

Subject 04

SEQUENCES

*Please do not write on this exam paper and give it back at the end of the test*

SEQUENCES: KOCH SNOWFLAKE

**1. Construction.**

You may use the triangle grid paper to help you with this drawing.

**Step One:** Start with a large equilateral triangle.

**Step Two:** Make a Star.

- Divide one side of the triangle into three equal parts and remove the middle section.
- Replace it with two lines the same length as the section you removed.
- Do this to all three sides of the triangle.

Do it again. If you did it infinitely many times, you would get a fractal.

What does this figure look like?

**2. Perimeter.**

A really interesting characteristic of the Koch Snowflake is its perimeter.

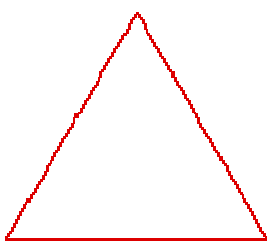
Ordinarily, when you increase the perimeter of a geometric figure, you also increase its area. If you have a square with a huge perimeter, it also has a huge area. But wait till you see what happens here!

Remember the process:

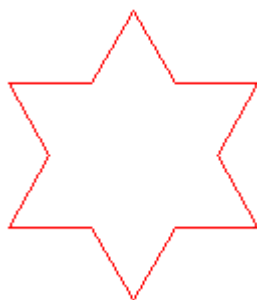
1. Divide a side of the triangle into three equal parts and remove the middle section.
2. Replace the missing section with two pieces the same length as the section you removed.
3. Do this to all three sides of the triangle.

Let's investigate the perimeter below.

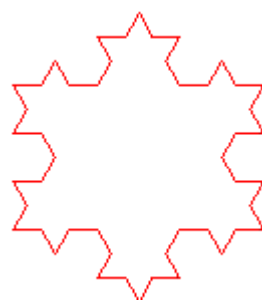
**Question 1:** If the perimeter of the equilateral triangle that you start with is 9 units, what is the perimeter of the other figures?



**perimeter = 9 units**



**perimeter = .... units**



**perimeter = .... units**

**Hint:** Think of the original triangle with sides of three parts, and the next figure with sides of four parts.

**Question 2:** Is there a pattern here? The perimeter of each figure is .... times the perimeter of the figure before. What kind of sequence does this lead to?

**Question 3:** If the original triangle has a perimeter of 9 units, how many iterations would it take to obtain a perimeter of 100 units? (Or as close to 100 as you can get.)

**Question 4:** Now think of doing this many, many times. The perimeter gets huge! But does the area?

**Annex:**

