
CSc 340 Homework **Dr. Jozo Dujmović**

Recursion

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1. Write an iterative version and a recursive version of function OCCURS that determines how many times an integer value x occurs in array a[0..na-1]. Write a main program that illustrates the work of your functions. E.g., if a[ ]={1,2,3,3,4,5} then 3 occurs 2 times and 7 occurs 0 times.

2. Write iterative and recursive versions of functions that compute the sum of components of an array. Fill the array with random numbers from 0 to 1 using the function double(rand( ))/double(RAND_MAX). Develop a main program for measuring differences in execution time of iterative and recursive version of the program. For time measurements use the following function:

   ```
   double sec(void){return double(clock( ))/CLOCKS_PER_SEC;}.
   ```

   In this measurement (and in all other time measurement problems) you must get reliable time measurements using the clock( ) function that has typical resolution of 10 ms. Consequently, comfortable measurement should take 3 seconds or more, and that can be achieved by repeating the measured code segment inside a *for* loop.

3. Write a recursive and iterative versions of binary search and compare their run times using the array `a[i]=i, i=0,…,n-1` and the following test method:

   ```
   for(i=0; i<n; i++)
     if(a[i] != a[binary_search(… a[i] …)]) cout << "ERROR\n";
   ```

4. Write a recursive function line(n) to display a line with n asterisks. Then write a recursive function histogram that plots a histogram using recursive calls of the function *line*. The histogram is specified using the array H[ ]. E.g. if H[ ]={3,4,5,4,3} then the histogram should be the following:

   ```
   3 ***
   4 ****
   5 *****
   4 ****
   3 ***
   ```

Homework format rules

1. Your homework must have a standard title page containing course name, homework number, your name, instructor name, and date.
2. For each program please submit the listing of the source program followed by the results generated during program execution.
3. Each program must have a standard header
4. Print each problem on a separate page.
5. Whenever appropriate, insert comments that explain the role of variables, the idea of your program, and the role of major program segments. Do not overdocument your program.
6. This HW and all others that will follow must be written in C++.