1 Problem

If the numbers 1 to 5 are written out in words: one, two, three, four, five, then there are $3 + 3 + 5 + 4 + 4 = 19$ letters used in total.

If all the numbers from 1 to 1000 (one thousand) inclusive were written out in words, how many letters would be used?

NOTE: Do not count spaces or hyphens. For example, 342 (three hundred and forty-two) contains 23 letters and 115 (one hundred and fifteen) contains 20 letters. The use of "and" when writing out numbers is in compliance with British usage.

2 Solution

```haskell
import qualified Data.Map as Map
import Data.Maybe

digitMap = Map.fromList
  [(1, "one")
  ,(2, "two")
  ,(3, "three")
  ,(4, "four")
  ,(5, "five")
  ,(6, "six")
  ,(7, "seven")
  ,(8, "eight")
  ,(9, "nine")
  ,(10, "ten")
  ,(11, "eleven")
  ,(12, "twelve")
  ,(13, "thirteen")
  ,(14, "fourteen")
  ,(15, "fifteen")
  ,(16, "sixteen")
  ,(17, "seventeen")
  ,(18, "eighteen")
  ,(19, "nineteen")
  ]
tensMap = Map.fromList
  [(20, "twenty")
  ,(30, "thirty")
  ,(40, "forty")
  ,(50, "fifty")
  ,(60, "sixty")
  ,(70, "seventy")
  ,(80, "eighty")
```

$, (90, \texttt{"ninety"})$
$]$

$numberToString :: Integer \rightarrow String$
$numberToString\ x$
    $|\ x \equiv 1000\ =\ \texttt{"one thousand "}$
    $|\ x \equiv 0\quad\ =\ \texttt{""}$
    $|\ x \geqslant 100\quad =\ (fromJust\ \$\ Map.lookup\ (x\ `div`\ 100)\ digitMap) +\!\!+\ \texttt{" hundred"} +\!\!+\ (addAnd\ x) +\!\!+\ (numbe$
    $|\ x \geqslant 20\quad\ =\ (fromJust\ \$\ Map.lookup\ ((x\ `div`\ 10) * 10)\ tensMap) +\!\!+\ \texttt{" "} +\!\!+\ (numberToString\ (x - 10$
    $|\ otherwise = fromJust\ \$\ Map.lookup\ x\ digitMap$

$addAnd :: Integer \rightarrow String$
$addAnd\ x$
    $|\ x - 100 * (x\ `div`\ 100) \equiv 0 = \texttt{""}$
    $|\ otherwise \qquad\qquad\qquad\quad = \texttt{" and "}$

$main = \mathbf{do}$
    $\mathbf{let}\ numSum = sum\ \$\ map\ (length \circ (filter\ (\lambda z \rightarrow z \not\equiv\ \text{'} \ \text{'})) \circ numberToString)\ [1 \mathinner{\ldotp\ldotp} 1000]$
    $putStrLn\ \$\ \texttt{"The total number of non-space, non-hyphen characters in the list 'one', 'tw}$

3   Result

```
runhaskell problem17.lhs
The total number of non-space, non-hyphen characters in the list 'one', 'two', ..., 'one-th
```

The total number of non-space, non-hyphen characters in the list *one, two, ..., one-thousand* is 21124.