KAUNO TECHNOLOGIJOS UNIVERSITETAS
INFORMATIKOS FAKULTETAS

Programavimo kalbų teorija (P175B124)

Laboratorinių darbų ataskaita

Atliko:
IFF-6/14 gr. studentas
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1. 3 lab. darbas - Haskell / F#

1.1. Darbo užduotis

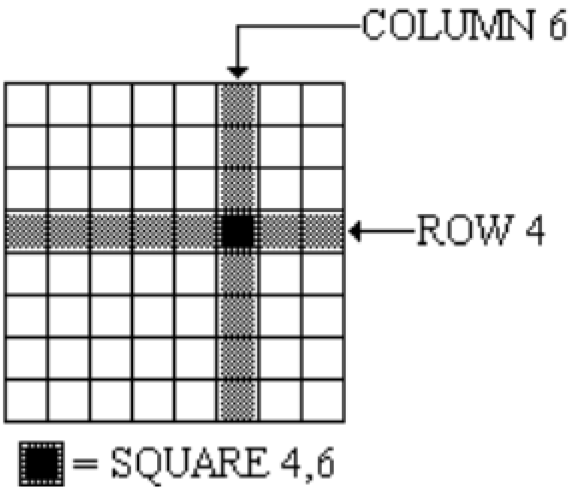
750 - 8 Queens Chess Problem

https://uva.onlinejudge.org/index.php?option=com_onlinejudge&Itemid=8&category=9&page=show_problem&problem=691

In chess it is possible to place eight queens on the board so that no one queen can be taken by anyother. Write a program that will determine all such possible arrangements for eight queens given theinitial position of one of the queens.Do not attempt to write a program which evaluates every possible 8 configuration of 8 queens placedon the board. This would require 88evaluations and would bring the system to its knees. There willbe a reasonable run time constraint placed on your program.

Input

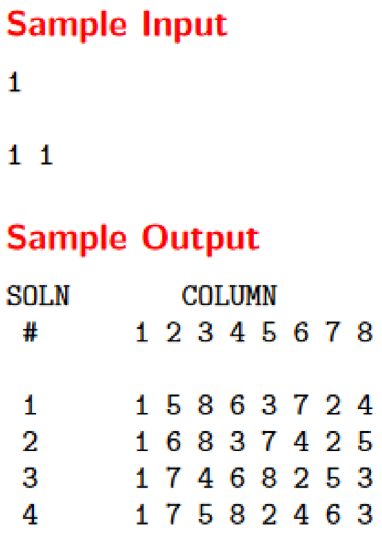
The first line of the input contains the number of datasets,and it's followed by a blank line.Each dataset contains a pair of positive integers separatedby a single space. The numbers represent the square on whichone of the eight queens must be positioned. A valid squarewill be represented; it will not be necessary to validate theinput.To standardize our notation, assume that the upper left-most corner of the board is position (1,1). Rows run horizontally and the top row is row 1. Columns are vertical andcolumn 1 is the left-most column. Any reference to a squareis by row then column; thus square (4,6) means row 4, column6.Each dataset is separated by a blank line.



Output

Output for each dataset will consist of a one-line-per-solution representation.Each solution will be sequentially numbered 1:::N. Each solution will consist of 8 numbers. Eachof the 8 numbers will be the ROW coordinate for that solution. The column coordinate will be indicatedby the order in which the 8 numbers are printed. That is, the first number represents the ROW inwhich the queen is positioned in column 1; the second number represents the ROW in which the queenis positioned in column 2, and so on.

Notes: The sample input below produces 4 solutions. The full 88 representation of each solution is shownbelow.



Sample Input

```
1

1 1
```

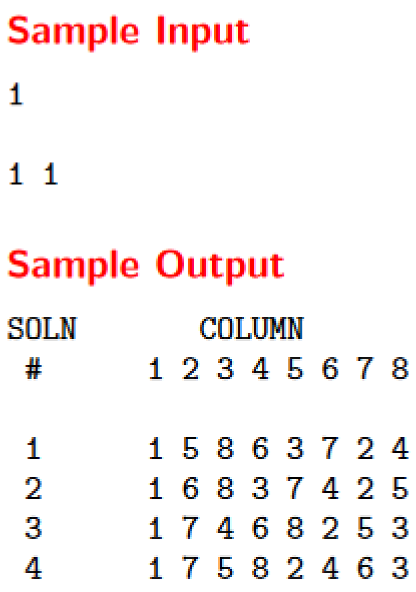
Sample Output

```
SOLN       COLUMN
 #      1 2 3 4 5 6 7 8

 1      1 5 8 6 3 7 2 4
 2      1 6 8 3 7 4 2 5
 3      1 7 4 6 8 2 5 3
 4      1 7 5 8 2 4 6 3
```

1.2. Programos tekstas

```
// Valdas Germanauskas IFF-6/14
// 750 - 8 Queens Chess Problem

open System
open System.IO

let rec iterate f value = seq {
    yield value
    yield! iterate f (f value) }

 //directions
let up i = i + 1
let right i = i
let down i = i - 1

let noCollisionGivenDir solution number dir =
    Seq.forall2 (<>) solution (Seq.skip 1 (iterate dir number))

let goodAddition solution number =
    List.forall (noCollisionGivenDir solution number) [ up; right; down ]

let extendSolution ps =
    [1..8]
    |> List.filter (goodAddition ps)
    |> List.map (fun num -> num :: ps)

let allSolutions =
    iterate (List.collect (extendSolution)) [[]]

//get solutions for the 8x8 chessboard where a queen is given at col and row
let findSolutions (col : int, row : int) =
    allSolutions
    |> Seq.item 8
    |> Seq.filter (fun x -> x.Item(col-1).Equals(row))

let print items =
    use file = System.IO.File.AppendText("temp.txt")
    items
    |> Seq.iter (fprintf file "%A")
    fprintfn file ""

[<EntryPoint>]
let main argv =

    printfn "Enter x coordinate and then the y coordinate"
    //get x and y coords of the first queen
    let xCoord = Console.ReadLine();
    let yCoord = Console.ReadLine();

    let results = findSolutions(Convert.ToInt32(xCoord), Convert.ToInt32(yCoord))

    use file = System.IO.File.CreateText("temp.txt")
    fprintfn file "SOLN#"

    file.Close()
    results
    |> Seq.iter print

    0;;
```

1.3. *Pradiniai duomenys ir rezultatai*



Sample Input

```
1

1 1
```

Sample Output

```
SOLN       COLUMN
 #      1 2 3 4 5 6 7 8

 1      1 5 8 6 3 7 2 4
 2      1 6 8 3 7 4 2 5
 3      1 7 4 6 8 2 5 3
 4      1 7 5 8 2 4 6 3
```

```
1 1
SOLN#
17468253
17582463
15863724
16837425

4 4
SOLN#
53847162
68241753
25741863
57142863
63741825
35841726
57248136
51842736

2 7
SOLN#
57138642
57413862
47531682
17468253
47185263
27581463
17582463
57142863
27368514
57263184
37286415
47382516
57248136
37285146
47526138
57263148
```