The Lebanese American University
School of Arts & Sciences
Byblos

CSC 216: Computer Programming II

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First Midterm Examination
Date: April 11, 2000

Problem	Max Points	Points Attained	Mean (Std Dev)
1 (a)	10		
1 (b)	20		
1 (c)	20		
1(d)	20		
2 (a)	10		
2 (b)	10		
2 (c)	10		
Total	100		

Please Read Carefully:

- This is a *Closed Book* exam. Write your name on the top of each page. You have *75 minutes*. Consider the points of each question and pace yourself accordingly.

- Read each problem carefully. No questions are allowed after the first 20 minutes. If something appears ambiguous, please write your assumptions.

- This exam has 9 pages and 2 main questions. Please do all of them and show your work as partial credit will be given.

- Make sure you follow the instructions as indicated. Failure to do so will result in loss of points.

Question 1: [25 Points]

a) Write a method that takes as a parameter an array and a key. The method searches for the key in array. If it is found, the position is returned; otherwise, -1 is returned.

b) What is the order of complexity of the above algorithm? Justify your answer.

Question 2: [15 Points]

Suppose you have the following declarations:

```
int[] data = new int [100];
int i;
```

Write a small segment of Java code that will shift data[50]..data[98] up one spot to the locations data[51]..data[99]. Insert the number 42 at location 50. Use a for loop.

Question 3: [10 Points]

a) Which of the following formulas in big-O notation best represent the expression $2n^2+35n+6$?

    A. $O(n)$
    B. $O(2n^2)$
    C. $O(n^2)$
    D. $O(n^2+n)$

b) Suppose we have this method:

```
Public static foo (int [] b)
{
     b[0]++;
}
What is printed by these statements?
int [] x = new int[100];
x[0] = 2;
foo(x);
System.out.println(x[0]);
```

    A. 0
    B. 1
    C. 2
    D. 3

c) What is the running time of the following method:

```
Public static int reduce(int n)
{
   int result = 0;
   while (n > 1)
   {
     n = n/2;
     result = result +1;
   }
   return result;
}
```

Question 4: [15 Points]

Write a method that accepts an array of integers and prints the following statistics: the average of the numbers in the array, the highest number, the lowest number, and number of items in the array.

Question 5: [15 Points]

What is the output of the following method if the array numbers has the following values: {23, 10, 25, 8, 82, 17}

```
class Test_Quiz {
   public static void quiz (int[] numbers) {

      for (int index = 1; index < numbers.length; index++) {
         int key = numbers[index];
         int position = index;

         while (position > 0 && numbers[position-1] > key) {
            numbers[position] = numbers[position-1];
            position--;
         }

         numbers[position] = key;
      }
   }

}
```

Question 6: [25 Points]

Design a data structure to represent a combination lock. When the lock is constructed, it is provided with an arbitrary length array of integers between 0 and 25 specifiying a combination. (if no combination is provided 9-0-21-0 is the default). Initially, it is locked. Two methods –**press** and **reset**—provide a means of entering a combination: **press** enters the next integer to be used toward matching the combination, while **reset** re-readies the lock for accepting the first integer of the combination. Only when **press** is used to match the last integer of the combination does the lock silently unlock. Mismatched integers require **reset** before the combination can again be entered. The **isLocked** method returns *true* if and only if the lock is locked. The lock method locks and resets the lock. In the unlocked state only the **isLocked** and **Lock** methods have effect.