1 These matchstick patterns are made of triangles sharing edges. Each stick is 3 cm long.



(a) Write down the number of sticks in patterns 1 to 4. (1)

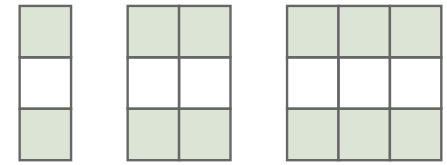
(b) Write down the term-to-term rule, and justify it from the picture. (2)

(c) How many sticks are in the pattern with 8 triangles? (1)

(d) The perimeter of pattern 1 is 9 cm. Find the perimeter of pattern 4. (1)

(5 marks)

2 The patterns below are made of white and shaded squares.



(a) Write down the number of white squares and the number of shaded squares in patterns 1, 2 and 3. (1)

(b) Which rule gives the number of shaded squares: (i) add 2 (ii) multiply by 2 (iii) add 3? (1)

(c) Justify your answer to (b) using the picture, not the numbers. (2)

(d) Explain why "multiply by 2" also fits the first two patterns but is still the wrong rule. (2)

(6 marks)

3 A sequence is formed by $1 \times 2,\ 2 \times 3,\ 3 \times 4,\ 4 \times 5,\ \ldots$

(a) Write down the first four terms. (1)

(b) Write down the differences between consecutive terms. What do you notice? (1)

(c) Use your answer to (b) to find the 6th term. (1)

(3 marks)

Extension.

4 Find the 7th term of the sequence $3,\ 4,\ 10,\ 24,\ 49,\ 88,\ \ldots$

(3 marks)

5 The Fibonacci sequence is $1,\ 1,\ 2,\ 3,\ 5,\ 8,\ 13,\ \ldots$

(a) What rule is used to obtain the terms? (1)

(b) Write down the next three terms. (1)

(c) Find the difference between each pair of neighbouring terms, and write down what you notice. (2)

(4 marks)