1. (DF1.7.8) Let A be a nonempty set and let k be a positive integer with $k \leq |A|$. The symmetric group S_A acts on the set B consisting of all subsets of A of cardinality k by $\sigma \cdot \{a_1, \ldots, a_k\} = \{\sigma(a_1), \ldots, \sigma(a_k)\}$.

   (a) Prove that this is a group action.

   (b) Describe explicitly how the elements $(1\,2)$ and $(1\,2\,3)$ act on the six 2-element subsets of $\{1, 2, 3, 4\}$.

2. (DF1.7.9) Do both parts of the preceding exercise with "ordered k-tuples" in place of "k-element subsets," where the action on k-tuples is defined as above but with set braces replaced by parentheses.

3. (DF1.7.21) Show that the group of rigid motions of a cube is isomorphic to S_4.

4. (DF1.7.23) Explain why the action of the group of rigid motions of a cube on the set of three pairs of opposite faces is not faithful. Find the kernel of this action.