

Growing and shrinking patterns; predict the next terms

CURRICULUM ALIGNMENT

ALG.PRR.3a

identify rules that describe the structure of a pattern and use these rules to make predictions.

INTERACTIVES Number Line · challenge, display, explore

WHAT THIS LESSON TEACHES

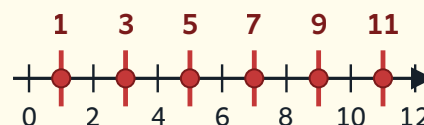
Each number in a pattern is a term – the number we land on, not the jump. A growing pattern gets bigger each time; a shrinking pattern gets smaller. The step is how much you add or take away to reach the next term.

- In 1, 3, 5, 7 the terms are 1, 3, 5, 7 and the step is +2 each time.
- In 20, 16, 12, 8 the pattern shrinks by taking away 4 each time.

MODEL THIS ON THE BOARD

STEADY +2 GROWING PATTERN

- 1 The terms already marked are 1, 3, 5, 7.
- 2 Each jump is the same: $3 - 1 = 2$, $5 - 3 = 2$, $7 - 5 = 2$, so the step is +2.
- 3 Add the same step twice more: $7 + 2 = 9$, then $9 + 2 = 11$.



DISCUSSION STARTER

REFLECT Was it easier to spot equal jumps or jumps that change each time? What helped?

LESSON ARC

Build a block staircase live with pattern blocks — 1, 3, 5 — and take real guesses for the 4th step before anyone names the rule. Move to the number line and walk four patterns, pivoting on what the gap between markers does: stays the same, grows, or shrinks. Pupils continue the staircase (9, 11) in their copy. The Try It Together and Class Challenge banks at the board test prediction, climaxing on a doubling pattern where the step itself grows.

TEACHING MOVES

1. **Getting Started.** Build the 1-3-5 staircase with pattern blocks as pupils settle, then take three or four genuine guesses for the 4th step. Hold the rule back — let them notice the climb of 2 themselves in the next beat. Resist the urge to confirm any guess yet.
2. **Watch and Notice.** Point at each gap on the number line and ask 'what do you notice?' before revealing the labelled jump. For 1, 3, 6, 10 draw out that the step grows by one; for 1, 2, 4, 8 contrast it sharply — 'this one doubles the last number, it isn't add-one-more-each-time'. Pause on the hands-up term-vs-step question before moving on.
3. **Build the Next Steps in Your Copy.** Pupils draw the next two staircase steps (9, then 11) and write the +2 beside each. Walk the room glancing only for the climb of 2 — this is a quick scan, not marking, so no individual corrections.

4. **Try It Together.** The line carries 3, 6, 9 (constant step). One pupil marks the next term while the watching class says the step rule aloud. Revoice a strong answer: 'so because the jump stayed the same, you landed the next one without counting all the way.'
5. **Class Challenge.** Pupils take turns at the board, place each marker and check it before the class confirms. Keep it brisk — don't re-explain each one. On the doubling pattern, just point: 'you can't count up in equal jumps here — double the last number.'
6. **What Did We Notice?.** Ask which grows faster — adding 2 or doubling. Press one pupil to name the term where doubling (1, 2, 4, 8, 16...) overtakes adding-2 (2, 4, 6, 8, 10...). Revoice: 'both start small, but doubling shoots ahead because its step keeps getting bigger.'

COMMON MISCONCEPTIONS

⚠ Asked for the step in 1, 3, 6, 10, pupils say '+2 every time' — they spotted the first gap and assumed the step is constant without checking the rest.

Mark all three gaps on the number line and label them +2, +3, +4 one at a time. 'Is every gap the same size? Look again.' Make them read each gap before deciding the step is constant.

⚠ Pupils call the jump the term — they point at the +2 and say 'the term is two', confusing the step with the number landed on.

On the number line, put a finger on the marker (the term) and a finger in the gap (the step) at the same time. 'This is where we land — the term. This is the jump — the step.' Re-run the on-screen hands-up question.

⚠ On the doubling pattern, pupils continue it by adding a constant amount (e.g. after 1, 2, 4, 8 they write 12, treating it as +4).

Stop and write the gaps aloud: +1, +2, +4. 'The jump itself is changing — it isn't add the same each time.' State the rule as 'double the last number' and have a pupil double 8 to get 16 at the board.

DIFFERENTIATION

EMERGING

- Stay on constant-step patterns only (2, 4, 6, 8 and 20, 16, 12, 8) for these pupils — leave the growing and doubling steps to the watch-and-notice demo.
- In the copybook staircase, let them draw the actual blocks for steps 9 and 11 rather than just writing the numbers, so the +2 is visible as a column.

DEVELOPING

- After the Class Challenge, give 2, 5, 11, 23 and ask: is the step constant, growing, or shrinking? (It doubles the gap.) What comes next?
- Ask them to predict the 7th term of 5, 10, 15 without writing every term in between — push them to use the rule, not count.

PROFICIENT

- At the board during fast-finisher moments, pose: a pattern adds 2 each time starting at 10; another doubles starting at 1. Which is bigger at the 6th term, and roughly when do they swap over? Have them justify aloud.
- Pull them ahead into the Student Activity Book and ask them to invent a shrinking pattern whose step also grows — then explain why the numbers don't shrink at a steady rate.

✂ **Cross-curricular:** Tie to STE — show how a row of cells dividing (1, 2, 4, 8...) is a real doubling pattern, the same rule pupils met on the number line.

ANSWER KEY

a) 17, 19, 21, 23, 25, 27

b) +5 each time

c) 20, 16, 12, 8, 4, 0

Q1: step +5; 33, 38

Q2: 15, 21

Spot: The jumps grow by 1 each time: +2, +3, +4, so the next jump is +5. $10 + 5 = 15$, not 13.

EXTENSION SHEET · STRETCH ANSWERS

S1: 53

S2: 56

S3: 63

S4: 75

S5: 66

Investigation: Invent a pattern — open-ended; scan pupils' working for valid solution paths rather than a single answer.