LEARNER GUIDE

Growing patterns

Quadratics. A short guide to walk beside you — read as much or as little as helps. *Connection before curriculum. Always.*

What this lesson is about

Some patterns grow by the same amount each time — 3, 5, 7, 9 goes up by 2 over and over. Those are the linear patterns you met with straight lines. This lesson is about a different kind: patterns that grow by more and more each time. Watch a square of dots grow — 1, then 4, then 9, then 16 — and the jumps between them are 3, then 5, then 7. Each jump is bigger than the last, so the pattern speeds up. A pattern that speeds up in this steady way is called a quadratic, and this is the first of its three faces: the number face, a growing sequence. You will build growing patterns from dots, work out the gaps (the first differences) between the terms, use those gaps to predict what comes next, and learn to tell a growing (quadratic) pattern apart from a steady (linear) one. There is no calculator today — the whole lesson is about looking at the jumps between the numbers. The question you are exploring is: when a pattern grows faster and faster, what stays steady underneath it?

What you are learning to notice

- That some number patterns grow by the same amount each time (steady, or linear), and some grow by more and more (growing, or quadratic).
- That the gaps between the terms — the first differences — tell you which kind of pattern you have.
- That in a growing pattern the gaps get bigger in a tidy, predictable way, which lets you work out the next term.
- That a pattern can go down and still be steady, as long as the gap never changes.

Moving through it, one step at a time

In Growing dots, pick a pattern and add one stage at a time; watch the dots — and the orange gaps between the terms — grow. In the Difference Machine, a sequence appears with its last term hidden: use the growing gaps to work out what comes next, pressing Show the gaps if it helps. In Steady or growing?, decide from the gaps alone whether each sequence is steady (linear) or growing (quadratic). The one habit to build is simple: write the gaps underneath the sequence and look at them.

Worked examples

Two full examples to follow. Read them slowly — the aim is to see how each line follows from the one before, not to memorise a rule. It can help to cover the steps and predict the next line before you reveal it.

Example 1 — predict the next term

This pattern is growing — the gaps get bigger. Write the gaps underneath, then use them to find the next term.



1. write the gaps underneath	4, 6, 8
2. the gaps grow by 2, so the next gap is	+10
3. add it to the last term	20 + 10

the next term is 30

Example 2 — steady or growing?

Always check the gaps first. If they are all equal, the pattern is steady (linear) — and the next term is just one more gap.



1. write the gaps underneath	4, 4, 4
2. the gaps are all equal, so this is	steady (linear)
3. add one more gap of 4	17 + 4

steady (linear) — the next term is 21

A gentle reminder

You can pause. You can return. You do not need to complete everything in one sitting.

If you get stuck

Getting stuck is part of doing mathematics, not a sign that something is wrong. There is support built into the lesson, and using it is a strong move:

- **Reconnection Routes** — if an earlier idea feels shaky (reading and continuing simple sequences, substituting a value into a rule (such as n^2), and squaring a number), open a short recap and return whenever you are ready.
- **Socratic prompt** — a question to nudge your thinking.
- **Hint** — a little more help with the step in front of you.
- **Check** — try an answer and see how you are doing; a wrong try is useful information.
- **Worked solution** — a full model to compare your thinking against.

How the worked solution unlocks

The worked solution unlocks after you use the Socratic prompt, use the hint, and check two answers. Those steps are the learning — the worked solution is there to confirm your thinking, not to replace it.

Using support is part of learning. It is not cheating.

Recording your thinking

You can show your working in whatever way suits you today — the on-screen Scratchpad, paper, a spoken explanation, or a photo of a sketch. There is no single right format. If you do not finish everything in one sitting, that is completely fine: what you have done is information for your next step, never a failure.

Before you begin

Settle into a comfortable pace and take the steps one at a time. If your attention drifts, pause and come back — the lesson will keep your place. When you are ready, begin.

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