CHIANG MAI UNIVERSITY

Bachelor of Science (Digital Industry Integration)

College of Arts, Media and Technology

3rd Semester / Academic Year 2019

Data Structure and Algorithm

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1. Write a program to find the smallest number in an input array using recursion.
    a. Analyze the best-case time complexity of your code.
    b. Describe the best-case scenario.
    c. Analyze the worst-case time complexity of your code.
    d. Describe the worst-case scenario.

2. Write a program to calculate a Fibonacci using recursion (based on the example from the lecture slide)
    a. Analyze the best-case and worst-case time complexities of your code.
    b. Design an alternative algorithm to calculate a Fibonacci with a time complexity of O(n).
    c. Explain how your new algorithm manages to reduce the time complexity.

3. The *lucky number* of an array is the value of key that occurs the most frequently in the array. For example, in array (2, 4, 3, 2, 5, 2) the *lucky number* is 2.
    a. Design a linear-time algorithm or write a program to compute the *lucky number* of an array consisting of n integers, each of which has a value between 1 and 4n. If there are multiple *lucky number*s, return only one of them.
    b. Analyze your algorithm to show the worst-case time complexity is O(n).