1 Problem

Triangle, pentagonal, and hexagonal numbers are generated by the following formulae:

Triangle	$T_n = n(n+1)/2$	$1, 3, 6, 10, 15, \ldots$
Pentagonal	$P_n = n(3n-1)/2$	$1, 5, 12, 22, 35, \ldots$
Hexagonal	$H_n = n(2n-1)$	$1, 6, 15, 28, 45, \ldots$

It can be verified that $T_285 = P_165 = H_143 = 40755$.

Find the next triangle number that is also pentagonal and hexagonal.

2 Solution

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

tris  = Set.fromList [(n * (n + 1)) `div` 2 | n ← [1..100000]]
pents = Set.fromList [(n * (3 * n - 1)) `div` 2 | n ← [1..100000]]
hexs = Set.fromList [n * (2 * n - 1) | n ← [1..100000]]

main = do
  let intsctn = Set.intersection tris $ Set.intersection pents hexs
      soln = minimum $ Set.toList $ Set.filter (>40755) intsctn
  putStrLn $ "The next smallest triangle number is " ++ show soln ++ "."
```

3 Result

```
runhaskell problem45.lhs
The next smallest triangle number is 1533776805.
```