ธนลัทร์ เกิดเปี่ยม 6505036

Lab 3: MyArray

Data Structures and Algorithms

This lab is to have you implement MyArray.Java, including all the method mentioned in lectures.

Your first task: Implement the following methods

- void add(int d) – add into an array with extension
- void insert(int d, int index) – insert into an ordered array
- int find(int d) – find unordered array
- int binarySearch(int d) – binary search in ordered array
- void deleteU(int index) – delete from an unordered array
- void deleteO(int index) – delete from an ordered array

Next, let do some benchmark of our amortized analysis. This is the tester code, ArrayTester.java, to be put in the same directory as MyArray.java

ArrayTester.java

```
public class ArrayTester {
    public static void main(String args[]) {
        for(int N=10000000; N<=100000000; N+=10000000) {
            long start = System.currentTimeMillis();
            MyArray mArray = new MyArray();
            for(int n=1; n<N; n++) {
                mArray.add((int)(Math.random()*1000));
            }
            long time = (System.currentTimeMillis()-start);
            System.out.println(N+" \t"+time);
        }
    }
}
```

Your second task: you are to run ArrayTester for 5 rounds and record the times. Then, find the average and average/n to prove empirically that add with expand is O(1). Not that average/n will be very small. You should record in the form $nx10^{-k}$ where $1 \le n < 10$ and k is positive integer.

n	Round 1	Round 2	Round 3	Round 4	Round 5	Average	Average/n
$1x10^7$	1,189	1,505	1,705	1,657	1,457	1,502	6,657
$2x10^7$	1,616	1,558	1,504	1,521	1,730	1,585	12,618
$3x10^7$	1,797	1,629	1,733	1,792	1,923	1,766	16,987
$4x10^7$	1,871	1,855	1,746	1,749	1,895	1,823	21,941
$5x10^7$	2,045	1,840	1,840	1,804	1,807	1,860	26,881
$6x10^7$	1,966	1,975	2,062	1,914	1,941	1,971	30,441
$7x10^7$	2,005	1,985	1,996	1,983	2,017	1,997	35,052
$8x10^7$	2,258	2,136	2,153	2,113	2,273	2,186	36,596
$9x10^7$	2,150	2,167	2,152	2,151	2,150	2,154	41,782
$10x10^7$	2,210	2,228	2,245	2,195	2,259	2,227	49,903

Note: you may want to modify ArrayTester.java to print every number in one run. You can redirect output of your program by using "java ArrayTester > output.txt". This way, you can open output.txt to copy numbers.

Hand in your work in Google Class assignment by fill in the answer in this file. Change the name of this file to assignment3_xxxxxxx.yyy where xxxxxx is your student id.