

Fibonacci's Final Frontier (Warm-Up)

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Instructor's Handout

The Fibonacci sequence is defined recursively as

$$a_0 = 0, \quad a_1 = 1, \quad a_n = a_{n-1} + a_{n-2} \quad \text{for } n \geq 2.$$

Calculate the 100th Fibonacci number a_{100} .

You don't need to be precise, but we will see who gets the closest!

Solution

The actual answer is $a_{100} = 354,224,848,179,261,915,075$.

One reasonable way to approximate this very very roughly is to think that the Fibonacci sequence doubles every iteration. So $a_{100} \approx 2^{100} \approx 10^{25}$. This is obviously very far off. (We round 2^4 down to 10 because we think that this should be an over approximation.)