Worksheet | Algebra

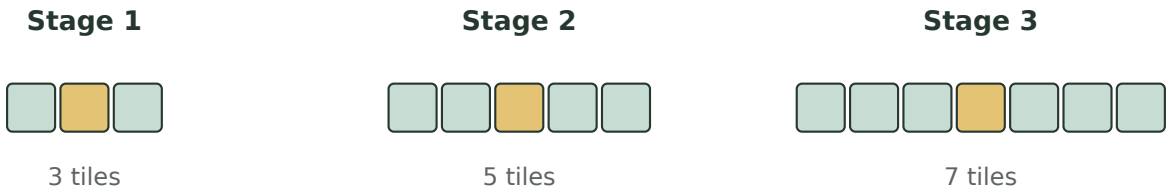
Growing patterns, tables and Cartesian graphs

Name: _____ Date: _____

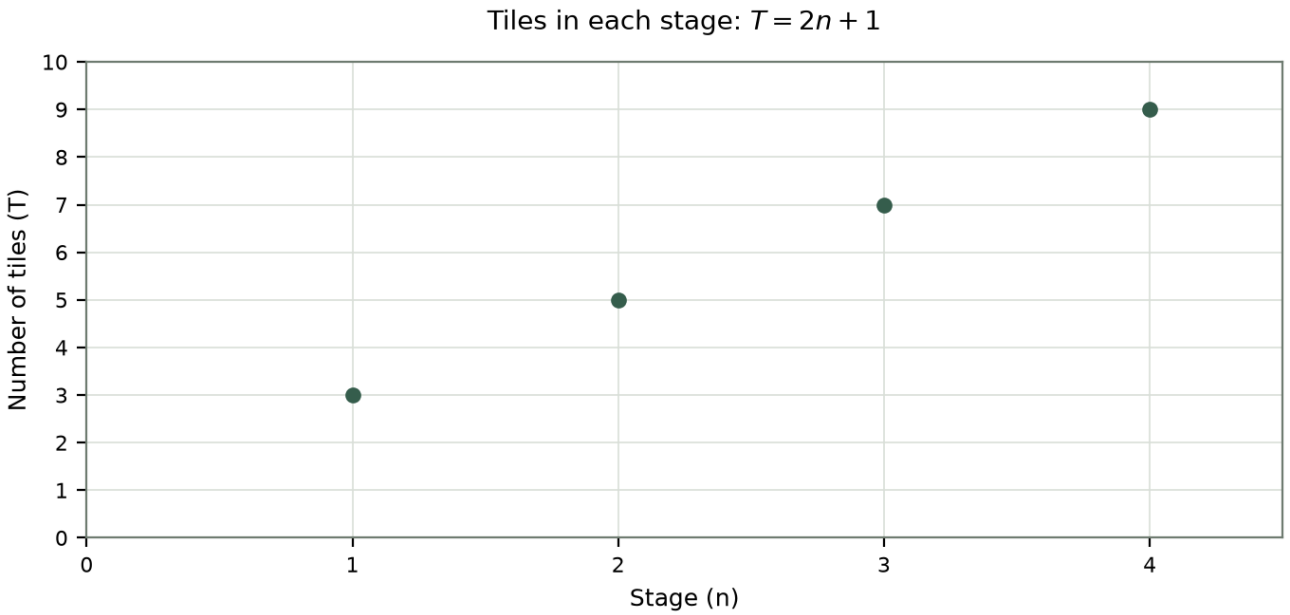
8 questions | 24 marks | Show your working.

Use exact values where possible. Simplify fractions and state units when required.

The growing tile pattern



Gold: one centre tile. Green: the two arms, each with n tiles.



Constructed tile pattern; positive whole-number stages only

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1. The pictured pattern has a centre tile and two arms. Stage 1 has 3 tiles, stage 2 has 5, and stage 3 has 7. Describe what is added at each step and find the number of tiles in stage 4. [2 marks]

2. For stages $n = 1, 2, 3, 4, 6$, complete the totals $T = 3, 5, \square, \square, \square$. Use $T = 2n + 1$ and show each missing calculation. [3 marks]

3. Find the total tiles in stage 15 of $T = 2n + 1$. Explain what the $2n$ and the $+1$ represent in the picture. [3 marks]

4. A student proposes $T = n + 2$ for the pattern $3, 5, 7, 9, \ldots$ because the total goes up by 2. Test the rule at stages 1 and 2, then explain why the constant difference is not a complete stage rule. [3 marks]

5. Draw a Cartesian graph for stages 1 to 4 of $T = 2n + 1$. Label the horizontal axis 'Stage n' and the vertical axis 'Tiles T'. Use a scale of 1 per interval on both axes, plot the four points and explain why they should remain separate points. [4 marks]

6. Which stage of $T = 2n + 1$ has 25 tiles? Show your calculation and check your answer by substitution. [3 marks]

7. The horizontal axis is stage number and the vertical axis is number of tiles. Which point represents stage 7 of $T = 2n + 1$: $(7, 15)$ or $(15, 7)$? Explain the coordinate order. [2 marks]

8. For $B = 3n + 1$, make a table for stages 1 to 4. List the four coordinates (n, B) and state how the total changes when the stage increases by 1. [4 marks]