Introduction to Computer Programming
Lecture 4.1:

Functions in Python

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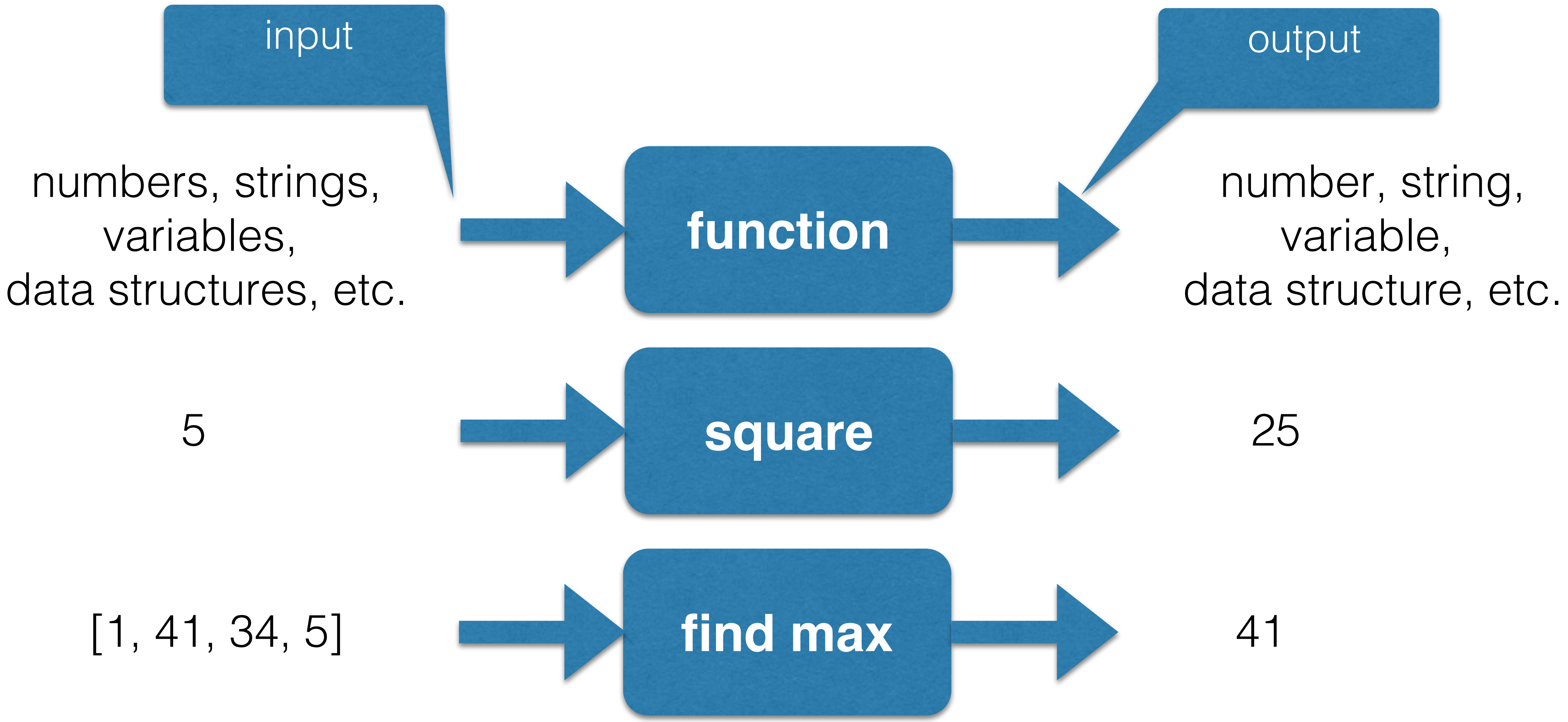
Functions

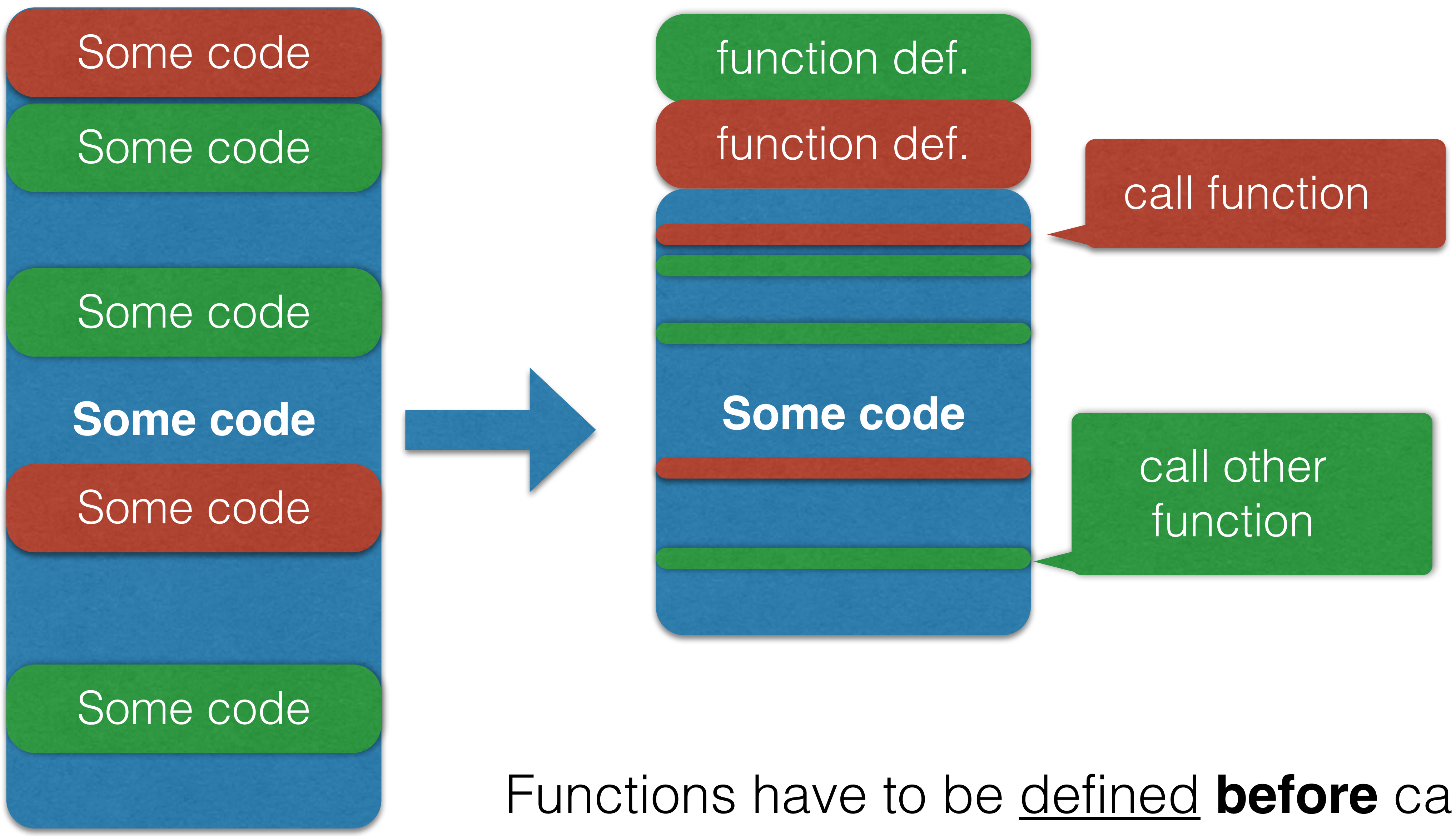
Functions are blocks of code that can be reused throughout your program.


input
output
numbers, strings, variables, data structures, etc.
function
number, string, variable, data structure, etc.
5
square
25
[1, 41, 34, 5]
find max
41

Functions

Functions often lead to **cleaner code** that is easier to understand and maintain.

Code is **typically shorter/smaller** and **more reusable**.

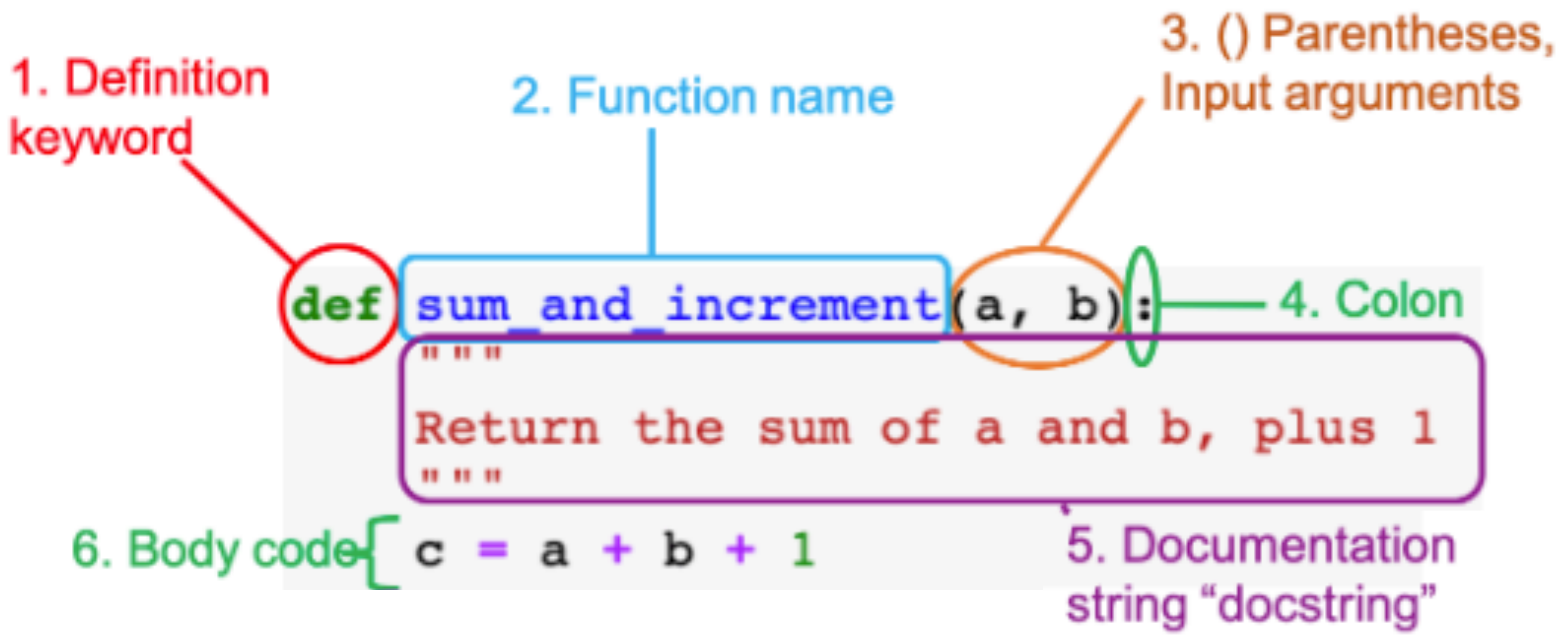


Functions have to be defined **before** called!

Function definition checklist

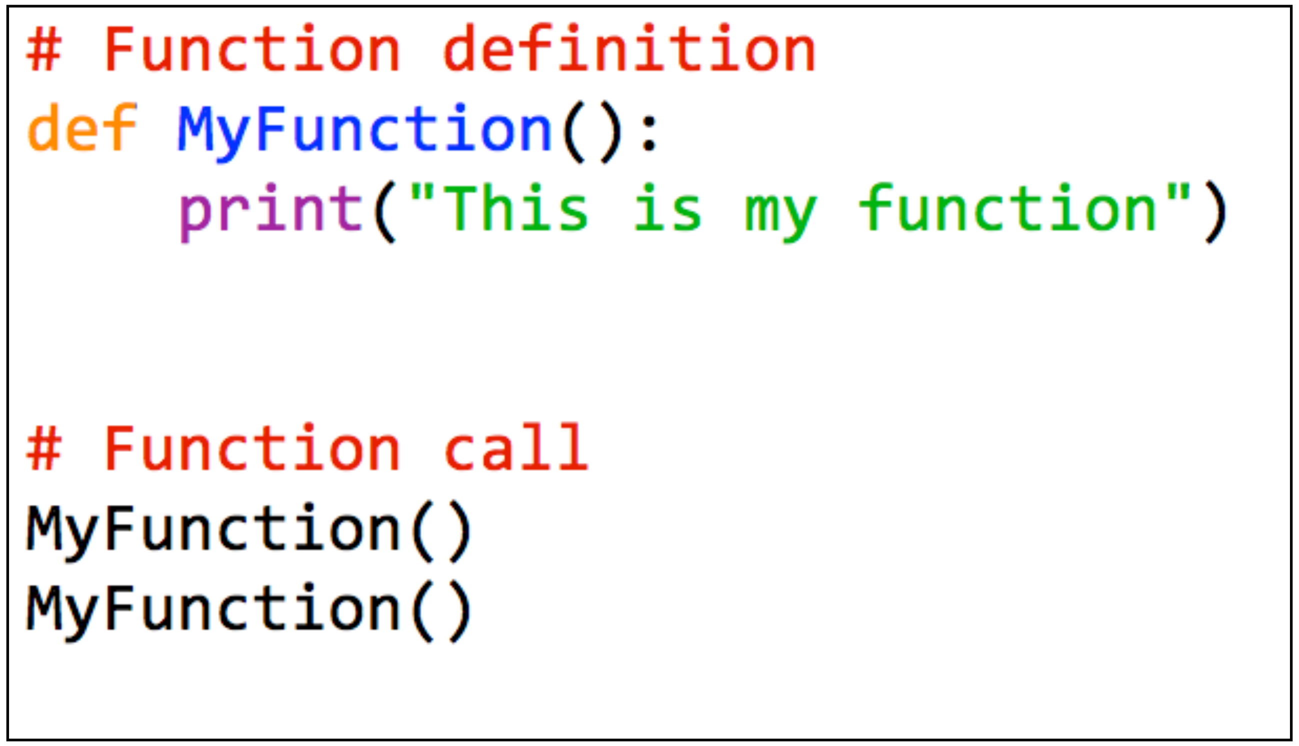
A function is **declared** using:

1. The definition keyword, `def`.
2. A **function name** of your choice.
3. **() parentheses** which optionally contain **arguments** (the *inputs* to the function)
4. **: a colon** character
5. A **documentation string** that says what the function does.
6. The **body code** to be executed when the function is *called*.


1. Definition keyword
2. Function name
3. () Parentheses, Input arguments
4. Colon
5. Documentation string "docstring"
6. Body code

```
def sum_and_increment(a, b):
    """
    Return the sum of a and b, plus 1
    """
    c = a + b + 1
```

Function Example



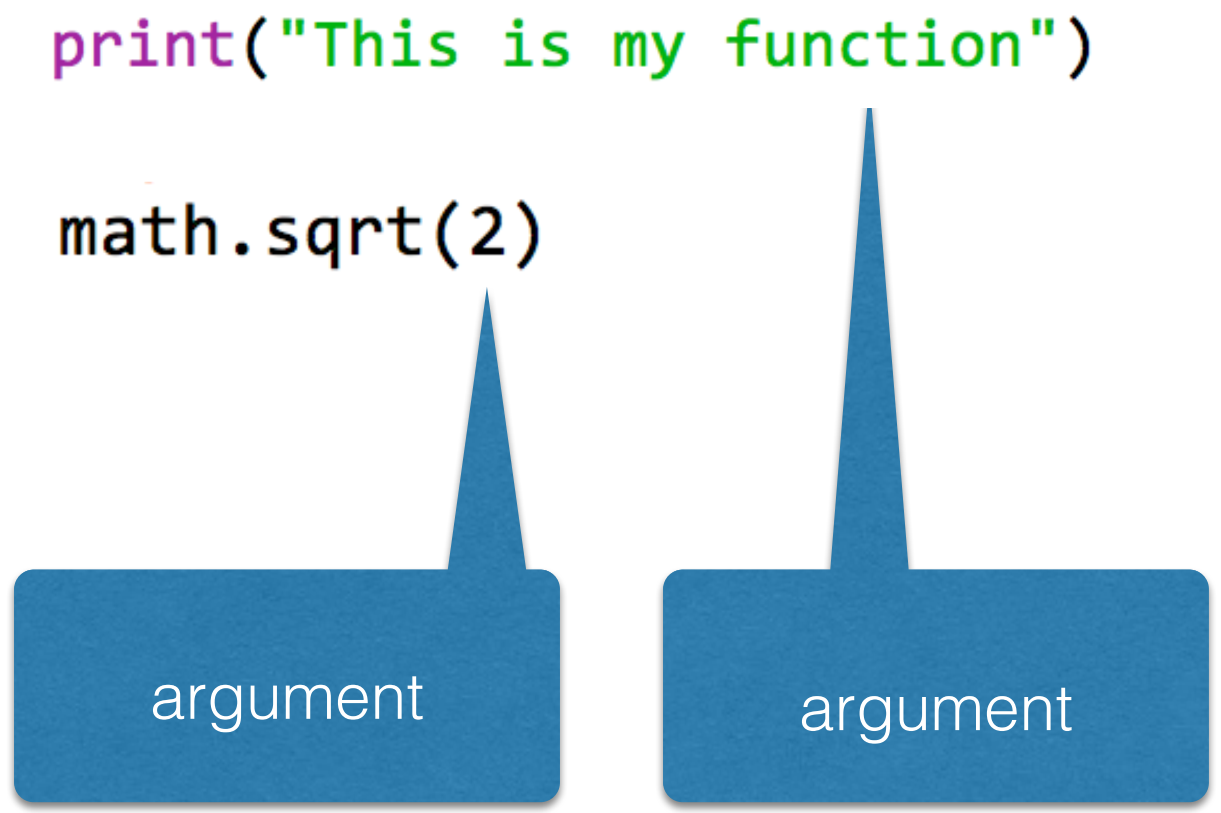
```python
# Function definition
def MyFunction():
    print("This is my function")


# Function call
MyFunction()
MyFunction()
```

```
This is my function
This is my function
```

Functions

You already know a number of predefined functions such as

- print(…)
- len(…)
- type(…)
- sqrt(…)
- etc.



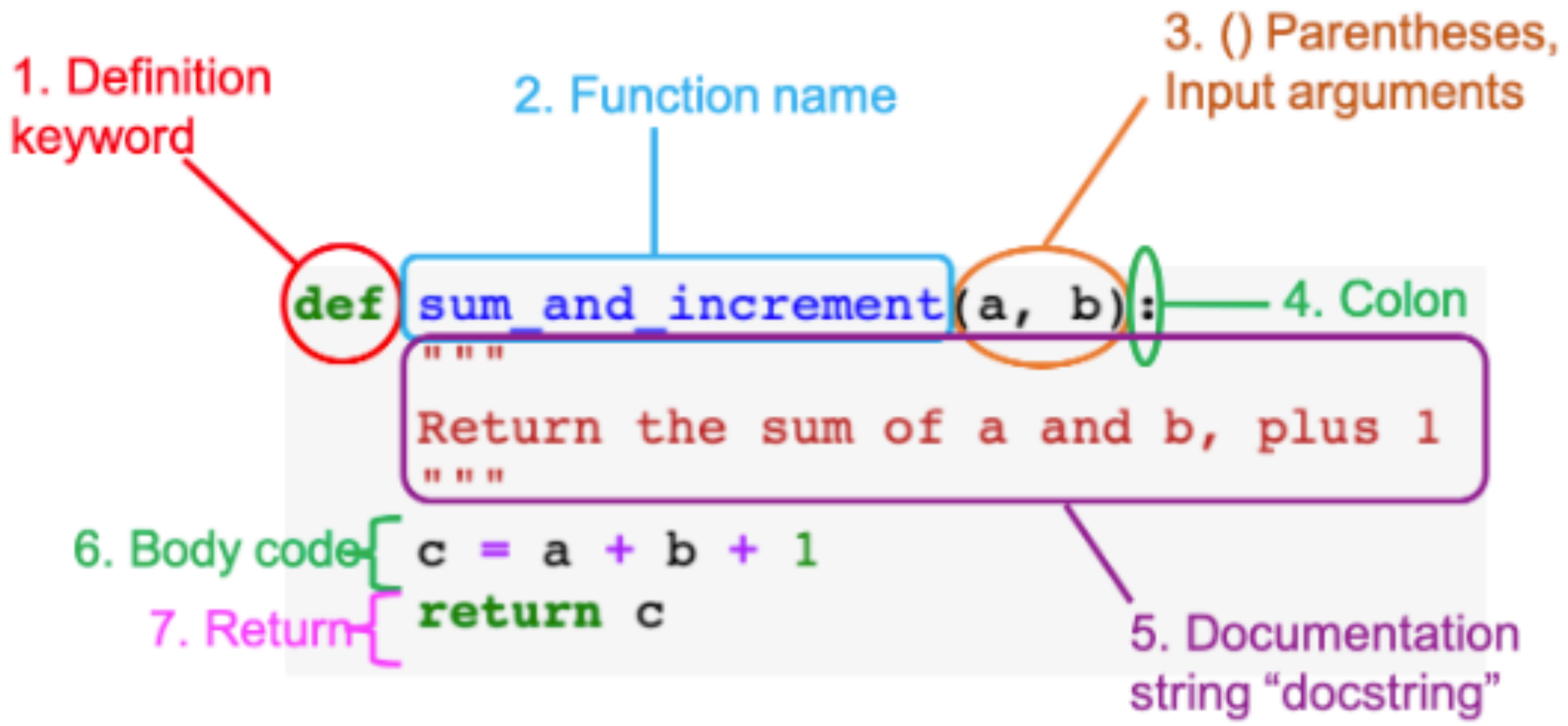
```
print("This is my function")

math.sqrt(2)
```

Function definition checklist: return

The results can be **returned in a variable**

A function is **declared** using:

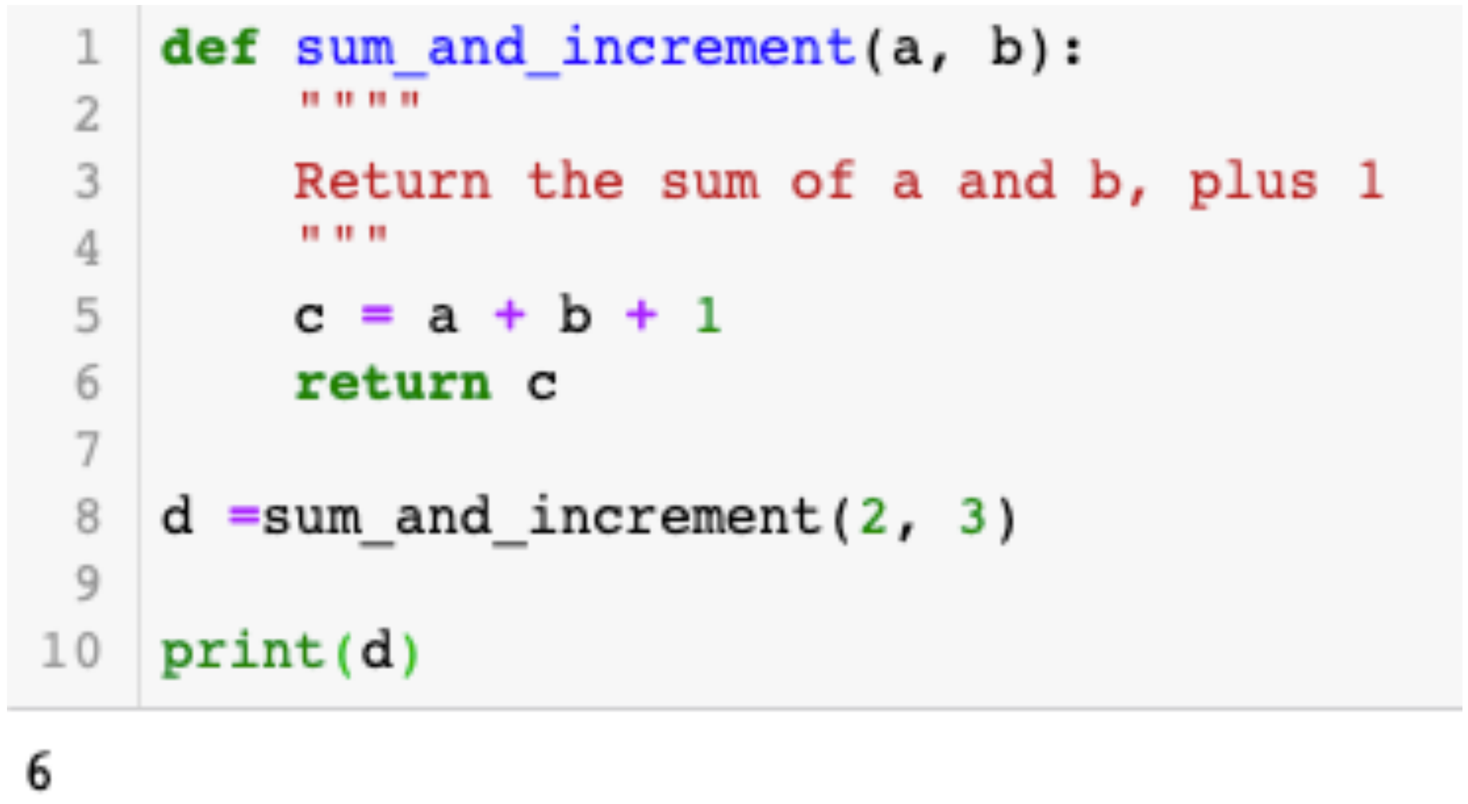
1. The definition keyword, `def`.
2. A **function name** of your choice.
3. **() parentheses** which optionally contain **arguments** (the *inputs* to the function)
4. **: a colon** character
5. A **documentation string** that says what the function does.
6. The **body code** to be executed when the function is *called*.
7. An optional **return** statement (the *output* of the function)



```python
def sum_and_increment(a, b):
    """
    Return the sum of a and b, plus 1
    """
    c = a + b + 1
    return c
```

1. Definition keyword
2. Function name
3. () Parentheses, Input arguments
4. Colon
5. Documentation string "docstring"
6. Body code
7. Return

Function Example



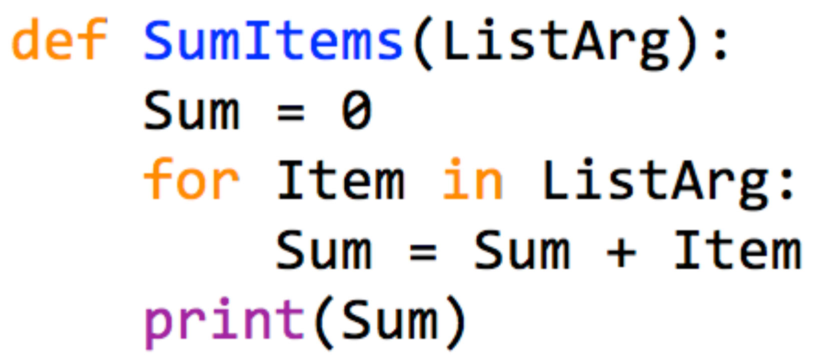
```python
def sum_and_increment(a, b):
    """"
    Return the sum of a and b, plus 1
    """
    c = a + b + 1
    return c

d =sum_and_increment(2, 3)

print(d)
```

```
6
```

Return Statements

The results can be **returned in a variable**

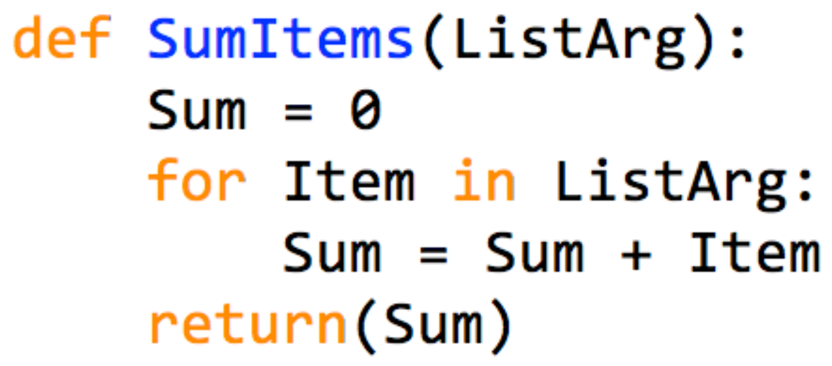
```
ListArg = [1, 2, 3]
```



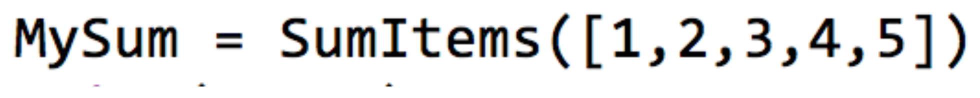
```
def SumItems(ListArg):
    Sum = 0
    for Item in ListArg:
        Sum = Sum + Item
    print(Sum)
```

```
SumItems([1,2,3])
```

```
6
```



```
def SumItems(ListArg):
    Sum = 0
    for Item in ListArg:
        Sum = Sum + Item
    return(Sum)
```



```
MySum = SumItems([1,2,3,4,5])
```

```
print(MySum)
```

```
6
```

```
print(MySum * 2)
```

```
12
```

Return Statements

If you return more values, Python converts into a tuple.

```
import math
def MinMax(ListArg):
    Min = math.inf
    Max = -1*math.inf
    for Item in ListArg:
        if Item < Min:
            Min = Item
        if Item > Max:
            Max = Item
    return(Min,Max)
```

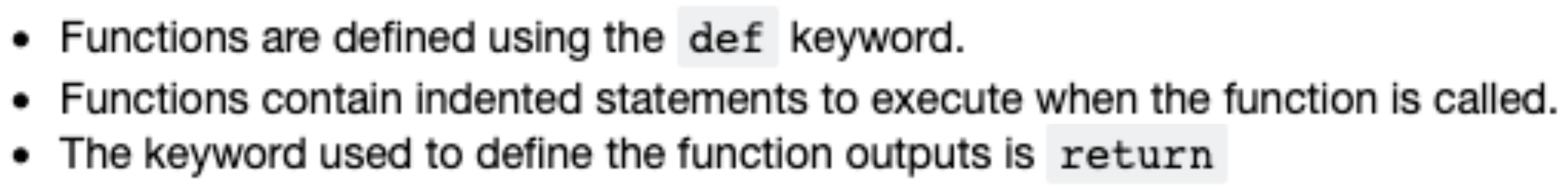
Python returns here a tuple with 2 element

This is variable is a tuple

```
MyMinMax = MinMax([math.pi,1.934,-3,45,9])
print("Min: " + str(MyMinMax[0]))
print("Max: " + str(MyMinMax[1]))
```

individual values can be accessed

Summary



- Functions are defined using the `def` keyword.
- Functions contain indented statements to execute when the function is called.
- The keyword used to define the function outputs is `return`