We call $X_b$ is the number of possible way if there are $b$ 2-steps.

$a$ is the number of 1-step

$\rightarrow \quad a + 2b = n$

$$X_b = \frac{(a+b)!}{a!\,b!} \qquad \text{(repeated permutation)}$$

$b = 0$ then $a = n$.

$\rightarrow \quad X_0 = \frac{n!}{n!\,0!} = 1$

For $b' = b-1$ then $a' = n - 2(b-1) = n - 2b + 2 = a + 2$

$$X_{b-1} = \frac{(a'+b')!}{a'!\,b'!} = \frac{(a+b+1)!}{(a+2)!\,(b-1)!}$$

$$\frac{X_b}{X_{b-1}} = \frac{(a+b)!}{a!\,b!} \cdot \frac{(a+2)!\,(b-1)!}{(a+b+1)!} = \frac{(a+2)(a+1)}{b(a+b+1)}$$

$$\rightarrow \quad \frac{X_b}{X_{b-1}} = \frac{(a+2)(a+1)}{b(a+b+1)}$$