Today we covered a few very basics of python to get you started: variable types and definitions of functions.

Python versions

Your laptop will most likely use python 3, but the PIC lab computers use version 2. Whenever you hand in homework, make sure that your code works on the PIC lab machines. The differences are small and I will point them out when we come across them.

Variable types

We discussed four important types of variables. For these, python will guess the type when you define the variable. For example, if you set $x = 2$, then python will make x an integer. If you set $x = 2.0$ python will make it a float.

- **integer**. These are the signed integers $\ldots -2, -1, 0, 1, 2, \ldots$

```
x=2
```

- **float**. These are real numbers with about 8 digits precision. There are modules that can give you arbitrary precision if needed.

```
y=2.67
```

- **string**. Strings can contain any ASCII characters.

```
a='abc123'
```

- **list**. Lists of length n are ordered set of variables indexed by $0 \ldots n - 1$.

```
L=[1,2,3]
```

- **dictionary**. A dictionary is a set of **keys** each pointing to a **value**. The list of keys is unique (keys may only point to one value), but values may be reused. For example, let the key 1 point to the value 2, and key 3 point to value 4.

```
d={1:2,3:4}
```

Defining functions

To understand functions we show a few examples. The following function takes as input an integer n, and outputs an integer equal to $n + 1$.

```
def nplusone(n):
   m=n+1
   return m
```

We call the function in the console as follows:

```
In:  nplusone(6)
Out:  7
```

The following function tells us whether a number n is big or not. Finish it yourself.

```
def isbig(n):
   if n>10:
    print('yes')
    return
   else:
   ...
```

Exercises

- We can retrieve the keys and values of a dictionary in the form of two lists in the following way:

  ```
  list(d.keys())
  list(d.values())
  ```

  Write a function that does the opposite: it takes two lists of the same length as input and outputs a dictionary which uses one as keys and the other as values (assuming that the list used for the keys does not contain any identical items).

- Write a function that takes as input a natural number n, and outputs a list that looks like $[1^2, 2^2, 3^2, \ldots, n^2]$.

- Write a function that takes as input a list, and outputs a list that contains only the items from even indices of the original lists. For example, $[4, 7, 3, 2]$ gives $[4, 3]$.

- Python has a built in $max()$ function for lists of numbers. Write one yourself.

- Write a function that takes as input a natural number n, and outputs the nth Fibonacci number.

- Python has a built in $len()$ function for lists. Write one yourself.

- Write a function that takes as input a string of one letter, and outputs the index of that letter in the alphabet.