NUMBER AND ALGEBRA

Tables and Chairs

Learning focus

- Explore growing patterns
- Devise rules to describe patterns and relationships
- Represent rules in symbolic form

Key vocabulary

- Pattern
- Sequence
- Growing
- Increasing
- Term
- Each time
- Always
- Rule
- Symbols

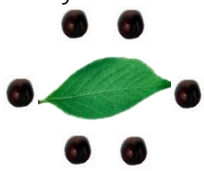
Resources

- Conkers
- Leaves
- Pencils, paper and clipboards
- Camera

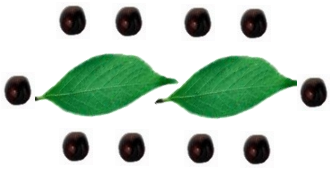
This is the third activity in a series of three activities on algebraic reasoning. The first is ‘Zeds’ and the second is ‘Star Sequence’.

Activity

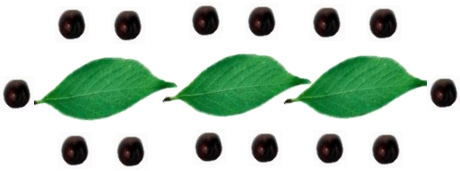
Introduce the problem by explaining that the caretaker needs to arrange some tables and chairs so that all the children in a class can sit together. Use natural resources such as leaves and conkers to show how many children can sit at one table.



Then remove the ‘chairs’ and add another ‘table’. Ask children to work out how many chairs can be seated around two tables.



Repeat for three tables.



Ask children to describe the pattern.

How is the pattern growing?
What do you notice?
What changes each time?
What stays the same?

Invite children to explore this growing pattern systematically and to keep track of their findings.

Number of tables	Number of chairs
1	6
2	10
3	14
4	18
5	22

Teaching point

Keeping a systematic record helps when looking for patterns and when explaining logic and reasoning.

Ask children to describe any patterns and relationships that they can see. Encourage plenty of discussion about the number of chairs. Children should notice that there is one chair at each end. They should also notice that each time a table is added, four more chairs are added (two on each side of the table), but no new chairs are placed at either end.

Teaching point

Exploring the construction of spatial patterns is a powerful tool in enabling children to generalise relationships.

Children should be able to deduce the sequential generalisation:

Add on 4 chairs each time.
Each time a table is added, we need 4 more chairs.

This is correct but encourage them to devise a rule connecting the number of tables with the number of chairs – a global generalization:

The total number of chairs is always 4 times the number of tables plus 2.
Multiply the number of tables by 4 and add 2 to find the total number of chairs.

This rule can be used to determine the total number of chairs that can be seated around any number of tables.

Teaching point

A sequential (or near) generalisation focuses on what changes each time in a sequence. It can be used to predict the next term in the sequence.

A global (or far) generalisation is a statement about what is the same; it does not change. It can be used to determine any term in the sequence. It is a much more powerful rule than the sequential generalisation.

It is important that children can devise a rule for finding the total number of chairs that can be seated around any number of tables. Now that they are able to express in words the rule for finding any term in the sequence, explain that there is a more efficient way of writing rules: using algebra.

Explain that in mathematics we often use letters to represent unknowns (or variables). Use the letter a to represent the 'number of tables' and the letter b to represent the 'number of chairs' in this growing pattern. Explain that a can be any number; and whatever number is chosen, the value of b is 4 times the value of a plus 2. So, the relationship (or formula) is $b = (4 \times a) + 2$.

The rule $b = (4 \times a) + 2$ for determining the number of chairs that can be seated around any number of tables is called a formula for finding the value of b. Use brackets to indicate which calculation should be done first. Later, children will omit the × and write $b = 4a + 2$

Teaching point

Algebra is a branch of mathematics in which letters are used to represent variables in order to express generalisations. Highlight that it does not matter what letters are chosen to represent the variables. However, avoid referring to, for example, 2a as '2 apples' and 3b as '3 bananas'; this can reinforce the idea that the letters stand for objects or specific numbers.

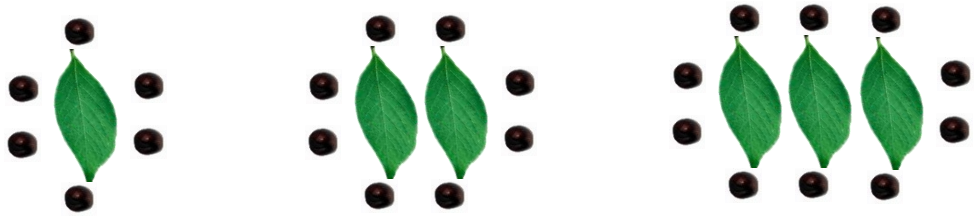
Pose questions which will challenge children's understanding of the growing pattern.

How many children can be seated around 10 tables? 25 tables?
How many tables are needed to accommodate a class of 24 children? 30 children?

Children should be able to explain their reasoning. They should also be able to explain that for some class sizes there will be empty seats.

Taking ideas further

Children could investigate other arrangements of tables and chairs. For example they could create this growing pattern:



They should be able to describe how their pattern is growing. Once they have created the first three or four terms, encourage them to record their findings in a table.

Take photographs of the different growing patterns. Invite children to share and discuss their growing patterns. Encourage them to devise rules for their growing patterns. They should also be able to explain why their rules make sense by relating them to the structure of the spatial pattern.

Encourage them to express their rules using symbolic notation.

Assessment opportunities

Are the children able to:

- Continue the spatial pattern correctly
- Describe how the spatial pattern is growing using appropriate vocabulary
- Use appropriate mathematical vocabulary to express rules for growing patterns
- Relate their rule to the structure of the spatial pattern
- Use symbolic notation to express rules for growing patterns
- Use and apply their understanding of rules to reason in problem solving situations