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 $\{x_1 x_2 \ldots x_{n-2} \mid x_i \in \{1, 2, \ldots, n\}$ and $x_i \neq x_j$ 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 $n > 1$.