#3

$$\begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix}^{14}$$

↓

$$\begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix} = \begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix}$$

↓

$$\begin{pmatrix} 2 & 1 \\ 1 & 1 \end{pmatrix}\begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix} = \begin{pmatrix} 3 & 2 \\ 2 & 1 \end{pmatrix}$$

↓

$$\begin{pmatrix} 3 & 2 \\ 2 & 1 \end{pmatrix}\begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix} = \begin{pmatrix} 5 & 3 \\ 3 & 2 \end{pmatrix}$$

Pattern

$$\begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix}^{k} = \begin{pmatrix} F_{k+1} & F_k \\ F_k & F_{k-1} \end{pmatrix} \quad \text{for } k \geq 1 \quad (F_0 := 0,\ F := 1)$$

Thus $\begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix}^{14} = \begin{pmatrix} F_{15} & F_{14} \\ F_{14} & F_{13} \end{pmatrix}$

k	F_k
0	0
1	1
2	1
3	2
4	3
5	5
6	8
7	13
8	21
9	34
10	55
11	89
12	144
13	233
14	377
15	610

↳ $\begin{pmatrix} 610 & 377 \\ 377 & 233 \end{pmatrix}$