]

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## 3 Exam-style questions

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**3.1** The first five terms of a sequence are 2, 9, 20, 35, 54.

(a) Write down the next term. [1]

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(b) Find an expression for the  $n$ th term. [3]

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**3.2** Write down the  $n$ th term of the sequence 1, 8, 27, 64, ... [1]

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