TUTORIAL HOUR - 25/10

1 Required

1.1 Material

- Permutation Puzzles by Dr.Jamie Mulholland as a part of MATH 304 at Simon Fraser University.

1.2 Exercises

1.2.1 Gallian

- Supplementary Exercises for Chapters 1 - 4, 1 - 10, A First Course in Abstract Algebra
- Chapter 5, 70 - 79, A First Course in Abstract Algebra

1.2.2 Programming

- Given a list of generators of a group (of order < 256) can you express every element of the group as a minimal product of the generators? A product is deemed minimal if no smaller product produces the same element.
- Given a finite group G find the longest chain of subgroups $\{H_i\}_{i=0}^{n}$ such that
  - $H_0 := \{e\}$
  - $H_n := G$
  - $H_{i-1} \subsetneq H_i$ for all $1 \leq i \leq n$

2 Additional

2.1 Furloughing non-performers

Define $GenSet(G) := \{S \subseteq G | S \text{ generates } G\}$ as the set of all possible generating sets of a group G. Observe $GenSet(G) \neq \phi$, as $G \in GenSet(G)$.

We call an element g of G a *non-generator* if for all generating sets S containing g, $S \setminus \{g\}$ is still a generating set.
Define $NotGen(G) := \{g \in G | g \text{ is a non-generator}\}$.

Compute the following:

- $NotGen(S_3)$
- $NotGen(\mathbb{Z})$
- $NotGen(\mathbb{Z}/4\mathbb{Z})$

Are all of these groups? Is $NotGen(G)$ always a subgroup of G?