SCC120 Fundamentals of Computer Science

Introduction to Algorithms

Week 7 Workshop

1. The time complexity of a certain algorithm is n^2, which indicates that the algorithm's ( ).

A. Problem scale is n^2.
B. Execution time is equal to n^2.
C. Execution time is asymptotic proportional to n^2.
D. Problem scale is asymptotic proportional to n^2.

2. Say we are given the names of n cities in an array and a function *dist* that returns distance given two cities given their names in constant time, that is, O(1) in the worst case. Also assume string operations are O(1).

State the worst case Big O complexities of the following tasks.

- Print all city names
- Find city with longest name
- Find distance between two cities given their names
- Find city with second-longest name
- Find distances between all pairs of cities

3. Write two algorithms for computing the sum of the first n positive integers, so that their complexity class is O(1) and O(n) respectively in the worst case.

4. What is it about function G that prevents us from assessing its time complexity?

```
public int G(Person[] Y)
{
    int P = 0;
    for (int i=0; i<Y.length; i++)
        P = P + Y[i].code();
    return P;
}
```

5. What is the worst case Big O complexity class of the following code fragment?

```
for (int j = n; j < n + 3; j++)
    { System.out.println("Hello");
}
```

6. The time complexity of the following algorithm is: _____

```
void fun(int n) {
    int i = 1;
    while (i <= n)
        i = i * 2;
}
```

7. Write an algorithm for finding the factorial of an integer n (n >= 0), and give its time complexity.

8. Find the complexity of the below program: _____

```
void function(int n) {
    if (n == 1)
       return;
    for (int i = 1; i <= n; i++) {
        for (int j = 1; j <= n; j++) {
            printf("*");
            break;
        }
      printf("\n");
    }
}
```