Lecture 2: Functions (part I)

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Today's lecture

1. Functions (ca. 20 min)
2. Functions live demo (ca. 20 min)
3. Course material setup live demo (ca. 20 min)

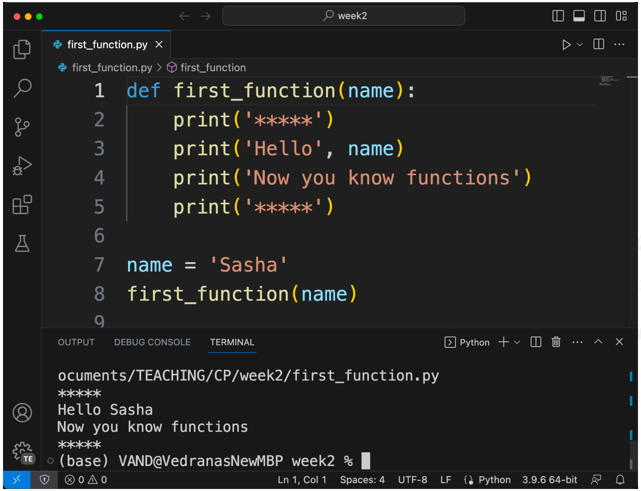
Definition

A function (in the context of programming) is a named sequence of statements that performs a computation.

Today we learn. . .

- Why write functions? Grouping, re-use, breaking down the problem. . .
- Coming up next: How to write functions? How to use functions?

First function



```
def first_function(name):
    print('*****')
    print('Hello', name)
    print('Now you know functions')
    print('*****')

name = 'Sasha'
first_function(name)
```

```
ocuments/TEACHING/CP/week2/first_function.py
*****
Hello Sasha
Now you know functions
*****
(base) VAND@VedranasNewMBP week2 %
```

- Writing functions:
  - function header
  - function body (Careful about the indentation!)
- Using functions:
  - function call

Functions come in different flavors

- Often, a function takes an argument (input) and returns a result, a return value (output)
- A function may have no, one, or several arguments
- A function may return a value (fruitful function) or not (void function)
- A function may have side effects

Functions can be

- Built-in (provided in Python), e.g. `print()`, `str()`
- Part of a package, e.g. `math.sin()`
- User-made

Important for functions (common pitfalls)

- Statements in the function body are executed when function is called. Not before!
- Parameters and variables defined inside the function are local

A problem solved using a function

Problem

Write a function `rectangle_area` that calculates and prints the area of the rectangle. As input, the function should take two variables `length` and `width`. For example, given as input 5 and 3, the function should print the message `The area is: 15`.

Test the function on an input `length=14.5` and `width=12`. The function should print the message `The area is: 74.0`.

Solution

```python
def rectangle_area(length, width):
    area = length * width
    print('The area is:', area)

rectangle_area(14.5, 12)
```

What is printed?

Example

```python
def my_function(a):
    print(a)

b = 72.2
my_function(b)
```

Examples

What is printed?

Example

```python
def my_function(a):
    print(a)

a = 13.6
my_function(17)
```

What is printed?

Example

```python
def full_price(price):
    rate = 0.2
    tip = rate * price
    total = price + tip
    print('Full price is', total)

cake_price = 100
full_price(cake_price)
print(cake_price)
print(tip)
print(price)
```

Problem

Write a function `area` that calculates and prints the area of the rectangle. (...)

Test the function on an input `a=8` and `b=16`. The function should print the message `Area is: 128`.

What is strange (wrong!) in the suggested solution?

Solution

```python
def area(a, b):
	a = 8
	b = 16
	print('Area is:', a*b)

area(8, 16)
```

What is printed?

Example

```python
def shout_name(name):
    print('Hey, ' + name + '!!!!')

def shout_twice(name):
    shout_name(name)
    shout_name(name)

shout_twice('Emmy')
```

Good practice

- A function should do one thing
- A function not be more than 20 lines long.
- Choose a descriptive name for your function, and its arguments
- Start by writing a program. Then, group and encapsulate (turn into functions)

Advanced

- Positional arguments and keyword arguments
- Default arguments