

Brian Chuk

## **Programming Part**

**2)**

0x7fff634889e0

0x7fff634889b0

0x7fff634889c0

0x7fff634889d0

nodePtr address: (nil)

**3)**

Memory location of 1: 0x1c800d4

Memory location of 2: 0x1c800d8

Memory location of 3: 0x1c800dc

Memory location of 4: 0x1c800e0

Memory location of 5: 0x1c800e4

0x1c800e4

## **Written Part**

**1)**

a)  $O(n)$

b)  $O(n^2)$

c)  $O(n\log(n))$

d)  $O(n^3)$

e)  $O(n^3)$

f)  $O(\log(n))$

g)  $O(n\log(n))$

h)  $O(n^2)$

i)  $O(n^2)$

**2)**

a)  $O(n)$

b)  $O(n^2)$

c)  $O(n^2/2)$

d)  $O(n^3)$

e)  $O(n)$

f)  $O(n^2)$

g)  $O(n^3)$

h)  $O(\log(n))$

i)  $O(n\log(n))$

j)  $O(\log(n))$

**3)**  $O(n^2)$

**4a)** 0.1 s

b)0.4 s

c)6.4 s

5) $O(n^2)$

6) $2n^2 + 4n\log(n) + 5n + 12 \leq 3n^2$  when  $n < 3$

7)

Actual Times:

| n    | maxSubsequenceSum1 $O(n^3)$ | maxSubsequenceSum2 $O(n^2)$ | maxSubsequenceSum4 $O(n)$ |
|------|-----------------------------|-----------------------------|---------------------------|
| 128  | 0.003538                    | 3.5e-05                     | 5e-06                     |
| 256  | 0.013308                    | 0.000132                    | 8e-06                     |
| 512  | 0.078325                    | 0.000504                    | 4e-06                     |
| 1024 | 0.598757                    | 0.003531                    | 6e-06                     |
| 2048 | 4.72344                     | 0.009444                    | 1.8e-05                   |
| 4096 | 38.663                      | 0.032645                    | 3.2e-05                   |

8)

Predicted Times:

| n    | exp. maxSubsequenceSum1 $O(n^3)$ | exp. maxSubsequenceSum2 $O(n^2)$ | exp. maxSubsequenceSum4 $O(n)$ |
|------|----------------------------------|----------------------------------|--------------------------------|
| 128  | 0.003538                         | 3.5e-05                          | 5e-06                          |
| 256  | 0.028304                         | 0.00014                          | 1e-05                          |
| 512  | 0.226432                         | 0.00056                          | 2e-05                          |
| 1024 | 1.811456                         | 0.00224                          | 4e-05                          |
| 2048 | 14.491648                        | 0.00896                          | 8e-05                          |
| 4096 | 115.933184                       | 0.03584                          | 1.6e-04                        |

**9)** if  $n = 2^{18}$

$$n_1 = r^k * t_0, r = n_1/n_0 = 2$$

$$n = 2^k * t_0$$

|                                  |               |
|----------------------------------|---------------|
| exp. maxSubsequenceSum1 $O(n^3)$ | 30391188.5865 |
| exp. maxSubsequenceSum2 $O(n^2)$ | 146.80064     |
| exp. maxSubsequenceSum4 $O(n)$   | 0.01024       |

**10)**

exp. maxSubsequenceSum1  $O(n^3)$

50 weeks, 1 day, 6 minutes, and 0.007124 of a second

exp. maxSubsequenceSum2  $O(n^2)$

2 minutes and 26.80064 seconds

exp. maxSubsequenceSum4  $O(n)$

0.01024 of a second