CW2HWST-7)

As I mentioned in class, this is all about putting 'balls' into 'boxes.' However, it's sometimes difficult to know which are the balls and which are the boxes. It's tempting to think of this problem as putting 100 'balls' into two 'boxes,' the left half and the right half of the container. In reality, there are fifty 'balls' (being on the right-ness) that you are putting into one hundred 'boxes.' Some particles have the BOTR balls and some don't.

N = 100 and n = 50, so the number of ways this can be done is

$$\frac{100!}{50!\ 50!} = 1.009 \times 10^{29} \quad .$$

FYI:

n identical balls into N boxes, no more than one to a box: $\frac{\mathrm{N!}}{\mathrm{n!(N-n)!}}$.

n distinguishable balls into N boxes, no more than one to a box: $\frac{\mathrm{N!}}{\mathrm{(N-n)!}}$.

n identical balls into N boxes, as many balls in a box as you like: $\frac{(N+n-1)!}{\mathrm{n!}(N-1)!}$.

n distinguishable balls into N boxes, as many balls in a box as you wish: $\mathrm{N^n}$.