1 A pattern is made of 3 rows of cubes, each as long as the pattern number, with 4 extra cubes.

(a) How many cubes in patterns 1, 2 and 3? (1)

(b) Write down the nth term (1)

(c) How many cubes in pattern 25? (1)

(d) A pattern has 46 cubes. Which pattern is it? (2)

(5 marks)

2 A square frame of cubes is built round a single cube. Pattern 1 has 8 cubes round the middle one, pattern 2 has 16, pattern 3 has 24.

(a) Write down the nth term for the frame cubes (1)

(b) Write down the nth term for the total number of cubes (1)

(c) Explain the difference between your two rules (2)

(4 marks)

3 Two pupils look at the same pattern of cubes. Ojok says the rule is $2(n+1)+3$. Kemi says it is $2n+5$.

(a) Work out both rules for $n=1$ and $n=4$ (2)

(b) Expand and simplify Ojok's rule (1)

(c) Are both pupils right? Explain how you know. (2)

(d) Describe how Ojok might have seen the pattern differently from Kemi (2)

(7 marks)

4 Write two different-looking rules for a pattern that has 4 cubes added each time and 6 cubes always there, and show that they are the same.

(4 marks)

5 A pattern of cubes grows in two directions: pattern 1 is a 1×1 square, pattern 2 is 2×2, pattern 3 is 3×3.

(a) How many cubes in patterns 1, 2, 3 and 4? (1)

(b) Write down the differences between consecutive terms (1)

(c) Explain why this pattern's rule is not of the form $an \pm b$ (2)

(4 marks)