(1) Write out the Cayley table of a group on the set \{o,p,q\} with o as the identity element.

(2) List all 8 elements of the subgroup of \(S_4\) generated by the subset \{(12)(34), (13)\}. You must express each element as a product of disjoint cycles.

(3) Let \(M\) and \(N\) be normal subgroups of a group \(G\). Show that the subset \(MN = \{mn \mid m \in M, n \in N\}\) of \(G\) is a normal subgroup of \(G\).

(4) Prove \(\text{Aut}(\mathbb{Z}_8) \cong \mathbb{Z}_2 \times \mathbb{Z}_2\).

(5) For a group \(G\), let \(\hat{G}\) be the diagonal subset

\[\hat{G} = \{(g, g) \mid g \in G\}\]

of \(G \times G\). Show that the group \(G\) is abelian if and only if \(\hat{G}\) is a normal subgroup of \(G \times G\).

(6) Show that there is no simple group of order 28.