**CSE221: Algorithms**

**Lab 01**

Task 1:

Write a Java program that uses the built-in stack class to do the following:

**push 10, push 5, push 6, pop, push 9, push 3, push 2, pop, pop**

After each push or pop, print the top of stack.

Sample Output:

|  |
| --- |
| Pushing 10….  Printing top:  10  Pushing 5…  Printing top:  5  Popping…  Printing top:  10 |

Hint/Help: <https://docs.oracle.com/javase/7/docs/api/java/util/Stack.html>

Task 2:

Write a Java Program that reads from a text file**(input.txt)** and prints it

Sample Output:

|  |
| --- |
| Printing file:  6  0 3  0 1  0 5  1 4  1 5  2 4  3 4 |

Hint/Help: <https://www.geeksforgeeks.org/different-ways-reading-text-file-java/>

Task 3:

The text file (input.txt) represents a graph. 1st integer is the number of vertices, the rest of the lines show edges. Write a Java program that reads from the file and does the following:

1. **Creates and Prints** the adjacency matrix [assume graph is undirected]
2. **Creates and Prints** the adjacency matrix [assume graph is directed, so 0 1 mean there is an edge 0 🡪 1]
3. **Creates and Prints** the adjacency list [assume graph is undirected, use built in linked list]
4. **Creates and Prints** the adjacency list [assume graph is directed, so 0 1 mean there is an edge 0 🡪 1]
5. Print the **out degree** of each node [for undirected graph]
6. Print the **in and out degree** of each node [for directed graph]

Sample Output:

|  |  |
| --- | --- |
| Undirected Graph…..  Adjacency Matrix :-  0 1 2 3 4 5  0 0 1 0 1 0 1  1 1 0 0 0 1 1  2 0 0 0 0 1 0  3 1 0 0 0 1 0  4 0 1 1 0 0 0  5 1 1 0 0 0 0  Adjacency List: -  0 - - > 1 3 4  1 - - > 0 4 5  2 - - > 4 5  3 - - >0 4  4 - - > 1 2  5 - - > 0 1  Out degree: -  0 - - > 3  1 - - > 3  2 - - > 1  3 - - >2  4 - - > 2  5 - - > 2 | Directed Graph…..  Adjacency Matrix :-  0 1 2 3 4 5  0 0 1 0 1 0 1  1 0 0 0 0 1 1  2 0 0 0 0 1 0  3 0 0 0 0 1 0  4 0 0 0 0 0 0  5 0 0 0 0 0 0  Adjacency List: -  0 - - > 1 3 4  1 - - > 0 4 5  2 - - > 4 5  3 - - >0 4  4 - - > 1 2  5 - - > 0 1  Out/IN degree: -  0 - - > 3/0  1 - - > 2/0  2 - - > 1/0  3 - - >1/0  4 - - > 0/3  5 - - > 0/2 |

Hint/Help: <https://www.tutorialspoint.com/How-to-create-an-array-of-linked-lists-in-java>

Home Task :

1. Complete all remaining tasks. **[+1 bonus if completed correctly in class]**
2. **[BONUS TASK]** Study and complete the “Learning Graph” code. This is an object oriented implementation of Graph. You can try the entire semester to finish it. You have to explain what you did when you submit.