MATH 579: Combinatorics

Homework 10: Due Dec.4

- 1. In S_6 , set $\pi = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 4 & 6 & 5 & 3 & 1 & 2 \end{pmatrix}$ and $\tau = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 6 & 2 & 1 & 5 & 4 \end{pmatrix}$. Calculate $\pi \circ \pi, \pi \circ \pi \circ \pi, \pi \circ \tau, \tau \circ \pi, \tau \circ \tau$.
- 2. In S_6 , set $\pi = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 4 & 6 & 5 & 3 & 1 & 2 \end{pmatrix}$ and $\tau = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 6 & 2 & 1 & 5 & 4 \end{pmatrix}$. Calculate π^{-1} and τ^{-1} . Express each answer in both two-line notation and in cycle notation.
- 3. In S_6 , set $\pi = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 4 & 6 & 5 & 3 & 1 & 2 \end{pmatrix}$ and $\tau = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 6 & 2 & 1 & 5 & 4 \end{pmatrix}$. Find all elements of $\langle \pi \rangle$ and $\langle \tau \rangle$.
- 4. In S_4 , set $\gamma = (1, 2, 3, 4)$ and $\rho = (1, 3)$. Find all elements of $\langle \gamma, \rho \rangle$.
- 5. Find the automorphism group for:



- 7. Find the automorphism groups for: $\begin{array}{c}
 1 - 2 - 3 \\
 5 - 4
 \end{array}, \begin{array}{c}
 1 - 2 - 3 \\
 5 - 4
 \end{array}, \begin{array}{c}
 1 - 2 - 3 \\
 5 - 4
 \end{array}, \begin{array}{c}
 1 - 2 - 3 \\
 5 - 4
 \end{array}.$ 8. Find the automorphism group for: $\begin{array}{c}
 1 - 2 - 3 \\
 5 - 4
 \end{array}, \begin{array}{c}
 1 - 2 - 3 \\
 5 - 4
 \end{array}.$ 9. Find the automorphism group for: $\begin{array}{c}
 1 - 2 - 3 \\
 5 - 4
 \end{array}, \begin{array}{c}
 1 - 2 - 3 \\
 4 - 5 \\
 6
 \end{array}$
- 10. Find the group of rotations for a (solid) cube.
- 11. Find the automorphism group for:



Contrast with the answer to the previous problem.