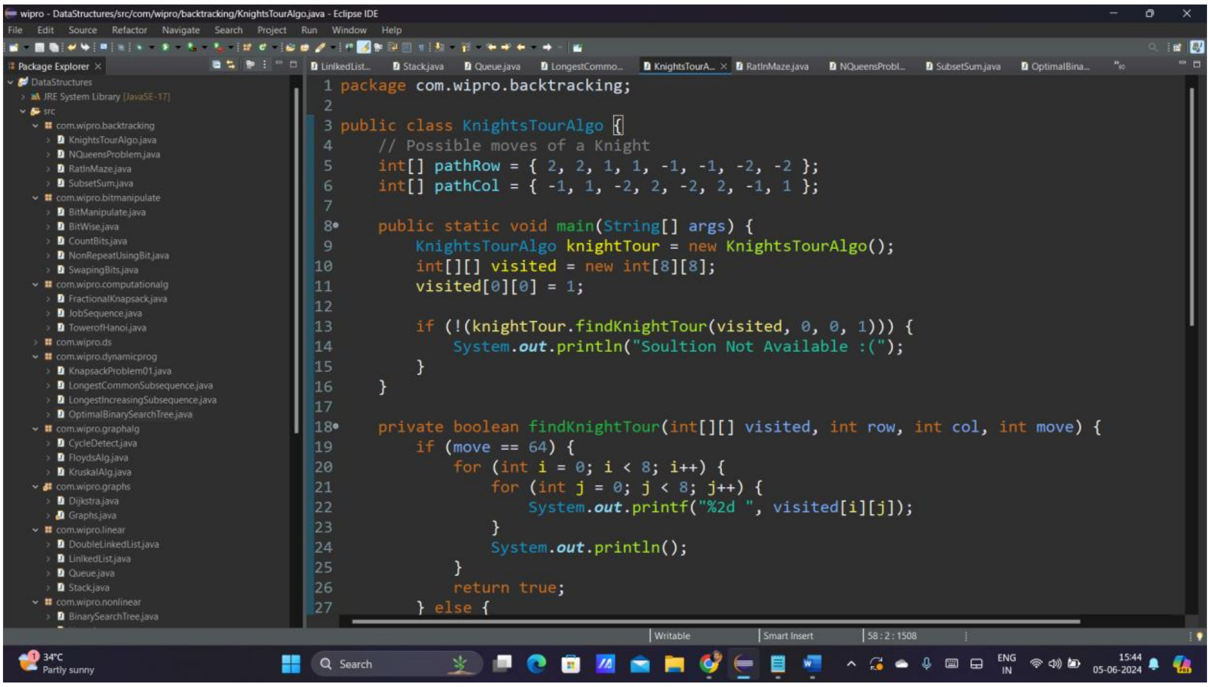
Assignments-Day 16 and 17

Day 16 and 17:

Task 1: The Knight’s Tour Problem

Create a function bool SolveKnightsTour(int[,] board, int moveX, int moveY, int moveCount, int[] xMove, int[] yMove) that attempts to solve the Knight's Tour problem using backtracking. The function should return true if a solution exists and false otherwise. The board represents the chessboard, moveX and moveY are the current coordinates of the knight, moveCount is the current move count, and xMove[], yMove[] are the possible next moves for the knight. Fill the chessboard such that the knight visits every square exactly once. Keep the chessboard size to 8x8.


wipro - DataStructures/src/com/wipro/backtracking/KnightsTourAlgo.java - Eclipse IDE
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Package Explorer
LinkedList... Stack.java Queue.java LongestCommo... KnightsTourA... RatInMaze.java NQueensProbl... SubsetSum.java OptimalBina...
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58 : 2 : 1508
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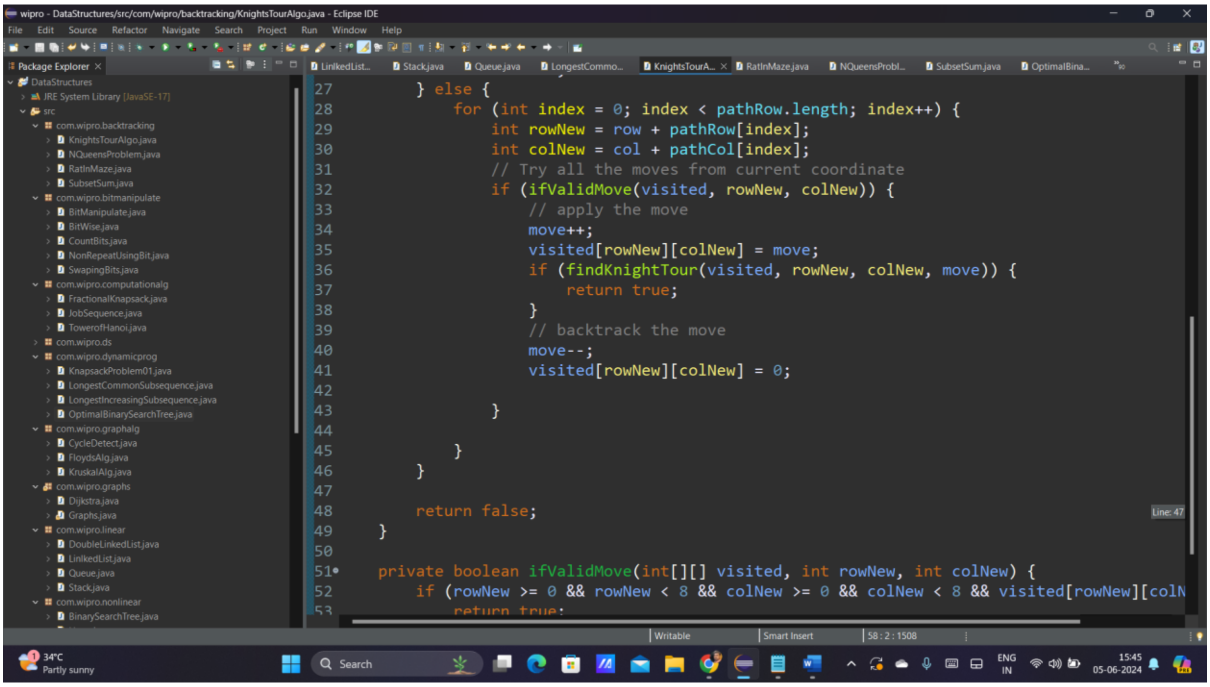
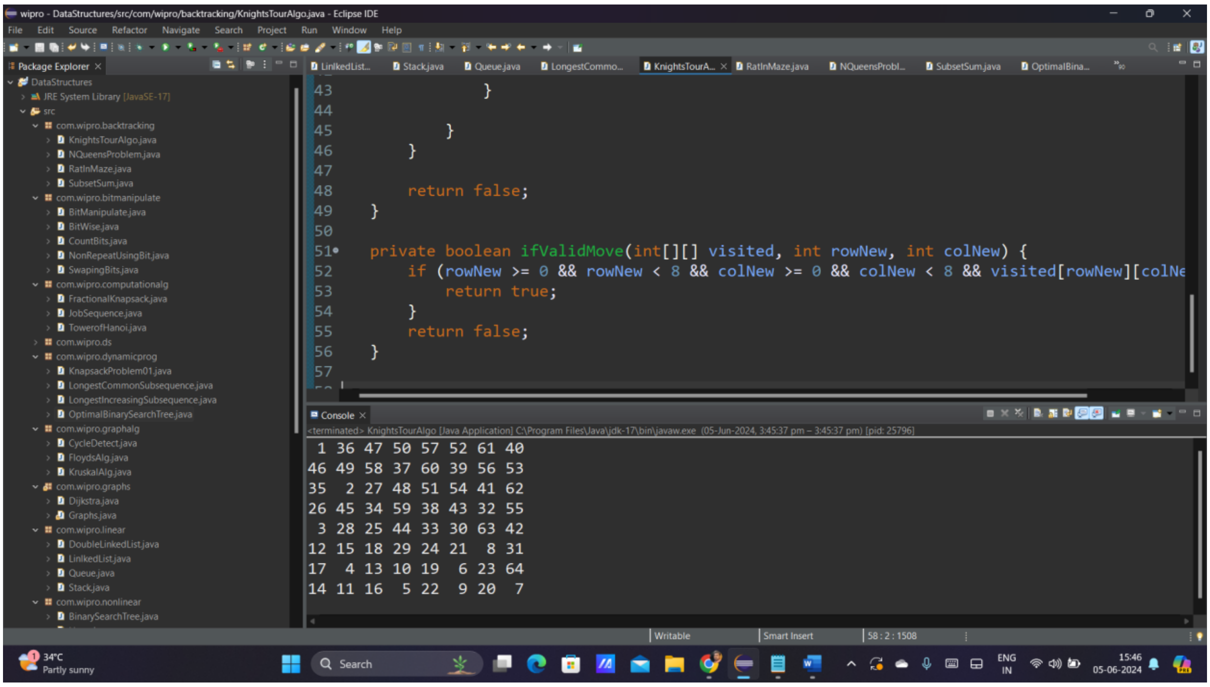
```java
package com.wipro.backtracking;

public class KnightsTourAlgo {
    // Possible moves of a Knight
    int[] pathRow = { 2, 2, 1, 1, -1, -1, -2, -2 };
    int[] pathCol = { -1, 1, -2, 2, -2, 2, -1, 1 };

    public static void main(String[] args) {
        KnightsTourAlgo knightTour = new KnightsTourAlgo();
        int[][] visited = new int[8][8];
        visited[0][0] = 1;

        if (!(knightTour.findKnightTour(visited, 0, 0, 1))) {
            System.out.println("Soultion Not Available :(");
        }
    }

    private boolean findKnightTour(int[][] visited, int row, int col, int move) {
        if (move == 64) {
            for (int i = 0; i < 8; i++) {
                for (int j = 0; j < 8; j++) {
                    System.out.printf("%2d ", visited[i][j]);
                }
                System.out.println();
            }
            return true;
        } else {
```


wipro - DataStructures/src/com/wipro/backtracking/KnightsTourAlgo.java - Eclipse IDE

```java
        } else {
            for (int index = 0; index < pathRow.length; index++) {
                int rowNew = row + pathRow[index];
                int colNew = col + pathCol[index];
                // Try all the moves from current coordinate
                if (ifValidMove(visited, rowNew, colNew)) {
                    // apply the move
                    move++;
                    visited[rowNew][colNew] = move;
                    if (findKnightTour(visited, rowNew, colNew, move)) {
                        return true;
                    }
                    // backtrack the move
                    move--;
                    visited[rowNew][colNew] = 0;

                }

            }
        }

        return false;
    }

    private boolean ifValidMove(int[][] visited, int rowNew, int colNew) {
        if (rowNew >= 0 && rowNew < 8 && colNew >= 0 && colNew < 8 && visited[rowNew][colN
            return true;
```

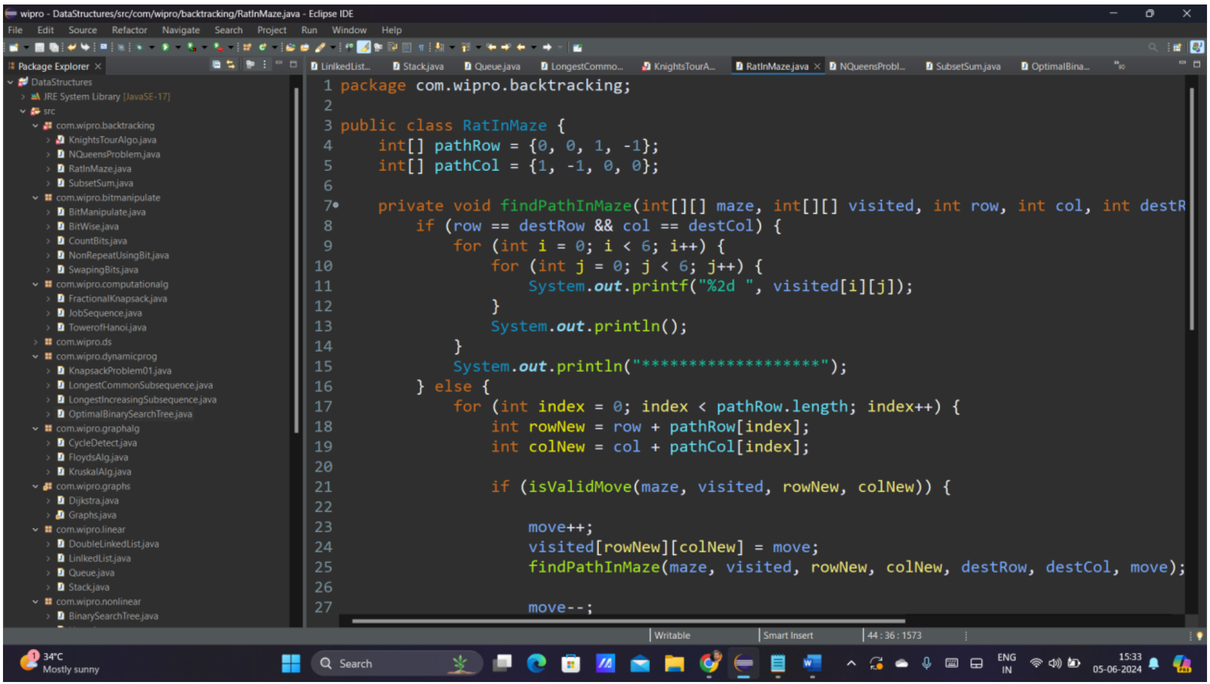

wipro - DataStructures/src/com/wipro/backtracking/KnightsTourAlgo.java - Eclipse IDE

```java
                }

            }
        }

        return false;
    }

    private boolean ifValidMove(int[][] visited, int rowNew, int colNew) {
        if (rowNew >= 0 && rowNew < 8 && colNew >= 0 && colNew < 8 && visited[rowNew][colNe
            return true;
        }
        return false;
    }

```

```
<terminated> KnightsTourAlgo [Java Application] C:\Program Files\Java\jdk-17\bin\javaw.exe  (05-Jun-2024, 3:45:37 pm – 3:45:37 pm) [pid: 25796]
 1 36 47 50 57 52 61 40
46 49 58 37 60 39 56 53
35  2 27 48 51 54 41 62
26 45 34 59 38 43 32 55
 3 28 25 44 33 30 63 42
12 15 18 29 24 21  8 31
17  4 13 10 19  6 23 64
14 11 16  5 22  9 20  7
```

Task 2: Rat in a Maze

mplement a function bool SolveMaze(int[,] maze) that uses backtracking to find a path from the top left corner to the bottom right corner of a maze. The maze is represented by a 2D array where 1s are paths and 0s are walls. Find a rat's path through the maze. The maze size is 6x6.


wipro - DataStructures/src/com/wipro/backtracking/RatInMaze.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer
RatInMaze.java
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44 : 36 : 1573
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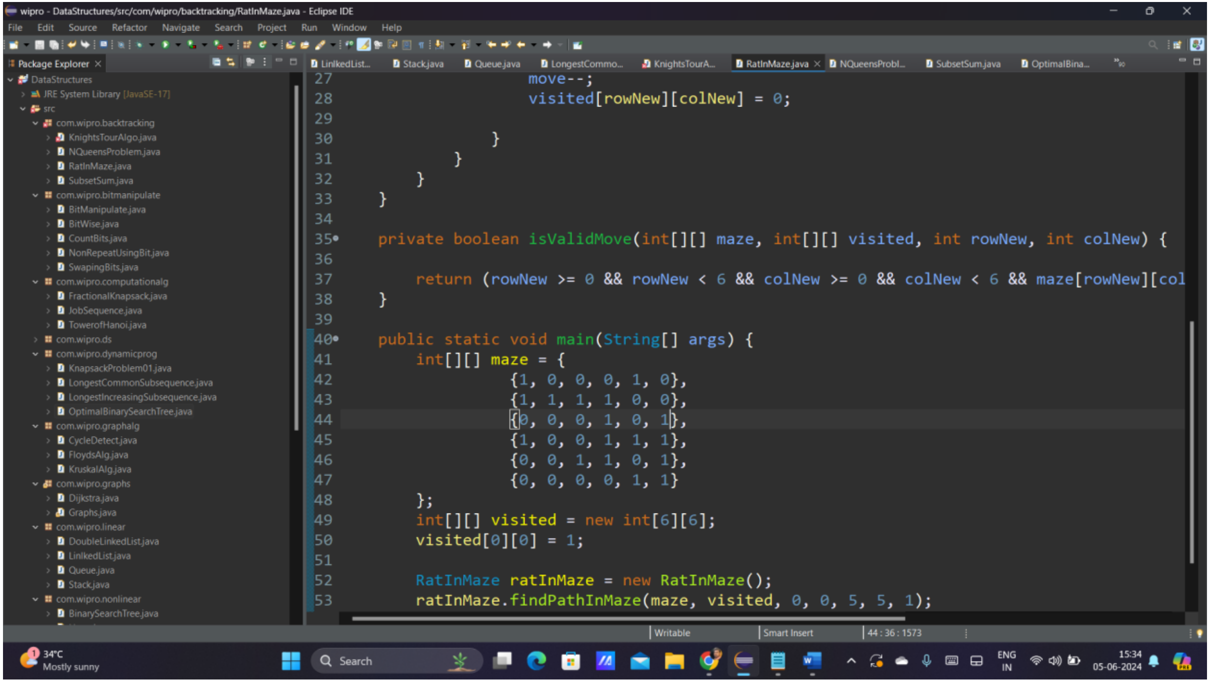
05-06-2024

```java
package com.wipro.backtracking;

public class RatInMaze {
    int[] pathRow = {0, 0, 1, -1};
    int[] pathCol = {1, -1, 0, 0};

    private void findPathInMaze(int[][] maze, int[][] visited, int row, int col, int destR
        if (row == destRow && col == destCol) {
            for (int i = 0; i < 6; i++) {
                for (int j = 0; j < 6; j++) {
                    System.out.printf("%2d ", visited[i][j]);
                }
                System.out.println();
            }
            System.out.println("*******************");
        } else {
            for (int index = 0; index < pathRow.length; index++) {
                int rowNew = row + pathRow[index];
                int colNew = col + pathCol[index];

                if (isValidMove(maze, visited, rowNew, colNew)) {

                    move++;
                    visited[rowNew][colNew] = move;
                    findPathInMaze(maze, visited, rowNew, colNew, destRow, destCol, move);

                    move--;
```


wipro - DataStructures/src/com/wipro/backtracking/RatInMaze.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer
RatInMaze.java
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44 : 36 : 1573
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Mostly sunny
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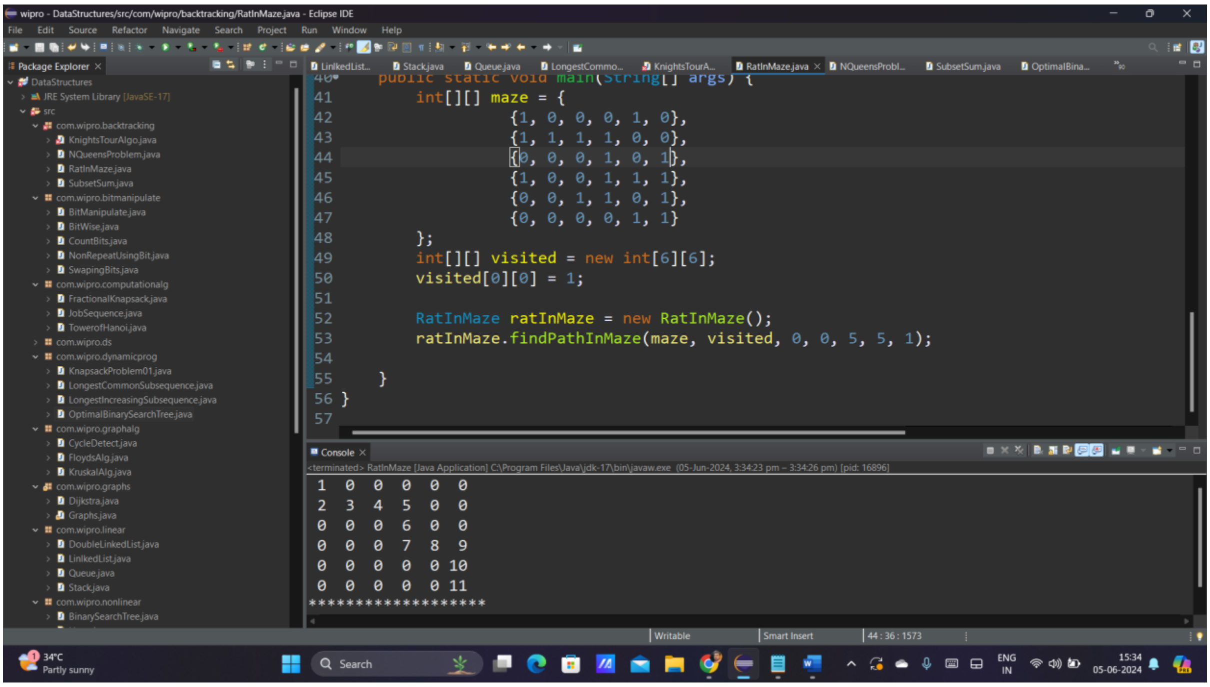
05-06-2024

```java
                    move--;
                    visited[rowNew][colNew] = 0;

                }
            }
        }
    }

    private boolean isValidMove(int[][] maze, int[][] visited, int rowNew, int colNew) {

        return (rowNew >= 0 && rowNew < 6 && colNew >= 0 && colNew < 6 && maze[rowNew][col
    }

    public static void main(String[] args) {
        int[][] maze = {
                {1, 0, 0, 0, 1, 0},
                {1, 1, 1, 1, 0, 0},
                {0, 0, 0, 1, 0, 1},
                {1, 0, 0, 1, 1, 1},
                {0, 0, 1, 1, 0, 1},
                {0, 0, 0, 0, 1, 1}
        };
        int[][] visited = new int[6][6];
        visited[0][0] = 1;

        RatInMaze ratInMaze = new RatInMaze();
        ratInMaze.findPathInMaze(maze, visited, 0, 0, 5, 5, 1);
```


wipro - DataStructures/src/com/wipro/backtracking/RatInMaze.java - Eclipse IDE
Package Explorer
RatInMaze.java
Console
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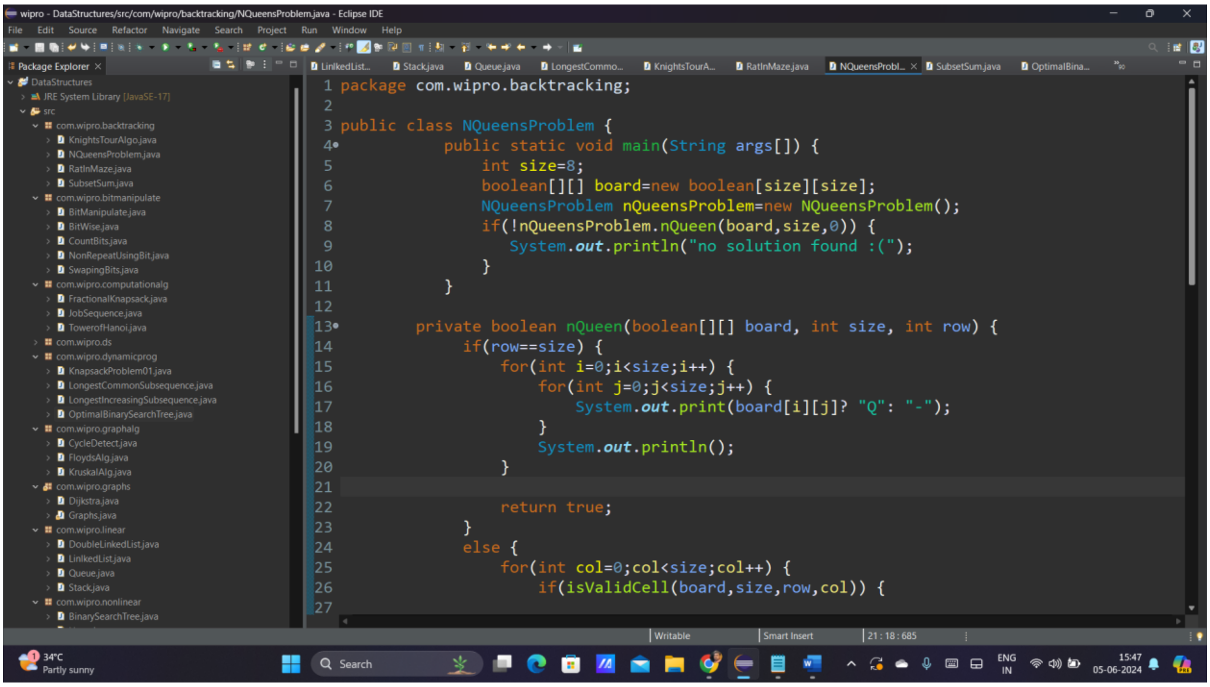
44 : 36 : 1573

```
  public static void main(String[] args) {
    int[][] maze = {
         {1, 0, 0, 0, 1, 0},
         {1, 1, 1, 1, 0, 0},
         {0, 0, 0, 1, 0, 1},
         {1, 0, 0, 1, 1, 1},
         {0, 0, 1, 1, 0, 1},
         {0, 0, 0, 0, 1, 1}
    };
    int[][] visited = new int[6][6];
    visited[0][0] = 1;

    RatInMaze ratInMaze = new RatInMaze();
    ratInMaze.findPathInMaze(maze, visited, 0, 0, 5, 5, 1);

  }
}
```

```
<terminated> RatInMaze [Java Application] C:\Program Files\Java\jdk-17\bin\javaw.exe (05-Jun-2024, 3:34:23 pm – 3:34:26 pm) [pid: 16896]
 1  0  0  0  0  0
 2  3  4  5  0  0
 0  0  0  6  0  0
 0  0  0  7  8  9
 0  0  0  0  0 10
 0  0  0  0  0 11
******************
```

Task 3: N Queen Problem

Write a function bool SolveNQueen(int[,] board, int col) in C# that places N queens on an N x N chessboard so that no two queens attack each other using backtracking. Place N queens on the board such that no two queens can attack each other. Use a standard 8x8 chessboard.


wipro - DataStructures/src/com/wipro/backtracking/NQueensProblem.java - Eclipse IDE
Package Explorer
NQueensProbl...
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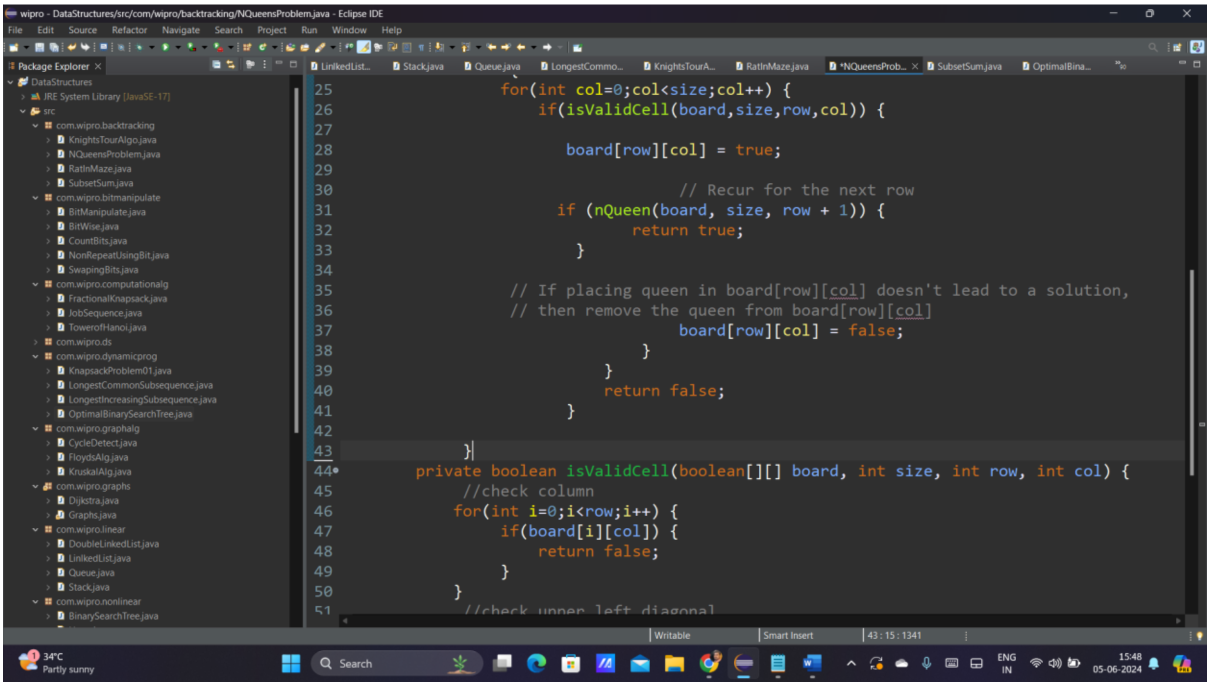
21 : 18 : 685

```
package com.wipro.backtracking;

public class NQueensProblem {
      public static void main(String args[]) {
        int size=8;
        boolean[][] board=new boolean[size][size];
        NQueensProblem nQueensProblem=new NQueensProblem();
        if(!nQueensProblem.nQueen(board,size,0)) {
          System.out.println("no solution found :(");
        }
      }

    private boolean nQueen(boolean[][] board, int size, int row) {
      if(row==size) {
        for(int i=0;i<size;i++) {
          for(int j=0;j<size;j++) {
            System.out.print(board[i][j]? "Q": "-");
          }
          System.out.println();
        }

        return true;
      }
      else {
        for(int col=0;col<size;col++) {
          if(isValidCell(board,size,row,col)) {
```



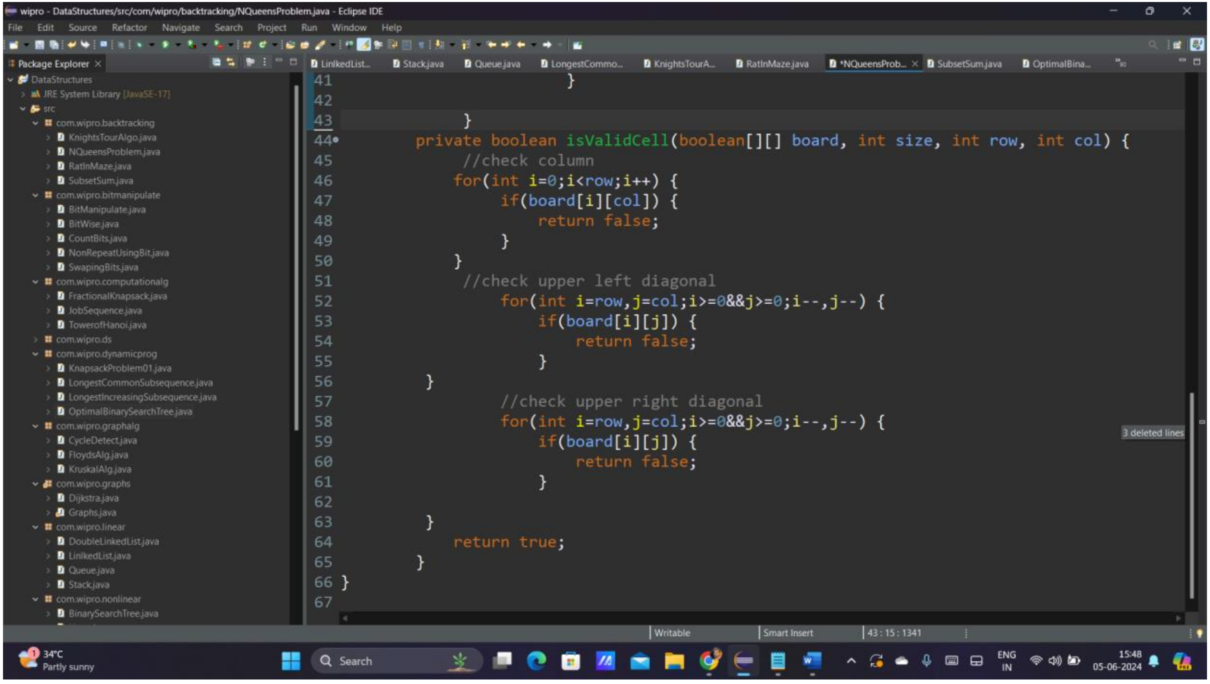
```
         for(int col=0;col<size;col++) {
           if(isValidCell(board,size,row,col)) {

               board[row][col] = true;

                     // Recur for the next row
              if (nQueen(board, size, row + 1)) {
                  return true;
              }

         // If placing queen in board[row][col] doesn't lead to a solution,
         // then remove the queen from board[row][col]
                     board[row][col] = false;
                 }
              }
              return false;
            }

       }
    private boolean isValidCell(boolean[][] board, int size, int row, int col) {
       //check column
      for(int i=0;i<row;i++) {
         if(board[i][col]) {
           return false;
         }
      }
       //check upper left diagonal
```

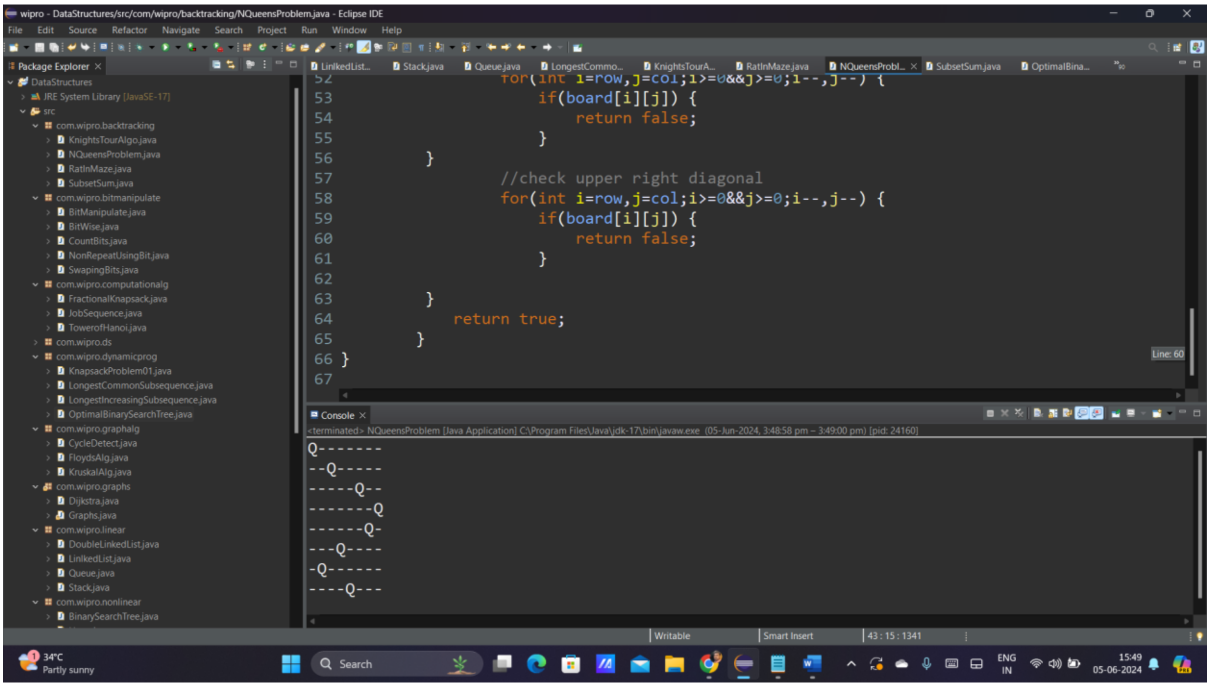


```
            }

       }
    private boolean isValidCell(boolean[][] board, int size, int row, int col) {
       //check column
      for(int i=0;i<row;i++) {
         if(board[i][col]) {
           return false;
         }
      }
       //check upper left diagonal
         for(int i=row,j=col;i>=0&&j>=0;i--,j--) {
           if(board[i][j]) {
               return false;
           }
     }
         //check upper right diagonal
         for(int i=row,j=col;i>=0&&j>=0;i--,j--) {
           if(board[i][j]) {
               return false;
           }

     }
      return true;
    }
}

```



```
                 for(int i=row,j=col;i>=0&&j>=0;i--,j--) {
                     if(board[i][j]) {
                         return false;
                     }
         }
                 //check upper right diagonal
                 for(int i=row,j=col;i>=0&&j>=0;i--,j--) {
                     if(board[i][j]) {
                         return false;
                     }

         }
            return true;
        }
}
```

<terminated> NQueensProblem [Java Application] C:\Program Files\Java\jdk-17\bin\javaw.exe (05-Jun-2024, 3:48:58 pm – 3:49:00 pm) [pid: 24160]

```
Q-------
--Q-----
-----Q--
-------Q
------Q-
---Q----
-Q------
----Q---
```