Peter Phuc
301460018
CMPT 225
Professor: John Edgar
October 2024

Assignment 3

Question 1:

- Cost Function: $4n^2 + 5n + 2$
- Barometer Operations: The inner while loop. Check the condition of the inner while loop condition (j < n), incrementing j (j++), the use of the << operator within the while loop twice. In total, 4 operations.
- O-Notation: this runs in $O(n^2)$

Question 2:

- Cost Function: $3n^2 + 13n + 3$
- Barometer Operations: Both the inner while loop. Check the condition of both the inner while loop conditions (j <= i), incrementing j (j++), and use of the << operator within the loop. 3 operations per while loop, 6 total operations.
- O-Notation: this runs in $O(n^2)$

Question 3:

- Cost Function: $5n^3 + 7n^2 + 4n + 4$
- Barometer Operations: Inner most while loop. Check the condition of the inner most while loop condition (iNext < rows), incrementing iNext (iNext++), and operating on next with the two calls to *rcIndex()* (which has a cost of 1). In total, 5 operations.
- O-Notation: this runs in $O(n^3)$

Question 4:

- Cost Function: $1.75n^2 + 5.5n - 6$
- Barometer Operations: Inner while loop. Check the condition of the inner while loop condition (next < n), incrementing next (next++), checking the if statement condition (arr[next] < arr[smallest]). This gives a total of 3 operations per loop iteration.
- O-Notation: this runs in $O(n^2)$

Question 5:

- Cost Function: $3n\log_2 n + 23n - 9$
- Barometer Operations: Inner while loop. Check the condition of the inner while loop condition (ast < n), incrementing ast (ast++), and the use of the << operator within the loop to print "*". The total of operations in the loop is 3 per loop iteration.
- O-Notation: this runs in O($\log n$)

Question 6:

- Cost Function: $3(2^n) - 4$
- Barometer Operations: The first if statement condition (len == 0) and the second if statement condition (arr[0] == target) since the two conditions will be checked every time the recursive call is made, resulting in 2 operations per recursive call.
- O-Notation: this runs in O(2^n)

Question 7:

- Cost Function: $\lfloor 6\log_e n + 7 \rfloor$
- Barometer Operations: Inner while loop. Check the condition of the while loop condition (exp > 0), checking the if statement condition (exp & 1), use of the >>= operator (exp >>= 1), and re-assignment of base (base = base*base). Therefore, the total operations is 5 per iteration of the while loop.
- O-Notation: this runs in O($n \log n$)