

1. Suppose you were a fleet commander during the WW 2 on the Pacific Ocean. On your sea chart, there are more than 5 carriers waiting for your orders. (Figure 1) Your first job is to divide the sea chart into several areas according to the current position of your carriers. Within each area, there is one and only one carrier. Any enemy ship unit appears on the map will be air-raided by the aircraft on the carrier within the same area with the enemy.

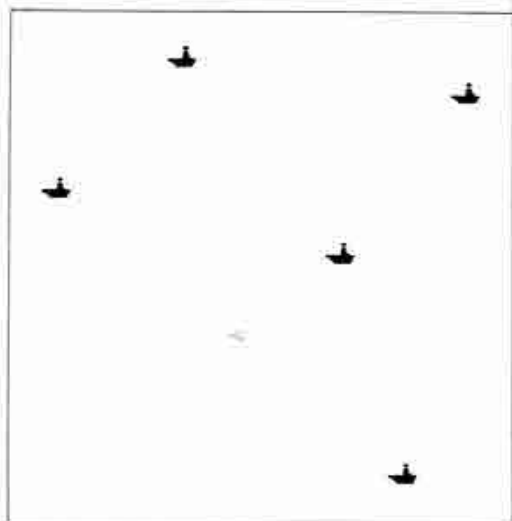


Figure 1.

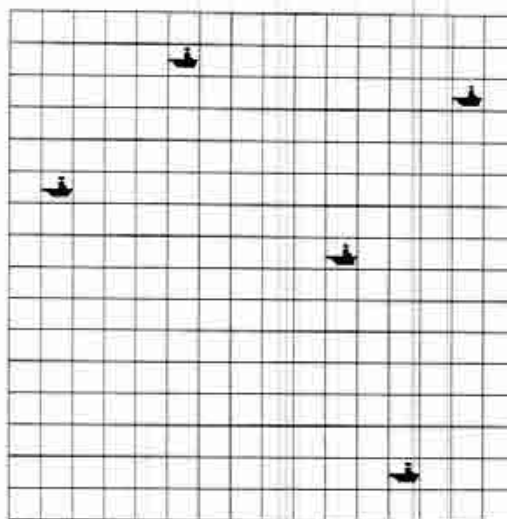


Figure 2.

- a. To air strikes your enemy as soon as possible, how should you divide your chart? (5%)
 - b. Outline an algorithm based upon the divide-and-conquer strategy to solve the above problem. Use figure 1 as an example to explain your method in detail. (30%)
 - c. For the same problem, outline a brute force algorithm that treats the sea chart as grids of the longitude and latitude. (Figure 2) Use figure 2 as an example to explain your method in detail. (10%)
2. a. Explain what the greedy method is. (5%)
 - b. In the three algorithms listed below, which one is or is not a greedy method: the Kruskal's algorithm, the Prim's algorithm, and the Dijkstra's algorithm (5%)
 - c. Explain the time complexities of the above three algorithms in the worst case. (15%)
3. Explain the time complexities of the binary search algorithms in the best case, the average case, and the worst case. (10%)
4. a. Explain the properties of the heap tree. (5%)
 - b. Create the heap tree for the following input key sequence, "B, U, I, L, D, H, E, A, P, T, R". Explain your result briefly. (10%)
 - c. Design a one dimensional data structure to represent your tree. (5%)