

$$\begin{aligned}
 (*) &= \frac{\binom{M}{k} \binom{L}{n-k}}{\binom{N}{n}} \\
 &\quad \swarrow \begin{array}{l} \text{cancelling} \\ (M-k)! \end{array} \qquad \text{cancelling} \\
 &\qquad \qquad \qquad (L-n-k+1) \\
 &= \frac{\frac{M(M-1)\dots(M-k+1)}{\underbrace{k!}} \frac{L(L-1)\dots(L-n-k+1)}{\underbrace{(n-k)!}}}{\frac{N(N-1)\dots(N-n+1)}{\underbrace{n!}} \leftarrow \text{goes on top}}
 \end{aligned}$$