

**Exercise 1.** Determine all of the Sylow 3-subgroups of  $S_5$ .

**Exercise 2.** Show that there is no simple group of order 200 (Hint: Look for a normal Sylow  $p$ -subgroup).

**Exercise 3.** Let  $G$  be a group of order  $p^n q$  for some primes  $p > q$ . Show that  $G$  contains a unique normal subgroup of index  $q$ .

**Exercise 4.** Show that every group of order  $p^2 q$  for distinct primes  $p, q$  is solvable.

**Exercise 5.** Let  $G$  be a group,  $K \leq G$ , and  $H \trianglelefteq G$ . Show that if  $H$  and  $K$  are solvable, then  $HK$  is solvable as well.