From Artin
Chapter 6 (pp 221–224) 2.7, 2.8, 2.13, 3.3, 7.3, 7.4(b).

Others:
1. How many elements of order 7 must there be in a simple group of order 168?
2. Let $G$ be a group of order 99, and $H < G$ of order 11. Prove that $H$ is a normal subgroup.
3. Let $p$, $q$, $r$ be distinct primes with $r > q > p$. Show that a group of order $pqr$ is not simple.
4. Identify a Sylow 2-subgroup of $S_6$.
5. Prove that there is no simple group of order 616.
6. Prove that there is no simple group of order 132.
7. (extra for entertainment) (a) Prove that two permutations in $S_n$ are conjugate if and only if they have the same cycle type.
(b) Let $\sigma \in S_n$ be written as a product of disjoint cycles of length $m_i$, with each cycle of length $m_i$ appearing $k_i$ times (so $n = \Sigma_k k_i m_i$). Prove that the number of conjugates of $\sigma$ is:
\[
\frac{n!}{k_1! k_2! \ldots k_s! m_1^{k_1} m_2^{k_2} \ldots m_s^{k_s}}
\]