1 Problem

Starting with the number 1 and moving to the right in a clockwise direction a 5 by 5 spiral is formed as follows:

21	22	23	24	25
20	7	8	9	10
19	6	1	2	11
18	5	4	3	12
17	16	15	14	13

It can be verified that the sum of the numbers on the diagonals is 101.

What is the sum of the numbers on the diagonals in a 1001 by 1001 spiral formed in the same way?

2 Solution

```
import Data.List
import qualified Data.Map as Map
import Data.Maybe
import System.Environment

numsInLevel :: (Integral a) => a -> a
numsInLevel 0 = 1
numsInLevel n = (2 * n + 1) ^ 2 - (2 * n - 1) ^ 2

sepAtLevel :: (Integral a) => a -> a
sepAtLevel 0 = 0
sepAtLevel 1 = 1
sepAtLevel n = 2 + (sepAtLevel $ n - 1)

pickDiagVals :: (Integral a) => [a] -> Int -> [a]
pickDiagVals [] sep = []
pickDiagVals vals sep = v : (pickDiagVals vals' sep)
  where vals' = drop (sep + 1) vals
        v = head $ drop sep vals

mkLevel stnum lv = ((lv, nums), diags)
  where
    nums = [stnum .. (stnum + (numsInLevel lv) - 1)]
    sep  = sepAtLevel lv
    diags = pickDiagVals nums sep

mkSpiral nmax sp
  | length sp == nmax = sp
  | otherwise         = mkSpiral nmax (concat [sp, [thisSpiral]])
    where startAt = if sp == []
                    then 1
                    else 1 + ((last . snd . fst . last) sp)
          lv      = length sp
          thisSpiral = mkLevel startAt lv

sumSpiral sp = (sum . concat) $ map snd sp

main = do
  let mySum = sumSpiral $ mkSpiral 501 []
  putStrLn $ "The sum of the diagonals on the 1001 x 1001 spiral grid is " ++ show mySum ++ "."
```

3 Result

```
*Main GOA> :main
The sum of the diagonals on the 1001 x 1001 spiral grid is 669171001.
```