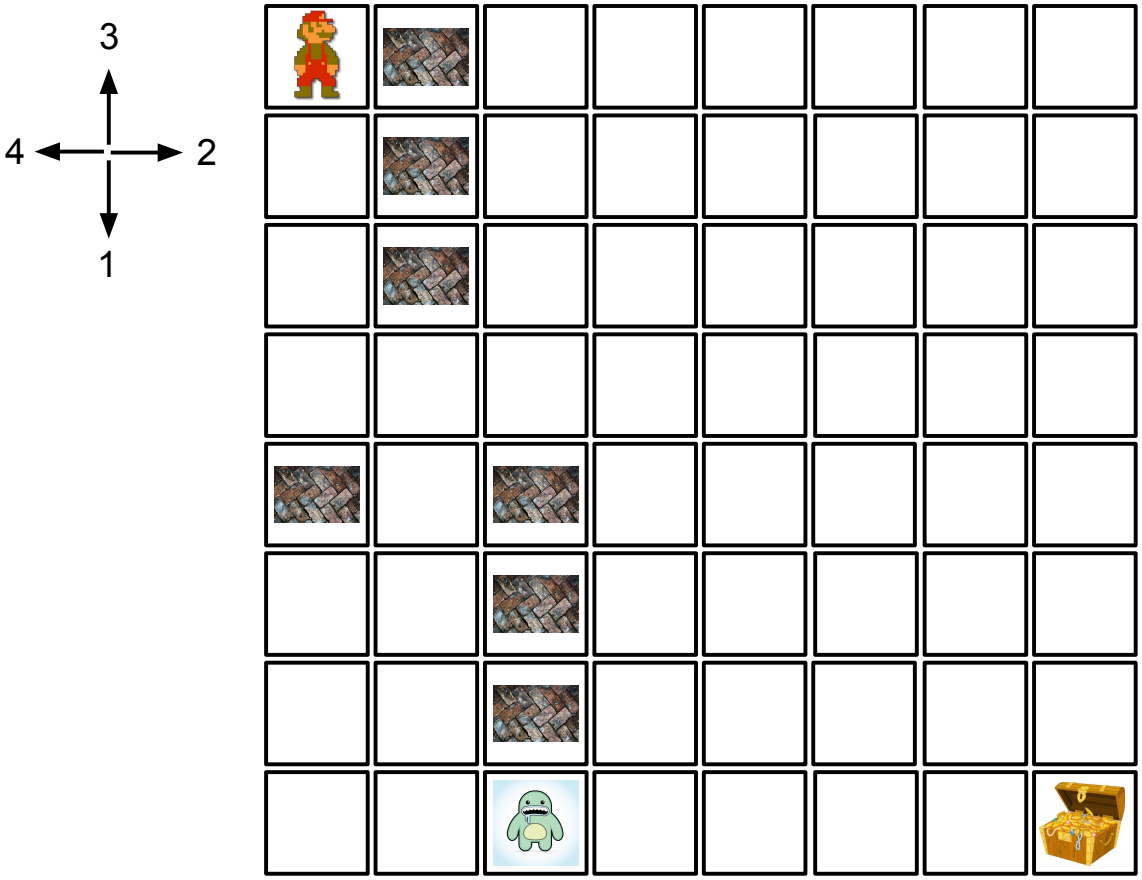
Рекурсия с връщане назад

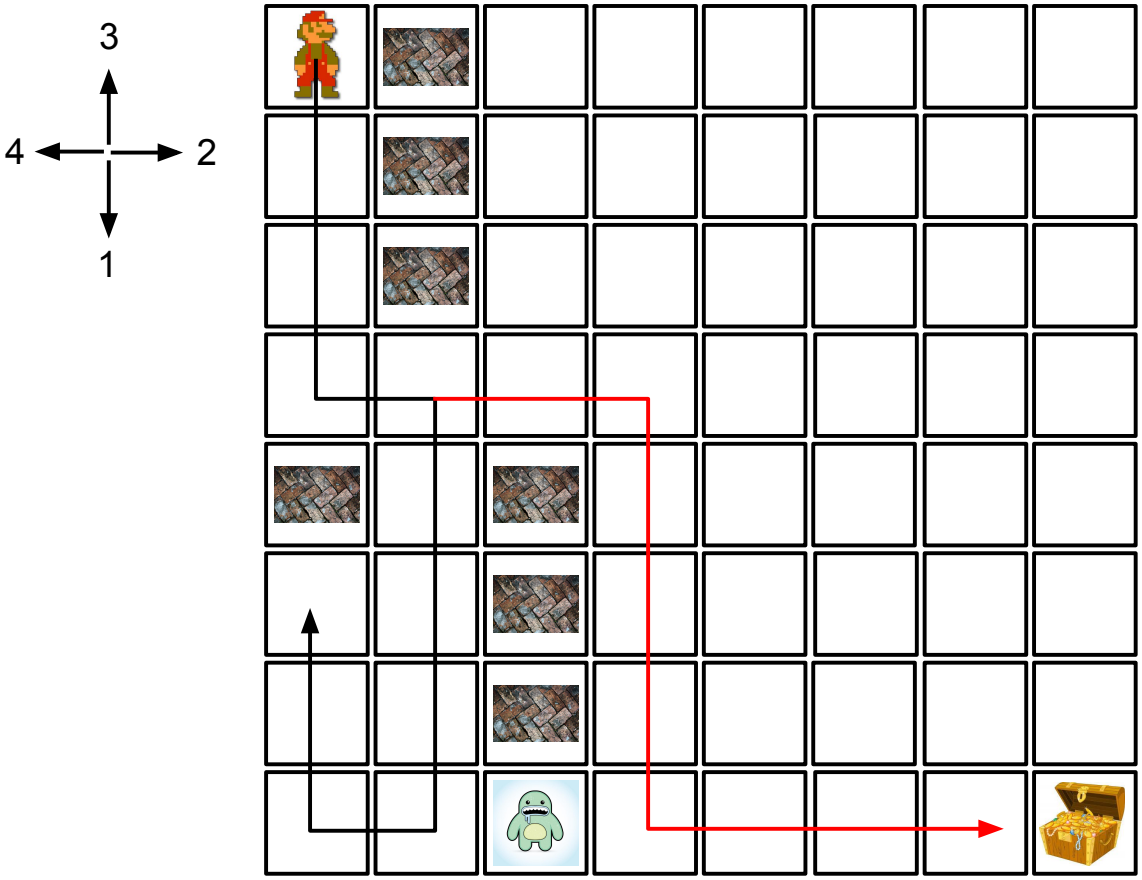
6 януари 2017 г.

Търсене на път в лабиринт

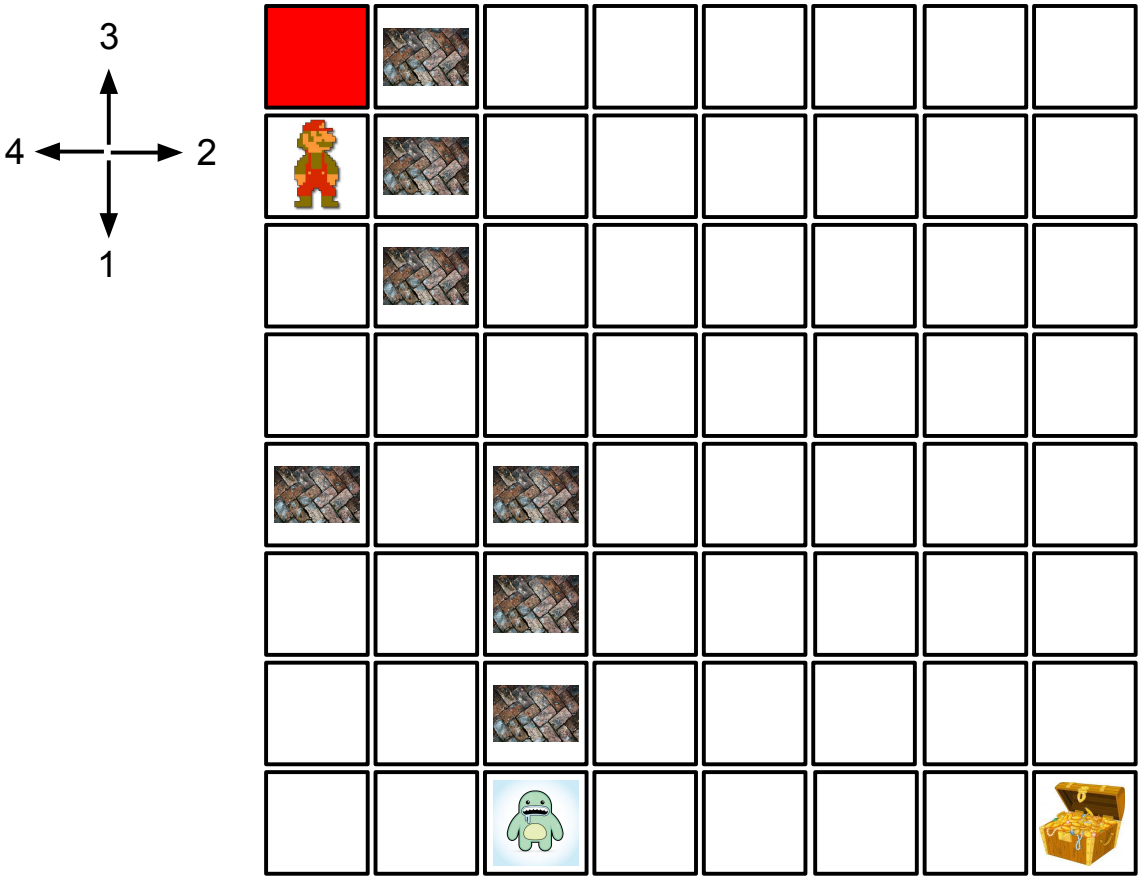
Задачата



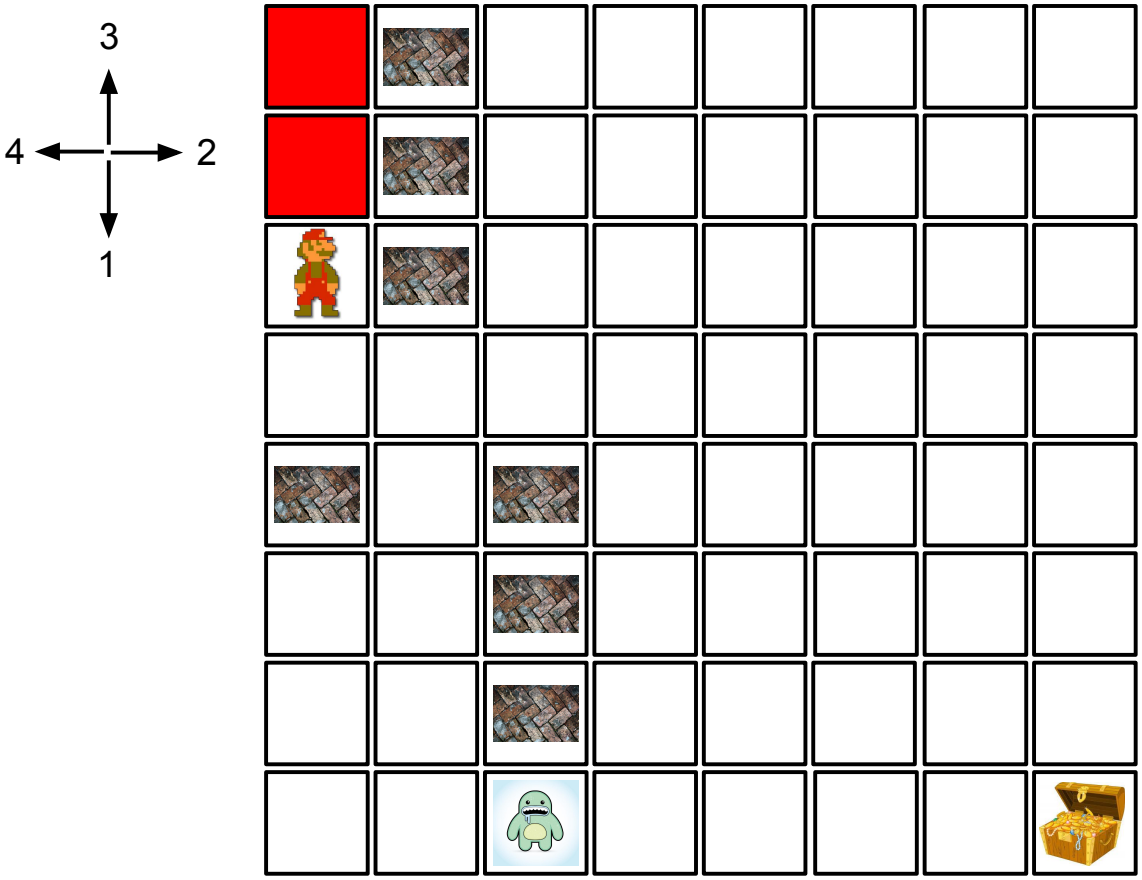
Задачата



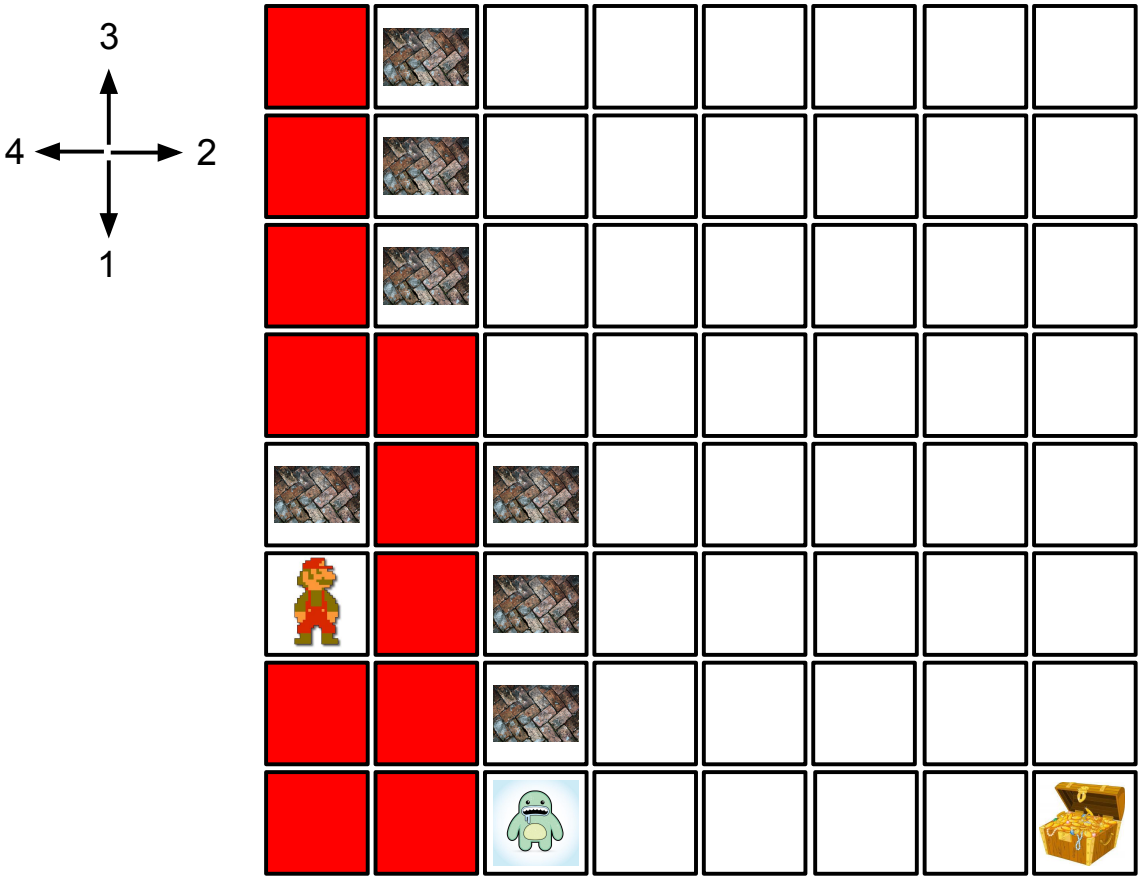
Подзадача



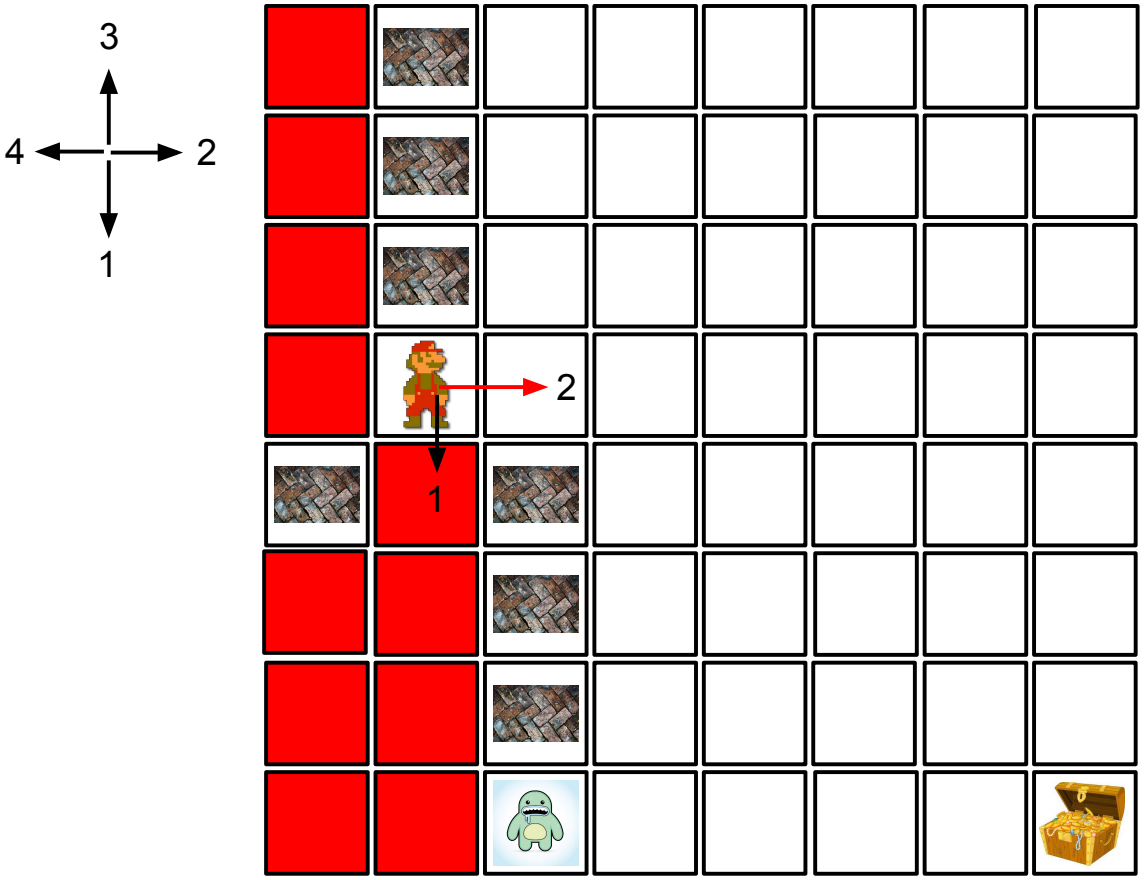
Търсене



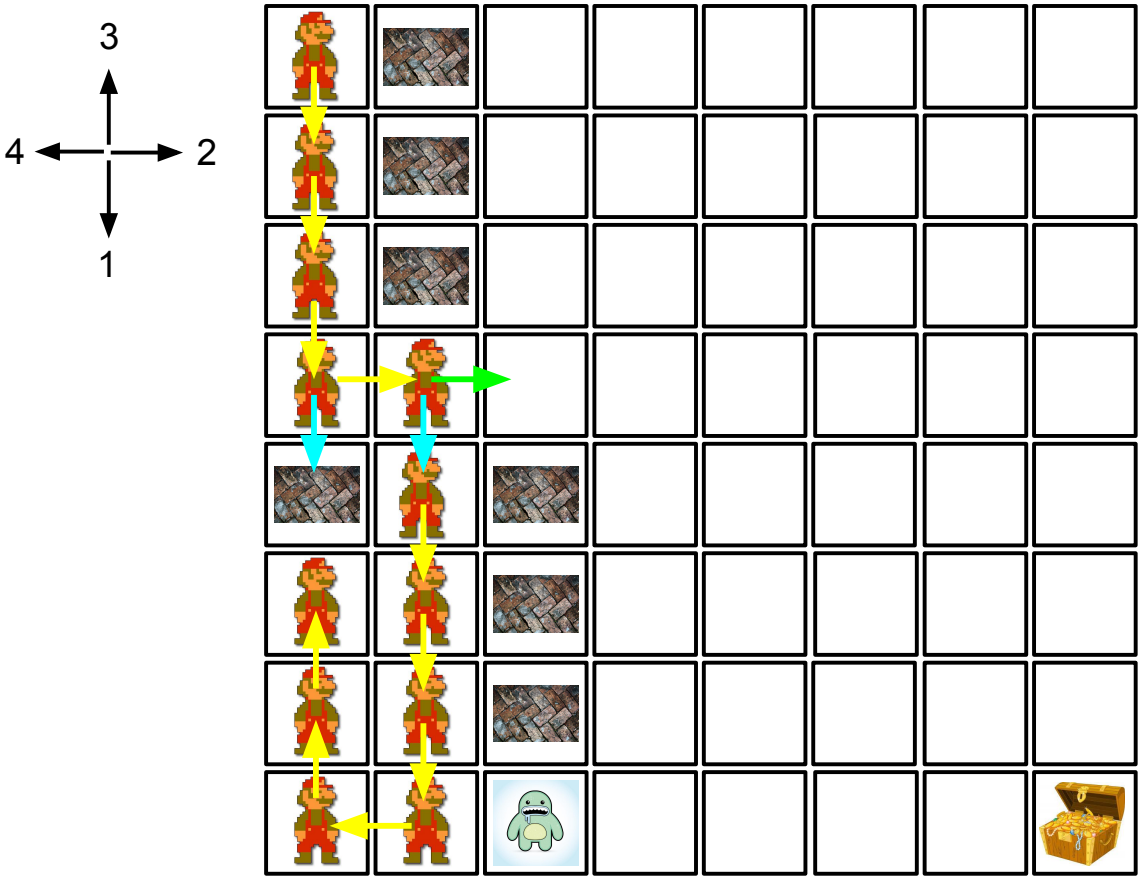
Търсене



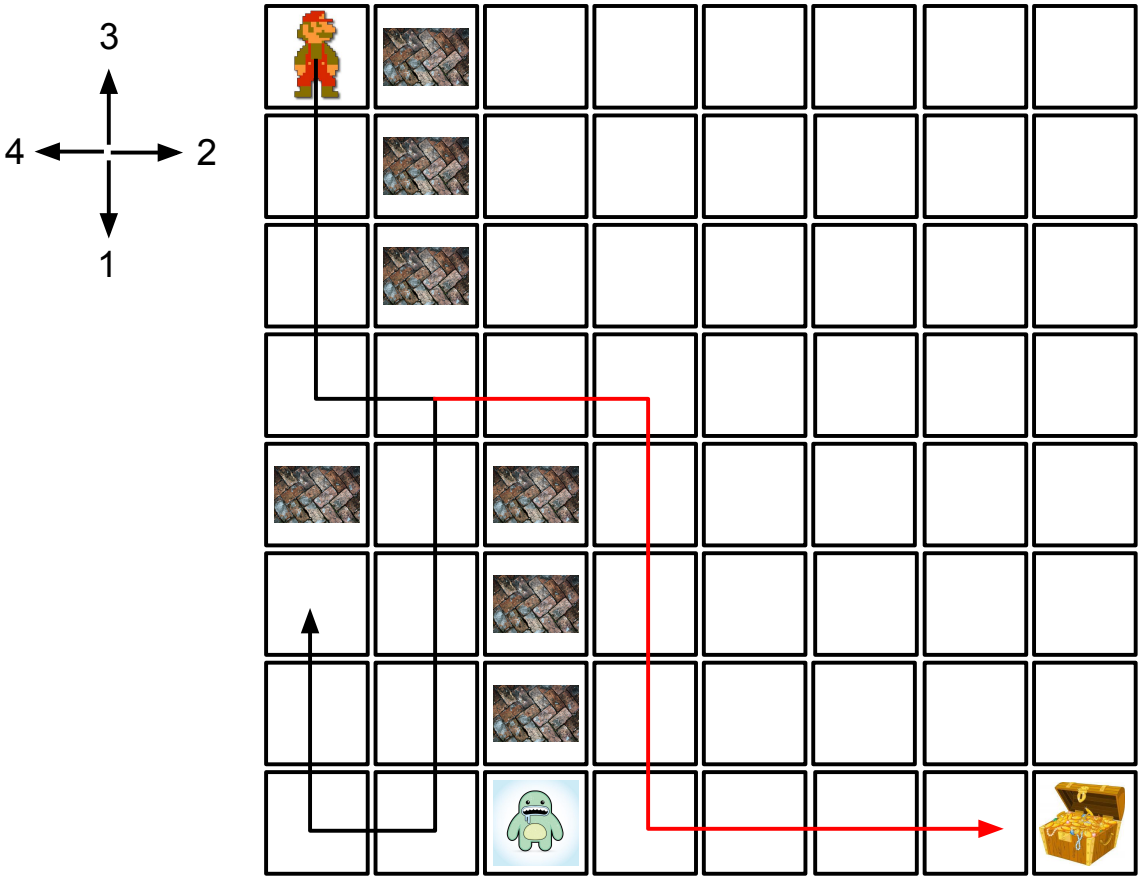
Търсене



Търсене



Търсене



Модел на лабиринта

```
const int ls = 8;
int lab[ls][ls] = {0,1,0,0,0,0,0,0,
                   0,1,0,0,0,0,0,0,
                   0,1,0,0,0,0,0,0,
                   0,0,0,0,0,0,0,0,
                   1,0,1,0,0,0,0,0,
                   0,0,1,0,0,0,0,0,
                   0,0,1,0,0,0,0,0,
                   0,0,2,0,0,0,0,0};
```

Модел на лабиринта

```
void markVisited (int lab[ls][ls], int row, int col)
{
  lab[row][col] = 9;
}

bool canStepOn (int lab[ls][ls], int row, int col)
{
  return row >= 0 &&
         col >= 0 &&
         row < ls &&
         col < ls &&
         lab[row][col] == 0;
}
```

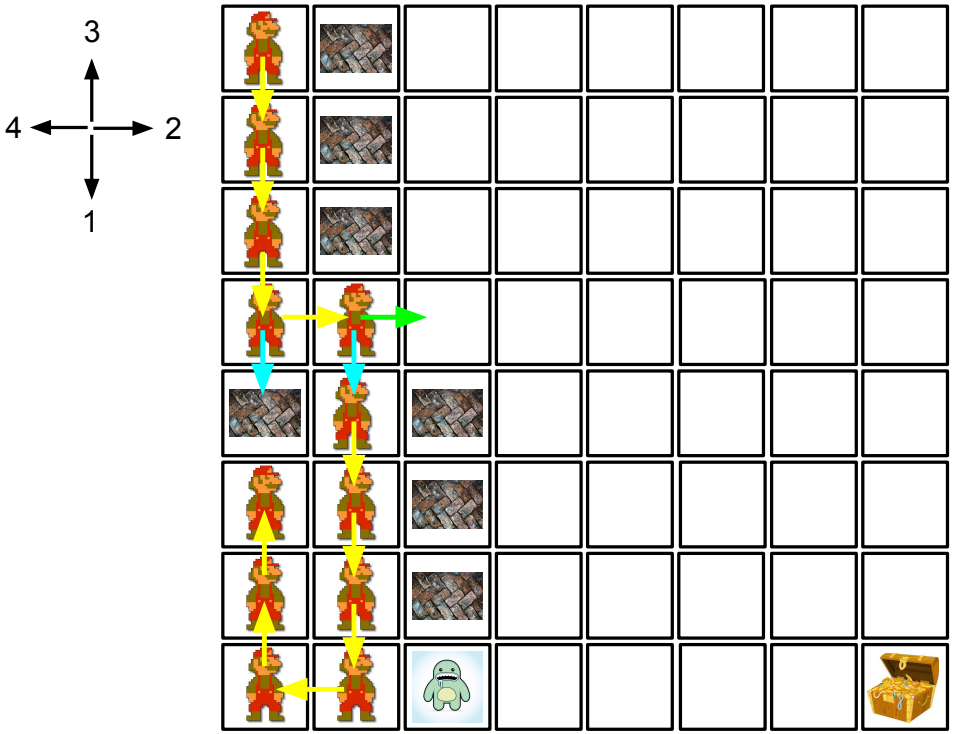
Проби и грешки

```
bool wayExists  (int lab[ls][ls], int startRow, int startCol)
{
  if (startRow == ls-1 && startCol == ls-1)
  { return true; }

  markVisited (lab,startRow,startCol);

  if (canStepOn (lab,startRow+1,startCol) &&
      wayExists (lab,startRow+1,startCol))
        return true;
  if (canStepOn (lab,startRow,startCol+1) &&
      wayExists (lab,startRow,startCol+1))
        return true;
  if (canStepOn (lab,startRow-1,startCol) &&
      wayExists (lab,startRow-1,startCol))
        return true;
  if (canStepOn (lab,startRow,startCol-1) &&
      wayExists (lab,startRow,startCol-1))
        return true;
  return false;
}
```

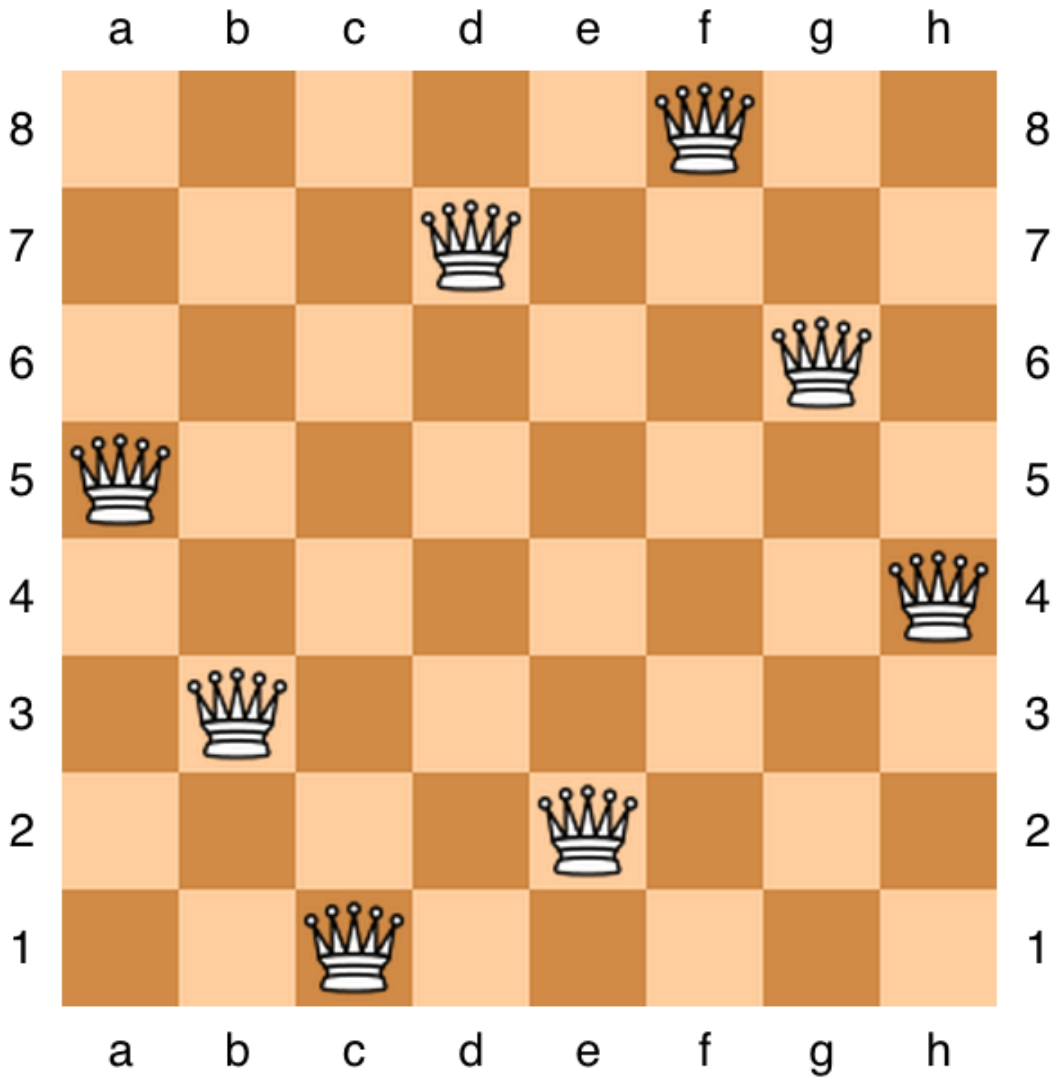
Проби и грешки




```
  if (canStepOn (lab,startRow+1,startCol) &&
      wayExists (lab,startRow+1,startCol))
        return true;
  if (canStepOn (lab,startRow,startCol+1) &&
      wayExists (lab,startRow,startCol+1))
        return true;
...
```

Пъзел с 8 царици

Задачата



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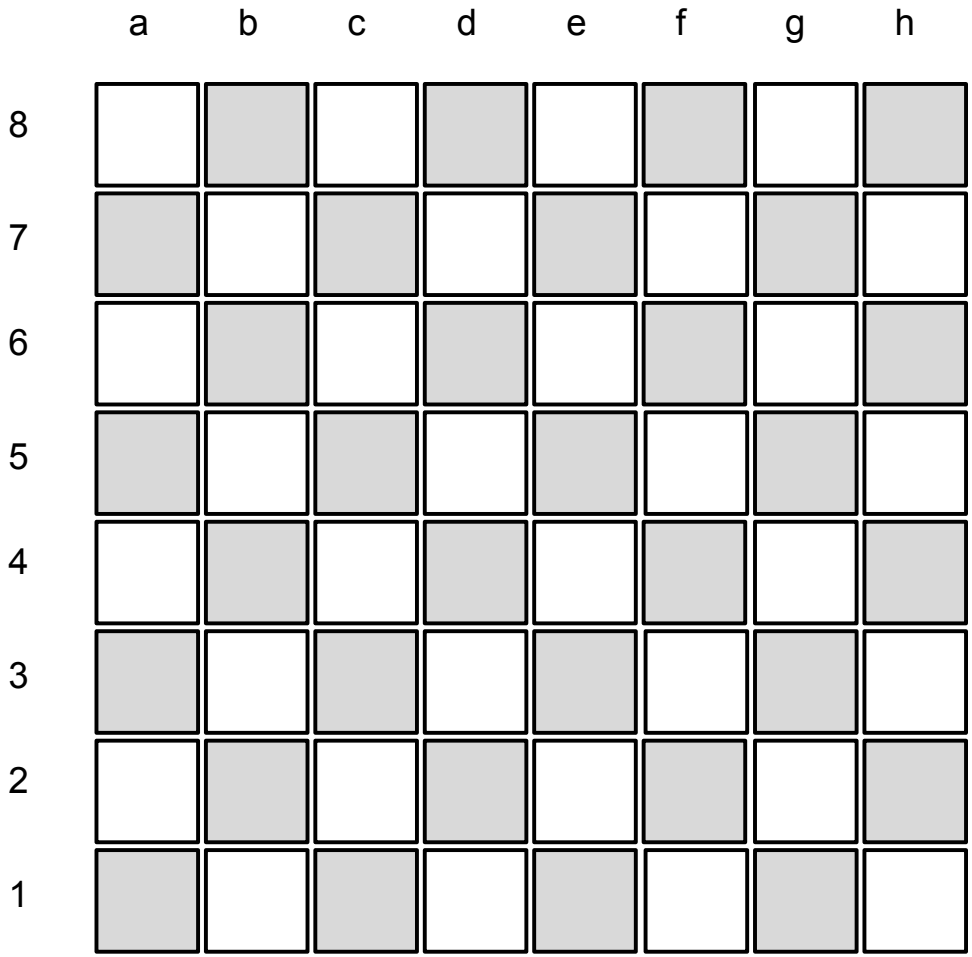

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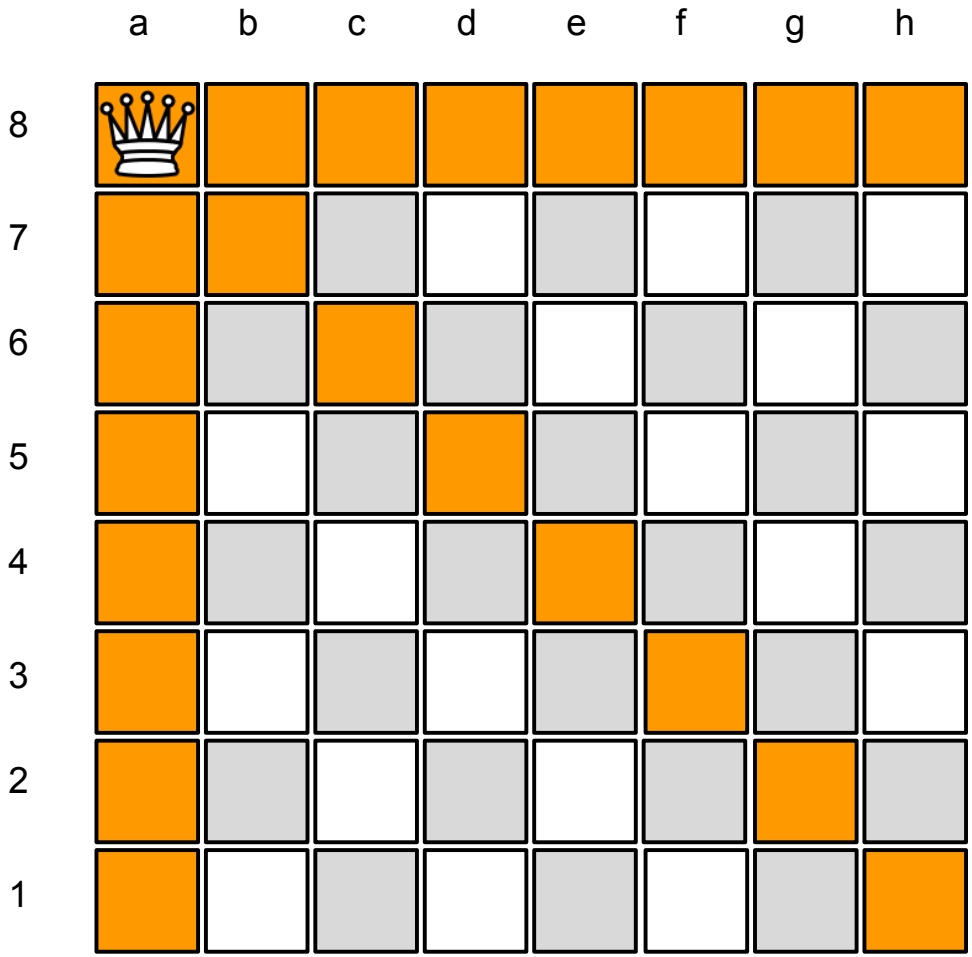

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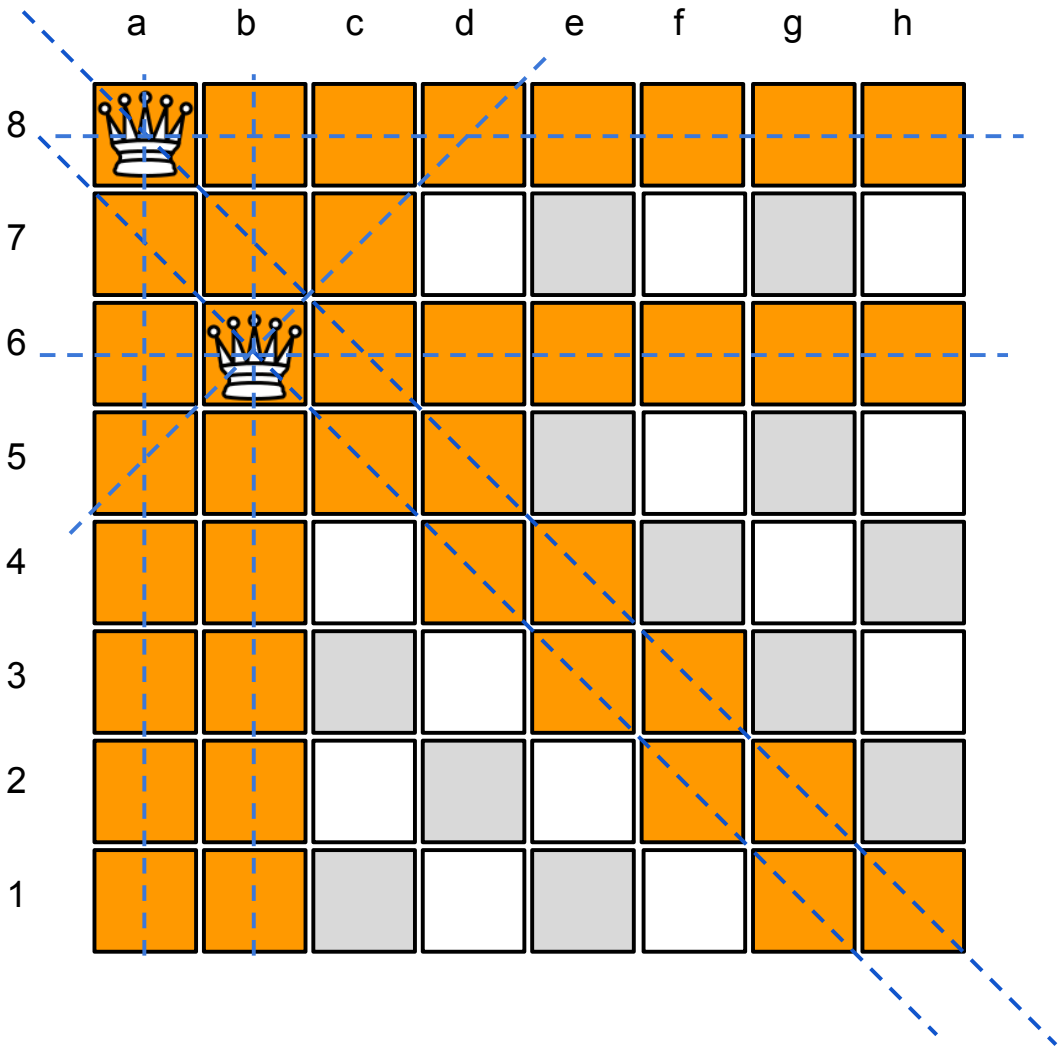

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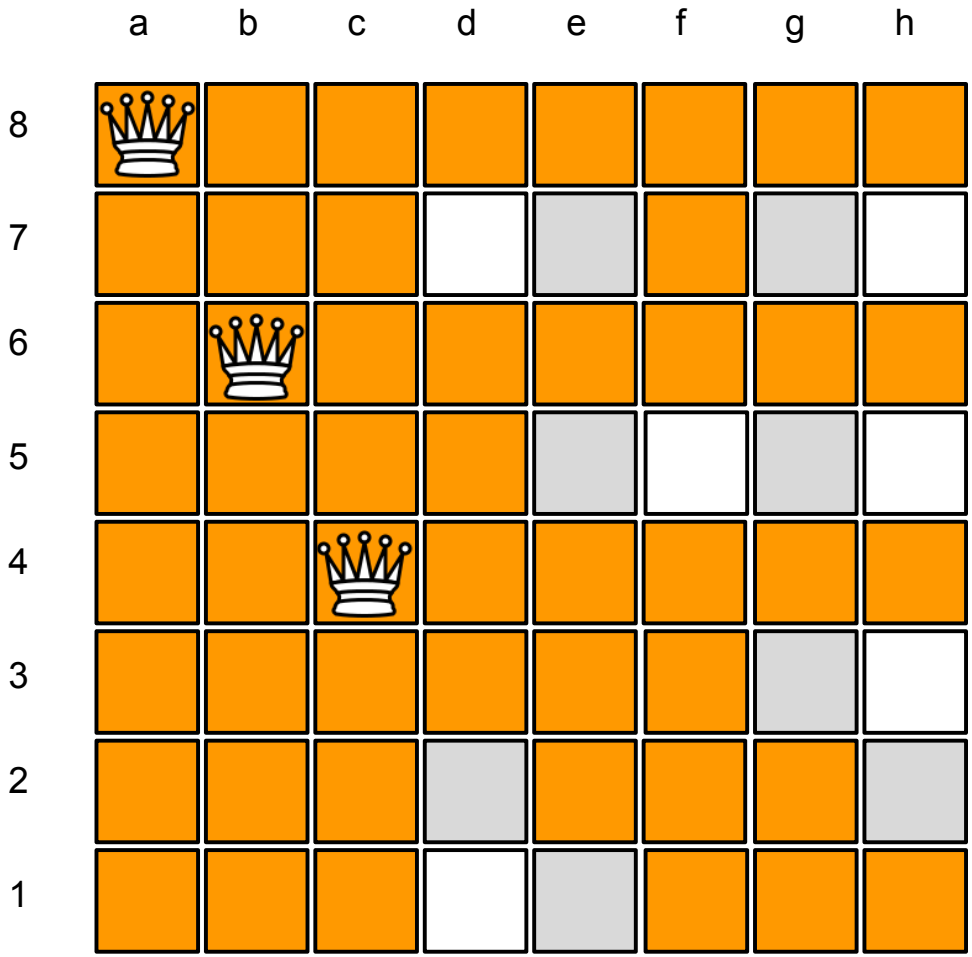
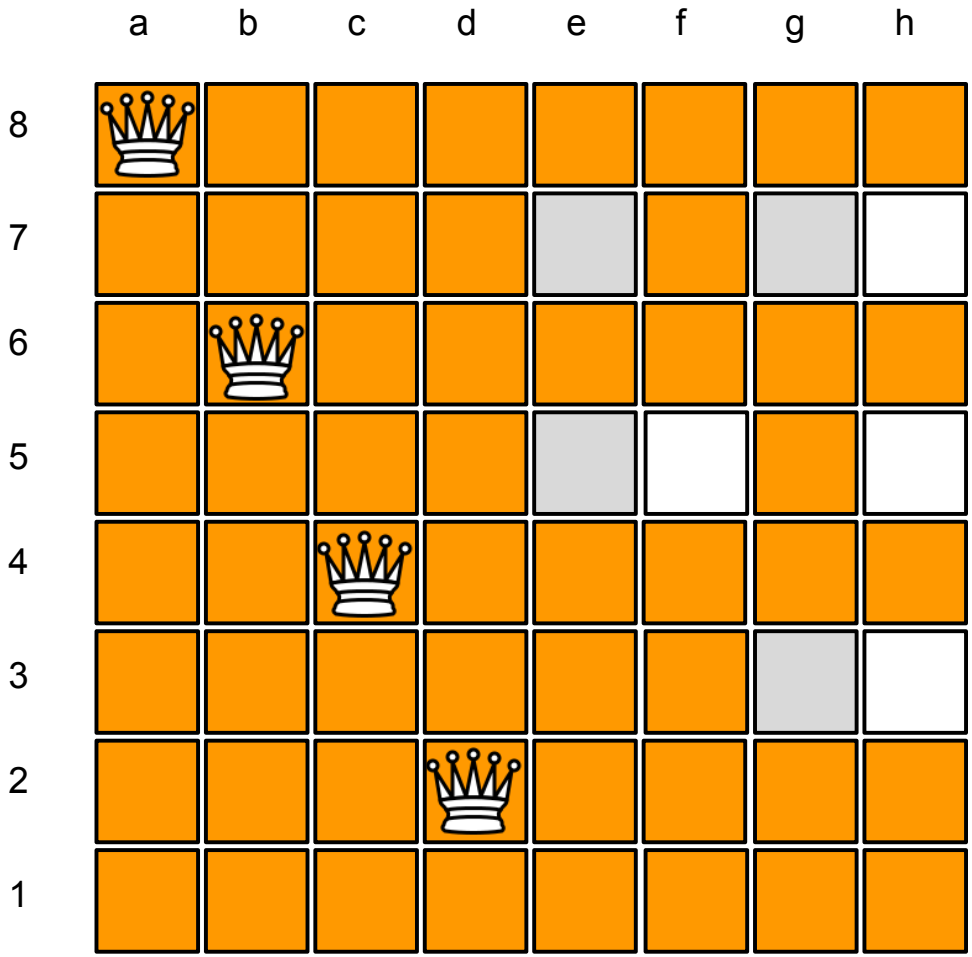
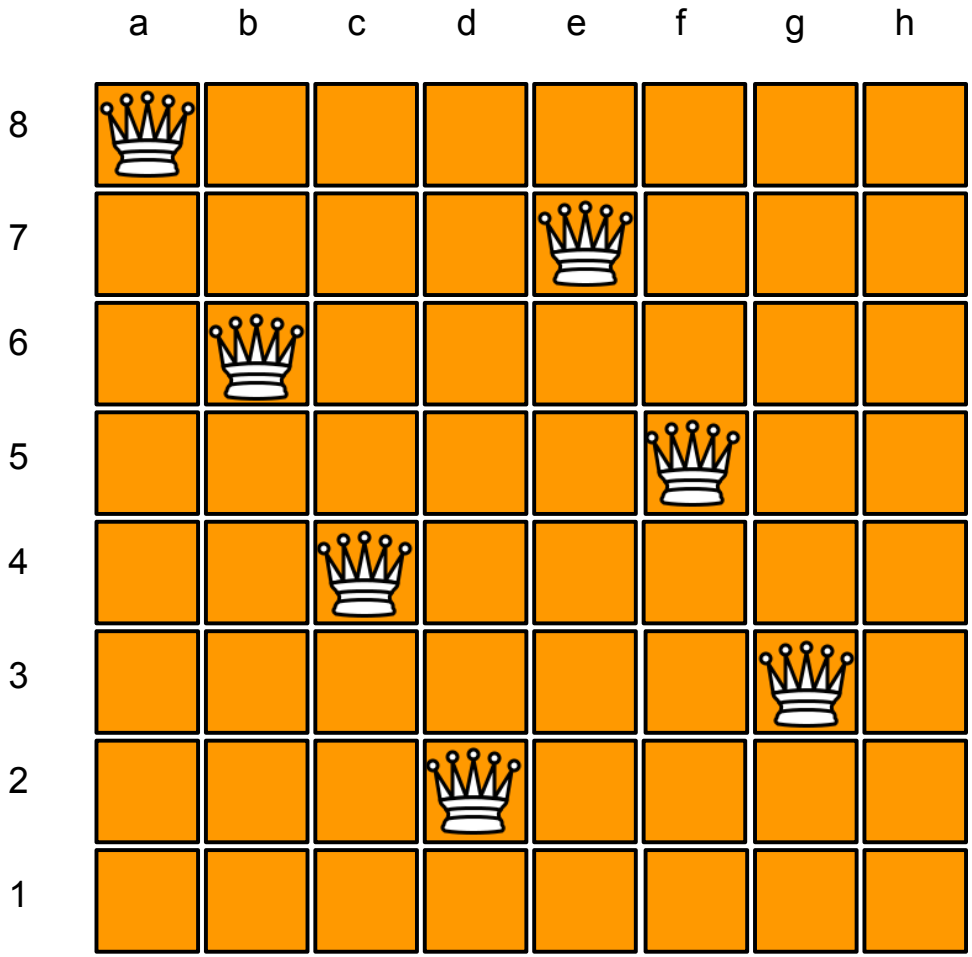


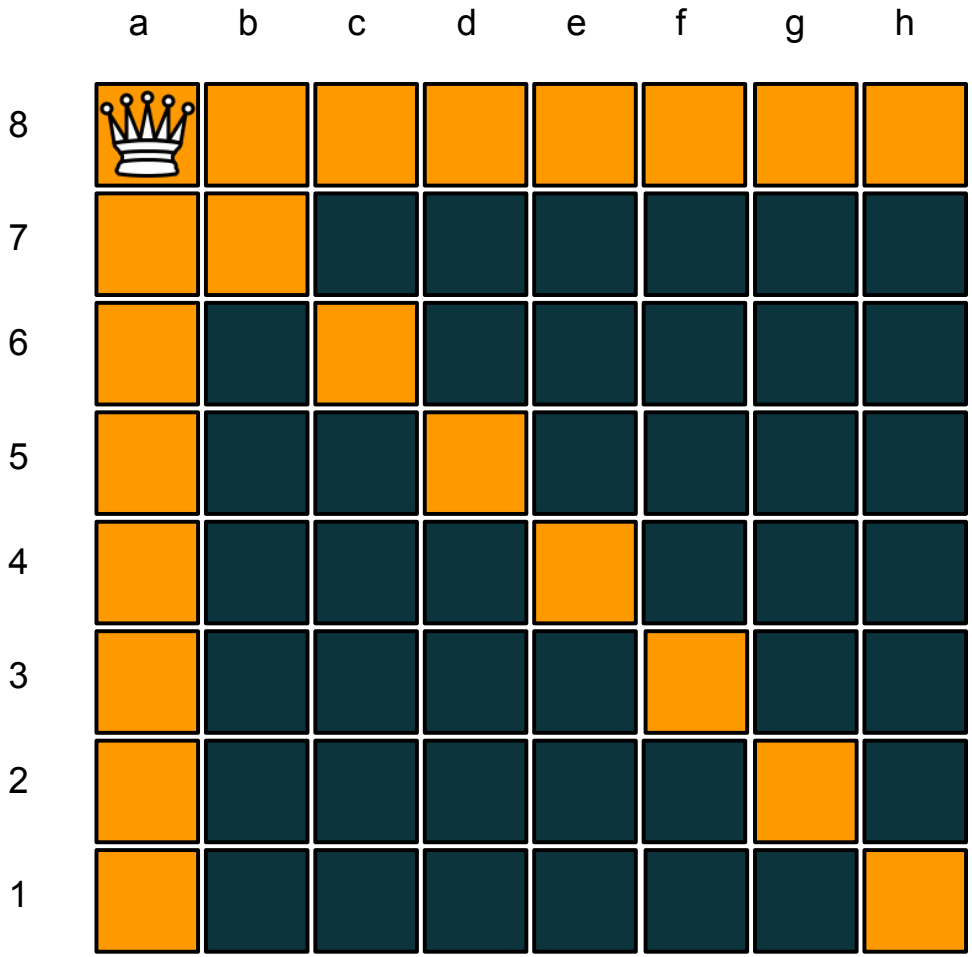
Търсене



Търсене



Подзадача



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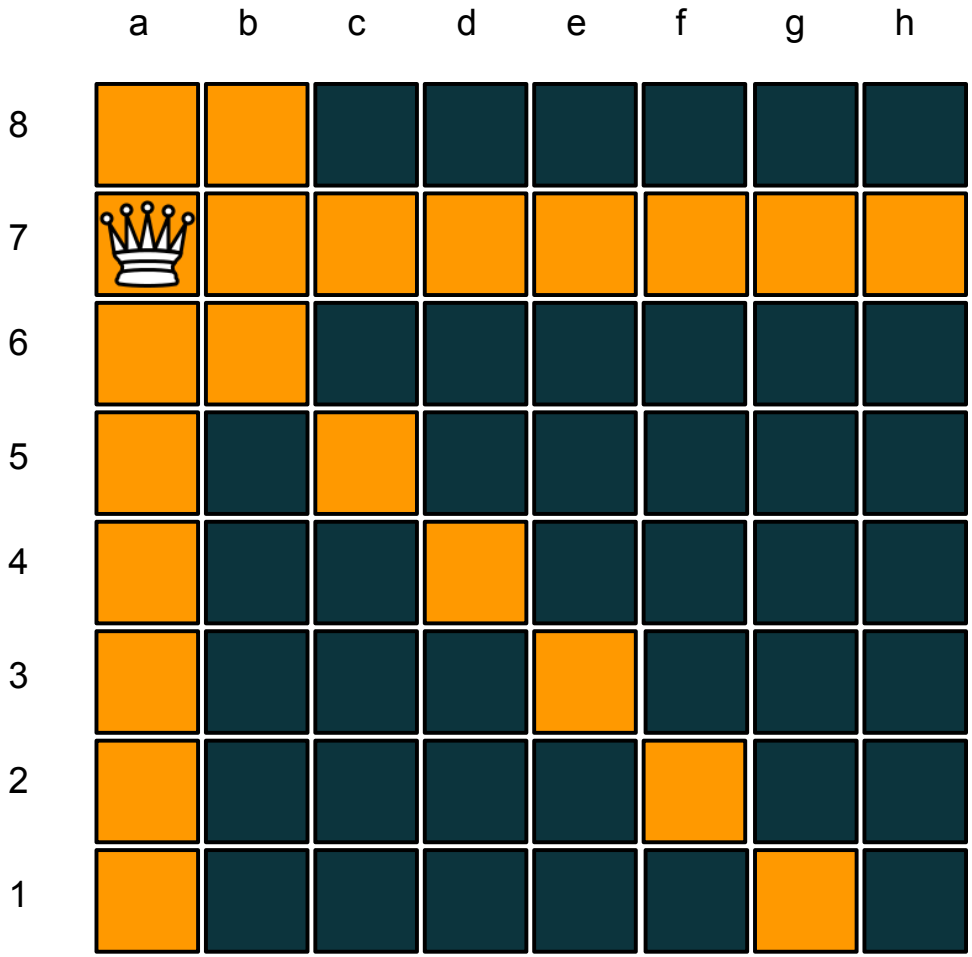
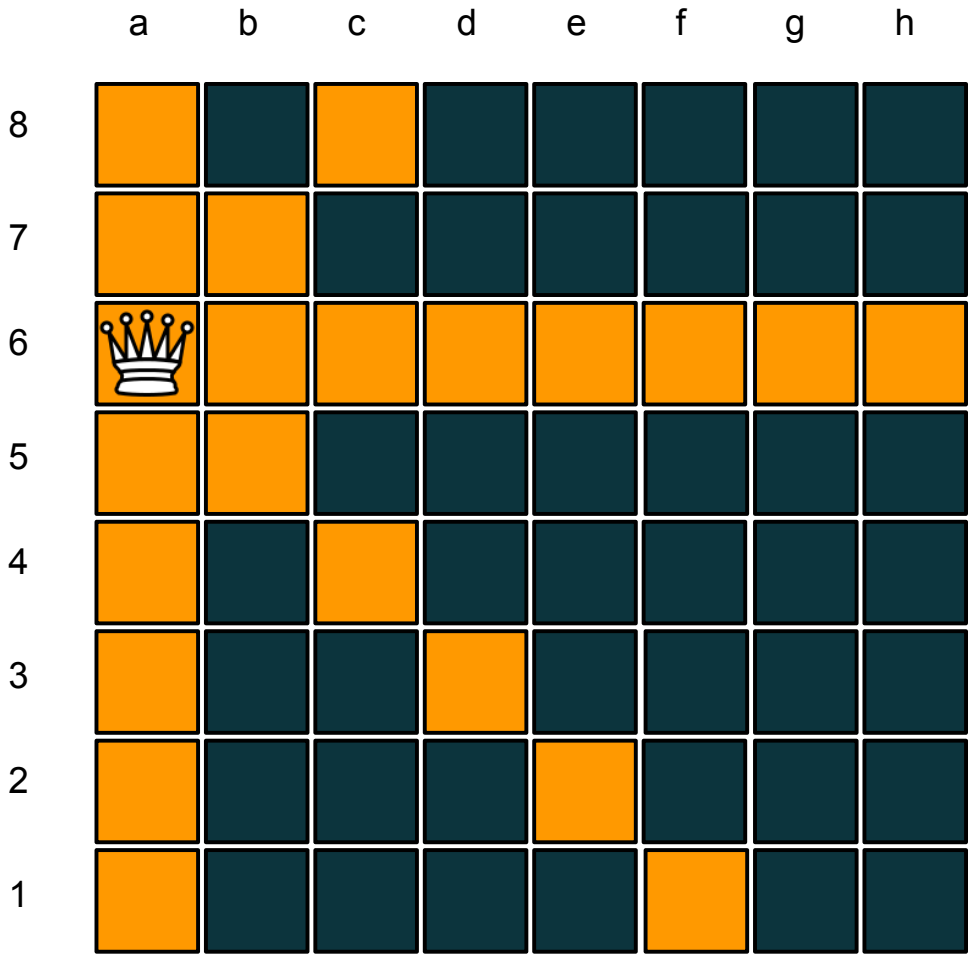


Търсене



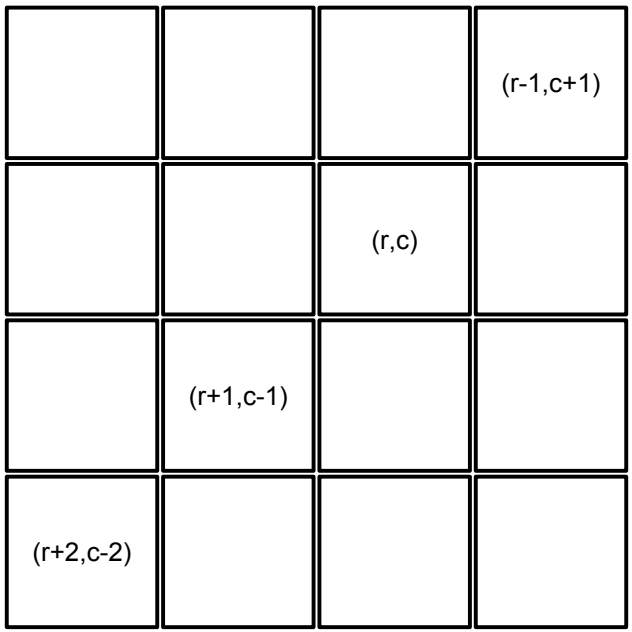
Модел на играта

```
const int bs = 5;
bool board[bs][bs] = {false};
```

Модел на играта

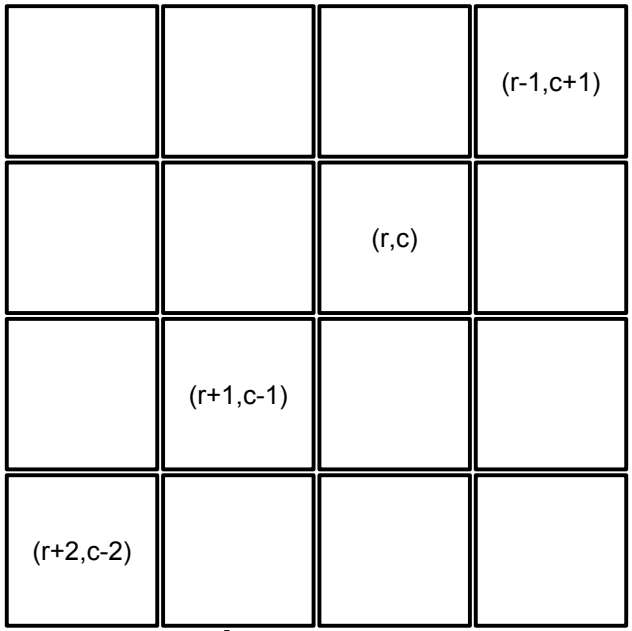
```
void placeQueen (bool board[bs][bs], int row, int col)
{
  board[row][col] = true;
}
bool canPlaceQueen (bool board[bs][bs], int row, int col)
{
  for (int count = 0; count < bs; count++)
  {
    if (board[row][count] || board[count][col])
      return false;
  }
//....
```

(Обхождане на обратния диагонал)



$$(row + i, col - i), i = -1, .., 2$$

(Обхождане на обратния диагонал)



$row + i > 0$ $\quad i > -row$

$row + i < 4$ $\quad i < 4 - row$

$col - i > 0$ $\quad i < col$

$col - i < 4$ $\quad i > col - 4$

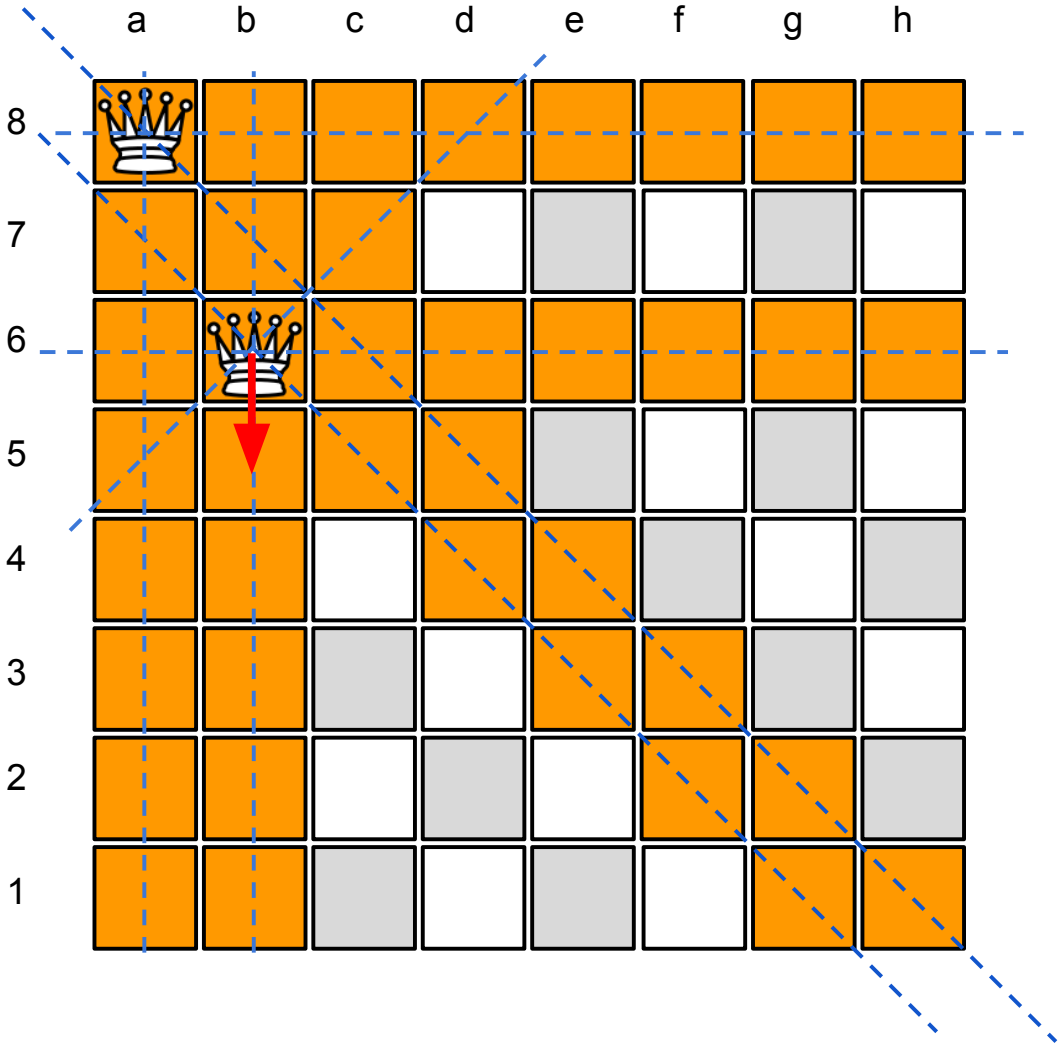
$$i = max(-row, col - 4), .., min(col, 4 - row)$$

Модел на играта

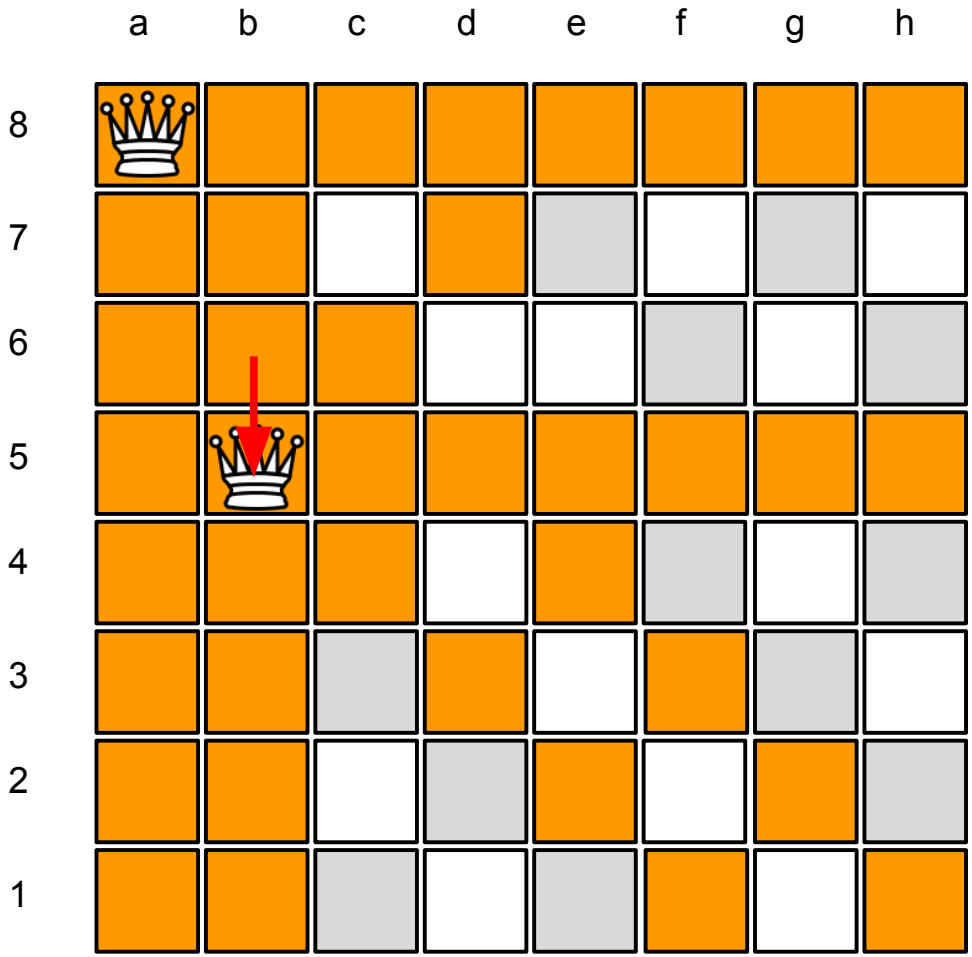
$$i = max(-row, col - bs), .., min(col, bs - row)$$

```
//....
  for (int count = -min(row,col);
           count < min (bs-row,bs-col);
           count++)
  {
    if (board[row+count][col+count])
      return false;
  }
  for (int count = max(-row,col-bs);
           count < min (col,bs-row);
           count++)
  {
    if (board[row+count][col-count])
      return false;
  }
  return true;
}
```

Връщане назад



Връщане назад



Връщане назад

```
void replaceQueen (bool board[bs][bs], int row, int col)
{
  board[row][col] = false;
}
```

Проби и грешки

```
void placeQuuens (bool board[bs][bs], int number)
{
  if (number == 0)
  {
    printBoard(board);
    return;
  }
  for (int row = 0; row < bs; row++)
  {
    for (int col = 0; col < bs; col++)
    {
      if (canPlaceQueen (board,row,col))
      {
        placeQueen (board,row,col);
        placeQuuens (board,number-1);
        replaceQueen (board,row,col);
      }
    }
  }
}
```

Благодаря за вниманието!