CS 367 - Introduction to Data Structures
Thursday, October 27, 2016

Program 3 assigned – due by 10pm Sunday Nov 6th -- join p3pair groups by 11/1
Exam 1 was returned last lecture – today is last chance to pickup after class
get exam questions to me by Tuesday 11/1

Homework 6 due by 10pm Friday Oct 28th

Last Time
   Call Stack Tracing
   Recursion
   • recursion vs. iteration
   • rules of recursion
   • constructing recursive code
   • practice writing recursive code
Exam 1 returned

Today
   Recursion
   • more practice writing recursive code
   • complexity of recursive methods
   • practice analyzing complexity

Next Time
   Read: finish Recursion, Search
   Read: start Trees
   Execution tree tracing
   Searching
   Categorizing ADTs Part 1
   General Trees
   • implementing
   • determining tree height
Practice – Array

→ Write a recursive method that passes these tests of evenCount.

```java
public void test1_evenCount_emptyArray() {
    int n = evenCount( new int[]{} );
    if ( n != 0 ) System.out.println( "test1 failed: " +
        evenCount(new int[]{})) = "+n);
}
public void test2_evenCount_nonEmptyArray() {
    int [] a = {3,2,-4,8,3,6,-5,12,2};
    int n = evenCount(a);
    if ( n != 6 )
        System.out.println( "test2 failed: evenCount(a)= "+n);
}

// Answer questions to lead to recursive solution
1. What is a smaller version of same problem?

2. What is a base case for this problem?

3. How does problem "grow" smaller?

4. Is a base case always reached? How? When?

public _____ evenCount(__________) { ______________________________ 

private _____ evenCount( ______________________ ) {
}
Analyzing Complexity of Recursive Methods

Options:
1.
2.

Steps
1.
2.
3.
4.
Practice – Complexity of Recursive `evenCount`

Problem size N is

1. Equations

2. Table

3. Verify

4. Complexity
Practice – Strings

→ Write a recursive method that determines if a string is a palindrome.

Examples:

- eye
- mom
- radar
- racecar
- Rise to vote, sir!
- Never odd or even!
- A nut for a jar of tuna.
- Campus Motto: Bottoms up, Mac.
- Ed, I saw Harpo Marx ram Oprah W aside!

Assumptions: non-null input string, all spaces and punctuation removed, all lower-case

Useful string methods:

- char charAt(int index)
- int length()
- String substring(int begin, int one_past_last)
Practice – Complexity of Recursive isPalindrome

Problem size N is

1. Equations

2. Table

3. Verify

4. Complexity
Towers of Hanoi

Algorithm

```c
solveTowers(count, src, dest, spare) {
```

Complexity

Problem size $N$ is

1. Equations

2. Table

3 Verify

4. Complexity