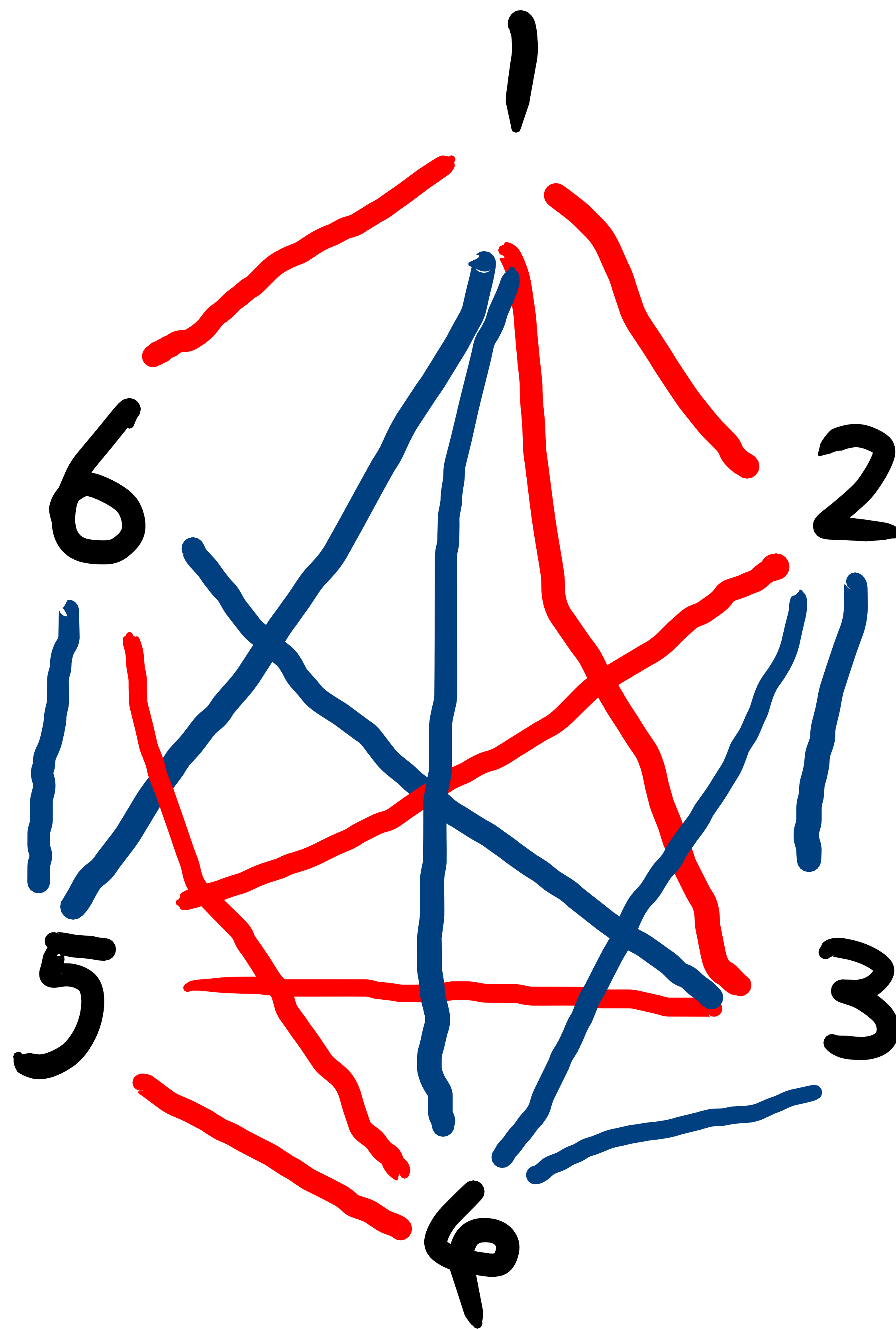


Sim

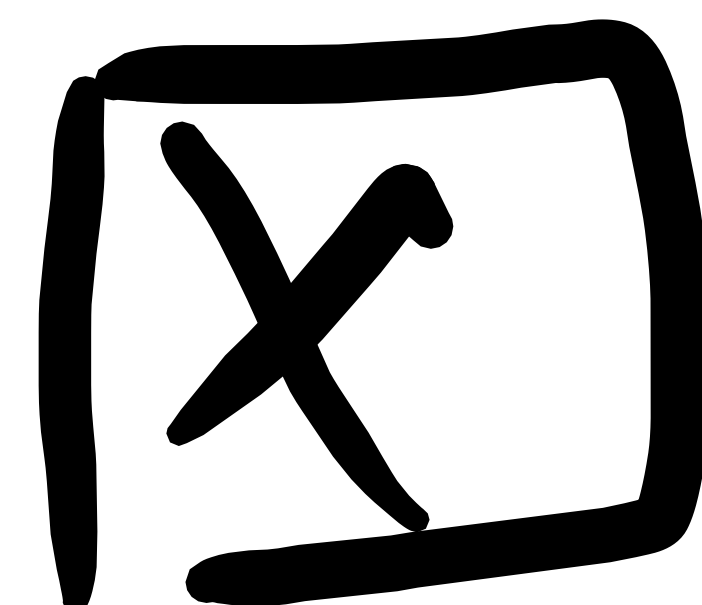
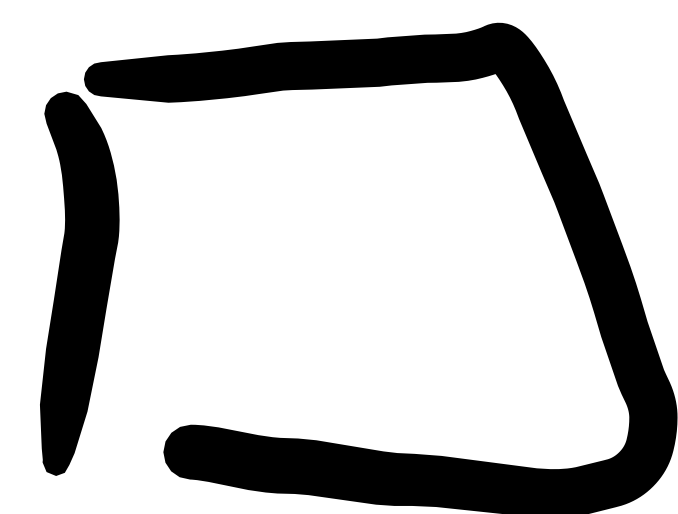
Blue lost

{2, 4, 3}

Blue should
always win!



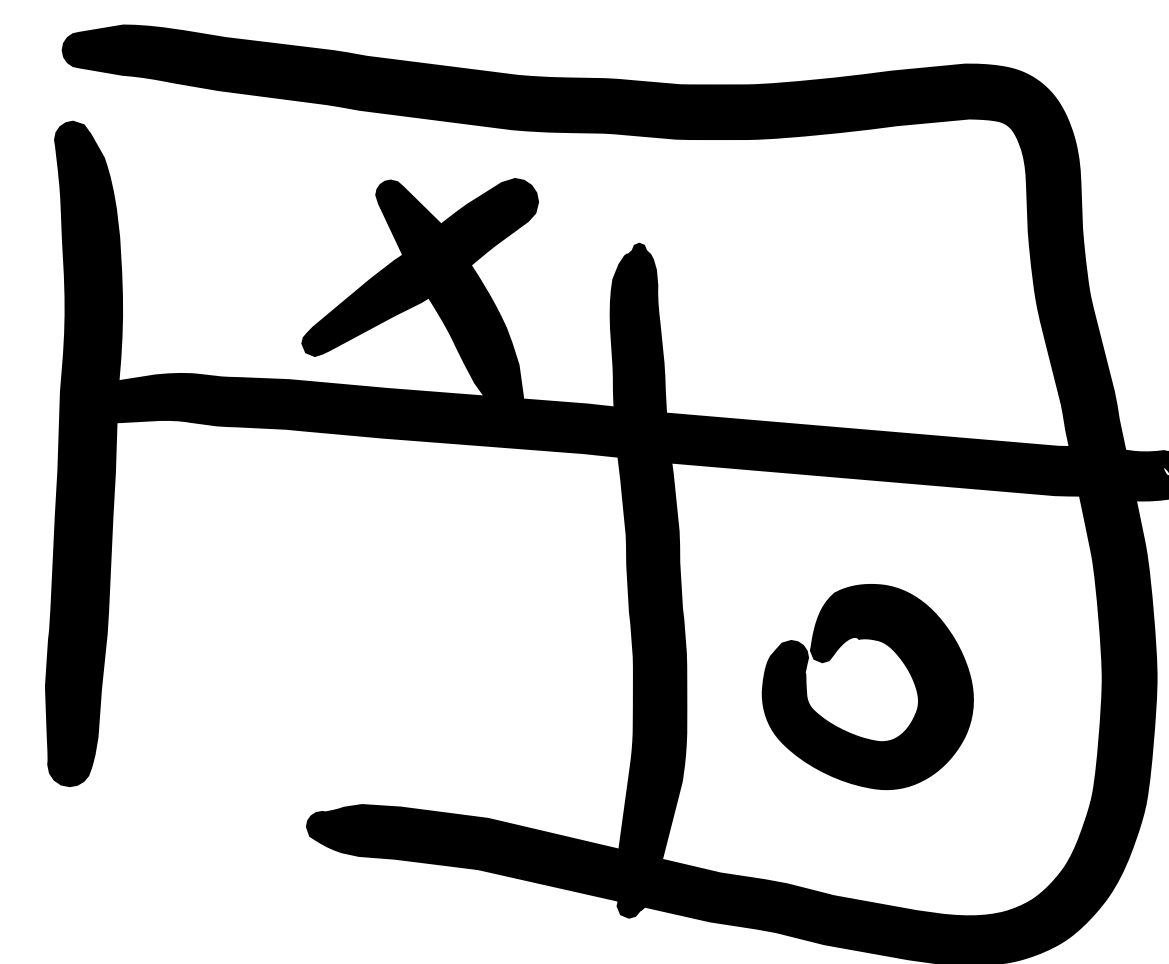
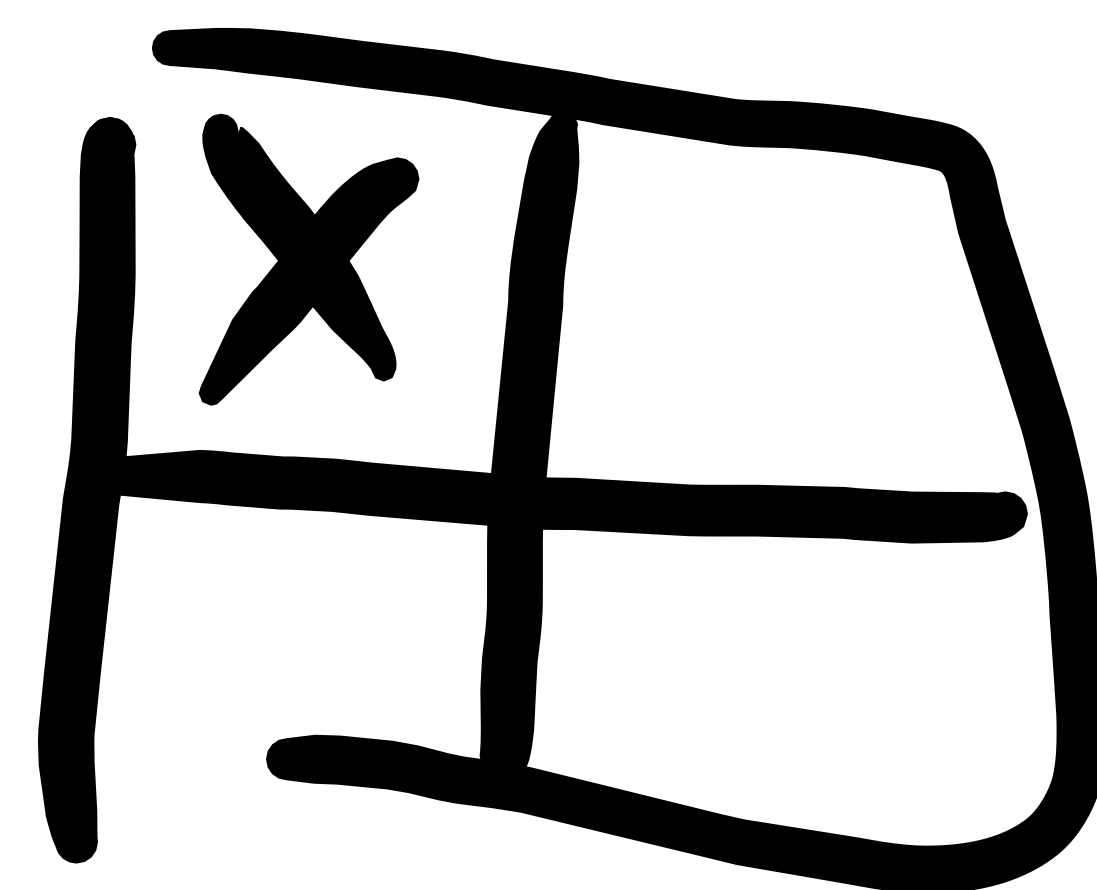
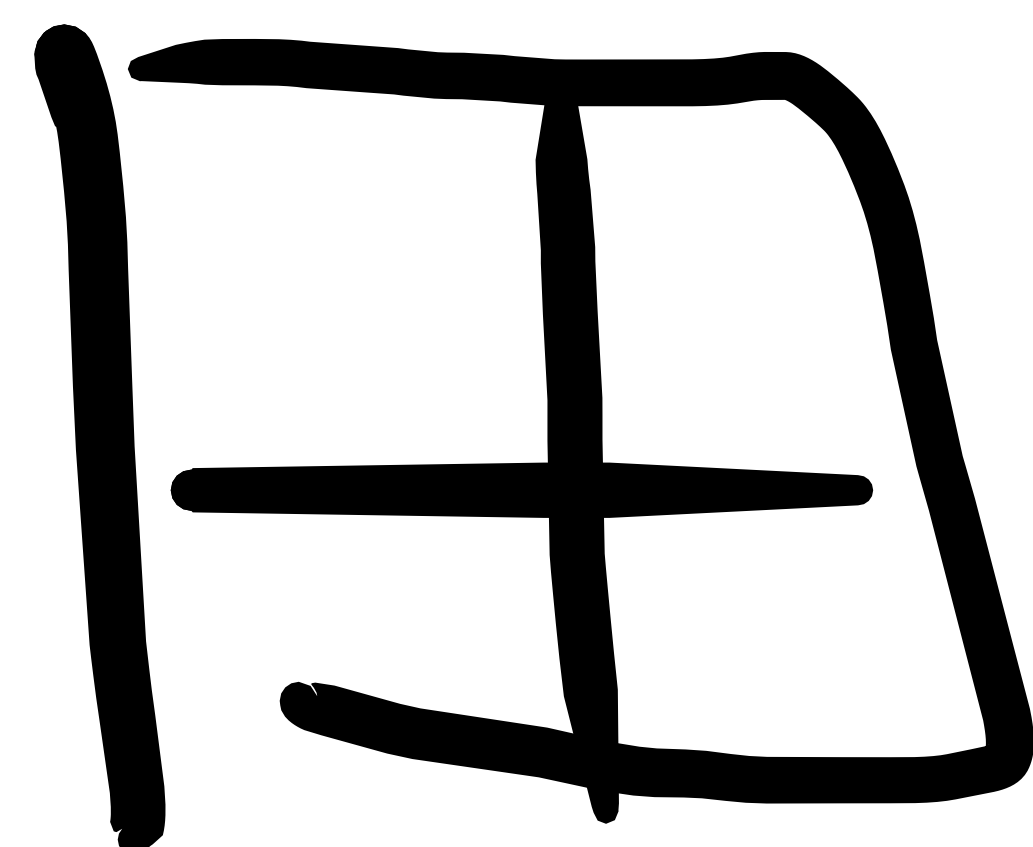
1x1 + + +



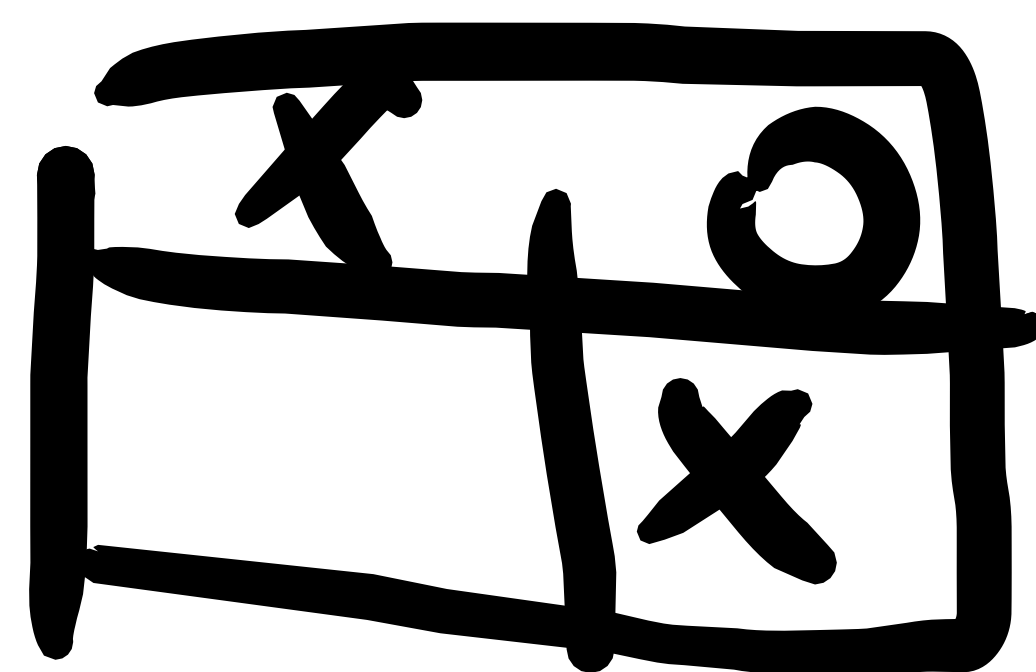
2 Possible boards

2x2 + + +

$$\leq 3^4 = 81$$



There are
29 valid
boards



Invalid

3x3 ttt

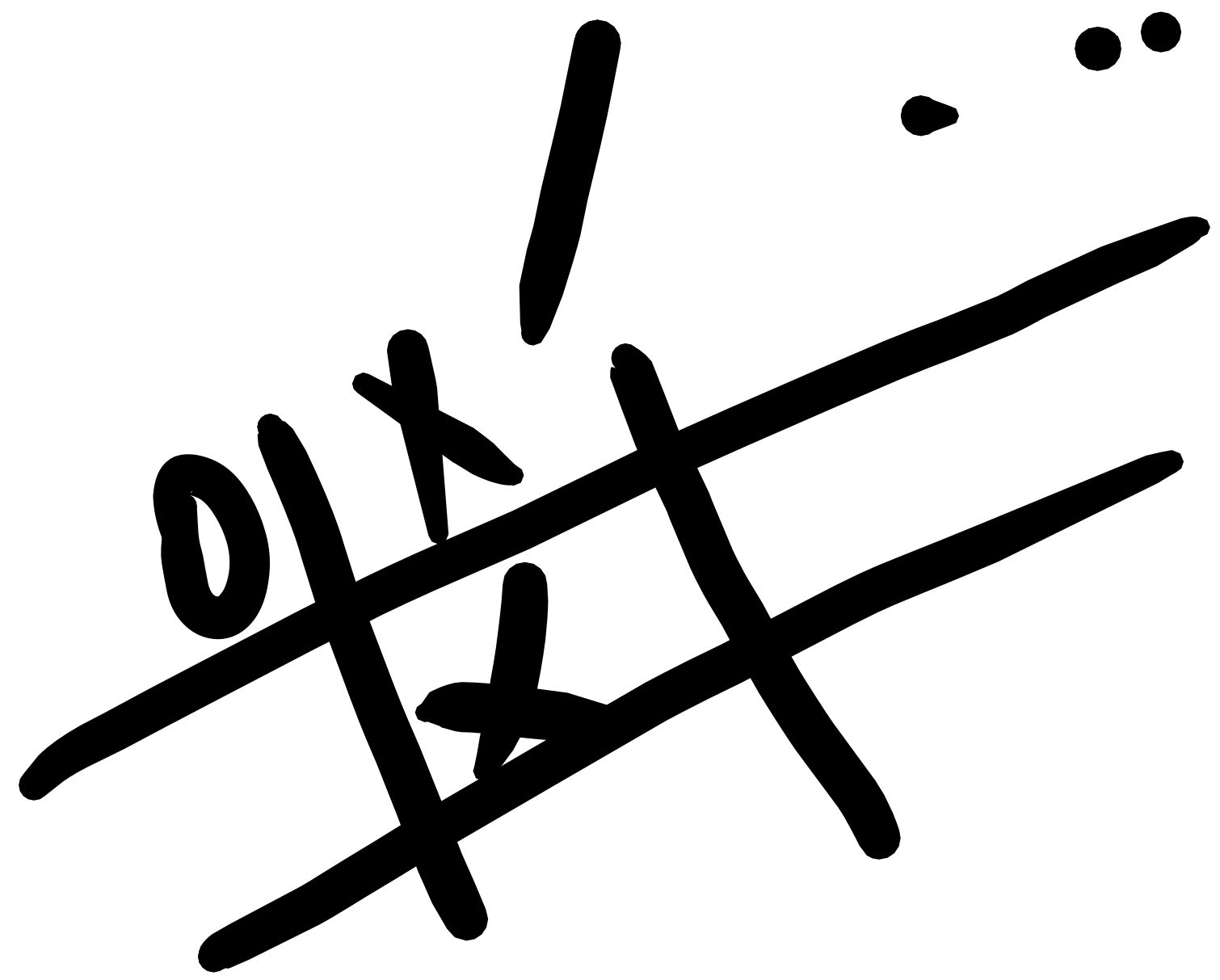
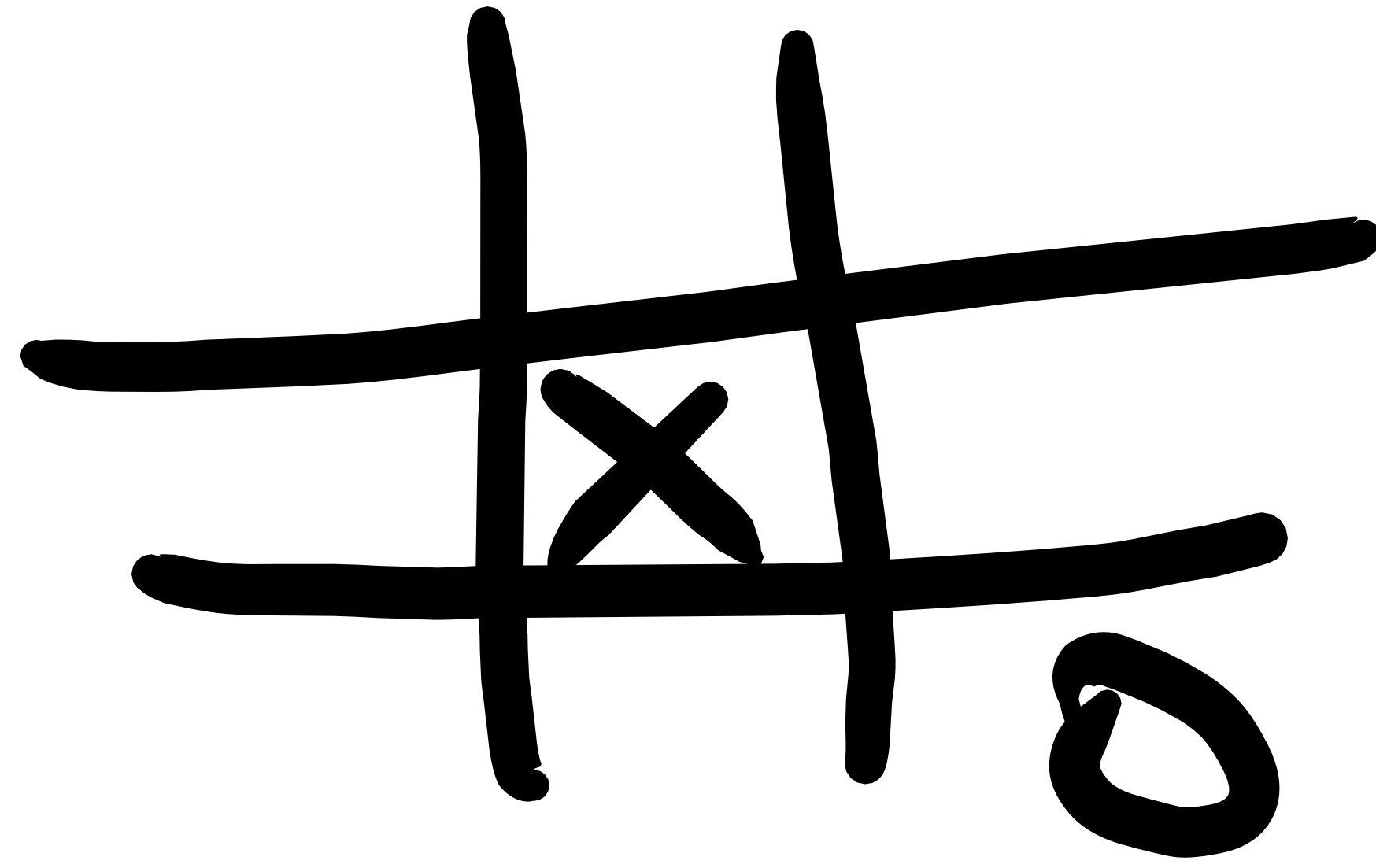
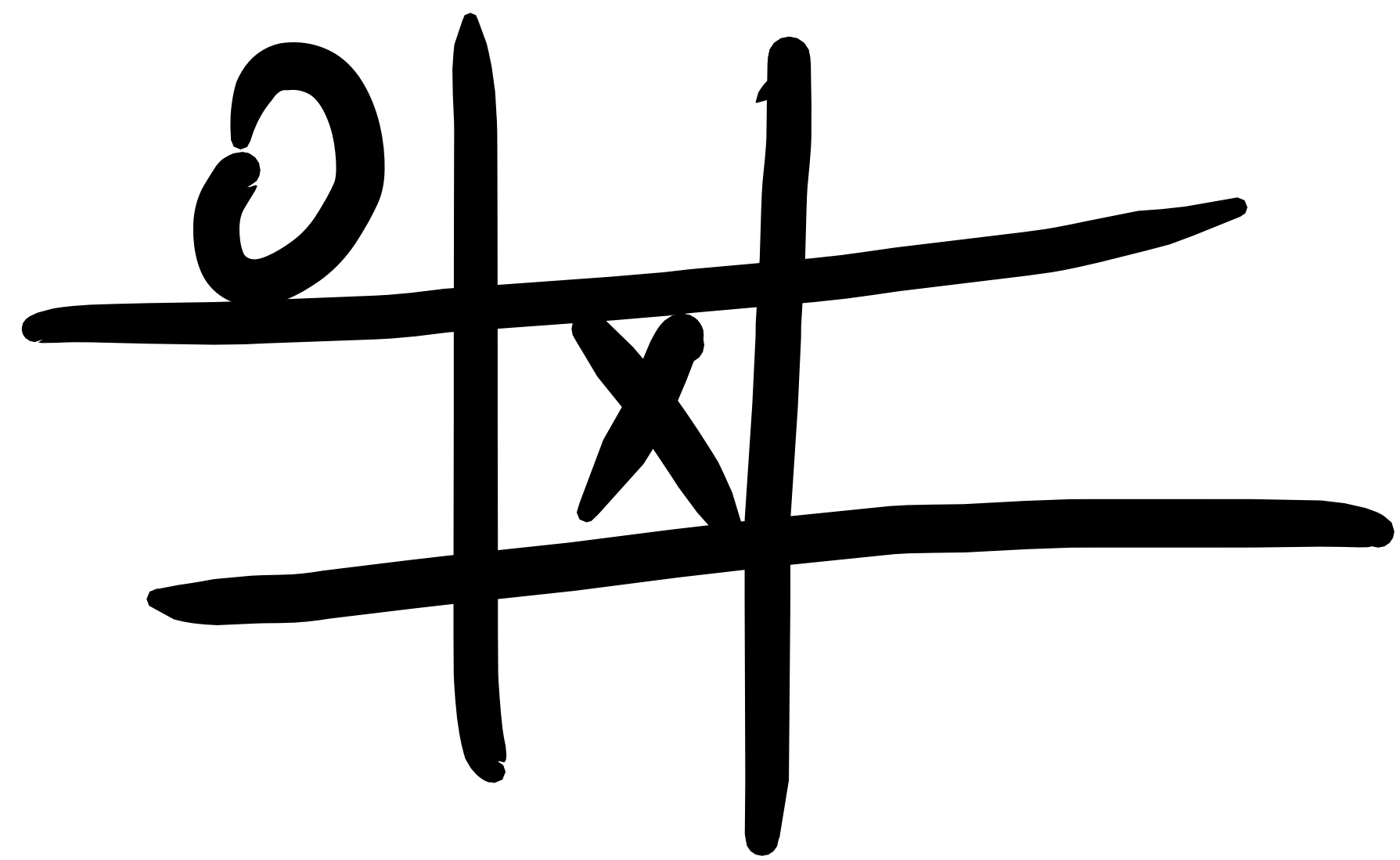
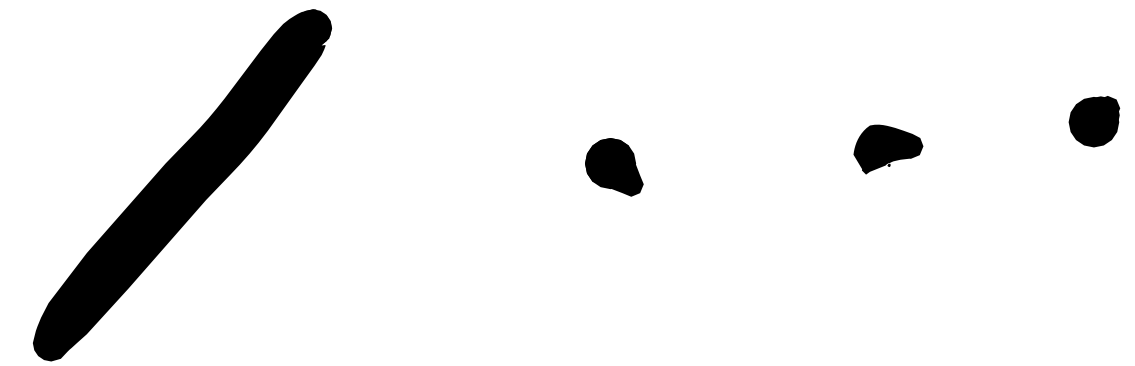
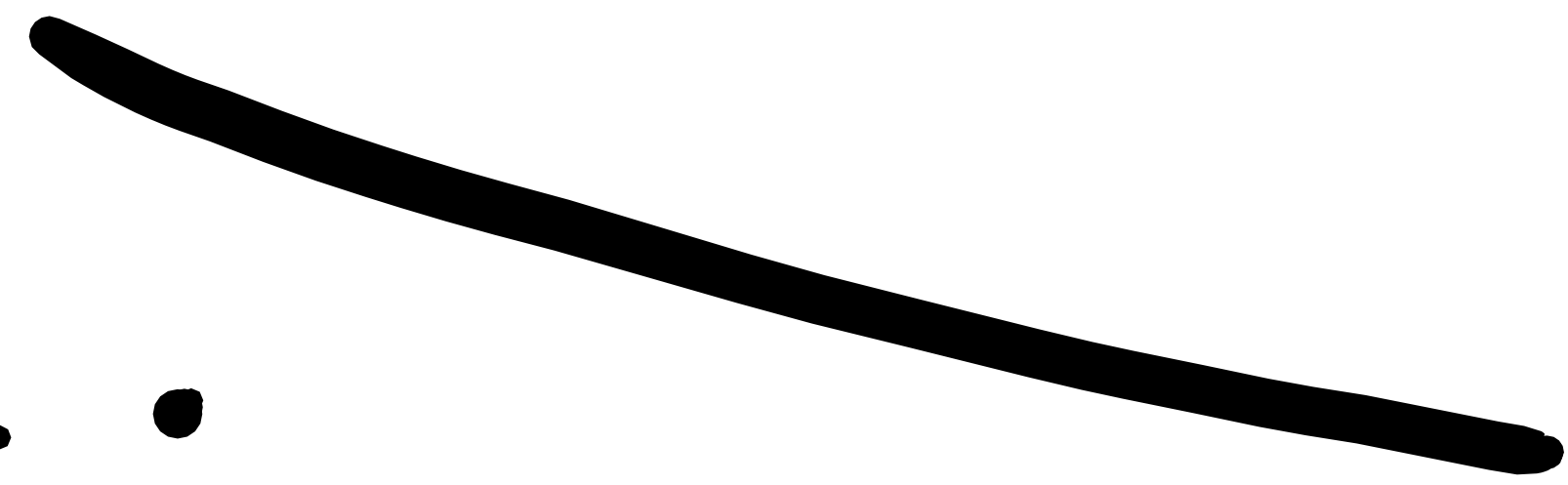
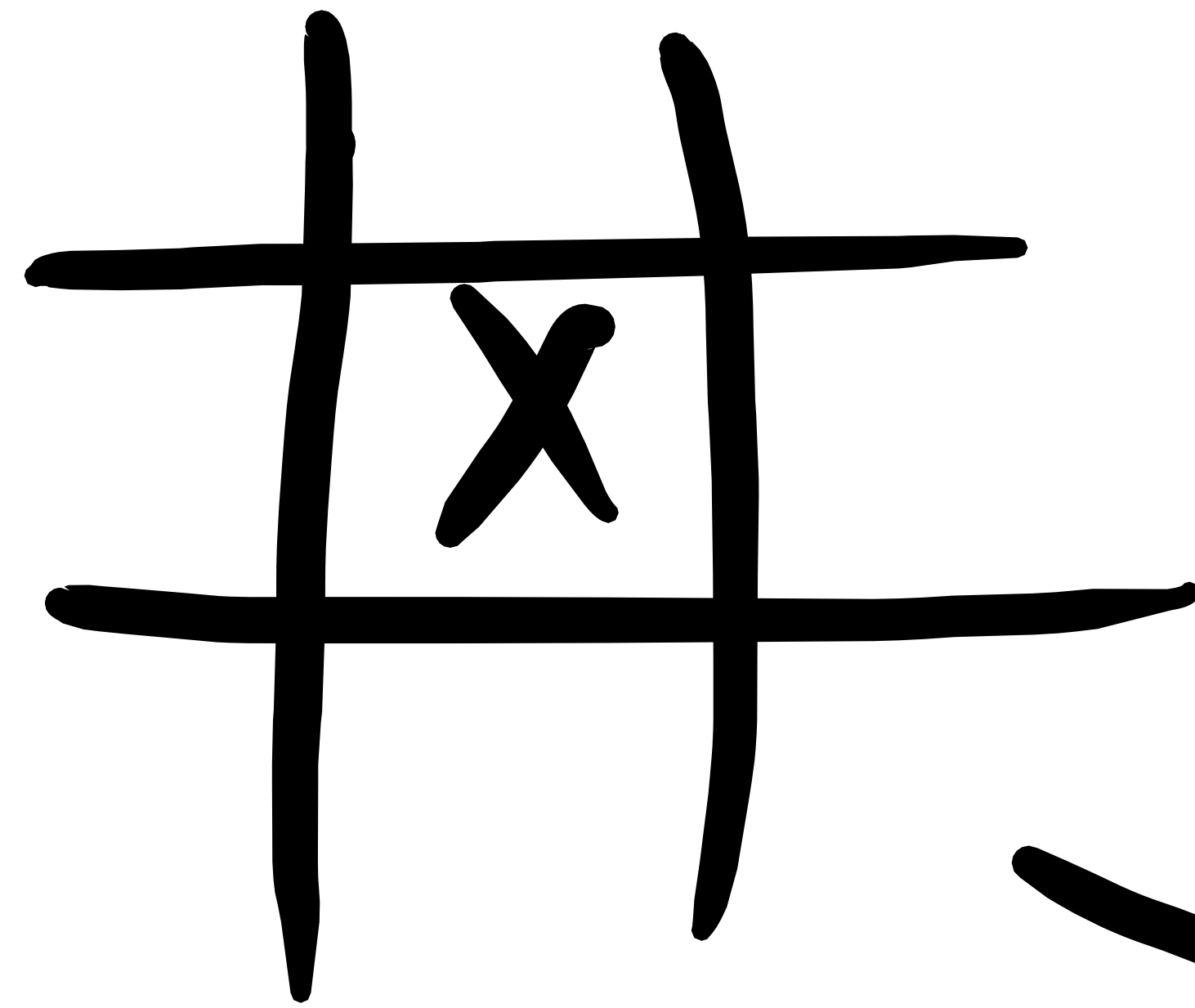
$\leq 3^9 = 19683$

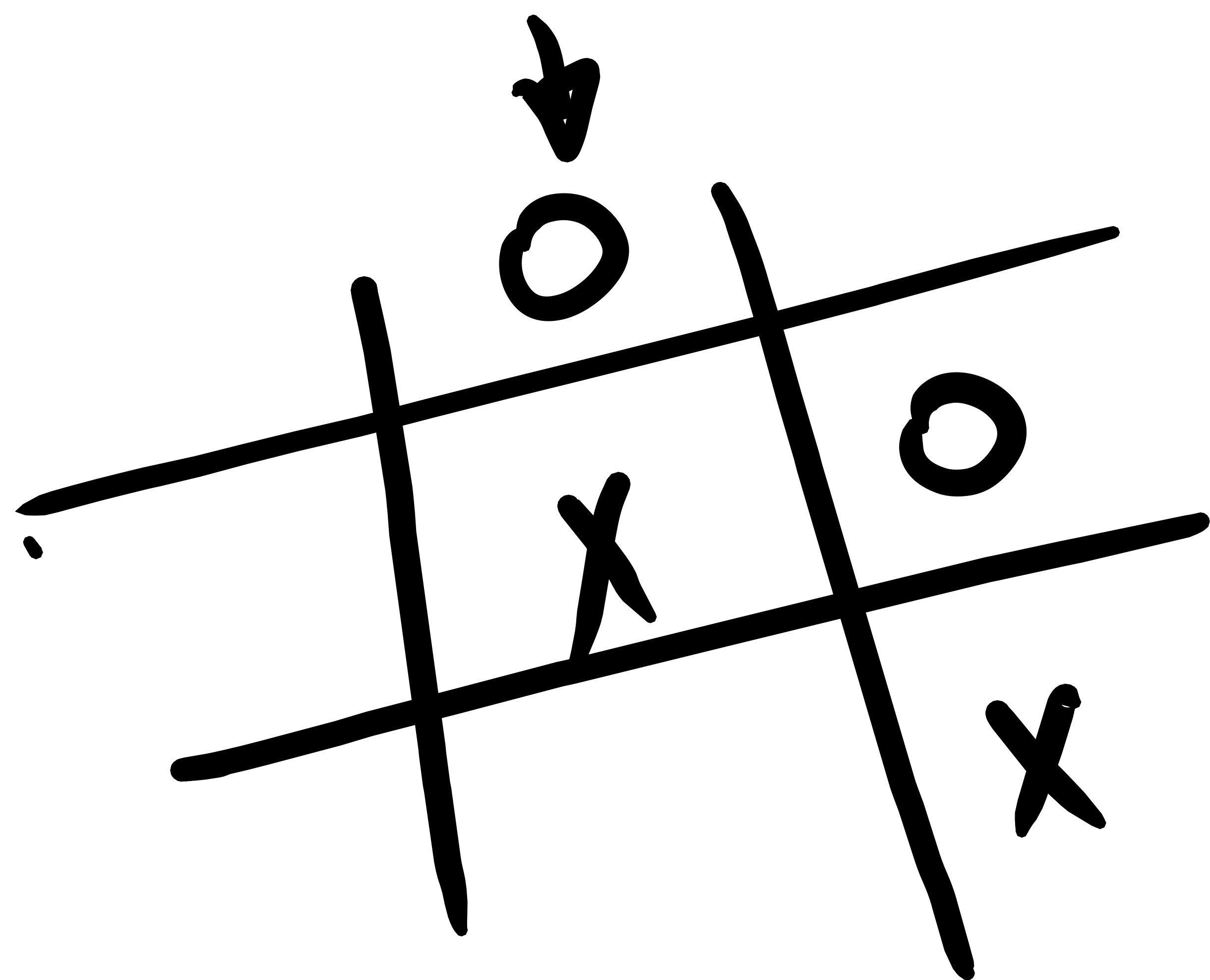
actual boards = 5478

4x4 ttt

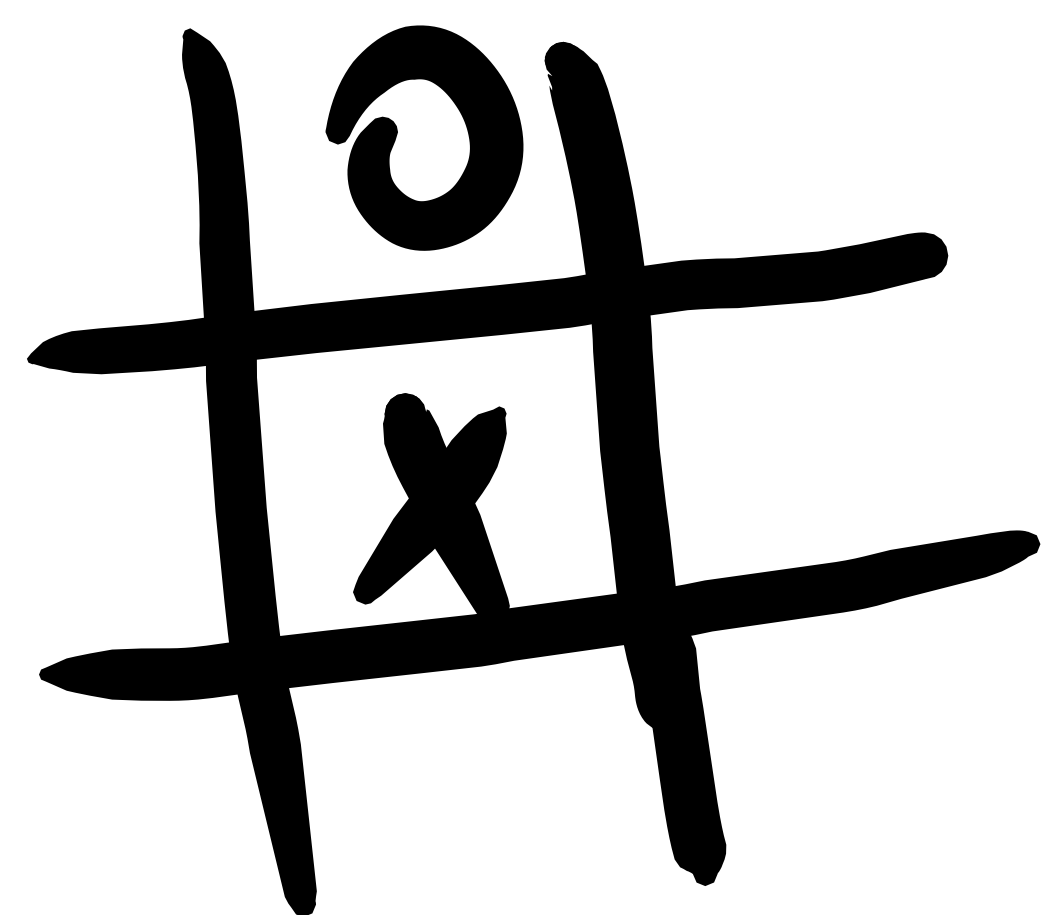
$\leq 3^{16} = 43046721 \sim 4 \text{ crores}$

actual boards = 97,22,011

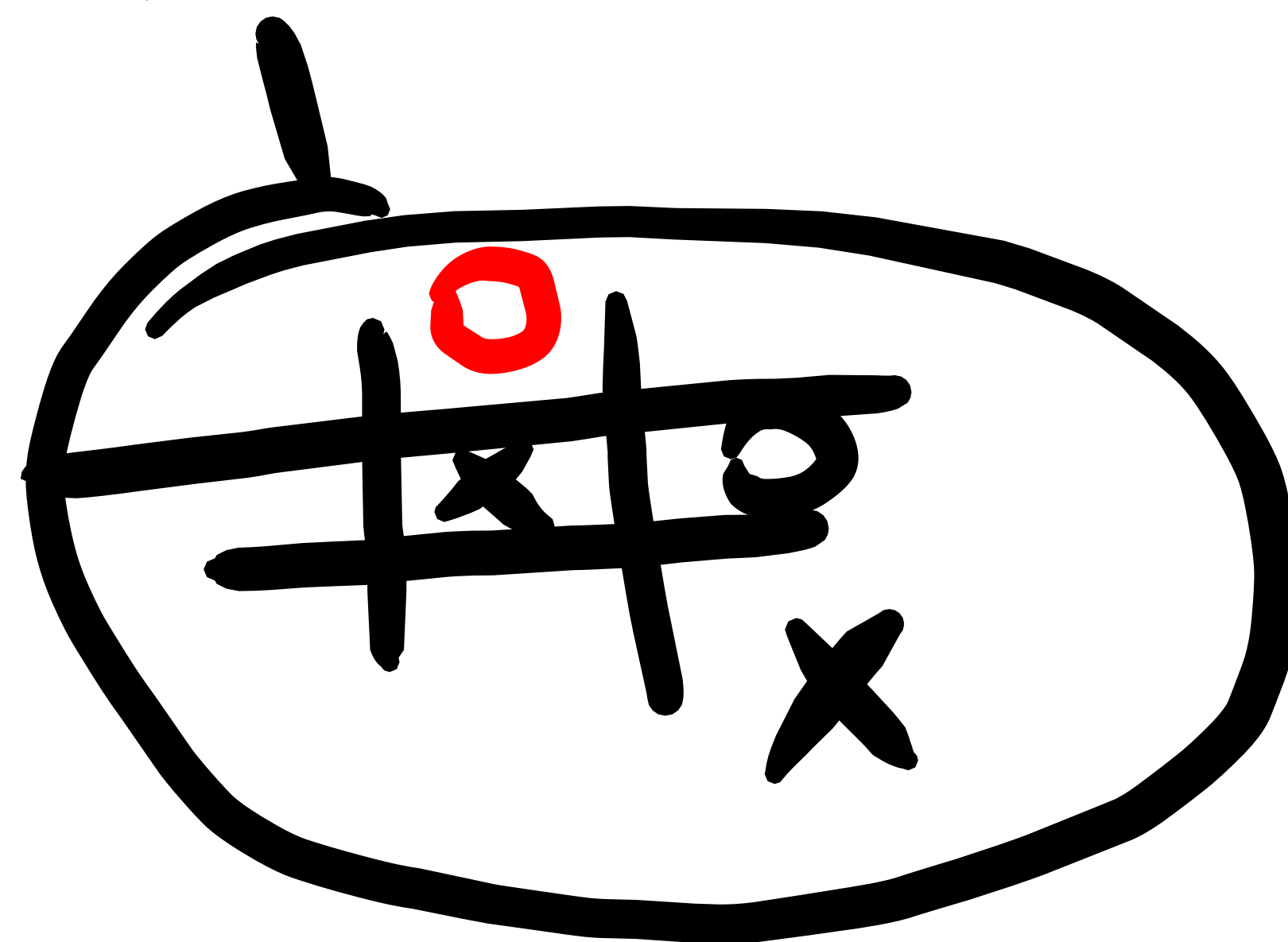
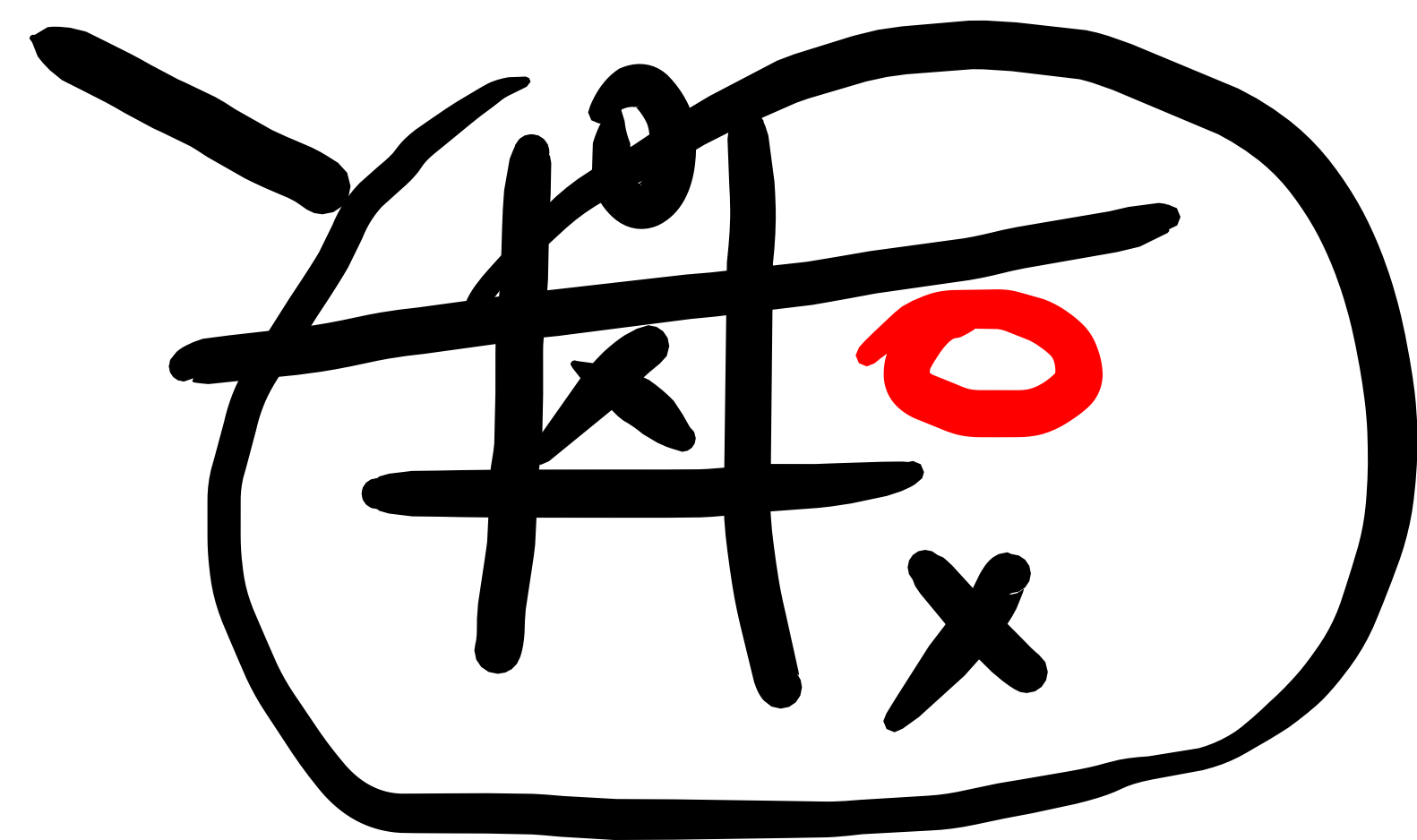
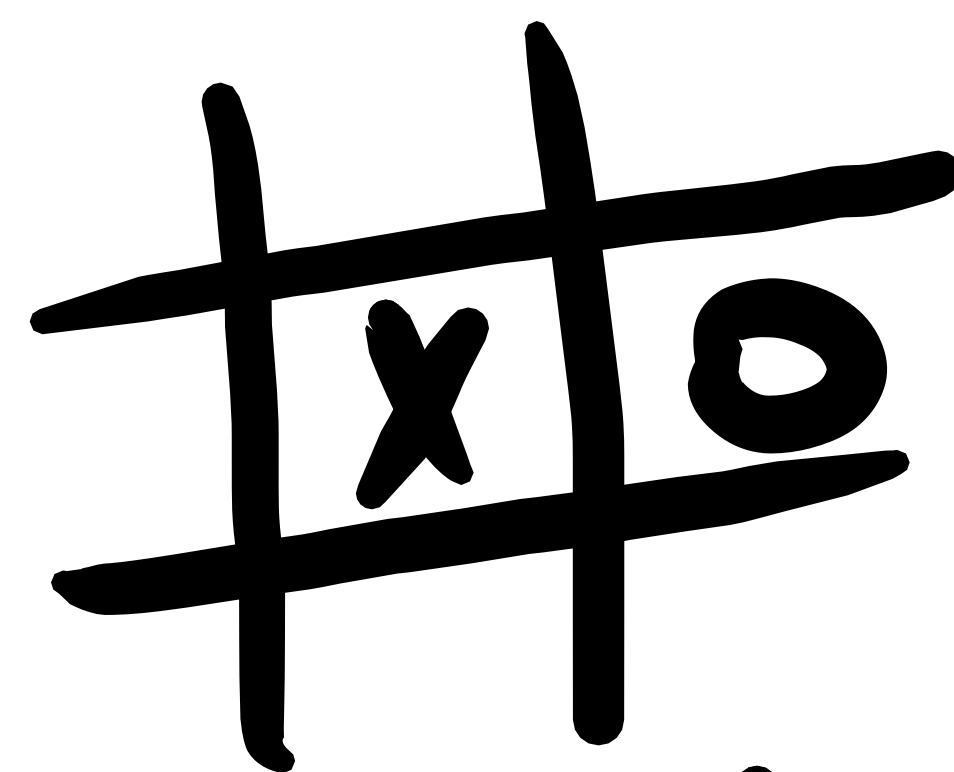




~ How many times
will this tree
occur in the
above tree?



...



Memoization

When we have finished analyzing a board position, store the optimal move. If `best_move()` is called on a board already analyzed return the computed move.

fib(50)

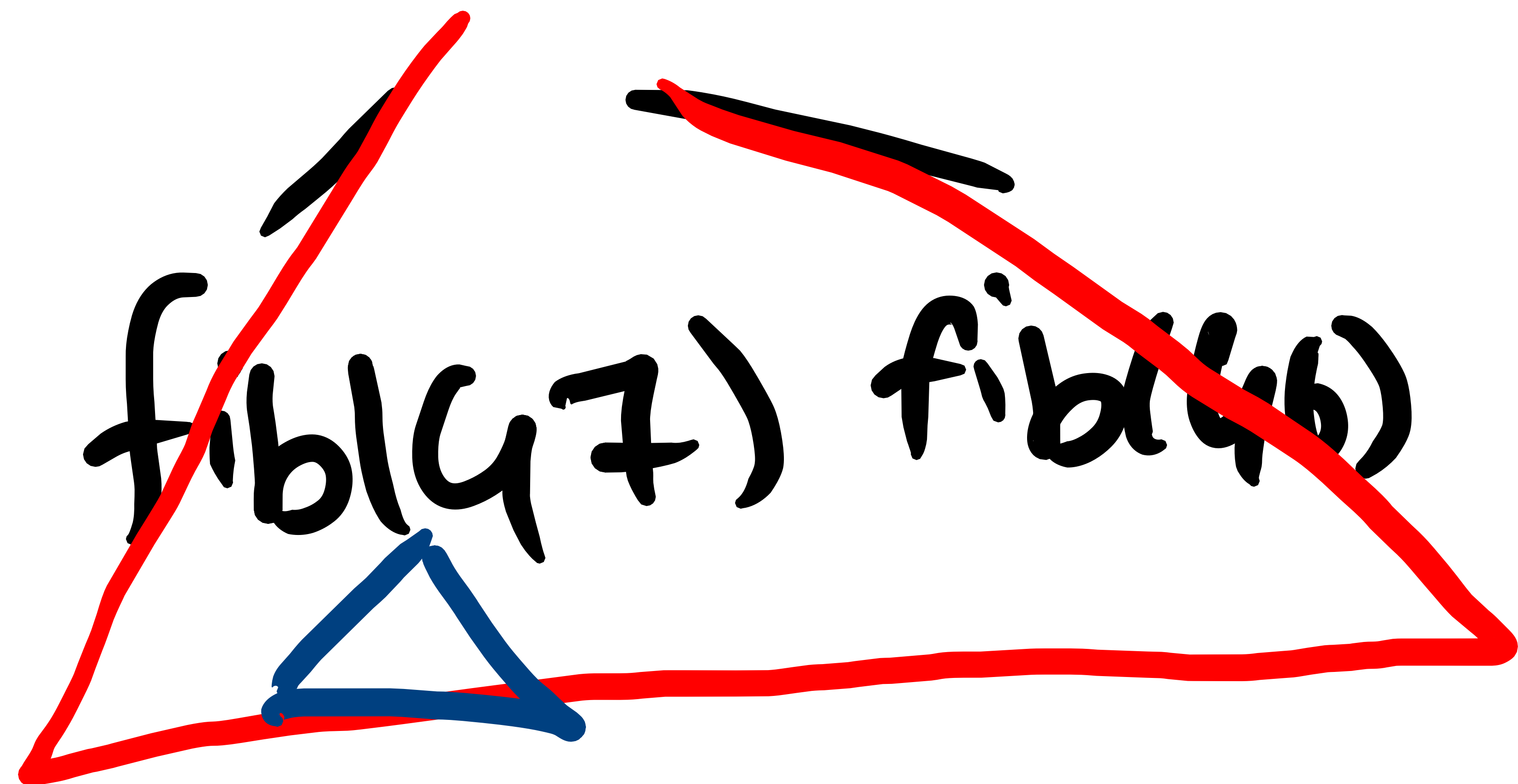
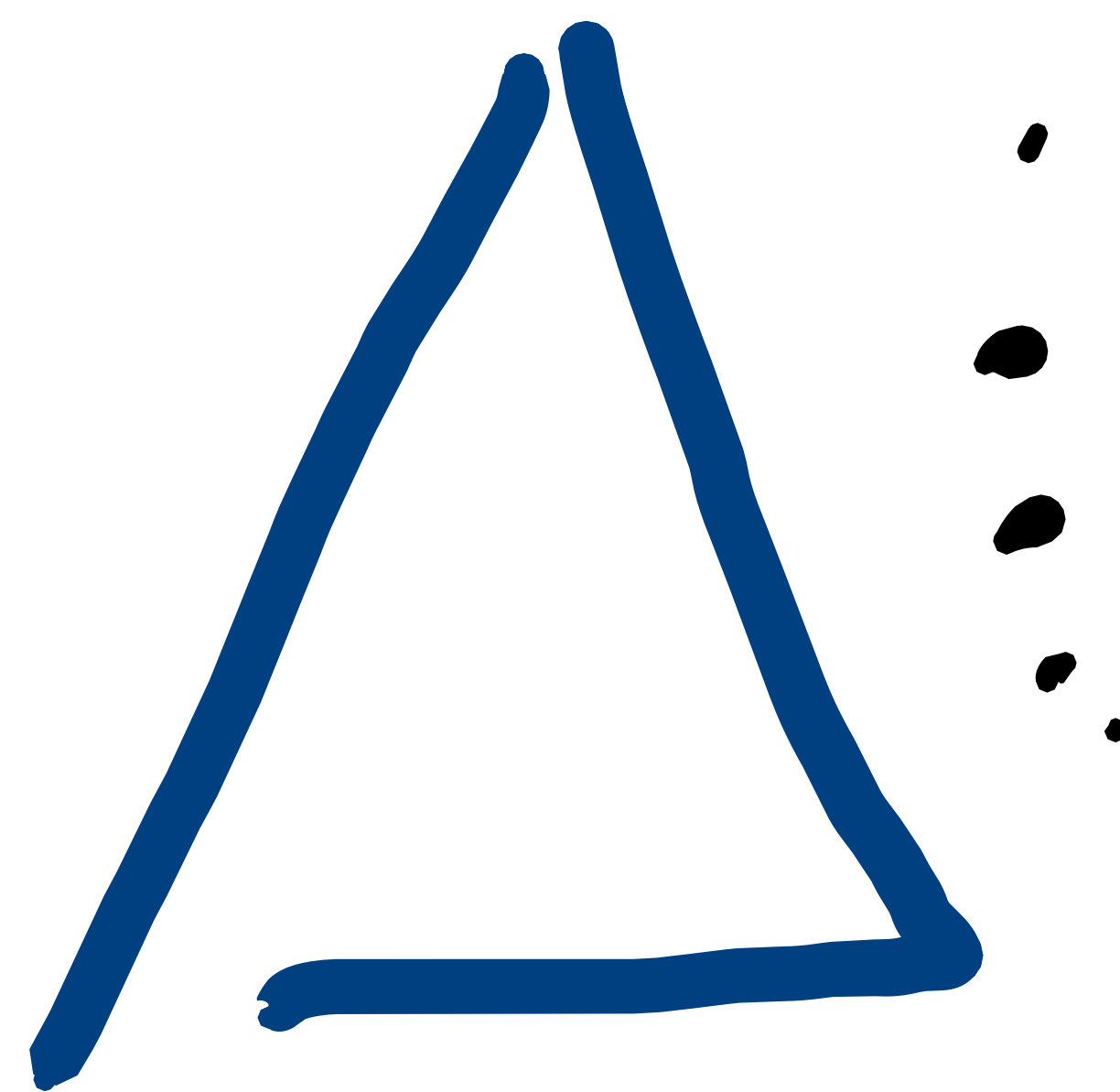
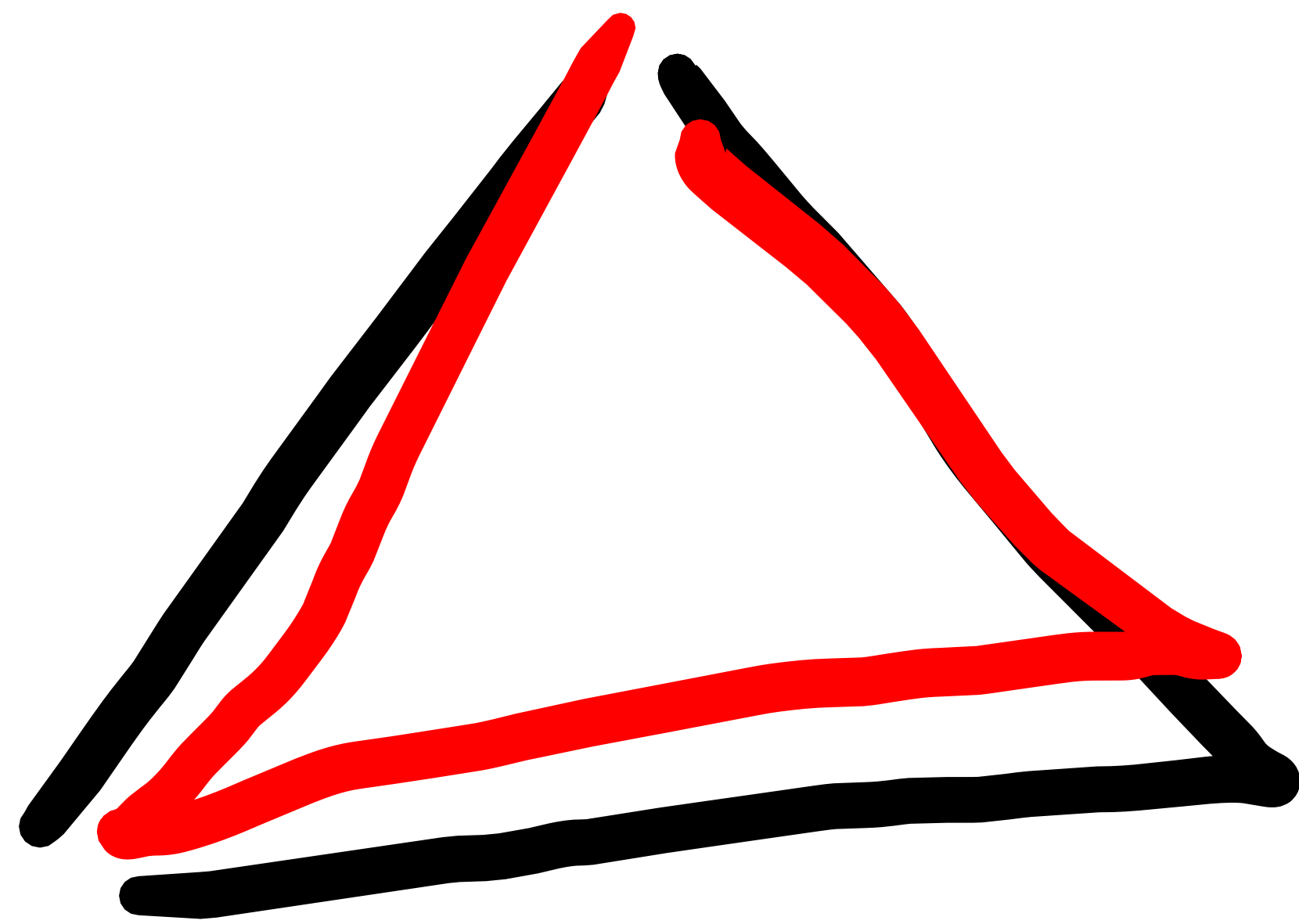
fib(49)

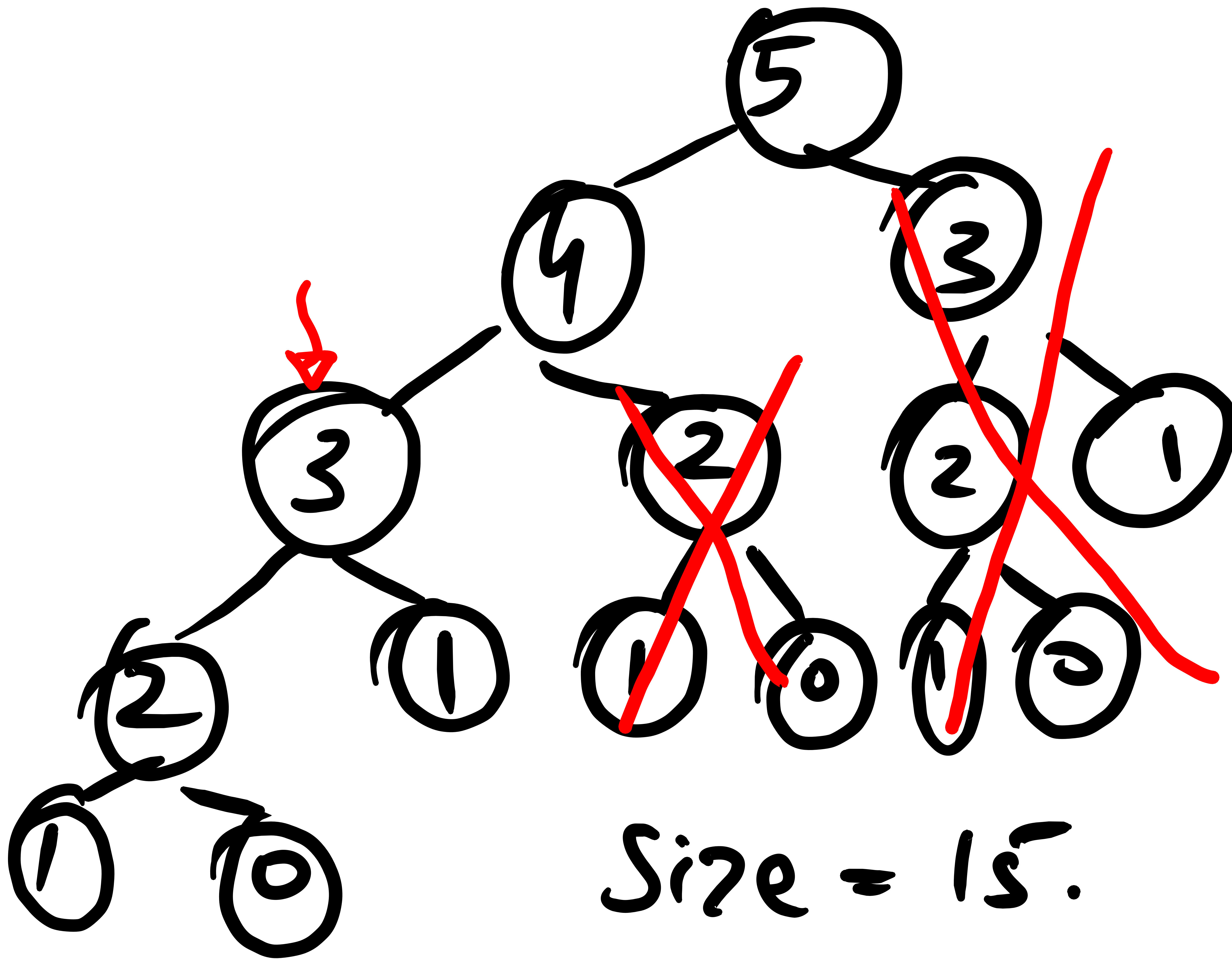
fib(48)

fib(48)

fib(47)

~~fib(47) fib(46)~~

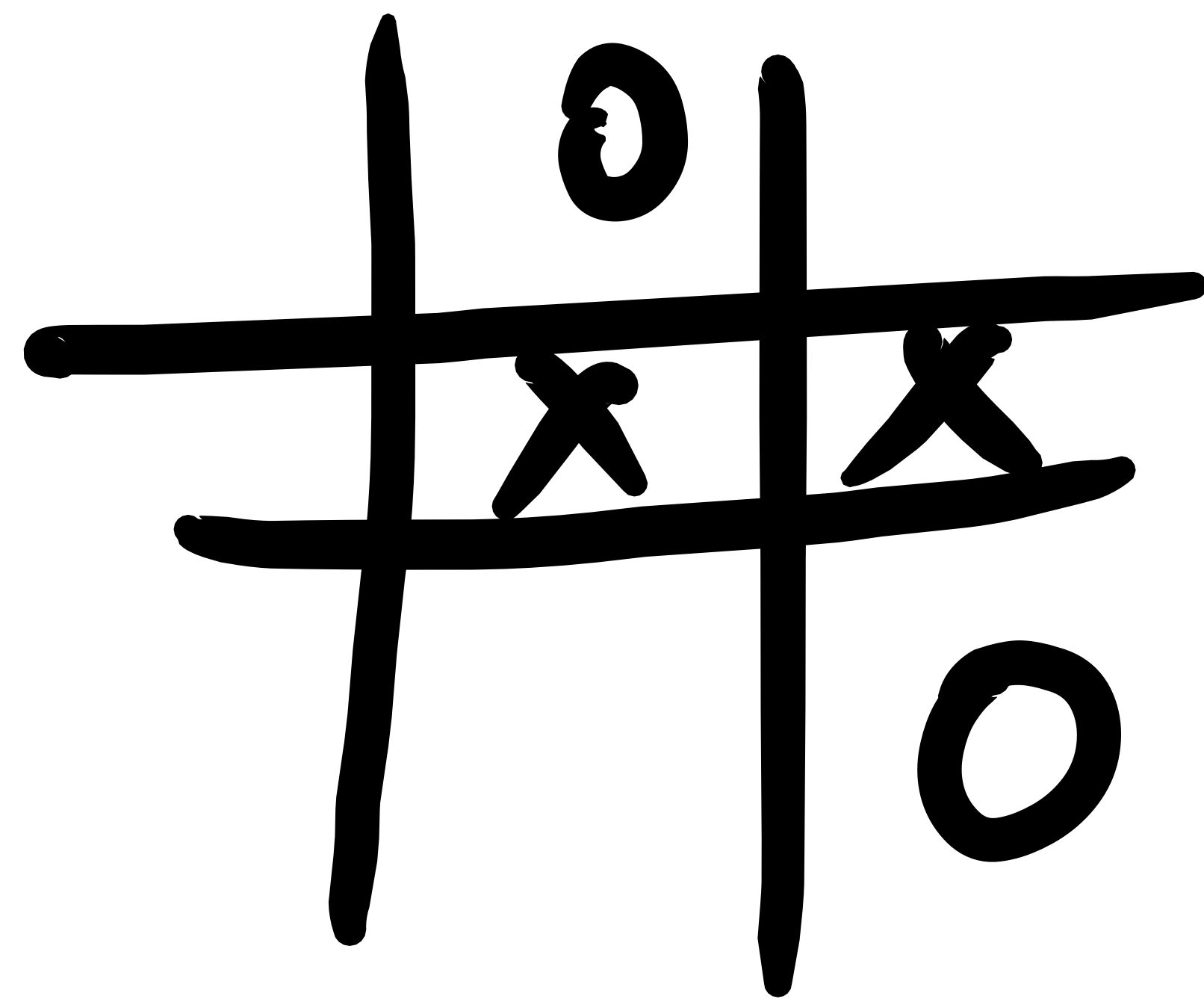




Size = 15.

Size of
recursion
tree
for $\text{fib}(n)$
= $\Theta(\text{fib}(n))$

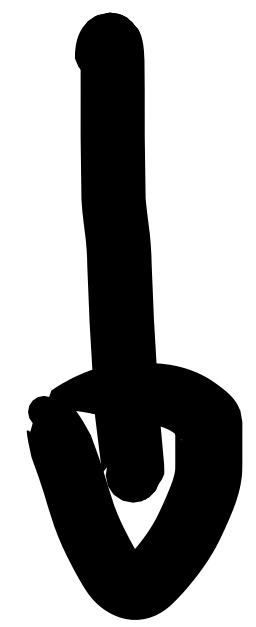
Size with memoization = $O(n)$.



Blank \rightarrow 0

x \rightarrow 1

0 \rightarrow 2



$$(020011002)_3 = 2 + 3^3 + 3^4 + 2 \times 3^7$$

~~00000000~~

~~$3^{10} - 1$~~

What is the board with the largest index?

000

xx-

- - -

222110000

(22221110)₃

=

000

xx0

xx-

000

0xx

xx-