Binomial Coefficients

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$

$$
\begin{aligned}
n! &= n^n \sqrt{2\pi n} e^{-n} (1 + \frac{1}{12n} + O\left(\frac{1}{n^2}\right)) \\
&= \frac{n^n e^{-n} \sqrt{2\pi n}}{k^k e^{-k} \sqrt{2\pi k} (n-k)^{n-k} e^{-n+k} \sqrt{2\pi (n-k)}} \\
&= \left(\frac{n}{k}\right)^k \left(\frac{n}{n-k}\right)^{n-k} \sqrt{\frac{n}{k(n-k)2\pi}}
\end{aligned}
$$