1. What is an algorithm with the smallest number of comparisons you can find for outputting both the maximum and the minimum of \( n \) numbers?

2. What is an algorithm with the smallest number of comparisons you can find for outputting the \( n^{1/3} \)-ranked item in a list of \( n \) unordered distinct items in the comparison-based model? You can use \( O(\cdot) \)-notation.

3. In class we saw how to find a \( k \)-multiplicative spanner with \( O(n^{1+1/t}) \) edges on any unweighted undirected graph \( G \) on \( n \) vertices, where \( k = 2^t - 1 \). Suppose now each edge \( e \) of \( G \) has a weight \( w_e \), and the distance between two nodes \( u \) and \( v \) in \( G \) along a path \( P \) is the sum of weights of the edges along \( P \). Then \( d_G(u, v) \) is the shortest path distance between \( u \) and \( v \). Show how to find a subgraph \( H \) of \( G \) which is a \( k \)-multiplicative spanner with \( O(n^{1+1/t}) \) edges.