1. Prove equation (4.1) in the text, i.e. that
\[
\binom{n}{r} = \binom{n-1}{r-1} + \binom{n-1}{r}, \quad 1 \leq r \leq n
\]

2. Show that in a group of 25 people, the odds of at least two people sharing a birthday is greater than 50%.

3. In arranging people around a circular table, we take into account their seats relative to each other, not the actual position of any one person. Show that \( n \) people can be arranged around a circular table in \((n - 1)!\) ways.