

科目：演算法 A

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請 “✓” 明 ✓不可看書 可看書

* 請將答案依題號順序寫入答案卷

答題時字跡需工整，否則不予計分。Write your answers legibly; otherwise you will get zero score.

1. Divide and Conquer: Given a set, S of n numbers in an array, I am looking for the pair of numbers in S such that the difference between the pair is the least. Design a divide and conquer algorithm. I need divide and conquer algorithm, so you cannot sort. How much time does it take?
2. Describe the algorithm that builds a max heap from an array of size n in linear time. Argue that it runs in Linear time.
3. If a max heap can be built in linear time, can we sort an array of n numbers in linear time?
4. Prim's minimum spanning tree algorithm: Describe the most efficient implementation of the algorithm and argue that it takes $O(m + n \log n)$ amortized cost, where m is the number of edges and n is the number vertices in the graph.
5. Linear time algorithm for selection problem, given n numbers, find the k' th largest in linear time: Typical implementation starts with partitioning the n numbers into $\lceil n/5 \rceil$ groups and each group contains 5 numbers or less (the last group). My question is, how about we partition the numbers into 3 in a group or 7 in a group? Please explain.

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命題老師簽名：