1 Evaluation Criterion

The evaluation of the first homework was done as follows:

- 10 points were awarded for completion of the homework and the other 10 points were awarded for correctness of the arguments.
- In order to get full points for completion the student has to give a serious attempt of solution to each of the problems.
- Half of the problems were completely read by me (Ian) and I wrote very short comments when I found it necessary. Even if you got a perfect score I might have written something.
- The second half of the problems were superficially read until I was convinced that the student was making a serious attempt of solution. In some cases I found mistakes on serious attempts of proofs for those problems. In those cases I also wrote comments, but no points for correctness were deducted. For non-serious attempts of solution points for completeness were deducted.

2 List of common mistakes and some comments

- If $G$ is a group and $H \leq G$ is a subgroup, then it is NOT always true that: $g_1Hg_2H = g_1g_2H$. For this identity to hold we usually require $H$ to be a normal subgroup of $G$.

- For problem 3, there was some confusion with the left action of $G$ on left cosets. The following function $f : G \times G/H \to G/H$ is not well defined: $f(g, aH) = agH$. Suppose we have two representatives $aH = ahH$ for $f(g, aH)$ to be well defined for each $g$ we have to verify that $ahgH = agH$. That is: $g^{-1}a^{-1}abg \in H$ or equivalently $h \in gHg^{-1}$ has to hold for each $g \in G$. This would imply $H$ is a normal subgroup of $G$, which was not in the hypothesis of this problem.

- For problem 2, one can not use the classification of finite abelian groups unless you prove beforehand that every group of order 4 is abelian.

- For problem 3 the common solution would construct a permutation action of $G$ on the set $G/H$ of left cosets. This would give a group homomorphism to $S_n$ where $n = [G : H]$. The mistake was to assume that the map $f : G/Ker(f) \to S_n$ is an isomorphism. In the general case $G/Ker(f)$ is only a subgroup of $S_n$.

- For problem 4, there were attempts of solution that would map the left coset $xH$ to the right coset $Hx$. This assignment will be well defined but it is not necessarily a bijection.

- The most common mistake happened for problem 3. One had to prove that if $H$ is a subgroup of $G$ of finite index, then there is a normal subgroup contained in $H$ that also has finite index. Many people forgot to prove the finite index part.