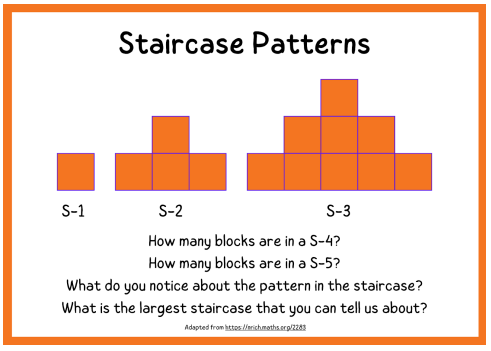
Up and Down Staircases

Stage	Strand	Strand Unit
4	Algebra	Patterns, Rules and Relationships

Learning Outcomes	Maths Concepts
• Through appropriately playful and engaging learning experiences, children should be able to identify, explain and apply generalisations, including properties of operations, mathematical models and patterns.	• Describing a real-life situation using words or symbols can be useful to solve problems or to determine values for unknown or future events. • A square number is what we get after multiplying an integer by itself. The square root of a number identifies what must be squared to get the number.

Learning Maths

This learning experience offers an engaging, practical context, to give learners the opportunity to explore, explain, predict and generalise patterns, while being introduced to square numbers. Learners build a one, two and three step staircase and count the number of blocks needed. They visualise and predict the number of blocks needed for a 4, 5 and 6 step staircase before building them and recording their results. They then proceed to write a rule to find the number of blocks in any step staircase.



Understanding and Connecting	Communicating	Reasoning	Applying and Problem Solving
The learner			
Quantifies the change in the number of blocks in the growing pattern.	Represents and records the growing pattern in a variety of ways.	Analyses the growing pattern. Justifies their predictions for the number of blocks in each staircase.	Uses knowledge of square number facts to find the number of blocks in any step staircase.

Teaching Maths

Fostering Productive Disposition

Give learners an opportunity to interact and work collaboratively with their peers, when exploring the problem.

Encouraging Playfulness with Mathematics

Provide concrete materials (whiteboards, cubes, blocks, paper etc.) to enable learners to explore the growing pattern.

Emphasising Mathematical Modeling

Encourage learners to use a variety of models to represent their thinking and celebrate creativity in working with mathematical models.

Allow learners to describe their rule in a variety of ways e.g. orally, words (You square the staircase number to find the number of blocks) or using a combination of words, letters or symbols, e.g. Staircase 2 = 2 squared.

Using Cognitively Challenging Tasks

Stretch and deepen the learners' understanding by encouraging them to apply the rule to find the number of cubes needed for a 20 step staircase.

Provide opportunities for learners to collectively share and evaluate their experience from working with this task.

Promoting Maths Talk

Use skilful, thoughtful questioning to enable learners to explore the pattern and identify changes -

- What is changing/ staying the same?
- What do you notice about the number of the staircase and the number of blocks?
- How will you track the number of blocks used and the staircase number?

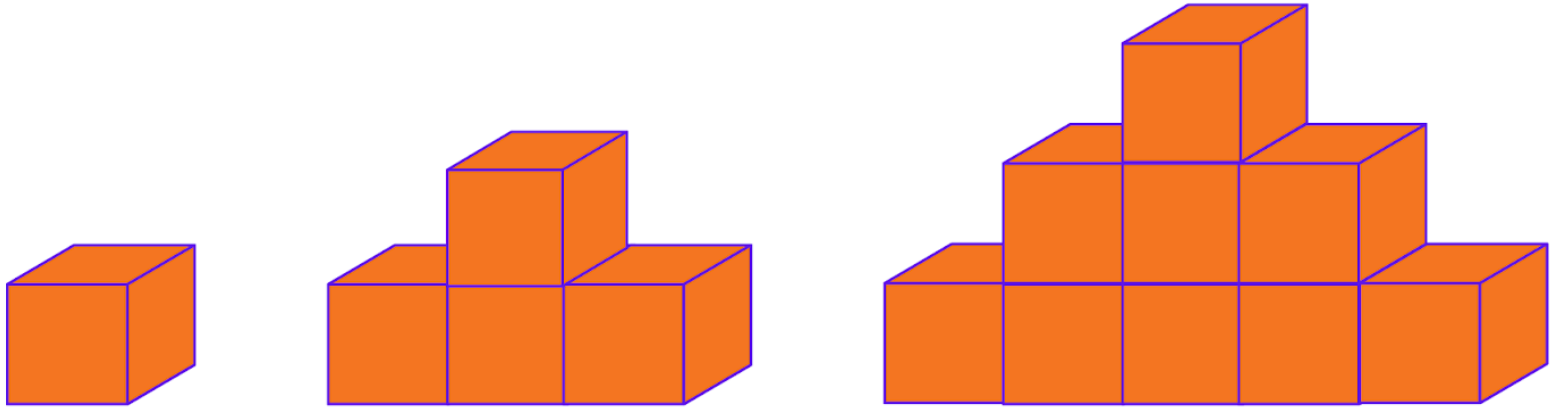
Assessing Maths

- Can the learner identify the elements changing and staying the same as the staircase gets bigger?
- Can the learner write a rule and explain it?
- Can the learner solve more complicated tasks?

Source

Adapted from: https://nrich.maths.org/2283

Staircase Patterns



S-1 S-2 S-3

How many blocks are in a S-4?

How many blocks are in a S-5?

What do you notice about the pattern in the staircase?

What is the largest staircase that you can tell us about?

Adapted from https://nrich.maths.org/2283