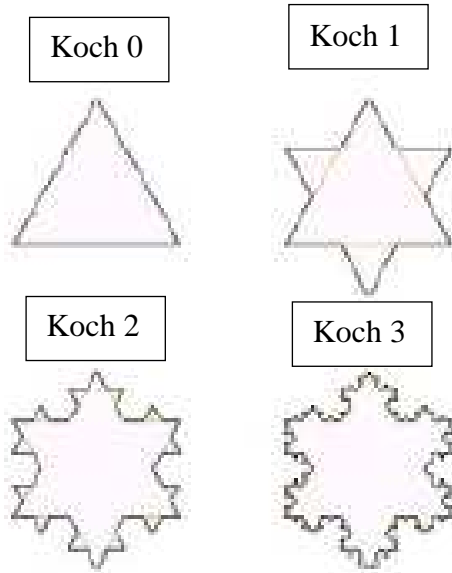


Subject n°9

Please don't write on the exam paper.

Koch Snowflake

A Koch Snowflake is constructed by starting with an equilateral triangle and successively adding smaller triangles scaled to $1/3$ of the size to each edge. The following figure shows $n = 0$, $n = 1$, $n = 2$, $n = 3$ iterations of this procedure.



We denote by $\text{Koch } n$ the figure at the n th stage and by L_n the length of its perimeter. The sides of the triangle $\text{Koch } 0$ are equal to 1.

1. Find the length of the perimeter L_1 of $\text{Koch } 1$.
2. Find the length of the perimeter L_2 of $\text{Koch } 2$.
3. How do you go from $(\text{Koch } n)$ to $(\text{Koch } n+1)$?
Then what relation is there between L_n and L_{n+1} ?
4. How does L_n evolve as n goes to infinity?
5. Carrying out these iterations leads to an object known as a fractal called the Koch snowflake.
What conjecture can you make concerning the area of this fractal object?