Problem Set 2

Practice problems relating to analysis notations.

Question 1

Suppose your friend discovers a new algorithm and in his excitement tells you that his algorithm has a lower bound of $O(n^2)$. Can you explain why your friend's statement makes no sense?

Question 2

Does $O(2^{2n})$ equal $O(2^n)$?

Question 3

Give an example of an algorithm whose best case is equal to its worst case?

Question 4

Work out the time complexity for the algorithm given below:

```
void averager(int[] A) {

    float avg = 0.0f;
    int j, count;

    for (j = 0; j < A.length; j++) {
        avg += A[j];
    }

    avg = avg / A.length;

    count = j = 0;

    do {

        while (j < A.length && A[j] != avg) {
            j++;
        }
```

```
            if (j < A.length) {
                A[j++] = 0;
                count++;
            }
        } while (j < A.length);
    }
```

Question 5

Q

What is the complexity of the below snippet

```
for( int i=0; i<array.length; i++){
  for(int j=0; j<10000; j++)
  {
    // some useful work done here.
  }
}
```

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Question 6

Consider the following snippet of code and determine its running time complexity?

```
    void complexMethod(int[] array) {
        int n = array.length;
```

```
    int runFor = Math.pow(-1, n) * Math.pow(n, 2);
    for (int i = 0; i < runFor; i++) {
        System.out.println("Find how complex I am ?")
    }
}
```

Question 7

Determine the time complexity for the following snippet of code

```
void complexMethod(int n, int m) {

   for (int j = 0; j < n; j++) {
      for (int i = 0; i < m % n; i++) {
          System.out.println("")
      }
   }
}
```

For non-java folks, m % n notation means m modulus n.

Question 8

Determine the time complexity for the following snippet of code

```
void someMethod(int n) {

   for (int j = 0; j < n; j++) {
      for (int i = 0; i < 3; i++) {
         for (int i = 0; i < n; i++) {
             System.out.println("I have 3 loops");
         }
      }
   }
}
```

Question 9

Determine the time complexity for the following snippet of code

```
void someMethod(int n, int m) {

   for (int i = 0; i < n; i++) {
```

```
        for (int i = 0; i < m; i++) {
            System.out.println("I have 2 loops");
        }
    }
}
```