A Notation for the Product of Factorials

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2015

1 Notation

Let $n \in \mathbb{N}$.

$$
\begin{aligned}
n \,!!\, n &= n! \cdot n! \\
n \,!!!\, n &= (n \,!!\, n)! \\
n \,!!!!\, n &= (n \,!!!\, n)! \\
&\lambda n.n \text{etc.}
\end{aligned}
$$

2 f

Let $ng!n = n \,!!!\, n$ if $g = 3$.

$$
\begin{aligned}
f_1 &= 2 \\
f_2 &= 4 \\
f_g &= (f_{g-1})\, f_{g-1}!\, (f_{g-1}) \\
f_3 &= (576!)! \implies f_3 > 10^{18}
\end{aligned}
$$