Web/Python Programming

웹/파이썬 프로그래밍

Today

- Review functions (Ch. 3)
- Designing new functions – A recipe

Question

```
>>> 0.1+0.2
0.30000000000000004
>>> round(4.5)
4
>>>
```

- Read: https://docs.python.org/3.7/tutorial/floatingpoint.html

- Floating-point numbers are represented in computer hardware as base 2 (binary) fractions.
- Decimal fraction vs. binary fraction

Functions

- In mathematics

$$y = f(x) = x^2 + 3x + 2$$

$$f(2) = 12$$

$$z = f(x, y) = x^2y + 4x + 1$$

$$f(2,3) = 21$$

- Python build-in functions

```
>>> abs(-9)
0
>>> pow(3,2)
9
>>> round(4.3)
4
>>> pow( abs(-2), round(4.3) )
16
>>> round(-3.5)
-4
```

Typecast

- Functions that convert from one type to another

```
>>> int(34.6)
34
>>> int(-4.3)
-4
>>>float(21)
21.0
```

help( )

```
>>> help(abs)
Help on built-in function abs in module builtins:

abs(x, /)
    Return the absolute value of the argument.

>>> help(pow)
Help on built-in function pow in module builtins:

pow(x, y, z=None, /)
    Equivalent to x**y (with two arguments) or x**y % z (with three arguments)

    Some types, such as ints, are able to use a more efficient algorithm when
    invoked using the three argument form.

>>> help(round)
Help on built-in function round in module builtins:

round(...)
    round(number[, ndigits]) -> number

    Round a number to a given precision in decimal digits (default 0 digits).
    This returns an int when called with one argument, otherwise the
    same type as the number. ndigits may be negative.

>>>
```

```
>>> pow(2,4)
16
>>> pow(2,4,3)
1
>>> round(3.141592)
3
>>> round(3.141592,2)
3.14
```

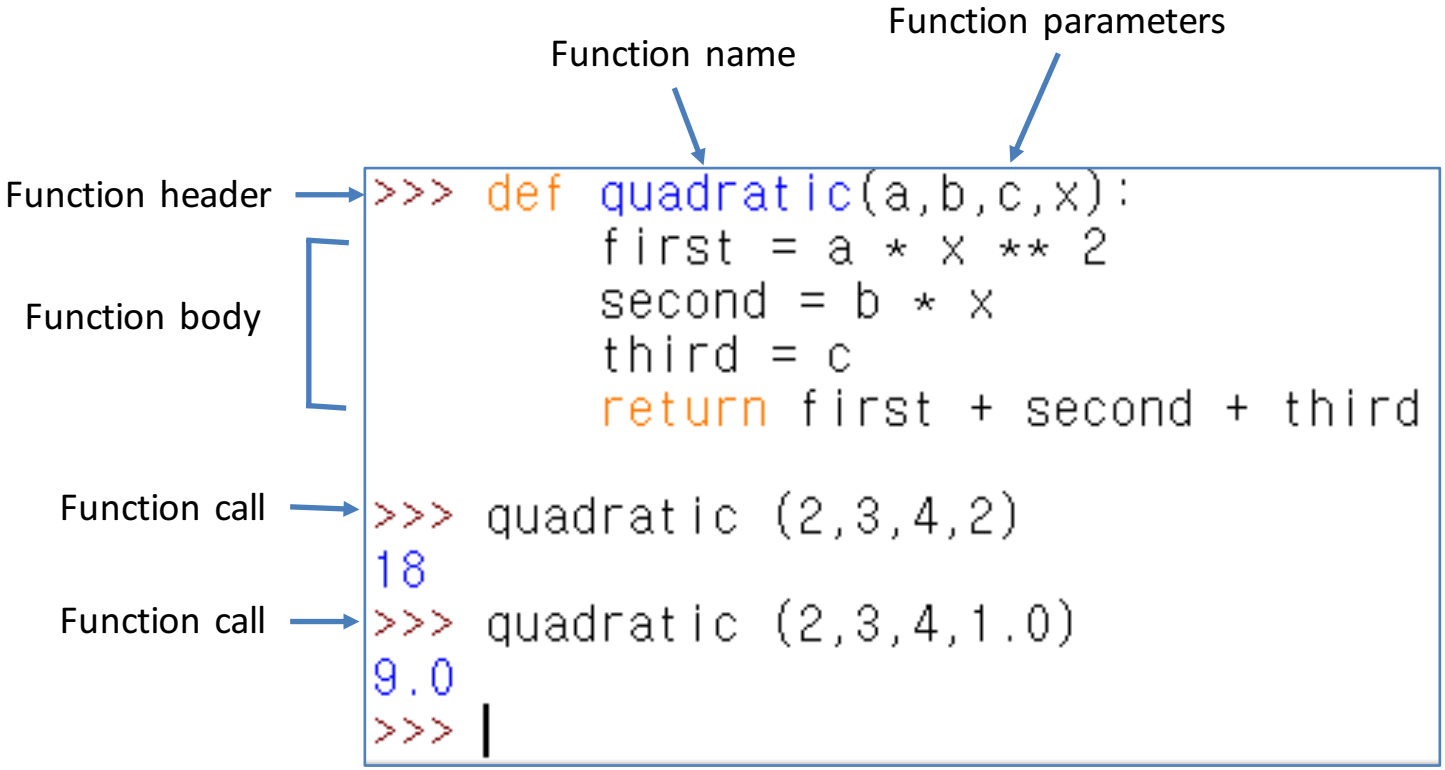
Defining your own functions

```
>>> convert_to_celsius(212)
100.0
```

```
>>> convert_to_celsius(212)
Traceback (most recent call last):
  File "<pyshell#48>", line 1, in <module>
    convert_to_celsius(212)
NameError: name 'convert_to_celsius' is not defined
```

```
>>> def convert_to_celsius (fahrenheit):
        return (fahrenheit - 32) * 5/9
```

Local variables



- Local variables are created within a function
- `first, second, third` are local variables of the function `quadratic`
- Function parameters are also local variables

Errors

- Number of parameters
- Redefinition is ok
- Local variables

```
>>> def quadratic(a,b,c,x):
        first = a * x ** 2
        second = b * x
        third = c
        return first + second + third

>>> quadratic (2,3,4,2)
18
>>> quadratic (2,3,4,1.0)
9.0
>>> quadratic ( 2,3,4)
Traceback (most recent call last):
  File "<pyshell#68>", line 1, in <module>
    quadratic ( 2,3,4)
TypeError: quadratic() missing 1 required positional argument: 'x'
>>> def quadratic (a,b,x):
        first = a * x **2
        second = b * x
        return first + second

>>> quadratic ( 2,3,4,2)
Traceback (most recent call last):
  File "<pyshell#75>", line 1, in <module>
    quadratic ( 2,3,4,2)
TypeError: quadratic() takes 3 positional arguments but 4 were given
>>> quadratic(2,3,2)
14
>>> first
Traceback (most recent call last):
  File "<pyshell#77>", line 1, in <module>
    first
NameError: name 'first' is not defined
```

Designing a new function

- Writing a good essay
  - A topic
  - Background material
  - An outline
  - Filling in the outline with details

- Writing a good function
  - An idea
  - A name
  - Parameters
  - A return value
  - Function body (the details)

Docstring

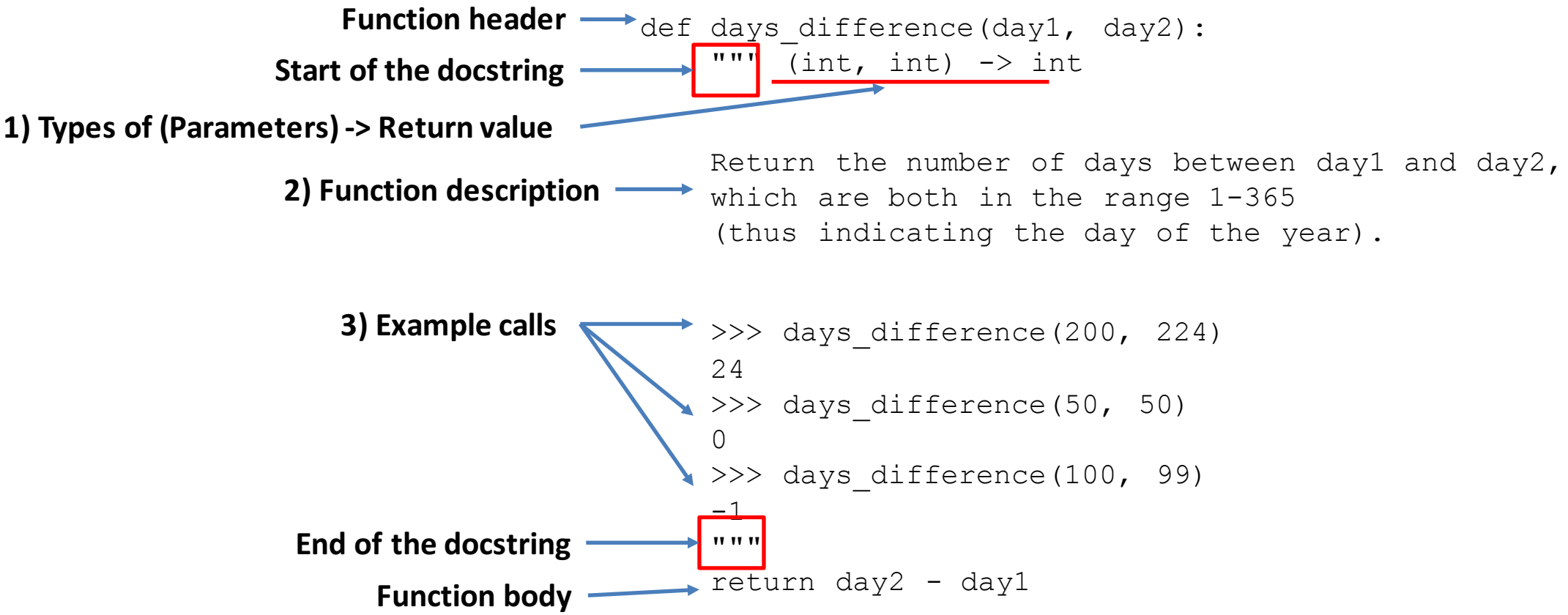
- Documentation string
- For humans to read
  - For yourself
  - For co-workers
  - For sharing

```
def days_difference(day1, day2):
    """ (int, int) -> int


    Return the number of days between day1 and day2,
    which are both in the range 1-365
    (thus indicating the day of the year).


    >>> days_difference(200, 224)
    24
    >>> days_difference(50, 50)
    0
    >>> days_difference(100, 99)
    -1
    """
    return day2 - day1
```

Docstring


Function header
Start of the docstring
1) Types of (Parameters) -> Return value
2) Function description
3) Example calls
End of the docstring
Function body
def days_difference(day1, day2):
"""
(int, int) -> int
Return the number of days between day1 and day2,
which are both in the range 1-365
(thus indicating the day of the year).
>>> days_difference(200, 224)
24
>>> days_difference(50, 50)
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"""
return day2 - day1

Function design recipe

- Examples
  - What arguments/parameters to give
  - What information it will return
  - Pick a function name
- Type contract
  - Types of parameters and return value
- Header
  - Give parameters names
- Description
- Body
- Test

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