$$\binom{n}{k} = \frac{\binom{n}{c}\binom{n-c}{k-c}}{\binom{k}{c}} \qquad n-c-k+c$$

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