Homework 5 - Math 546H, Frank Thorne (thornef@mailbox.sc.edu)

Due Thursday, October 31

(1) Saracino, Chapter 7: 7, 8; Chapter 8: 1, 2, 7, 11, 12, 15, 16, 18, 26; Chapter 9: 3, 8, 12, 15, 18.

(2) Find subgroups of $Sym(5)$ whose orders are: 1, 2, 3, 4, 5, 6, 8, 10, 12, 20, 24, 60, and 120.

(3) Explain: `https://www.youtube.com/watch?v=7lNk7bfkFq8` (**No Googling for the answer**)

(4) **Bonus.** One hundred prisoners are numbered 1 through 100. They are informed by the jail warden that each of them, in turn, will be taken to a room with 100 boxes labeled 1 through 100. In the boxes are 100 slips of paper, printed with one number from 1 through 100 (every slip of paper has a different number), and put in the boxes at random.

Each prisoner may look inside fifty of the boxes. If *all* of the prisoners see their own number, then all of them will be pardoned. If *any* of the prisoners does not see his/her own number, then all of the prisoners will be executed.

The prisoners may freely talk and coordinate a strategy beforehand, but once they begin they have no way of communicating with each other (including by adjusting the boxes, flipping the lights on or off, etc., etc.) With optimal strategy, what is the probability that the prisoners will go free?