1. Prove that $\sum_{k=0}^{n} k \cdot k! = (k + 1)! - 1$

2. Prove that $\sum_{k=1}^{n} \frac{1}{k \cdot (k+1)} = \frac{n}{n+1}$

3. Prove that $n > 6 \rightarrow 3^n < n!$

4. Prove that if $A_0, A_1, \ldots, A_{n-1}$ and $B$ are sets, then $\bigcap_{A_i \cup B} = (A_0 \cup B) \cap (A_1 \cup B) \cap \ldots \cap (A_{n-1} \cup B)$.

5. Prove that a set with $n \geq 2$ elements has $n(n - 1)/2$ subsets of size 2.