

Lecture 2: Functions (part I)

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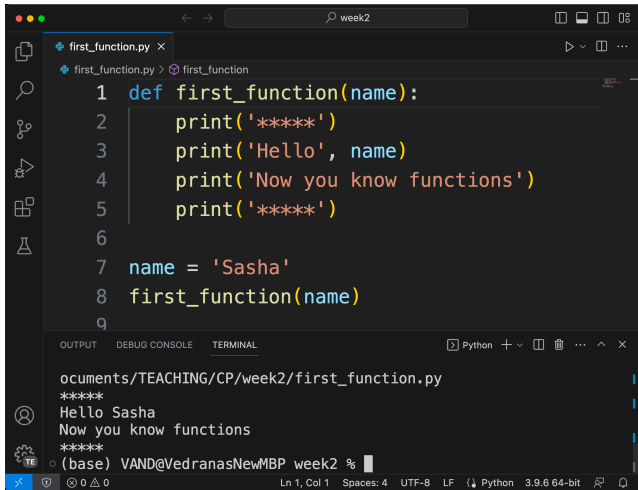
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$$f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^i}{i!} f^{(i)}(x)$$

Today's lecture

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

First function



```

1 def first_function(name):
2     print('*****')
3     print('Hello', name)
4     print('Now you know functions')
5     print('*****')
6
7 name = 'Sasha'
8 first_function(name)
9

```

OUTPUT DEBUG CONSOLE TERMINAL

```

documents/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

```
1 def rectangle_area(length, width):  
2     area = length * width  
3     print('The area is:', area)  
4  
5 rectangle_area(14.5, 12)
```

What is printed?

Example

```
1 def my_function(a):
2     print(a)
3
4 b = 72.2
5 my_function(b)
```


Examples

What is printed?

Example

```
1 def my_function(a):  
2     print(a)  
3  
4 a = 13.6  
5 my_function(17)
```

What is printed?

Example

```

1 def full_price(price):
2     rate = 0.2
3     tip = rate * price
4     total = price + tip
5     print('Full price is', total)
6
7 cake_price = 100
8 full_price(cake_price)
9 print(cake_price)
10 print(tip)
11 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

```
1 def area(a, b):  
2     a = 8  
3     b = 16  
4     print('Area is:', a*b)  
5  
6 area(8, 16)
```

What is printed?

Example

```
1 def shout_name(name):  
2     print('Hey, ' + name + '!!!!')  
3  
4 def shout_twice(name):  
5     shout_name(name)  
6     shout_name(name)  
7  
8 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