1. Write group presentations for
   (i) $S_5$
   (ii) $\mathbb{Z}/4\mathbb{Z} \oplus \mathbb{Z}/6\mathbb{Z} \oplus \mathbb{Z}/12\mathbb{Z}$.
2. Let $G$ be a group with $[G : Z(G)] = 4$. Show that $G/Z(G) \cong \mathbb{Z}/2\mathbb{Z} \oplus \mathbb{Z}/2\mathbb{Z}$.
3. If $G$ is a group of order $105 = 3 \cdot 5 \cdot 7$, show that any subgroup of order 35 is normal.
4. Let $Q_8 := \{\pm 1, \pm i, \pm j, \pm k\}$ with the relations $i^2 = j^2 = k^2 = ijk = -1$.
   (i) Show that $Z(Q_8) = \{\pm 1\}$.
   (ii) Find a group presentation of $Q_8$.
   (iii) Show that every subgroup of $Q_8$ is normal.