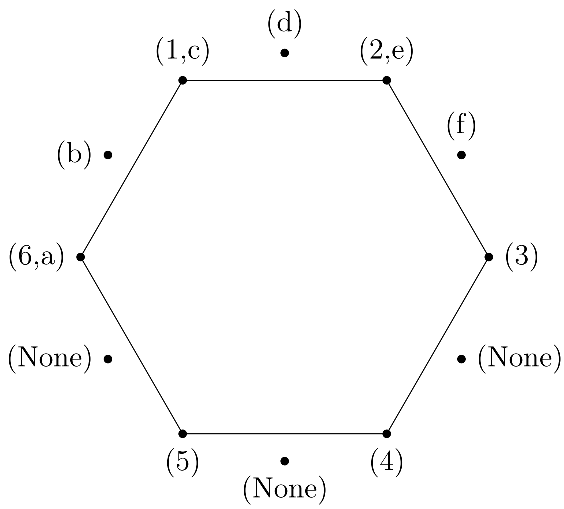
Homework 4

p77 F.1, p78 H.1, p86 A.1 (a,b,c), A.2 (b,c,d), and A.4 (d)

1. **p77 F.1.** Let G be the group of symmetries of the regular hexagon. List the elements of G (there are 12 of them), then write the table of G.



(No need to write the group table of G.)

Solution.

$$R_0 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 1 & 2 & 3 & 4 & 5 & 6 \end{pmatrix} \quad R_1 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 3 & 4 & 5 & 6 & 1 \end{pmatrix}$$

$$R_2 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 4 & 5 & 6 & 1 & 2 \end{pmatrix} \quad R_3 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ x & x & x & x & x & x \end{pmatrix}$$

etc...

2. **p78 H.1.** Let A be a set of $a \in A$. Let G be the subset of S_A consisting of all the permutation F of A such that $F(a) = a$. Prove that G is a subgroup of S_A.

Solution.

3. **p86 A.1 (a,b,c).** Compute each of the following products in S_9. (Write your answer as a singuler permutation.)

   Solution.

   (a) (145)(37)(682)

   (b) (17)(628)(9354)

   (c) (71825)(36)(49)

4. **p86 A.2 (b,c,d).** Write each of the following permutations in S_9 as a product of disjoint cycles:

   Solution.

   (a) Not Assigned

   (b) $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 7 & 4 & 9 & 2 & 3 & 8 & 1 & 6 & 5 \end{pmatrix}$

   (c) $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 7 & 9 & 5 & 3 & 1 & 2 & 4 & 8 & 6 \end{pmatrix}$

   (d) $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 9 & 8 & 7 & 4 & 3 & 6 & 5 & 1 & 2 \end{pmatrix}$

5. **p86 A.4 (d).** If $\alpha = (3714), \beta = (123), and \gamma = (24135)$ in S_7, express each of the following as a product of disjoint cycles:

   (d) $\beta^2\alpha\gamma$

   Solution.