1 Problem

Surprisingly there are only three numbers that can be written as the sum of fourth powers of their digits:

$$1634 = 1^4 + 6^4 + 3^4 + 4^4 \qquad 8208 = 8^4 + 2^4 + 0^4 + 8^4 \qquad 9474 = 9^4 + 4^4 + 7^4 + 4^4$$

As $1 = 1^4$ is not a sum it is not included.

The sum of these numbers is $1634 + 8208 + 9474 = 19316$.

Find the sum of all the numbers that can be written as the sum of fifth powers of their digits.

2 Solution

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

sumPowerDigits :: Integer -> Integer -> Integer
sumPowerDigits x p = sum $ map (↑p) dgs
  where dgs = foldl (λacc z → (read (z : "") :: Integer) : acc) [] (show x)

stringToDigits :: String -> [Integer]
stringToDigits "" = []
stringToDigits (x : xs) = (read (x : "") :: Integer) : (stringToDigits xs)

main = do
  let maxPossible = 5 * 9 ↑ 5
      fiveDigitMagics = filter (λz → sumPowerDigits z 5 ≡ z) [2 .. maxPossible]
  putStrLn $ "There are a total of " ++ show (length fiveDigitMagics) ++
    " that can be written as the sum of the fifth\npowers of their digits.  " ++
    "The sum of these numbers is " ++ show (sum fiveDigitMagics) ++ "."
```

3 Result

```
runhaskell problem30.lhs
There are a total of 6 that can be written as the sum of the fifth
powers of their digits.  The sum of these numbers is 443839.
```