Useful Mathematical Notation (n is a positive integer)

$\sqrt{n}$ is the positive square root of *n.*

$n!$ is n **factorial**, means $n(n-1)(n-2)\ldots\ldots 2.1$ which is the number of permutations of n objects e.g. 3! means the number of three digit numbers that can be made with 1, 2, and 3.

$!n$ is the number of **derangements** of *n* objects e.g. !3 means the number of three digit numbers that can be made with 1, 2, and 3 with no 1 in the hundreds position, no 2 in the tens position, and no 3 in the units position.

$n!!$ is not the same as $(n!)!$.
It is defined as $n = \begin{cases} 1 \times 3 \times 5 \ldots\ldots n & n\ odd \\ 2 \times 4 \times 6 \ldots\ldots n & n\ even \end{cases}\ n \geq 2$
Other multifactorials can be defined similarly.

If n is fractional $\lfloor n \rfloor$ is the **floor** of n. $\lfloor n \rfloor$ is the largest integer less than or equal to n.

Similarly, $\lceil n \rceil$ is the **ceiling** of n. $\lfloor n \rfloor$ is the smallest integer larger than or equal to n.

So $\lfloor 1 \div 4 \rfloor = 0$ and $\lceil 1 \div 4 \rceil = 1$

Interesting formula: $!n = \left\lfloor \frac{n!}{e} + \frac{1}{2} \right\rfloor$

Note:
$\sqrt{2} \approx 1.41$ $\sqrt{3} \approx 1.73$

!1=0 !2=1 !3=2 !4=9

4!!=8

(3!)!=720 **(4!)!=** 6.20448401 E+23