Group Theory
Homework Assignment 10
Spring, 2020

1. Simplify the following permutations into the product of cycles without any common object.
   (a) $(1\ \ 2)(2\ \ 3)(1\ \ 2)$.
   (b) $(1\ \ 2\ \ 3)(1\ \ 3\ \ 4)(3\ \ 2\ \ 1)$.
   (c) $(1\ \ 2\ \ 3\ \ 4)^{-1}$.
   (d) $(1\ \ 2\ \ 4\ \ 5)(4\ \ 3\ \ 2\ \ 6)$.
   (e) $(1\ \ 2\ \ 3)(4\ \ 2\ \ 6)(3\ \ 4\ \ 5\ \ 6)$.
2. Write down all the Young patterns of the permutation group S_6 from the largest to the smallest.
3. Using the hook rule, calculate the number $d_{[3,2,1,1]}(S_7)$ of the standard Young tableaux for the Young pattern $[3,2,1,1]$ of the permutation group S_7.
4. Write down the Young operator corresponding to the following Young tableau.

1	2
3	4

5. Write down the permutation R_{12} transforming the Young tableau $\mathcal{Y}_2$ to the Young tableau $\mathcal{Y}_1$.

$\mathcal{Y}_1$:

1	2	3	
4			

$\mathcal{Y}_2$:

1	2	4	
3			

Show that $\mathcal{P}_1 R_{12} = R_{12}\mathcal{P}_2$, $\mathcal{Q}_1 R_{12} = R_{12}\mathcal{Q}_2$, and $\mathcal{Y}_1 R_{12} = R_{12}\mathcal{Y}_2$.