1. Prove the lemma formulated in class: if $K, L \subset G$ are subgroups such that $K$ normalizes $L$, i.e. $kLk^{-1} = L$ for all $k \in K$, then the set $KL = \{kl, k \in K, l \in L\} \subset G$ is a subgroup isomorphic to $K \rtimes L/K \cap L$.

2. Describe all Sylow 2-subgroups and 3-subgroups of $D_{12}$ (symmetries of a regular hexagon).

3. Prove that if $|G| = 105$, then $G$ has a normal Sylow 5-subgroup and a normal Sylow 7-subgroup.

4. Let $G$ be a group of order $p^2q$, where $p, q$ are prime, $p < q$. Assume that $p$ does not divide $q - 1$. Prove that then $G$ is abelian.

5. Classify all groups of order 75.

6. Classify all groups of order 20.