Your notes

GCSE Maths: revision notes

Sequences and the nth term

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Term-to-term rules

- A **sequence** is a list of numbers in a pattern. The **term-to-term rule** tells you how to get from one **term** to the next: 7, 11, 15, 19 ... add 4.
- A **geometric sequence** multiplies by the same number (the **common ratio**) each time: 3, 6, 12, 24 ... × 2.

The nth term of a linear sequence

- In an arithmetic (linear) **sequence**, the difference between **terms** is the same.
- **nth term** = difference × n + (first **term** − difference). For 5, 8, 11, 14 the difference is 3, so the **nth term** is 3n + 2.
- For a decreasing **sequence** the difference is negative: 20, 17, 14, 11 has **nth term** 23 − 3n.
- Substitute to find any **term**: the 10th **term** of 4n − 1 is 39.

Is a number in the sequence?

- Set the **nth term** equal to the number and solve. If n is a whole number, it is in the **sequence**.
- 3n + 2 = 51 gives n = 49/3, which is not a whole number, so 51 is not a **term**.

Special sequences

- Square numbers: 1, 4, 9, 16...; cube numbers: 1, 8, 27, 64...; triangular numbers: 1, 3, 6, 10, 15...
- Fibonacci-type **sequences** add the two previous **terms**: 1, 1, 2, 3, 5, 8, 13...
- (Higher) **Quadratic sequences** have a constant second difference. The coefficient of n^2 is half the second difference: 2, 5, 10, 17... is $n^2 + 1$.

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Worked examples

Find the nth term of 5, 8, 11, 14, ...

Find the difference between terms: it goes up by 3, so the rule starts 3n. **3n**

Compare with 3n: 3, 6, 9, 12. Each term in the sequence is 2 more. **3n + 2**

Check: n = 1 gives 5 and n = 4 gives 14. ✓

Answer: 3n + 2

Is 100 a term in the sequence with nth term 3n + 2?

Set the nth term equal to 100. **3n + 2 = 100**

Solve it. **3n = 98, so n = 32.66...**

The position n has to be a whole number, and it isn't.

Answer: No, 100 is not in the sequence

Key terms

Sequence	A list of numbers that follow a rule.
Term	A number in a sequence.
Term-to-term rule	The rule for getting from one term to the next.
nth term	A formula that gives any term from its position n.
Arithmetic sequence	A sequence with a constant difference between terms.
Geometric sequence	A sequence where each term is multiplied by the same number.
Common ratio	The number each term is multiplied by in a geometric sequence.
Quadratic sequence	A sequence whose nth term includes n^2, with a constant second difference.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What is the next term of 5, 8, 11, 14?
2. What is the nth term of 5, 8, 11, 14?
3. What is the 10th term of 4n – 1?
4. What is the nth term of 20, 17, 14, 11?
5. Is 51 a term of the sequence with nth term 3n + 2?
6. What is the next term of 3, 6, 12, 24?
7. What is the next triangular number after 1, 3, 6, 10?
8. What is the next term of 1, 1, 2, 3, 5, 8?

Your notes

Answers

1. 17
2. 3n + 2
3. 39
4. 23 – 3n
5. No, because n would not be a whole number
6. 48
7. 15
8. 13

What to do next

Practise 12 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

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