

Project 1

Due: October 7, 2011

Recommended length: 2-3 pages.

Format: typed.

The goal of this assignment is to examine the behavior of in and out shuffles. Suppose that you have a deck of $2n$ cards. Let $i \in S_{2n}$ denote the permutation that gives an in-shuffle, and let $o \in S_{2n}$ denote the permutation that gives the out-shuffle (see Homework 3). The main goal is to begin understanding the subgroup generated by i and o .

Some things to do in the course of the paper:

- (1) Identify a characteristic that all permutations in $\langle i, o \rangle$ share; make this as precise as possible and prove it.
- (2) Show that all permutations that have the characteristic found in (1) form a proper subgroup of S_{2n} .

In doing this you should

- (a) Briefly introduce the topic.
- (b) Give the necessary definitions and results you will need for your main theorems. You do not need to prove the results that are in the book, but both the results and the definitions should be stated in your own words in a way that focuses them on the theorem. You may assume that the reader has read up through Chapter 8 of the textbook.
- (c) State and prove the main theorems.

Note that this is a writing assignment, so the main focus should be on clearly communicating the ideas in the proof. I recommend looking at your favorite mathematics texts and trying to emulate their style. I also suggest you have another member of the class read through a draft before handing it in.