Investigation — the staircase pattern

MODULE 8 · ALGEBRA — PATTERNS, EXPRESSIONS AND EQUATIONS ALGEBRA

STAIRCASE PATTERN — FIND THE RULE

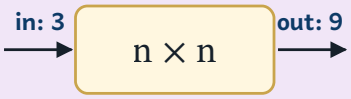
1. Step **1** uses **1** square. Step **2** uses **3** squares. Step **3** uses **6** squares. Step **4** uses **10** squares.
2. Differences between terms: +2, +3, +4... each difference grows by **1**.
3. Rule in words: 'add **n** more squares to get the **n-th step**.'
4. Step 5 uses 10 + 5 = **15** squares. Step 6 uses 15 + 6 = **21**.

HOW TO ANSWER TODAY

- **Function machine.** Do EACH step of the rule in order to the input.
  Rule × 4 + 2, input 5 → 5 × 4 = 20, + 2 = 22

TRY IT ON THE LINE

Each staircase has a step number n. Count the unit squares. Find the rule that connects step number → squares.

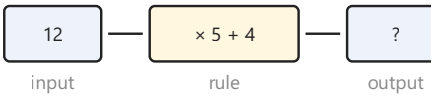


1. Build the first 4 staircases on squared paper (1 square, 1+2=3, 1+2+3=6, 1+2+3+4=10).
2. Make a table: n → squares. n=1→1, n=2→3, n=3→6, n=4→10, n=5→_____
3. Difference between consecutive values: 2, 3, 4, 5, ... the rule grows by adding **n** each time.
4. Rule for the n-th staircase: total = _____ (Gauss's formula).

PRACTICE

1. The 5th class library tracks how many books are borrowed each week. The first four weeks show **5**, **15**, **25** and **35** books borrowed. If the pattern continues, how many books will be borrowed in the next week?

   What comes next in the sequence: 5, 15, 25, 35, ___ ?

2. 

   Aoife's granny is baking barmbrack for the Halloween weekend. Each loaf needs **5** spoons of sultanas plus **4** extra spoons for the topping. If she bakes **12** loaves, how many spoons of sultanas does she use altogether?