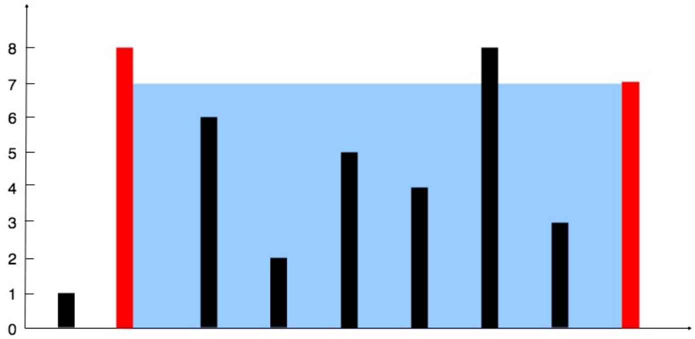
Assignment 2

Features of JAVA

CO2: Applying OOP concepts in solving problems and demonstration with ethical practice

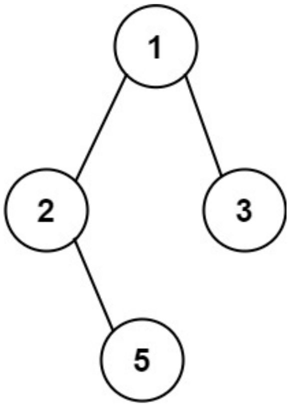
1. An integer array representing height of length n is given as input. There are n vertical lines drawn from the array such that the two endpoints of the i^{th} line are (i, 0) and (i, height[i]). Any two lines along with the x-axis form a container that can hold water. Find the largest container that can hold maximum water. Collection classes are NOT allowed.



2. Print the sum of all even numbers stored in a circular linked list. Represent Node as an inner class. Collection classes are NOT allowed.

3. Given the root of a binary tree, return *all root-to-leaf paths in **any order***. A **leaf** is a node with no children. Treat a node as an inner class. Write appropriate code representing the node containing an integer (1>n>100) or a string (6 letter names). You may use ArrayList (List<String> example = new ArrayList<String/Integer>();).

   Sample I/O:



   Input: root = [1,2,3,null,5]

   Output: ["1->2->5","1->3"]

4. Every bank account holds an account no and a calculateInterest method. A customer can have a “SavingsAccount” and/or a “CurrentAccount”. For current account, there is a method called displayOverdraftAmount(). Different accounts can have different interest rates. User should be able to verify the existence of an account, adding new account and displaying all accounts. Implement appropriate objects utilizing inheritance and show its behavior from the parent class.

5. Each customer of a bank has customer id, name, and current loan amount and phone number. One can change the attributes like name, phone number. A customer may ask for loan of certain amount.

It is granted provided the sum of current loan amount and asked amount does not exceed credit limit (fixed amount for all customer). A customer can be a privileged customer. For such customers credit limit is higher. Once a loan is sanctioned necessary updates should be made. Any type of customer should be able to find his credit limit, current loan amount and amount of loan (s)he can seek. No customer can change customer id once created. Print customer name when the object is printed by toString() method.

Design and implement the classes. Show the working through a menu driven user interface.

6. Consider a wrapper class for a numeric basic type. Check the support for the following: conversion from i) basic type to object ii) object to basic type iii) basic type to String iv) String (holding numeric data) to numeric object v) object to String.
7. Take a String input that contains multiple words. Do the following: i) number of times 'a' appears ii) number of times "and" appears iii) whether it starts with "The" or not iv) put the String into an array of characters v) display the tokens in the String (tokens are the substrings separated by space or @ or .) vi)Find the largest palindrome in a given input sentence after removing any non-alphanumeric character.
8. Write a class that implements the CharSequence interface found in the java.lang package. So, it would contain the following methods.

   (i) char charAt(int index)

   (ii) int length()

   (iii) CharSequence subSequence(int start, int end)

   (iv) Override toString()

   Your implementation should return the string ***backwards***. Select one of the sentences from the lecture slide to use as the data. Write a small main method to test your class; make sure to call all four methods.

9. A Planet Explorer routinely travels across the planets in the Solar System to discover life form, minerals available, etc. However, the method of exploring is different on each planet, due to the difference in atmosphere and surface composition. Every explorer should have an explore method that is defined based on the type of the explorer and the planet where (s)he is exploring. Consider three planets-Mars, Venus, and Saturn.

   Implement it using interfaces, abstract class, inheritance.