Lesson 105 ALGEBRA

Rules for patterns using words and tables

CURRICULUM ALIGNMENT

ALG.PRR.4a identify, explain and apply generalisations, including properties of operations, mathematical models and patterns.

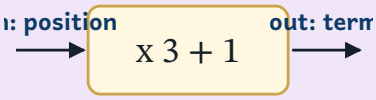
ALG.PRR.4b represent mathematical structures in multiple ways, including verbal expressions, diagrams and symbolic representations.

INTERACTIVES Function Machine · challenge, display, explore

WHAT THIS LESSON TEACHES

A **rule** links a term's **position** to its value. A table of position and value helps you find it.

→ Position × 4 − 1 gives 3, 7, 11, 15… (term n = 4n − 1).



MODEL THIS ON THE BOARD

FIND THE RULE FOR 4, 7, 10, 13, …

1. It goes up **3** each time, so the rule uses 3 × position.
2. Position 1 gives 4, so the rule is **3 × position + 1**.
3. Check position 4: 3 × 4 + 1 = 13. ✓

LESSON ARC

Display the growing tile pattern (3, 5, 7) and ask how many tiles pattern 10 needs without drawing — leave it open. Introduce the term-to-value machine: feed in 1, 2, 3, read the values, and pin the step between values to the multiplier. Build a two-row table on the board for the 4, 7, 10 pattern, agree the rule in words, then pupils copy the table and rule into their copies. Class Challenge cracks a few rules and leaps to far terms.

TEACHING MOVES

1. **Getting Started.** Display the three growing patterns (3, 5, 7 tiles) and give a full five seconds of quiet think-time before any hands. Take three answers for pattern 10 but do NOT confirm the right one — leave it open so the table earns its place next.
2. **Watch and Notice.** Run all three machine examples aloud, pointing at the +2, +3, +4 step between values each time and saying 'it grows by this much for every extra term, so that's the times-number'. Before feeding example 3's terms, ask 'what number do the values jump by?' and revoice a pupil's answer as the rule: step → multiplier, then check term 1 for the adjustment.
3. **Try It Together.** Send terms 4 and 5 through the machine for the 4, 7, 10 pattern and build the two-row table on the board as values land. Ask 'what is the step between values?' (3) before anyone names the full rule. Watch for pupils saying the rule is just 'add three' — that continues the pattern but can't leap; steer them to 'three times the term, then add one'.
4. **Build the Table in Your Copy.** Pupils draw the two-row table (term-number top, value bottom) for terms 1–5 and write the rule sentence underneath. Glance for two things as you walk: two clear rows, and a rule that says 'times the term number' not just 'add three'.

5. **Class Challenge.** Keep it brisk — pupils take turns at the board, probe one extra input to test the guess, then confirm the rule and check each answer as a class. After each rule lands, ask 'so what would term 10 be?' to practise the far-term leap. On the final challenge watch for pupils stopping at 'four times the term' and forgetting to take 2 off.
6. **What Did We Notice?.** Listen for pupils naming the step between values as the clue to the multiplier and revoice it: 'once we know the step, we know the times-number, the rest is the adjustment.' Push back gently on 'add the step each time' — ask how they'd reach term 50 with only that.

COMMON MISCONCEPTIONS

⚠ Pupils give the rule as 'add three each time' and think that's the whole rule — it continues the pattern but can't leap straight to term 50.

Accept it as a real observation, then challenge: 'what's term 50 then?' Watch them realise they'd have to list every step. Steer back to the table and the 'three times the term number' form, which jumps straight there.

⚠ On a pattern with a 'minus' adjustment, pupils spot the step is 4 and stop at 'four times the term number', forgetting to take 2 off — so term 1 comes out as 4, not 2.

Send term 1 back through the machine and compare: four times 1 is 4, but the value is 2. Ask 'what do we do to 4 to get 2?' so the minus-2 adjustment surfaces from the table itself.

DIFFERENTIATION

EMERGING

- Keep these pupils on the +2 pattern (3, 5, 7) at the board while the class moves to steeper steps — same machine, smaller jump to track.
- Pre-draw the two empty table rows with the term-numbers 1–5 already filled in, so pupils only fill the value row and read the step off.

DEVELOPING

- After their copybook table, hand them a pattern with a step of 5 and an adjustment, and ask them to find term 20 from the rule alone — no drawing.
- Pose a missing-value variant: 'term 4 gives 13, the step is 3 — what does term 1 give?' so they work the rule backwards.

PROFICIENT

- Pull them ahead into a teacher-narrated harder variant: 'a pattern's rule is five times the term minus 4 — which term gives a value of 51?' They work the rule in reverse to find the term number, then explain their method to the class.

Cross-curricular: Tie to Geography — pupils tabulate term-number against value for a real growing sequence like seats added per row in the Croke Park stands.

ANSWER KEY

W1: $\times 9$

W2: 8

Q1: $+11$

Q2: 15

Q3: $\times 6 + 4$

Q4: 68

EXTENSION SHEET · STRETCH ANSWERS

S1: 129

S2: $\times 3 + 6$

S3: 63

S4: $\times 3 + 8$

S5: $+13$