NPRG065: Programming in Python
Lecture 7

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Functions
(continuation from lect. 5)

Type hints

- Function parameters – no explicit type defined
  - it's obvious as Python is dynamically typed
- But they can be added via type hints
  - since python 3.5
  - only for documentation purposes!
  - still no type checking at runtime!

```
def greeting(name: str) -> str:
    return 'Hello ' + name
```

See
hints.py

Lambdas & Functional programming

- Anonymous functions
  - `adder = lambda x, y: x + y`
  - `print_val = lambda name, value: name + '=' + str(value)`

- Lambda body ~ single expression
  - rather limited
    - Python authors do not like lambdas
      - but it is not a big deal; regular functions are first class objects, references to them can be passed

Lambdas & Functional programming

- Functional programming (FP)
  - declarative programming paradigm
  - computation as the evaluation of mathematical functions
  - avoids changing-state and mutable data

- Python builtin functions for FP
  - **`map`** and **`filter`**
  - **`enumerate`**, **`sorted`**, **`any`**, **`all`**, **`zip`**
  - module **`functools`**
    - and **`operator`**

Examine and run functional.py

Generators

- When you need elements of a sequence but not the complete sequence
  - similar to an iterator
- Generator functions
  - a function with yield instead of return
  - yield – allows functions to suspend and resume their state between each call

```
def get_squares_gen(n):
    for x in range(n):
        yield x ** 2
```

- Generator expressions
  - similar to list comprehensions, but
  - return an object that produces results one by one
    - instead of directly producing a list

Examine and run generators.py

```
(k**2 for k in range(10))
```

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Back to core types

int

- Supports “big-size” integers
- Internal representation
  - till **`sys.maxsize`** – regular int
  - over **`sys.maxsize`** – a sequence of digits

```
import sys
import math
math.log(sys.maxsize, 2)
  # prints out size of "small" integers in bits
```

- **`int`** is a class
  - integers are objects (instances of the **`int`** class)
    - classes will start next lecture
  - is not computing inefficient? (i.e., creating too many objects)
  - a pool for the commonly used numbers (-5 to 256)

See
nums.py

float

- floats are inherently imprecise
  - internally represented as base 2 fractions
    - “human floats” are base 10 fractions

```
print(0.1 + 0.1 + 0.1 == 0.3)       # -> False
print(1/10 + 1/10 + 1/10 == 3/10)   # -> False
```

- Decimal and Fraction types
  - exact representation
    - but slower computations

See
nums.py

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