# Introduction to Computer Science and Programming 1 – CSCI120

Chapter 13: Algorithm Complexity Analysis

Assignment 13

**Note:** This document has been designed and developed as part of an initiative for creating an OER (Open Education Resource) package for the course CSCI 120 at Columbia College.

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**Note1:** For this assignment write the answers to the questions on this word file under each question.

**Note2:** If you need to write any code for the following questions, then include the python file as well in your submission

# Problem1

* Define complexity class of each of the following algorithms (operations) – Complete the table below:

1. Adding an item to a list
2. Adding an item to a specific index
3. Removing an item from the end of the list
4. Searching for an item in the list

# Problem2

* Think about a solution for each problem and then figure out the time complexity order and the class of complexity for the proposed solution:

1. A list of numbers is given and we want to know how many numbers our greater than 0.
2. A number is given and we want to know whether the number is prime or not.
3. A list of numbers is given and we would like to know how many numbers in the list are prime.
4. A list is given which may or may not have repeated numbers in it. We would like to create a set from the list.

# Problem3

What is the time complexity order of the following flowchart?



# Problem4

Consider the following two scenarios and decide what algorithms would you use in each scenario and why.

Suppose, there is a list of numbers (not sorted) and we want to search for an item (a number) in the list.

**Scenario1:** If the size of the list is 10 (there are only 10 numbers in the list) and we want to search for a number only once then what algorithms (merge sort, selection sort, linear search, binary search, combinations of these, …) would you use and why?

**Scenario2:** If the size of the list is 150 (there are 150 numbers in the list) and we want to search for a number only once then what algorithms (merge sort, selection sort, linear search, binary search, combinations of these, …) would you use and why?

**Scenario3:** If the size of the list is 150 (there are 150 numbers in the list) and we want to search for a number 10 times. (running the search algorithm 10 times) then what algorithms (merge sort, selection sort, linear search, binary search, combinations of these, …) would you use and why?

# Problem5

* What data structure would you use in order to represent the following pieces of information.

1. To represent the annual income of a person
2. To represent the number of trees in a park
3. To represent the weather temperature
4. An item (which contains name, price) from a grocery shop.

# Problem6

The table below represent the courses should be completed in order to the corresponding certificate is awarded. Please look at the table and answer the following questions:

|  |  |
| --- | --- |
| Certificate | Courses |
| Web development | Java core, Javascript, html, React JS |
| Mobile development | Java core, Swift, Kotlin, Data structure |
| Business | Business Management, Micro Economics, Accounting |
| UI/UX program | Core of arts and interactivity, Media information, UI Design |
| Chemistry | Chemistry, Organic products |

* What Data Structure would you use to represent the table shown above?
* What is time complexity of adding a new certificate and the courses.
* What is the order of complexity of finding the list of courses for a specific program.
* What is the order of complexity of finding whether a specific course is needed to complete a program.

**Good Luck ☺**