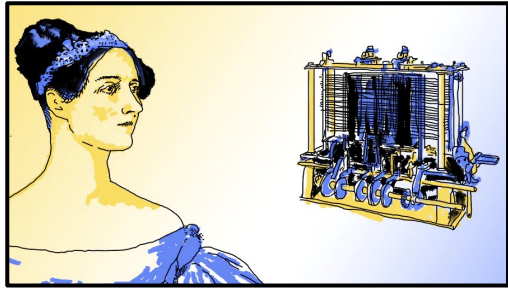# ADA LOVELACE

"The analytical engine has no pretensions to originate anything. It can do whatever we know how to order it to perform. It can follow analysis, but it has no power of anticipating any analytical relations or truths."

Ada Lovelace (1815-1852) was an English mathematician and writer, known for her work on the Analytical Engine - a mechanical general-purpose computer proposed by Charles Babbage. Lovelace is considered to be the world's [first computer programmer,](#) as she wrote the first algorithm intended to be processed by a machine. Lovelace's contributions to computer science were largely unrecognized during her lifetime, but she is now celebrated as a pioneer in the field, and her legacy has inspired countless women to pursue careers in STEM.

The First Computer Programmer

The Analytical Engine was a theoretical mechanical computer that used punch cards to input data and perform calculations, much like modern computers. Lovelace recognized its potential to perform more than just mathematical calculations, e.g. manipulating symbols and creating new forms of artistic expression.
Her most famous work, **"[Notes on the Analytical Engine,](#)"** describes how the machine could be programmed to perform a variety of tasks, including creating music and graphics. She also wrote an algorithm for the engine to calculate Bernoulli numbers, a sequence of rational numbers that arise in number theory.

Fibonacci sequence

The Fibonacci sequence is a sequence of numbers in which each number is the sum of the two preceding ones. The sequence starts with 0 and 1, and the next number in the sequence is the sum of the previous two numbers. So the first few numbers in the sequence are 0, 1, 1, 2, 3, 5, 8, 13, 21, ... The equation for the nth fibonacci number is:

$$F_n = F_{n-1} + F_{n-2}$$

Experiment

Implement the Fibonacci sequence in Python. There are several ways to do this, and here we provide some hints:

1. Definte a function that takes an input n^{th}, and outputs F_n
2. Use **if statements** to initialize $F_0 = 0$, and $F_1 = 1$.
3. Use **for loops** to obtain plotting coordinates of spiral

What you need

Python Online Editor: [Google Colaboratory Notebook](#)
Python Modules to import: matplotlyb, math
Coordinates to plot:

$$x_n = F_n \cos\left(\frac{2\pi n}{\phi}\right) \qquad y_n = F_n \sin\left(\frac{2\pi n}{\phi}\right) \qquad \begin{aligned} \pi &= 3.141 \\ \phi &= 1.618 \end{aligned} \qquad n = 1, ..., N.$$

1. What do you observe on the plot?
2. What happens if you use different values for N?
3. Can you find other sequences with interesting patterns?

More information

[Notes on The Analytical Engine](#)

[Ada Lovelace Documentary](#)

[The ADA computer language](#)

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