Hello, My name is Lara and I am presenting my poster on Koch's Snowflake.
First I wanted to explain a bit of what fractals are. Fractals occur when we start off with one shape and repeat a process of division of multiplication on that over and over again. This results in never ending patterns that if you zoom in, you would be able to see a small version of the same initial shape. This first image is of a Romanesco broccoli and we can notice it keeps its triangular shape to its very edges. This happens with many things in nature, not just vegetables.
Now about Niels Fabian Helge Von Koch, he did the world a great favor and thoroughly studied the fundamentals of fractals and developed his curve, which he used to create the snowflake. He also helped with studies in the area of quantum physics.
I put here some fun applications of the specific snowflake I chose to study. Charles Fowlkes tried to bake a pie with infinite crust and a finite amount of filling, because apparently he loves the crust more than the interior and wanted to have a bigger ratio of crust to filling. His experiment went wrong because the dough on the crust got too thin and was overtaken by filling.
The second experiment is being currently developed by a group of students, they are trying to build a pool table that isn't rectangular like normal tables, but has Koch's snowflake shape on the perimeter. This would result in varied trajectory patterns for the billiard balls shot inside the table, patterns that could be used in the study of how sound waves reflect off of rough surfaces.
Entering the explanation of the actual snowflake I would like to start off with the line on this third image right here, what Koch did was cut the middle third of the line and add two lines of the same length to that middle section, creating a triangle shape. He did this process many times, to all sides of the new triangles. This process is called iteration. He developed this because he was trying to achieve a figure which was then thought to be impossible, something with continuous perimeter all around, but differentiable nowhere. This snowflake has cusps on every single point you can pick, therefore we cannot derive it in any part, being continuous but noon differentiable everywhere.
Another curious aspect of this snowflake is that since iterations are made to all sides, perimeter increases every time, but the area is increasing at a decreasing rate, which means each new area is bigger than the previous one, but by a smaller amount than it was from the one before that. Therefore it's area tends to a finite number, but its perimeter goes to infinity.
A cool application on a daily use would be the tiling of these snowflakes. Their sides will fit into each other and form the same shape in the middle, since they are all the same shape. In the image we can see 6 green snowflakes being tiled and forming a big yellow one in the middle.
As for the mathematical proof of the area we can see that using a simple triangle area we find the final area to be 8/5 of the initial area, so if we started with an area of 1m^2, as the process goes on and the number of iterations goes to infinity, the area would go to 8/5m^2. For the perimeter it's even simpler, the perimeter is the number of sides times the length of each side, and that equation, as the number of iterations goes to infinity, also goes to infinity. That's all for my presentation, thank you for listening/reading.