Problem Set 1

Practice problems to hone analysis skills.

The quiz questions below are related to the insertion sort algorithm discussed in the lesson.

1

Following is another implementation of insertion sort. If we feed an already sorted array to the following snippet will the algorithm execute a linear number of instructions? Insertion sort's best case running time is linear (think running a single loop) and not quadratic.

```
void sort(int[] input) {
    for (int i = 1; i < input.length; i++) {
        int key = input[i];
        for (int j = i - 1; j >= 0; j--) {
            if (input[j] > key) {
                int tmp = input[j];
                input[j] = key;
                input[j + 1] = tmp;
            }
        }
    }
}
```

- A) Yes
- B) No

2

We calculated the number of instructions required for the worst case of our algorithm. Can you determine the number of instructions executed for the best case when the array size is 5? The best case happens when the array is already sorted in ascending order. The code is reprinted below:

```
1.          for (int i = 0; i < input.length; i++) {
2.              int key = input[i];
3.              j = i - 1;
4.              while (j >= 0 && input[j] > key) {
5.                  if (input[j] > key) {
6.                      int tmp = input[j];
7.                      input[j] = key;
8.                      input[j + 1] = tmp;
9.                      j--;
10.                  }
11.             }
12.         }
```

- A) 30
- B) 32
- C) 34

3

Can you generalize and express the number of instructions executed for the best case as a function of the size of the array n?

- A) $6n + 2$

B) $6n + 1$

C) $6n + 3$

CHECK ANSWERS