

- (1) (Algebra Comp F08) Show that all groups of order 45 are abelian.
- (2) (Algebra Comp F03) Let G be a p -group and $N \trianglelefteq G$, a normal subgroup of order p . Prove that N is in the center of G .
- (3) According to the handout, S_4 has 9 subgroups of order 2. These subgroups cannot all be conjugate since 9 does not divide 24. Partition these subgroups into conjugacy classes.
- (4) Let G be a group and $\{D_1, D_2, D_3\}$ a conjugacy class of subgroups.
 - (a) Show that $|G : D_i| \geq 3$ for $i = 1, 2, 3$.
 - (b) Show that G has a normal subgroup N such that $|G : N|$ is 3 or 6.