1) What is a group?
2) What is an abelian group?
3) Give an example of each of the following:
   a) A finite abelian group,
   b) An infinite abelian group,
   c) A finite nonabelian group,
   d) An infinite nonabelian group.
4) What is a subgroup?
5) What is a normal subgroup?
6) Give examples of nonabelian groups with at least 3 normal subgroups.
7) What is a homomorphism? What is an automorphism? Give examples.
8) Show that if \( f: G \rightarrow H \) is a homomorphism, then \( f(1) = 1 \) and \( f(x^{-1}) = f(x)^{-1} \).
9) Recall that if \( f: G \rightarrow H \) is a homomorphism, the kernel, \( \text{Ker}(f) \), is defined as follows:
   \[ \text{Ker}(f) = \{ g \in G : f(g) = 1 \} \]
   Show that \( \text{Ker}(f) \) is a normal subgroup of \( G \).
10) If \( H \) is a normal subgroup of \( G \), what can you say about \( G/H \)?
11) Find the subgroup of \( \langle \mathbb{Q}, +, 0 \rangle \) generated by \( \frac{1}{2} \) and \( \frac{1}{5} \).
12) Find the subgroup of \( \langle \mathbb{Q}^*, \times, 1 \rangle \) generated by all rational numbers > 0 and < 1. (Recall that \( \mathbb{Q}^* = \mathbb{Q} \setminus \{0\} \)).
13) Find the subgroup of \( \text{Sym}(6) \) generated by \((1,2)\), \((3,4)\) and \((5,6)\).
14) What is the order of an element in a group?
15) Show that a group whose elements have order 2 is abelian.
16) Let \( f: G \rightarrow H \) be a homomorphism and \( g \in G \). Assume that the order of \( g \) and \( f(g) \) are prime to each other. Show that \( g = 1 \).