**LAB ASSIGNMENT 17.2**

**Knight's Tour 1**

**Create a new project, TwoDimensionalArrays.**

**Create a new class, Knight into this project.**

The Swiss mathematician Leonhard Euler (1707 – 1783) proposed a problem regarding the movement of the knight chess piece on a chess board. The challenge that Euler proposed was to move the knight around an empty chessboard, and to touch each of the 64 squares *once and only once*.

**Explanation**

To start, move the knight from any position on the board using its standard L-shaped moves (two over in one direction, then one in a perpendicular direction). Practice on this empty grid. Number any position as 1 and then visit as many squares as possible, numbering each move as you go:



This task is much more difficult than it first appears!

**Directions**

Your task in this lab is to write a program that will move a knight around an empty chess board, leaving behind a trail of increasing integers, ranging from 1 to, hopefully, 64. Here are the specifications for your assignment:

The knight will start in row 1, column 1.

The program will mark squares as they are visited, ranging from 1-64.

The program will continue until a complete tour is accomplished (all 64 squares) or the program gets stuck with nowhere to go.

Use the Math class to generate the necessary random numbers.

|  |
| --- |
| **Example Output** |
| **1 2 3 4 5 6 7 8**  **1** 1 0 21 0 0 14 23 12  2 20 0 6 9 22 11 0 0  3 7 2 19 36 15 46 13 24  4 0 5 8 47 10 37 0 45  5 0 18 3 16 35 44 25 38  6 4 31 34 0 42 39 28 0  7 0 0 17 32 29 26 43 40  8 0 33 30 0 0 41 0 27  47 squares were visited |

**Suggestions**

**Suggestion 1** Think about the 8 different possible moves a knight can make from a square. If we analyze them, we can break each one down into a horizontal and vertical component.



Here are the 8 different possible moves analyzed as horizontal and vertical components:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Move** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| horizontal | +1 | +2 | +2 | +1 | -1 | -2 | -2 | -1 |
|  |  |  |  |  |  |  |  |  |
| vertical | -2 | -1 | +1 | +2 | +2 | +1 | -1 | -2 |

If you stored the above data in 2 arrays, called horizontal and vertical, it would be possible to move the knight to the next square using a statement like:

row = row + vertical[moveNumber];

col = col + horizontal[moveNumber];

This kind of approach will help to simplify your program.

**Suggestion 2** Declare the board as a 9 x 9 grid.

This will allow you to work with rows 1..8 and column 1..8. Row 0 and column 0 will not be used in this approach.