UNIVERSITY OF INFORMATION TECHNOLOGY
FACULTY OF INFORMATION SYSTEMS

PRACTICE TEST
TERM II, ACADEMIC YEAR 2022-2023

Course Title: Computer Science II
Duration: 90 minutes (References are not allowed)
Test's Code: 02

Question 1:

Define an Abstract Data type (use C++ Class) to store information about a rectangle containing length and width. Implement methods to compute the rectangle's area and check whether it is a square.

Given a list of **n** rectangles, write a program to do the following requirements:

- Allocate memory and input the list of rectangles.
- A square is a special rectangle where the length is equal to the width, find indexes of squares whose areas are equal to the minimum area of all the squares in the list using **pointer operators**.

Input:

- The first line is the number of rectangles **n**.
- The next **n** lines are the sizes of the rectangles. Each line contains the length and width of a rectangle separated by a space.

Output:

- Indexes of satisfied squares separated by a new line (assume the list uses zero-based indexing).

Examples:

Input	**Output**

5
2 2
2 4
4 4
6 8
3 3
	0

Question 2:

Write a program to insert nodes into a single linked list, the value of each node is an integer. Insertion stops when the program encounters a node with a "0" value (this node is not inserted into the list).

Find the start and end indexes of the longest duplicates of prime numbers (assume the list uses one-based indexing), then remove these duplicates from the list.

Input:

- List of elements of the list, separated by a new line.

Output:

- Print out "Empty List" if the list is empty.
- Print out the list.

- Print out the start and end indexes of the longest duplicate separated by a space. Duplicates are separated by a new line if there are many of them.
- Print the list after removing the longest duplicates.

Examples:

Input	Output
2 3 3 9 7 7 7 8 0	- 2 3 3 9 7 7 7 8 - 5 7 - 2 3 3 9 8

Question 3:

Implement a Stack and its operators using a Single Linked List. Each element is an integer.

Do the following requirements:

- Push a sequence of integers into the stack. Insertion stops when encountering the "0" element.
- **Use stack operators** to sort the stack in the order such that the odd numbers are below the even numbers in the stack and keep the relative positions among the odd and even numbers unchanged.

Input:

- Sequence of integers separated by a new line.

Output:

- Print out elements of the stack separated by a space.
- Print the stack after sorting.

Input	Output
6 5 5 4 3 8 9 0	- 9 8 3 4 5 5 6 - 8 4 6 9 3 5 5

Question 4:

Use **recursion** to compute the value of your investment after **n** years with a fixed annually interest rate.

Input:

- The first line is the initial investment.
- The second line is the annual interest rate.
- The third line is the number of years **n**.

Output:

- The value after **n** years.

Examples

Input	**Output**
10000000 10 7	19487171

Question 5:

Given a string consisting of opening and closing square brackets, find the length of the longest valid square brackets substring.

Examples

Input	**Output**
[[]][[[[	4