1. List the members of your group below. Underline your name.

2. Define sorting and comparison sorting.

3. Name a well-known comparison-sorting algorithm and another sorting algorithm that is not a comparison-sort.

4. Define a permutation of a collection of objects. List all permutations of the collection \( \{1, 1, 3, 5, 5\} \).
5. For an integer $n > 1$, let $V_n$ be the set of $(n - 2)$-character strings $\{x_1x_2\ldots x_{n-2} \mid x_i \in \{1, 2, \ldots, n\} \text{ and } x_i \neq x_j \text{ unless } i = j\}$.

(a) List $V_n$ for $n = 2, 3, 4$.
(b) What is the cardinality of $V_n$, as a function of $n$?
(c) Provide an alternate, equivalent (perhaps simpler) definition of $V_n$. 
6. For an integer \( n > 1 \), define a digraph \( Q_n = (V_n, E_n) \) where the set of vertices \( V_n \) defined in Question 5 and the set of edges \( E_n = \{(u, v) \mid u, v \in V_n \text{ with } u = x_1x_2x_3 \cdots x_{n-2}, v = x_2x_3 \cdots x_{n-2}x_{n-1}, \text{ where } x_i \neq x_j \text{ for } i \neq j \} \).

(a) Depict \( Q_n \) for \( n = 2, 3, 4 \).
(b) What is the cardinality of \( E_n \), as a function of \( n \)?
(c) Is there anything notable about the degrees of vertices in \( Q_n \)?
(d) Provide an alternate, equivalent (perhaps simpler) definition of \( Q_n \).
7. Do the graphs $Q_2$, $Q_3$, and $Q_4$ of Question 6 have Eulerian paths? For each graph, exhibit an Eulerian path or explain why no such path exists.

Recall that an Eulerian path in a digraph is a directed path that traverses each edge exactly once. A digraph with such a path is called Eulerian.

8. Prove or disprove: The graphs $Q_n$ of Question 6 are Eulerian for all $n > 1$. 