



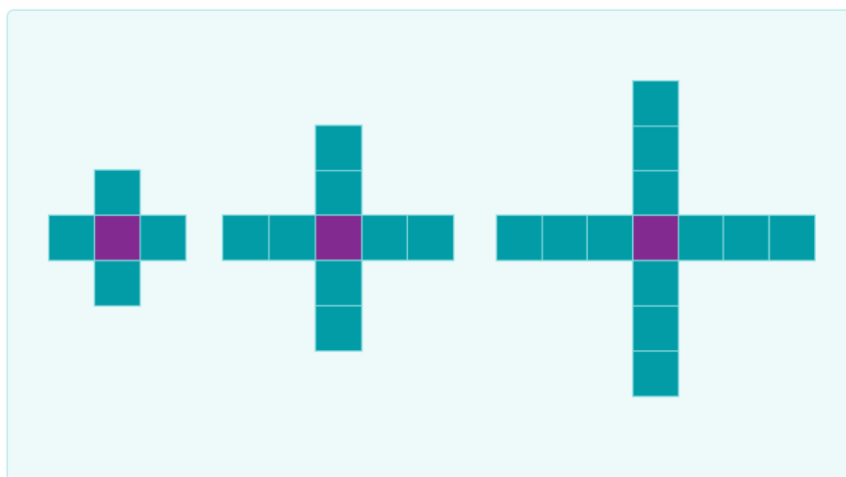
Exploring Growing Patterns

Part 1: Visual Patterns

Teacher notes

Why this activity: Visual patterns provide opportunities for students to explore early algebraic ideas in an engaging way. They also provide opportunities for students to reason and problem solve.

Explore: Present students with a visual growing pattern to investigate and explore. For example, present the below image to your students:



In pairs or small groups ask students to:

- predict and create the next image in the sequence (this could be drawn or modelled with concrete materials)
- explain what is happening each time
- identify the counting pattern

Discuss: After some time, bring the groups of students together to share their findings. Encourage students to explain their patterns, noting the various approaches used by students. For example, did students:

- add four each time (one to each 'arm')
- recognise counts of 5, 9, 13 and notice a difference of four each time
- see each arm expanding from 1s to 2s to 3s
- count the total as $1 + 1 + 1 + 1 + 1$; $1 + 2 + 2 + 2 + 2$; $1 + 3 + 3 + 3 + 3$
- find it challenging to explain the pattern, even though they have continued the pattern
- clearly explain their thinking



Note: It is important to note that students will be unlikely to represent the pattern above numerically or as an expression. The focus here is more to capture the thinking and process adopted by students and to encourage multiple ways to approach the same task.

For more visual patterns, head to: <https://www.visualpatterns.org/>

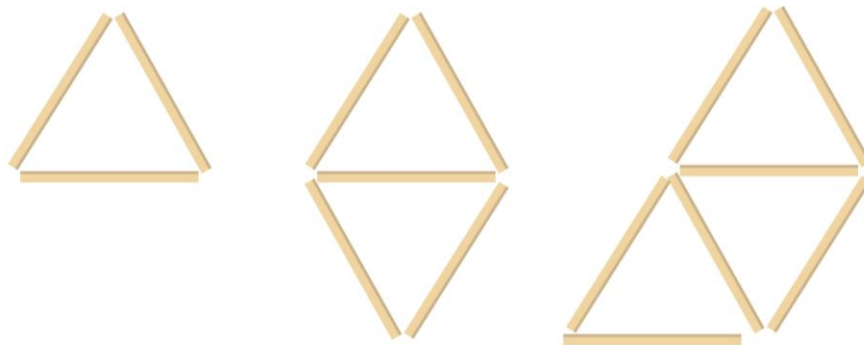
Part 2: Creating Growing Patterns

Teacher notes

Why this activity: Exploring geometric patterns helps students to see the pattern and allows them to interact and manipulate the patterns concretely.

Materials: Objects for creating growing patterns. E.g. matchsticks, counters, unifix.

Tune In: Present students with the following pattern.



Give students time to think about:

- What they notice
- What is happening in each step
- What predictions can be made. E.g:
 - What will the next (fourth) 'term' look like?
 - What about the fifth term?
 - What about the tenth?
- How could the whole pattern be described? E.g.
 - "Start with 3 and add 2 each time"

Explore: In pairs, take turns creating a hidden growing pattern made up of three steps. Describe the hidden pattern to your partner so they can replicate it. For the above example, the description might be: "Start with 3 matchsticks. Add 2 each time."



Part 3: Recording Growing Patterns

Teacher notes

Summary: Use visual prompts and classroom talks protocols to revise growing patterns and connect this to using tables.

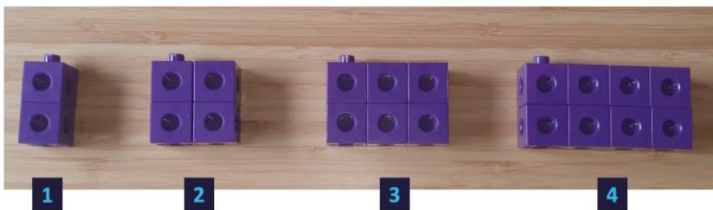
Why this activity: Give students the opportunity to make their own meaning when thinking about ways to record additive patterns. They will also see the usefulness of using tables to organise mathematical observations.

Materials:

- [Slides](#) and access to a slide projector
- A blank page for each student or a new page in their maths book
- Access to physical materials for making patterns

Lesson: Facilitate a classroom talk using the slides provided.

Discussion Part 1A: You will notice that both visual patterns begin with time to notice and wonder. This is an accessible question pair that allows everyone to engage with the visual and contribute to the discussion. It is likely that through this process, students will identify and describe key ideas that are relevant to the lesson.



Tip1: Provide 15-30 seconds of think time at each stage of the discussion. During this time, students refrain from raising their hand when they have an idea. Instead, they look and think for the entire time and see how many ideas they can come up with.

some example responses for image 1.

- Each set of blocks is labelled with a number
- I wonder why the number label doesn't match the total number of blocks in that set
- The number label doesn't match the number of blocks
- The number label matches the number of columns
- The number labels indicate position in the sequence
- Each step increases by 2
- Each set is a rectangle shape. The second set is also a square.
- I wonder how long the pattern goes on for

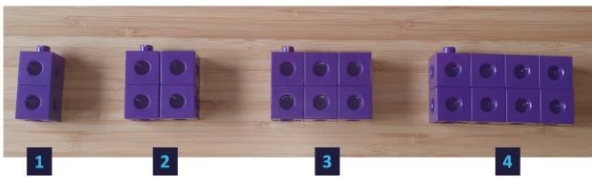
Invite students to share their ideas. Here are

Tip 2: When collecting responses, invite both noticings and wonderings at once. This will help the conversation to flow.



Discussion Part 1B: The second prompt is for the same visual and narrows into key ideas about pattern. It may well be that the answers to these questions came up in the 'notice and wonder' stage. Nevertheless, be sure to provide quite think time for *all* students to make sense of and answer one or both of the questions.

**How does the pattern change at each step?
What will the next step look like?**



Tip 3: When giving think time, let the group know that if they already have an answer to both questions, to spend the time thinking about a clear way to share their explanations verbally so that others will understand. This will help make sure that think time is productive for everyone.





Invite students to share their ideas. Ask students to clarify key vocabulary they use for the benefit of others, e.g:

- Term, Step, Position
- Element

Discussion Part 2A: The next image includes recording using a table. We begin with notice & wonder again to let students make sense, make connections and make meaning. Again, provide think time and then facilitate the sharing of ideas.

What do you notice here? What do you wonder?







Position	1	2	3	4	5	6
Element	 2	 4	 6	 8		



Discussion Part 2B: This part of the discussion incites students to evaluate the recording. It's an opportunity for them to think about how it makes sense, what is the purpose of the recording and share any ideas for how else it could be done.

Does this table recording make sense to you?
 What would you do the same?
 What would you do differently?

Position	1	2	3	4	5	6
Element	 2	 4	 6	 8		

Explore: Students have the opportunity to create their own growing patterns and record them in a way that makes sense to them, and to others.

As students work, observe how they are choosing to organise their patterns. Model curiosity about the different patterns

Share: It can be useful to share student ideas and recording samples part-way through the investigation. This gives the group access to others' ideas for organising and recording information.