

# OUT AND ABOUT

## OUTDOOR ACTIVITIES FOR KEY STAGE 2 MATHEMATICS

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### NUMBER AND ALGEBRA

## Zeds

### Learning focus

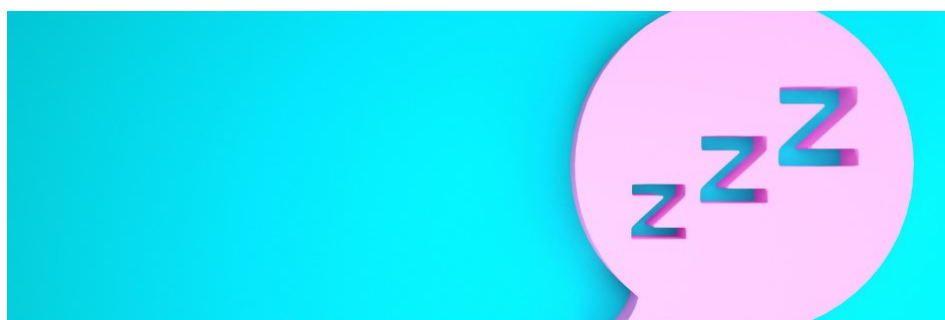
- Explore growing patterns
- Describe patterns and relationships using appropriate mathematical vocabulary
- Devise rules to express patterns and relationships

### Key vocabulary

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

### Resources

- Sticks
- Pencils, paper and clipboards
- Camera



This is the first activity in a series of three activities on algebraic reasoning. The second is 'Sequence of Stars' and the third is 'Tables and Chairs'.

### Activity

Invite one child to make the letter 'Z' using 3 sticks. Then invite other children to continue the pattern by making two letter 'Zs'; and then three letter 'Zs'.



Ask children to describe the pattern.

*How many sticks are in the first figure? The second? The third?*

*How is the pattern growing? What do you notice?  
What will the next figure look like?*

Encourage them to predict the number of sticks needed to make the 4<sup>th</sup> and 5<sup>th</sup> figures. Once they have given their predictions, invite two children to check by using more sticks to continue the pattern.

Work with the children to complete a table to record their findings.

Number of Zeds	Number of sticks
1	3
2	6
3	9
4	12
5	15

## 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 they can see. They are most likely to use a rule which refers to the increasing number of sticks in the right hand column.

*There are 3 more sticks each time.*

*Add on 3 each time.*

## 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.

This is correct but encourage them to look across the columns for a rule connecting the number of Zeds and the number of sticks. A rule such as 'times 3' or 'multiply by 3' should be suggested. Encourage the children to express this rule in a complete sentence.

*The number of sticks is always 3 times the number of Zeds.*

*Multiply the number of Zeds by 3 to find the number of sticks.*

## Teaching point

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.

This is an important step in the development of algebraic thinking. For children who need some extra support leave two blank spaces for the 6<sup>th</sup> and 7<sup>th</sup> figures and ask:

*How many sticks would you need for the 8<sup>th</sup> figure? How did you work this out?*

*Is there a way to work out how to make the 10<sup>th</sup> figure without making all the figures?*

## Teaching point

It can be tedious to extend the pattern to a figure further out in the sequence. The use of a 'large number' challenges children to look for the relationship between the term in the sequence and the number of elements (sticks) needed to make it.

## Taking ideas further

Now invite children to use sticks to create their own growing pattern of letters or shapes. For example, they could create a growing pattern using 'A' or a rhombus:



They should be able to describe how their pattern is growing.

Once they have created the first 3 or 4 figures, encourage them to record their findings in a table. Ask them to identify any patterns and relationships they can see.

Take photographs of the different growing patterns. Encourage them to explain their growing patterns using appropriate mathematical vocabulary.

As before, they may create a rule which refers to the increasing number of sticks. Encourage them to create a rule to determine the number of sticks needed for any number of figures. They could then use the rule to determine the number of sticks needed for other terms and check by using sticks or drawing pictures.

## Assessment opportunities

Are the children able to:

- Continue the spatial pattern correctly
- Describe how the spatial pattern is growing using appropriate vocabulary
- Predict the next few terms in the number sequence
- Record their results systematically in a table
- Use strategies to work out the relationship between the number of Zeds (the term in the sequence) and the number of sticks needed