1. Describe an algorithm that, given an array of \( n \) integers in the range 0 to \( k \), preprocesses its input and then answers any query about how many of the \( n \) integers fall into a range \([a..b]\) in \( O(1) \) time. Your algorithm should use no more than \( O(n + k) \) preprocessing time.

2. Design a simple scheme that makes any comparison-based sorting algorithm stable. (A sorting algorithm is called stable if it preserves the relative order of elements which are equal.)

3. Show the path of the decision tree for Mergesort operating on the array \((5, 3, 2, 4)\).