Types and Polymorphism

- Exercises are given every week on the PL page of the SCG website
  (http://scg.unibe.ch/teaching/pl)

- Solutions to each assignment must be sent to **mohammadreza.hazhirpasand@inf.unibe.ch**

- The solutions of the assignments are to be delivered before every Thursday at 11 PM. Solutions
  handed in later than the specified time will not be accepted. In case of serious reasons send an
  e-mail to **mohammadreza.hazhirpasand@inf.unibe.ch**

Exercise (6 points)

1. Infer types of the functions `factors`, `isPerfect`, `mH`, and `insert` and say whether they are
   monomorphic or polymorphic functions. Please justify your answer. (3 pts)

```
mod :: Int -> Int -> Int
factors n = [x | x <- [1..n-1], mod n x == 0 ]
isPerfect n = sum (factors n) == n

insert _ n [] = [n]
insert 0 n l = n:l
insert i n (x:xs) = x : insert (i-1) n xs

mH (a, b, c) = c
```

2. Some functions can be used with different argument types, but rarely with any type. Consider the
   square function, and identify which type is invalid. Please justify your answer. (1 pts)

```
square :: Int -> Int
square :: Float -> Float
square :: Char -> Char
square :: Double -> Double
```

3. Define a function to calculate the circumference of a circle and the area of a rectangle. It is required
   to define **a union type** containing the necessary parameters of a circle and a rectangle. (2 pts)

```
Hints :
   Circumference of a circle : 2 * 3.14 * r
   Area of a rectangle : l  * w
```