Assignment 3

1. The number of permutations of $1, 2, \cdots, 6$ with cycle type $3 + 3$ is (please enter only the final numerical answer):

2. The number of permutations of $1, 2, \cdots, 6$ with cycle type $3 + 2 + 1$ is:

3. Let σ be the following permutation of $1, 2, \cdots, 5$ (written in cycle notation): $\sigma = (1\ 5)(2\ 4)(3)$. The number of inversions (crossings) of σ is:

4. Let π be the following permutation of $1, 2, \cdots, 5$ (written in cycle notation): $\pi = (1\ 3\ 5)(2\ 4)$. The number of inversions of π is:

5. Among the following permutations of $1, 2, \cdots, 5$ (written in one-line notation), choose *all the even permutations* (there could be more than one):

   - 23451.
   - 34521.
   - 42315.
   - 52341.

6. Let n be a natural number, and let S_n denote the set of all permutations of $1, 2, \cdots, n$. What is the maximum possible number of crossings a permutation in S_n could have ?

   - $\frac{n(n+1)}{2}$.
   - $\frac{n(n-1)}{2}$.
   - n^2.
   - n.

7. Referring back to the previous question, how many different permutations in S_n have this maximum number of crossings ?

   - 1.
   - 2.
   - $n!$
   - n.

8. Let σ, π be arbitrary permutations in S_n (where S_n is as above). Then $\sigma \circ \pi$ and $\pi \circ \sigma$ have the same number of crossings.

   - True.
   - False.