1. What is the number of one-to-one functions $f$ from the set \{1, 2, \ldots, n\} to the set \{1, 2, \ldots, 2n\} so that $f(x) \neq x$ and $f(x) \neq 2n - x + 1$ for all $x$?

2. Given a finite set $S$, let the relation $R = \{(S_1, S_2) \mid S_1, S_2 \subseteq S, |S_1| = |S_2|\}$. Show whether or not $R$ is reflexive, symmetric, antisymmetric or transitive.

3. Given a function $f : A \rightarrow B$, let $R$ be the relation defined on $A$ by $aR_a'$ whenever $f(a) = f(a')$. Prove that $R$ is an equivalence relation and determine the equivalence classes.

4. Construct a deterministic finite-state automaton for the language $L = \{w \in \{0, 1\}^* \mid w$ contains 011 exactly once\}.

5. Give an informal description of a deterministic Turing machine for the language $L = \{ww^Rw \mid w \in \{0, 1\}^*\}$. 