Infinity
Infinity

- What is infinity?
- Why do we need infinity?
- Why do we denote infinity by $\infty$?
- What is $\infty - 1$?
Hilbert's Hotel

- Hilbert was a very famous mathematician
- Imagine a hotel with infinitely many rooms
- Imagine all rooms are occupied
- A new guest arrives
- Can the guest get a room?
Hilbert's Hotel

- Imagine now that the hotel is full
- A bus with infinitely many new guests arrives
- Is there a way for all the guests get a room?
Hilbert's Hotel

https://www.youtube.com/watch?v=faQBrAQ87I4
Koch Snowflake

- Draw a triangle with a pencil
- Remove the middle third of each side
- Replace it with two sides of the same length drawn in a 60 degree angle
- Repeat this process
Koch Snowflake

- Say we start with a line segment of length 1.

- Do the first step of the process.

- How long is this segment?
Koch Snowflake

- So let 1 be the circumference of a triangle
- After the first round of the process, the circumference will be 4/3
- After the second step it will be 4/3*4/3
- What will it be after n steps? After infinitely many?
- The Koch Snowflake is the figure you get when you repeat the process infinitely often
Koch Snowflake

- The circumference seems to go to infinity
- What about the area?
- Do you know something in nature that is similar?
Koch Snowflake

https://www.youtube.com/watch?v=PKbwrzkupaU
Infinite Sums

- What is $1+1+1+1+1+...$?
- Can an infinite sum be finite?
- How about $0.1+0.01+0.001+0.0001+...$?
- What should $1-1+1-1+1-1+1-1+...$ be?