AOT/JAVA/CSE-CSBS/@2023

1. Alia's faculty has asked her to write a java method that finds and returns the Nth prime number. N will be passed as input to that java method. Assumption: 1 <= N <= 1000, where N is the position of the prime number,
The first prime number is 2
The second prime number is 3
The third prime number is 5
The fourth prime number is 7
The fifth prime number is 11
.... and so on.
solve the problem to impress Alia, and help her to get good marks.

Example1: if the given number N is 10, the method must return the 10th prime number i.e. 29

Example2: if the given prime number N is 13, the method must return the 13th prime number i.e. 41

2. Two friends named String A and String B lived in a land of letters and wanted to find out if they were anagrams of each other. They asked for help from God, who then asked for your help to determine if their letters could be rearranged to form a new word.

Example-1:
Input:
String A is “A Gentleman”
String B is “Elegant Man.”
Output:
They are the greatest anagram!
Explanation: “A Gentleman” can be rearranged to spell “Elegant Man”.

Example-2:
Input:
String A is “Apple”
String B is “Orange”
Output:
They are not the greatest anagram!
Explanation: We can't rearrange "Apple" to "Orange".

3. Once upon a time in a land of data structures, a LinkedList of user-defined objects was struggling to reverse itself. It had tried every method, but none seemed to work without consuming too much time or space. One day, LinkedList came to you and asked for a solution without using the Collections.reverse(-) method, with a time complexity of O(n/2) and space complexity of O(1).

4. A matrix of alphabets is given, no alphabets are repeated, and all are in lowercase. Take the matrix as input in the form of List of String. In the next line take an alphabet as input. If the alphabet is present in the matrix print the preceding row values and then the preceding column values. If the alphabet is not present in the matrix print the following: "Alphabet not Found".

Example:

a g s t y
b r x l e
p q z m w
l

Output: b r x t

5. Create an ArrayList of String of words ["Madam", "ABCD", "radar", "efgh", "ABBA"], find which of them are palindrome and which are not and store them in two different ArrayLists named as, withPalindrome and withoutPalidrome.

6. Create a class named Cable having a utility method public String materialType(). There are two types of cables, CoaxialCable and FibreOpticCable, where the material types are copper and glass respectively. Check the polymorphic behaviour of the materialType() method.

7. Write an interface called Government, with a method void jobs(). Let this interface be placed in a package called **com.govt**. Write a class called CivilServices which implements Government interface. Inside jobs method: "Indian Administrative Service". Let this class be placed in a package **com.govt.cs**. Write a class called MilitaryServices which implements Government interface. Inside jobs method: "Lieutenant General". Let this class be placed in a package **com.govt.ms**. Write another class Test in a package called **com.govt.test,** Then, do the following:
a. Create an instance of CivilServices and call jobs() method.
b. Create an instance of MilitaryServices and call jobs() method.

8. Once upon a time, there was a group of 5 friends who loved to collect Treasures from their adventures. Each of them collected one Treasure and each Treasure has a name (like gold, silver or platinum), weight and price. They decided to create a database with the help of ArrayList to store 5 Treasures and keep track of their collection. However, they noticed that they could store only 5 Treasures in their database but the ArrayList had some extra space allocated that was not being used. To optimize their database and reduce memory usage, they asked you to trim the capacity of the ArrayList to be the list's current size. Could you help them to write the code?

9. Create a class called ReserveBank that acts as base class for all banks. This class has getSavingInterestRate and getFDInterestRate methods, which return the savings account interest rate and fixed deposit account interest rate that the specific bank gives. Since ReserveBank cannot say what percentage which bank would give, make these methods abstract.

Create two subclasses of ReserveBank called AxisBank and SBIBank. Override the inherited methods from the base class. The following are the interest rates of these banks.
AxisBank - Savings: 4%, Fixed: 8.5%.
SBIBank - Savings: 6%, Fixed: 9%.

Create a main method to test the above classes and their methods. Try one by one and observe your findings

a) AxisBank a=new AxisBank();
b) SBIBank s=new SBIBank();
c) ReserveBank r=new SBIBank();
d) ReserveBank r=new AxisBank();

10. Freddy, a third-year B.Sc student. He is a very bright student and very good in studies. He was currently doing a project where he has to change all integer numbers of a book to Roman Integer numbers. But he was facing some problems in converting those numbers. Also, the deadline was near. Freddy came to you to help him with his problem. Give him an efficient solution to convert any integer number to any Roman integer number.

Constraints: Number should be within 0 to 1000.
Example 1:
input: 26
output: XXVI