# 1 Problem

The number, 1406357289, is a 0 to 9 pandigital number because it is made up of each of the digits 0 to 9 in some order, but it also has a rather interesting sub-string divisibility property.

Let $d_1$ be the $1^{\text{st}}$ digit, $d_2$ be the $2^{\text{nd}}$ digit, and so on. In this way, we note the following:

- $d_2d_3d_4 = 406$ is divisible by 2
- $d_3d_4d_5 = 063$ is divisible by 3
- $d_4d_5d_6 = 635$ is divisible by 5
- $d_5d_6d_7 = 357$ is divisible by 7
- $d_6d_7d_8 = 572$ is divisible by 11
- $d_7d_8d_9 = 728$ is divisible by 13
- $d_8d_9d_{10} = 289$ is divisible by 17

Find the sum of all 0 to 9 pandigital numbers with this property.

# 2 Solution

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

checkDivisibility :: Integer -> Integer -> Bool
checkDivisibility n d = n' `mod` d' == 0
  where n' = read (take 3 $ drop (fromIntegral (d - 1)) $ show n) :: Int
        d' = fromIntegral (primes !! (fromIntegral (d - 2))) :: Int

nDigitPans :: Int -> [Integer]
nDigitPans n = map (\z -> read z :: Integer) (permutations (take n "0123456789"))

main = do
  let ns    = nDigitPans 10
      magics = foldl (\acc z -> filter (\k -> checkDivisibility k z) acc) ns [2..8]
      msum = sum magics
  putStrLn $ "The sum of all such numbers is " ++ show msum ++ "."
```

## 3 Result

```
runhaskell problem43.lhs
The sum of all such numbers is 16695334890.
```