

Lecture: 2-1

- Prerequisites for this lecture are: 1-1.

Python

- Python is a scripting language

Python Gotha's

- blocks are defined by indentation!
- turn off tabs in your favourite editor
- in your own programs examples never create a name clash with a Python library module
- Python2 vs Python3
 - we will be using Python3

Python verses similar tools

- Python is a scripting language
 - it can be compiled if necessary to increase speed
- is more powerful than many other scripting languages, Tcl
 - applicable to larger systems development (games, net admin)
- has a much cleaner syntax than Perl
 - easier to maintain
- does not compete head on with Java
 - Java is a systems language like C++

Python and games

- [examples of games which use Python](http://wiki.python.org/moin/PythonGames) (<http://wiki.python.org/moin/PythonGames>)

Python can be simple

- ```
#!/usr/bin/python3
print("hello world")
```

## Python Modules allow for problem decomposition

- similar to Modula-2

- `myfile.py`

```
#!/usr/bin/python3
title = "hello world"
```

- `foo.py`

```
#!/usr/bin/python3
import myfile
print(myfile.title)
```

- when run prints hello world

## Alternative import

■ `bar.py`

```
#!/usr/bin/python3
from myfile import title
print(title)
```

- note that all python modules need to be saved as *name.py*
  - so in our example the module `myfile` was saved into a file called `myfile.py`

## Python builtin types

- python contains many builtin types
  - use them..
- builtin objects make simple programs easy to understand
  - lists, dictionaries, exist, don't reinvent the wheel
- built in objects are more efficient than custom data types

## Builtin objects

- |              |                                      |
|--------------|--------------------------------------|
| numbers      | 3.14159, 1234                        |
| strings      | 'spam', "fred's"                     |
| lists        | [1, [2, 'three'], 4]                 |
| dictionaries | {'food': 'spam', 'taste': 'yum'}     |
| tuples       | (1, 'spam', 4, 'U')                  |
| files        | text=open('/etc/passwd', 'r').read() |

## Expression operators

- |                          |                                   |
|--------------------------|-----------------------------------|
| or, and, not             | logical operators (short circuit) |
| <, <=, >, >=, ==, <>, != | comparison operators              |
| x   y                    | bitwise or                        |
| z & y                    | bitwise and                       |
| x << y                   | shift left by y bits              |
| x >> y                   | shift right by y bits             |
| x[i]                     | indexing                          |
| x[i:y]                   | slicing                           |
| x.y                      | qualifying (imports)              |
| x(y)                     | function calls                    |

## Strings

- concatenation via +
  - repeated via \*

```
#!/usr/bin/python3
print("hi " * 4)
```

- yields

```
hi hi hi hi
```

## Slicing

- given a string, s= "hello world"
  - can obtain portion of string via: s[2:5]
  - yields: llo
- first character has index 0
  - and also -11
  - last character index is 10 in this example
  - last character index is also -1
- negative values start at right and move to the left
- strings can be sliced using positive and negative values

## Using dir

- often you may wish to see what methods a module provides
  - run python interactively

```
python
Python 1.5.2
>>> import string
>>> dir(string)
['capitalize', 'capwords', 'center', 'count', \
 'digits', 'expandtabs', 'find', 'hexdigits', \
 'index', 'index_error', 'join', 'joinfields', \
 'letters', 'ljust', 'lower', 'lowercase', \
 'lstrip', 'maketrans', 'octdigits', 'replace', \
 'rfind', 'rindex', 'rjust', 'rstrip', 'split', \
 'splitfields', 'strip', 'swapcase', \
 'upper', 'uppercase', 'whitespace', 'zfill']
```

- displays methods available

## Methods and documentation

- [python online docs](http://floppsie.comp.glam.ac.uk/python/html/index.html) <http://floppsie.comp.glam.ac.uk/python/html/index.html>
  - under GNU/Linux
- tutorial/laboratory
  - read through the online tutorial under the web address above
  - read about functions and scope rules
    - name resolution, LGB rule
    - local, global, builtin scope

## Statements

- assignment, calls, if/else/elif, for, while, break/continue
  - `print` used to be a statement in Python 2, it is a function in Python 3
- try, except, raise,
- def, return
  - function definitions and returning values

## Statements

- class
- assert
- exec
- del
- global

## Example 8 times table

```
#!/usr/bin/python3
for n in range(1, 13):
 print(n, "x 8 =", n*8)
```

## Example 8 times table

```
$ python3 eight.py
1 x 8 = 8
2 x 8 = 16
3 x 8 = 24
4 x 8 = 32
5 x 8 = 40
6 x 8 = 48
7 x 8 = 56
8 x 8 = 64
9 x 8 = 72
10 x 8 = 80
11 x 8 = 88
12 x 8 = 96
```

## Example of for loop

```
#!/usr/bin/python3

for n in range(2, 10):
 print("n is", n)
else:
 print("finished for loop, n is", n)
```

## Example of for loop

```
./py7.py
n is 2
n is 3
n is 4
n is 5
n is 6
n is 7
n is 8
n is 9
finished for loop, n is 9
```

## Tricky example code

```
#!/usr/bin/python3

for n in range(2, 10):
 print("n is", n)
 for x in range(2, n):
 print("x is", x)
 if n % x == 0:
 print(n, "equals", x, "*", n/x)
 break
 else:
 print(n, "is a prime number")
```

## Tricky example code

```
./py6.py
2 is a prime number
3 is a prime number
4 equals 2 * 2
5 is a prime number
6 equals 2 * 3
7 is a prime number
8 equals 2 * 4
9 equals 3 * 3
```

## Install tkinter for Python

- in your GNU/Linux installation start a terminal and type:
- `$ sudo apt install python3-tk`
- answer Y to all the questions, this will install tkinter for Python3 permanently on your system

## Graphical hello world as an example of Python simplicity

- ```
#!/usr/bin/python3

import tkinter

def makebutton (message):
    w = tkinter.Button (text=message, command="exit")
    w.pack ()
    w.mainloop ()

makebutton ("Hello world")
```