1. Determine the character table for $D_6$.

2. (a) Determine the character table for the groups $C_5$ and $D_5$.
    
   (b) Decompose the restriction of each irreducible character of $D_5$ into irreducible characters of $C_5$.

3. (Artin 10.6.2) Let $\rho$ be the permutation representation associated to the operation of $D_3$ on itself by conjugation. Decompose the character of $\rho$ into irreducible characters.

4. (Artin 10.6.5) The symmetric group $S_n$ operates on $\mathbb{C}^n$ by permuting the coordinates. Decompose this representation explicitly into irreducible representations.

5. (Artin 10.7.4) Let $\rho$ be a representation of $G$ and let $C$ be a conjugacy class in $G$. Show that the linear operator $T = \sum_{g \in C} \rho_g$ is $G$-invariant.