Sequences: fact sheet

Planner week 2 · Learn these facts

Term-to-term rule



What you do to get from one term to the **next**

Rule: add 5. Next term 23

Going down



Find the difference. It can be **negative**

Rule: subtract 6. Next 73

Patterns



4, 7, 10, … goes up in 3s

Count each pattern, then find the rule

Pattern 4 has 13 counters

Finding the nth term

5×	5	10	15	20
	↓−2	↓−2	↓−2	↓−2
seq	3	8	13	18

nth term = 5n − 2

Write the times table **above** the sequence. How do you get from it to the sequence?

Check: n = 1 gives 3 ✓

Using the nth term

nth term 4n + 3

9th: 4 × 9 + 3 = 39

Put the term number in for n

1st term: 4 × 1 + 3 = 7

Is it in the sequence?

Is 21 in 3n + 4?

3n + 4 = 21 → n = 5.67

not a whole number → No

Set the nth term equal to the number and solve

Whole number → Yes.
Decimal → No

Fibonacci sequences

3 3 6 9 15

add the two before: 9 + 15 = 24

Each term is the **sum of the two before** it

1, 1, 2, 3, 5, 8, 13

Special sequences

Square	1, 4, 9, 16, 25, 36
Triangle	1, 3, 6, 10, 15, 21
Cube	1, 8, 27, 64, 125
Odd	1, 3, 5, 7, 9 ($2n − 1$)
Even	2, 4, 6, 8, 10 ($2n$)

Which sheet do I need?

Term-to-term rules and patterns ▸
next terms, patterns, the rule

The nth term ▸
"nth term", or "is … in the sequence?"

Key words

- **Term** a number in the sequence
- **Term-to-term rule** how to get the next term
- **nth term** a rule using the position n
- **Arithmetic** goes up or down by the same amount

Exam tips

- Write the **differences** above the gaps.
- "Explain why 50 is not in the sequence": say what all the terms have in common (e.g. they all end in 3 or 8) or solve and get a decimal.
- "Explain how you got your answer": write the **rule**, e.g. "add 7".
- For a far-away term (10th, 20th) use the **nth term** or keep adding: don't guess.
- **Check** your nth term: put n = 1 in and you should get the 1st term.
- $3n^2$ means $3 \times n^2$, not $(3n)^2$.

Term-to-term rules and patterns: fact sheet

Sequences · Planner week 2 · Learn the method

Worked example

QUESTION

Here are the first four terms of a sequence.

97 91 85 79

(a) Write down the next term. (b) Is 52 a term in this sequence? Give a reason.

ANSWER

1. Find the difference: 97 → 91 is −6, 91 → 85 is −6. The rule is **subtract 6**.
2. (a) 79 − 6 = 73
3. (b) Every term is an odd number. 52 is even.

(a) 73 (b) No, because 52 is even and all the terms are odd

Find the difference between the terms, then keep going.

How to do it

1. Work out the **difference** between each pair of terms.
2. Use the same rule to find the **next terms**.
3. For patterns, **count** each pattern and write the numbers as a sequence.
4. If the differences are not the same, look for another rule (×2, add the two before, …).
5. "Explain why … is not in the sequence": say what all the terms have in common.

Model answer ("explain how"):

73. No: all the terms are odd

Watch out

- Writing only the number: "explain" needs the **rule**.
- Counting the wrong thing in a pattern (squares vs circles).
- Forgetting a negative difference (97, 91, … goes **down**).

The nth term: fact sheet

Sequences · Planner week 2 · Work out which type it is, follow the example

1 Finding the nth term

Find the *n*th term of 3, 8, 13, 18.

5 times table	5	10	15	20
	↓ −2	↓ −2	↓ −2	↓ −2
sequence	3	8	13	18

1. Difference 5: linked to the **5 times table**, so start with
2. Write the 5 times table above the sequence
3. How do I get from the 5 times table to the sequence? **Subtract 2**
4. ***n*th term = $5n - 2$**

Use this when: 'find an expression for the nth term', 'in terms of n'

2 Using the nth term

The *n*th term of a sequence is $4n + 3$. Work out the 9th term.

$$4 \times 9 + 3$$

1. The 9th term means $n = 9$
2. Put 9 in for n: $4 \times 9 + 3$
3. $= 36 + 3 =$ **39**

Use this when: you are given the nth term and asked for a particular term

3 Is it in the sequence?

The *n*th term of a sequence is $3n + 4$. Is 21 a term of the sequence?

$$\begin{aligned} 3n + 4 &= 21 \\ -4 \quad & \quad -4 \\ 3n &= 17 \\ \div 3 \quad & \quad \div 3 \\ n &= 5.67 \end{aligned}$$

1. Set the nth term equal to 21
2. Solve: write the operation under both sides
3. $n = 5.67$ is not a whole number: **No**
4. A whole number answer means **Yes**

Use this when: 'is 50 in the sequence?', 'explain why … is not a term', 'which term is…?'

The big question

Do they want the **next few terms**, a **rule with *n*** in it, or to know if a number **is in** the sequence?

Next term: Term-to-term rules sheet. Rule with n, using the rule, or is it in: this sheet.

Careful: a far-away term (like the 50th) needs the nth term.

Watch out

- Writing $n + 5$ instead of $5n$.
- Getting the sign wrong: −5, 3, 11 is $8n - 13$.
- Saying "yes" when n comes out as a decimal.