

CS 49J – Programming in Java

Hands-On X

1. Write a program to compute the Fibonacci sequence. Method that computes the Fibonacci sequence should be recursive. Given k , it should print the first k numbers in the Fibonacci sequence. Also, write another method that returns the n^{th} number in the Fibonacci sequence given n .
2. Write a program which takes array of integers as input. Write a recursive function that returns a resultant value by performing the following on the values stored in an array,
 - a. If the number parsed from array is even, then divide it by 5 and add it to the resultant.
 - b. If the number is odd, then multiply it by 3 and add 1 and subtract this value from the resultant.
 - c. Print the value of the resultant. Continue until the end of the array. [Treat the result of division as an integer].
3. Using linked lists, simulate the following data structures. The node of the list stores integer data.
 - a. Stacks – implement methods such as push (push the element to stack), pop (pop the element from the stack) and getTop (return the topmost element).
 - b. Queues – implement methods such as insertFront, insertRear (insert at the beginning and end of the queue), removeFront, removeRear (remove from the beginning and end of the queue).
4. Write a program that creates a map of words with their positions of occurrence in a given paragraph [key = word and values = positions]. Given the following paragraph:
"Today is a sunny day. Day like this is the best for outdoor sports."
Map contains the following–

today --> 1	is --> 2, 9
a --> 3	sunny --> 4
day --> 5, 6	like --> 7
this --> 8	the --> 10
best --> 11	for --> 12
outdoor --> 13	sports --> 14
5. Write a program that checks if words in every sentence in a given paragraph are unique or not. Given the following paragraph:
"Have you watched The Lord of the Rings? It is the best movie and it makes me feel so happy every time I watch it."
Output should be:
Sentence 1: all words are unique
Sentence 2: words are repeated
6. Write a program to create a binary tree. Implement methods, insert, preorder traverse, postorder traverse and inorder traverse. Write another method to check if the binary tree is a binary search tree or not. [Note: insert method should ask where the element needs to be inserted and accordingly you should insert at a proper place.]