Math 5370 **ALGEBRAIC STRUCTURES** Spring 2020
Dr. Duval **Homework 4**
due Thursday, February 20

1. Recall (or recreate) the multiplication table you made for the group of symmetries of a triangle. Prove that this group is isomorphic to the group of all permutations on the set $\{1, 2, 3\}$.

2. Let k be a positive integer. Prove that $k\mathbf{Z} = \{kn \colon n \in \mathbf{Z}\}$ is a subgroup of $(\mathbf{Z}, +)$, the additive subgroup of $\mathbf{Z}$. Then describe all the left cosets of $k\mathbf{Z}$ (your answer will depend on k).

3. Let G and H be groups, and let ϕ be a homomorphism from G to H. Prove that $\ker \phi$ is a subgroup of G.

4. Let G be a group, and let H be a subgroup of G. Prove that $c \in H$ if and only if $cH = H$ and $Hc = H$.