Name:



Part 1A



The above shows how a fractal is constructed in stages from left to right. Each stage is constructed from the previous stage by splitting each remaining square into 9 equal squares and removing 4 of them. Stage 0 (the leftmost image) is a 1×1 square, so it has total area of 1 unit².

(a) Explain why stage 1 has a total area of $\frac{5}{9}$ unit².

(b) Explain why stage 2 has a total area of $\frac{25}{81}$ unit².

Part 1A continued...



(e) Hence, or otherwise, write an expression using indices to represent the area of Stage n.



Part 1B

The perimeter of stage 0 is 4 units.

(a) Write an expression for the perimeter of stage 1 as a multiple of the perimeter of stage 0 (so 4 multiplied by something). Explain how you arrived at your answer.



(b) Write an expression for the perimeter of stage 2 as a multiple of the perimeter of stage 0 (so 4 multiplied by something). Explain how you arrived at your answer.



Part 1B continued...

(c) Write an expression *using indices* for the perimeter of stage 3 as a multiple of the perimeter of stage 0 (so 4 multiplied by something).



(d) Hence, or otherwise, Write an expression using indices for the perimeter of stage n as a multiple of the perimeter of stage 0 (so 4 multiplied by something).



(e) Let A_n represent the area (from part 1A (e)) and P_n represent the perimeter (from part 1B (d)) of stage n. Find the perimeter-to-area ratio $\frac{P_n}{A_n}$.



Part 2

In this part you will construct your own fractal. It can be based on a square (like this one), or a triangle, or another shape.



(a) Draw the first 3 stages of your fractal.

(b) Describe, in detail, how each stage of your fractal is constructed from the previous stage.



Part 2 continued...

(a) Find an expression for the area of stage n of your fractal.

(b) Find an expression for the perimeter of stage n of your fractal.



(c) Find an expression for the perimeter-to-area ratio of stage n of your fractal.

