Certificate in Beginner Artificial Intelligence and Data Science

67130001 Computer Programming

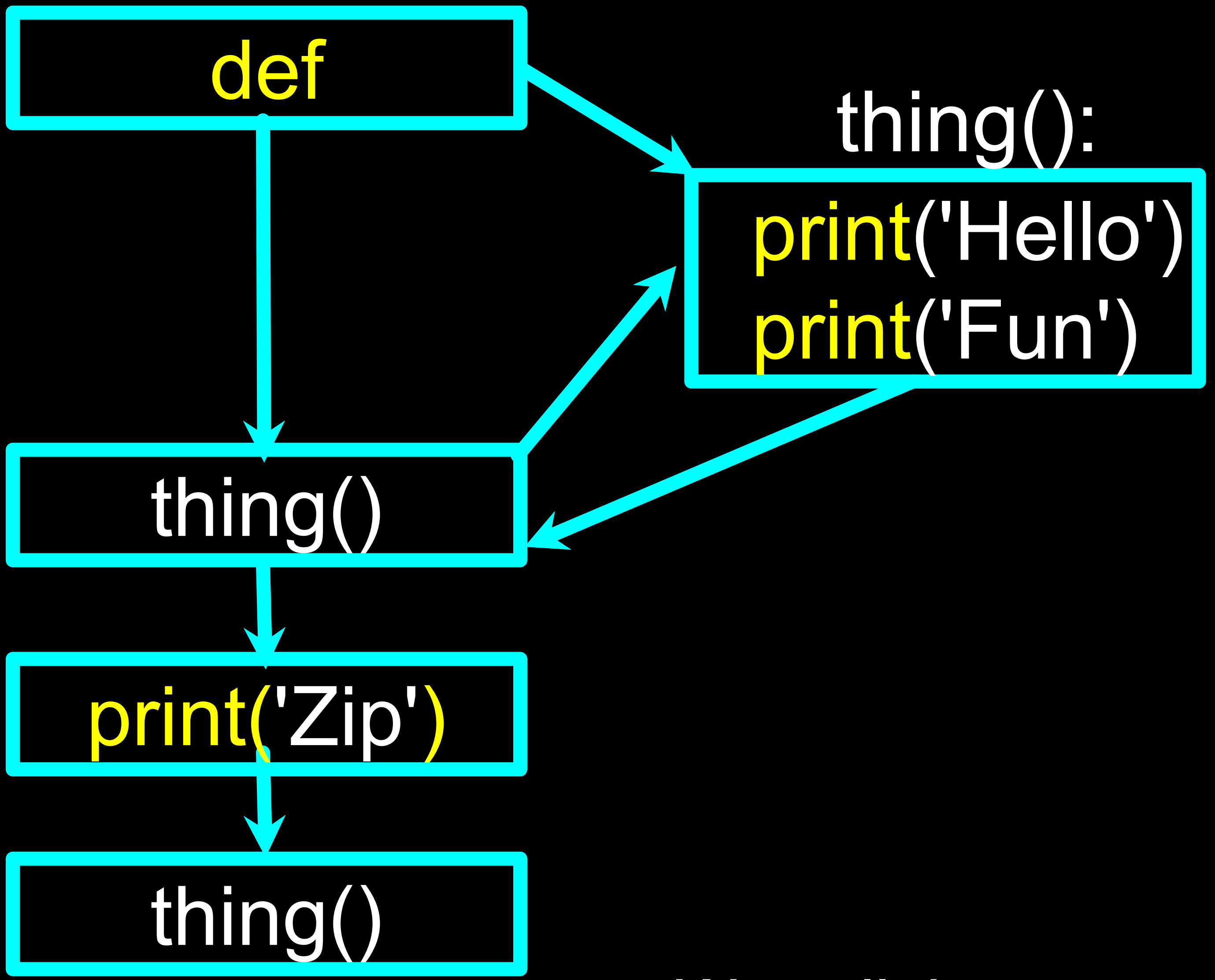
Lect. Wutthichai Puangmanee

Section 4. June, 2025

Topics

- Functions
- Parameter Passing
- Return Values

Stored (and reused) Steps



Program:

```
def thing():
    print('Hello')
    print('Fun')

thing()
print('Zip')
thing()
```

Output:

```
Hello
Fun
Zip
Hello
Fun
```

We call these reusable pieces of code “functions”

Python Functions

- There are two kinds of functions in Python.

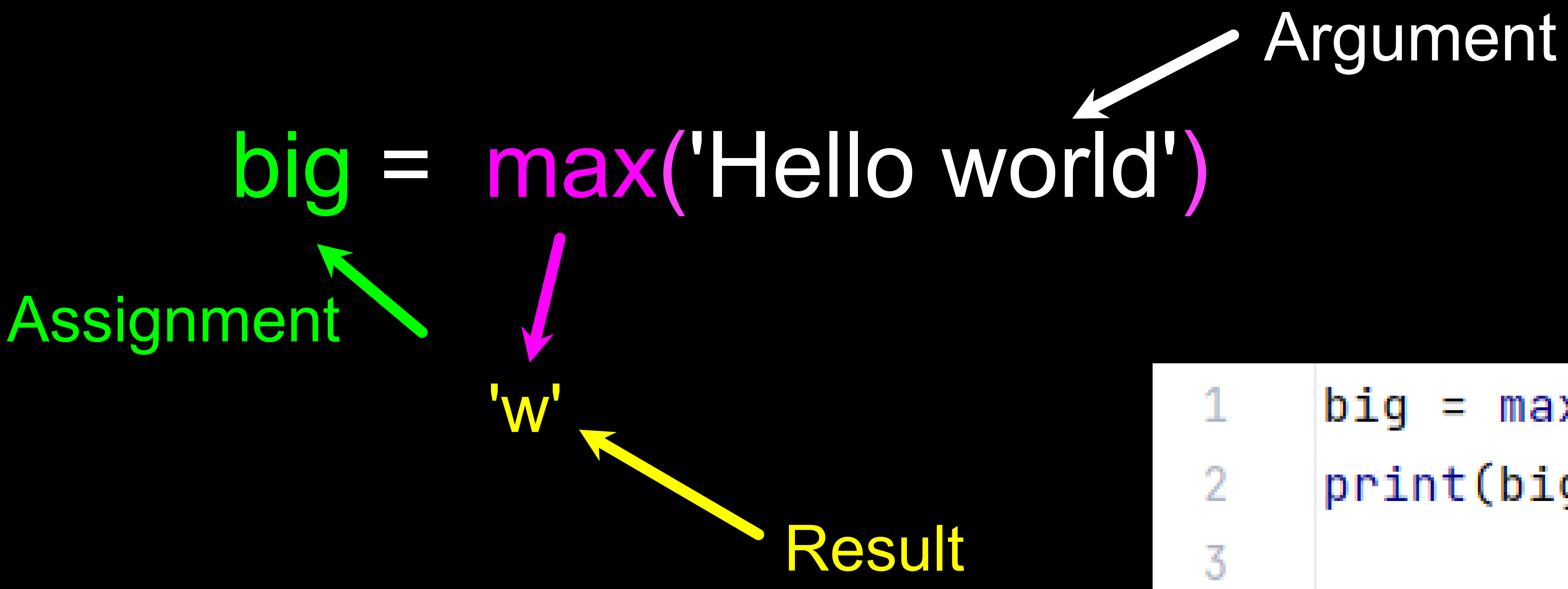
  - Built-in functions that are provided as part of Python - print(), input(), type(), float(), int() ...

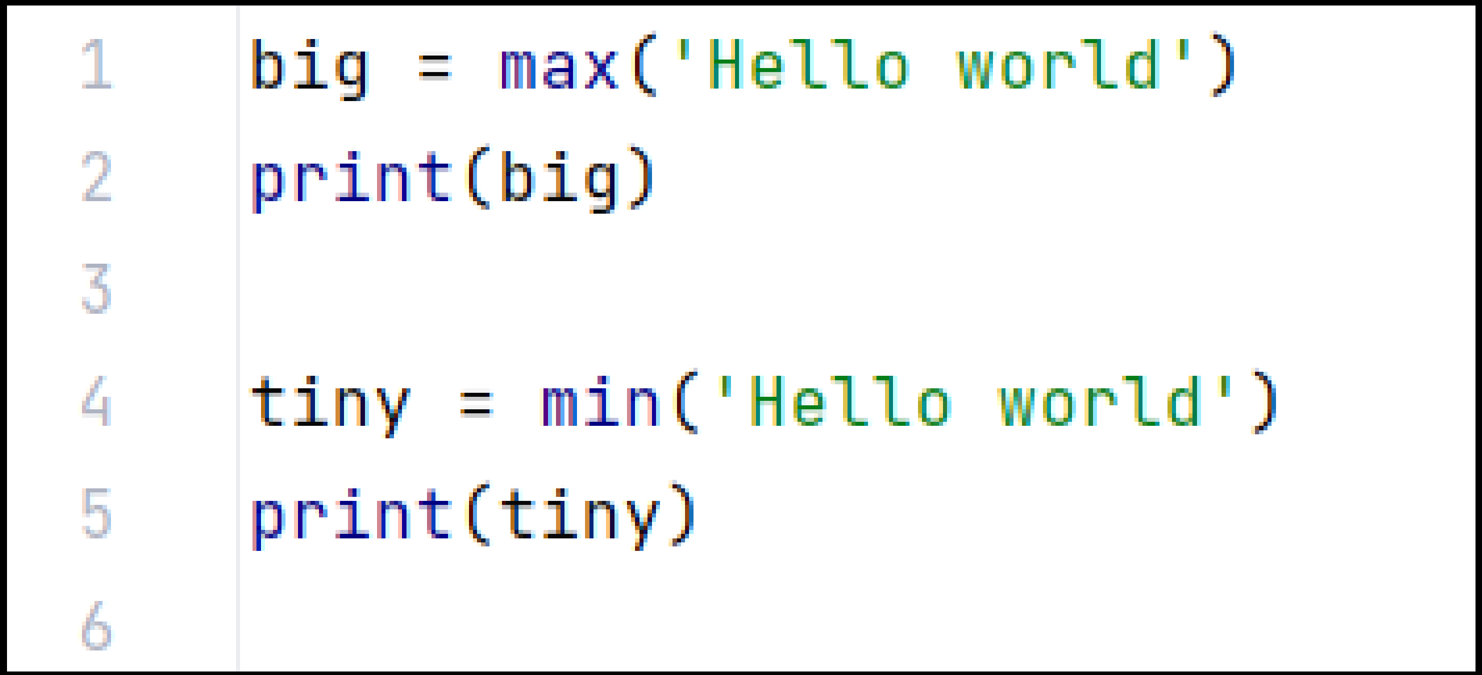
  - Functions that we define ourselves and then use

- We treat function names as “new” reserved words (i.e., we avoid them as variable names)

Function Definition

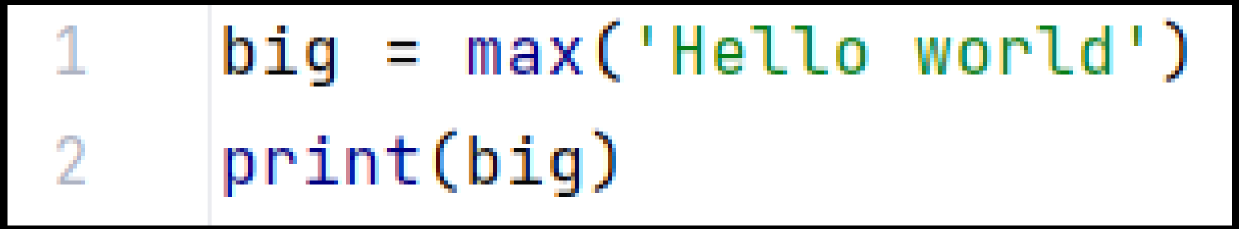
- In Python a function is some reusable code that takes arguments(s) as input, does some computation, and then returns a result or results
- We define a function using the def reserved word
- We call/invoke the function by using the function name, parentheses, and arguments in an expression





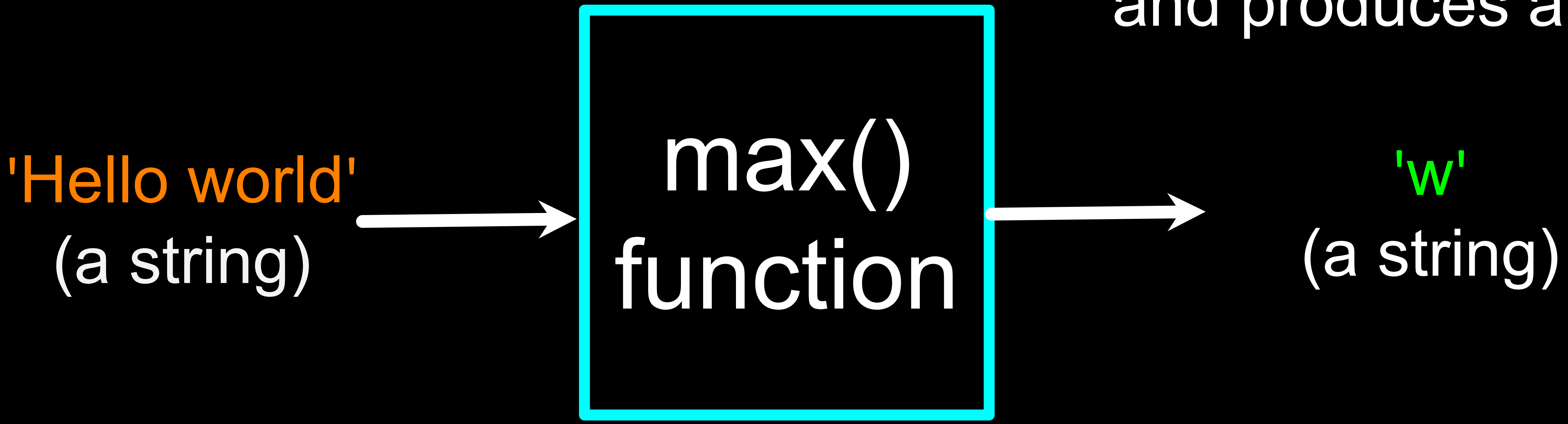
```python
big = max('Hello world')
print(big)

tiny = min('Hello world')
print(tiny)

```

Max Function



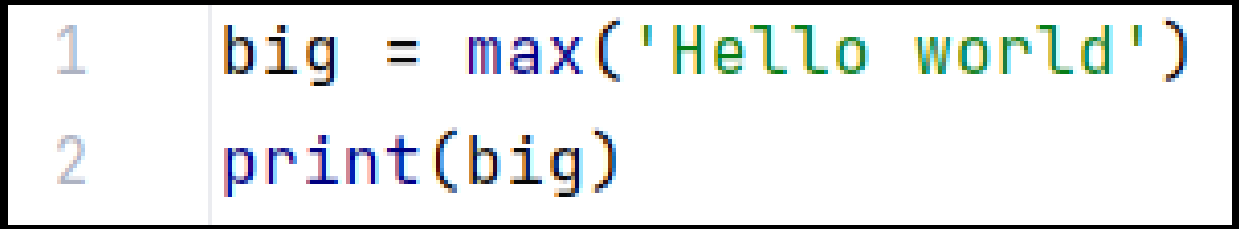
```
big = max('Hello world')
print(big)
```

A function is some stored code that we use. A function takes some input and produces an output.



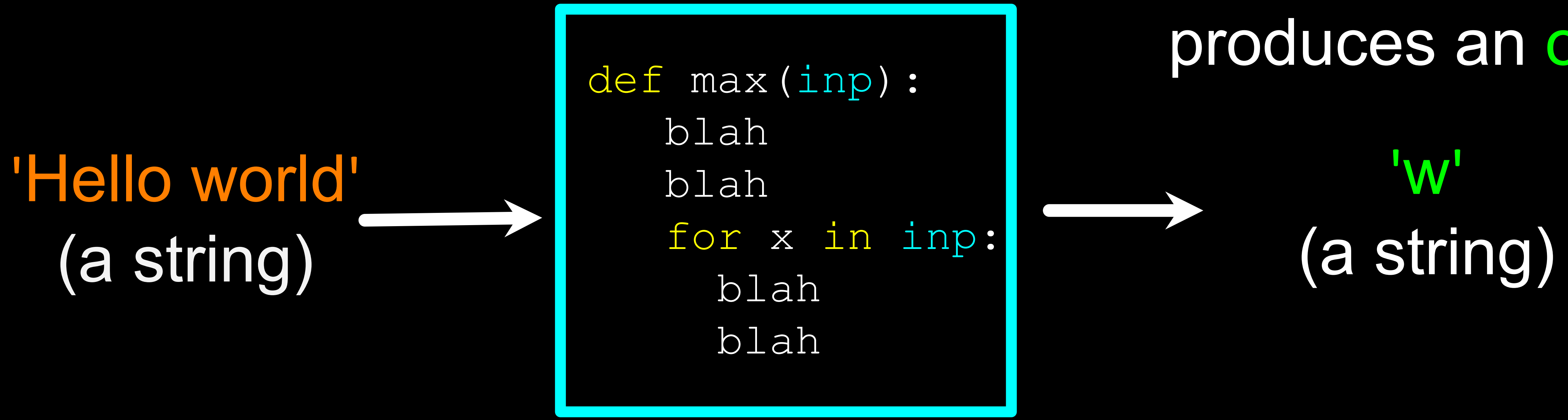
Guido wrote this code

Max Function



```python
big = max('Hello world')
print(big)
```

A function is some stored code that we use. A function takes some input and produces an output.

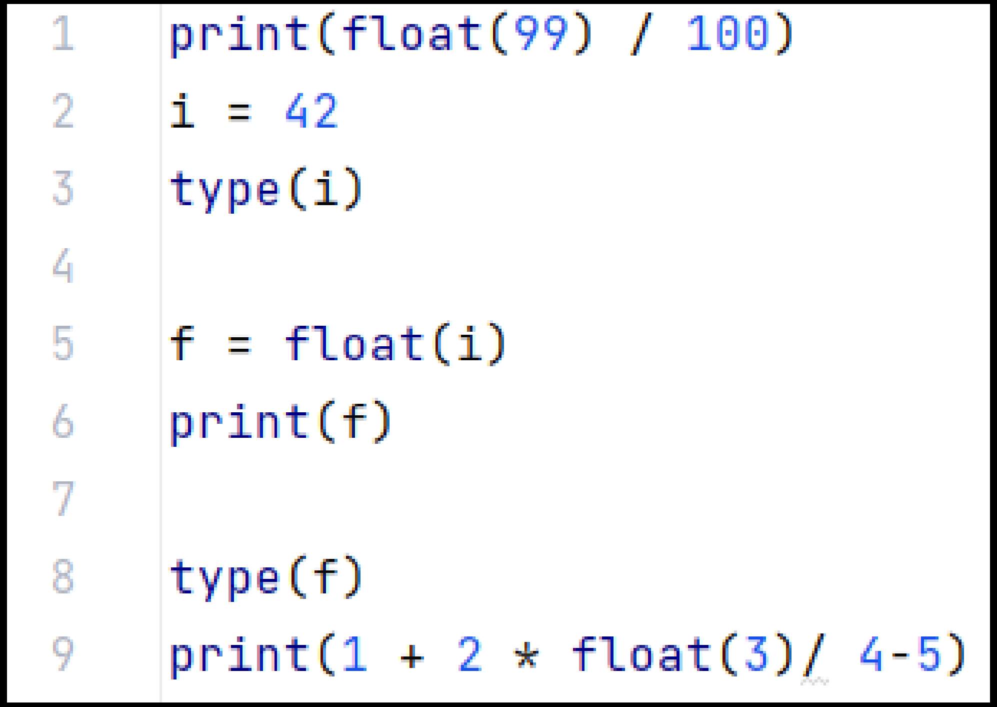


```
def max(inp):
    blah
    blah
    for x in inp:
        blah
        blah
```

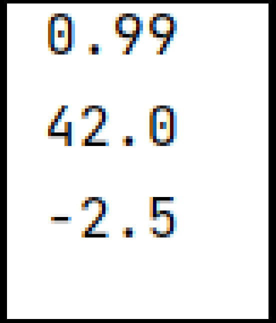
Guido wrote this code

Type Conversions

- When you put an integer and floating point in an expression, the integer is implicitly converted to a float
- You can control this with the built-in functions int() and float()



```python
print(float(99) / 100)
i = 42
type(i)

f = float(i)
print(f)

type(f)
print(1 + 2 * float(3)/ 4-5)
```



```
0.99
42.0
-2.5
```

String Conversions

- You can also use int() and float() to convert between strings and integers
- You will get an error if the string does not contain numeric characters

```
>>> sval = '123'
>>> type(sval)
<class 'str'>
>>> print(sval + 1)
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
TypeError: can only concatenate str
(not "int") to str
>>> ival = int(sval)
>>> type(ival)
<class 'int'>
>>> print(ival + 1)
124
>>> nsv = 'hello bob'
>>> niv = int(nsv)
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
ValueError: invalid literal for int()
```

Functions of Our Own…

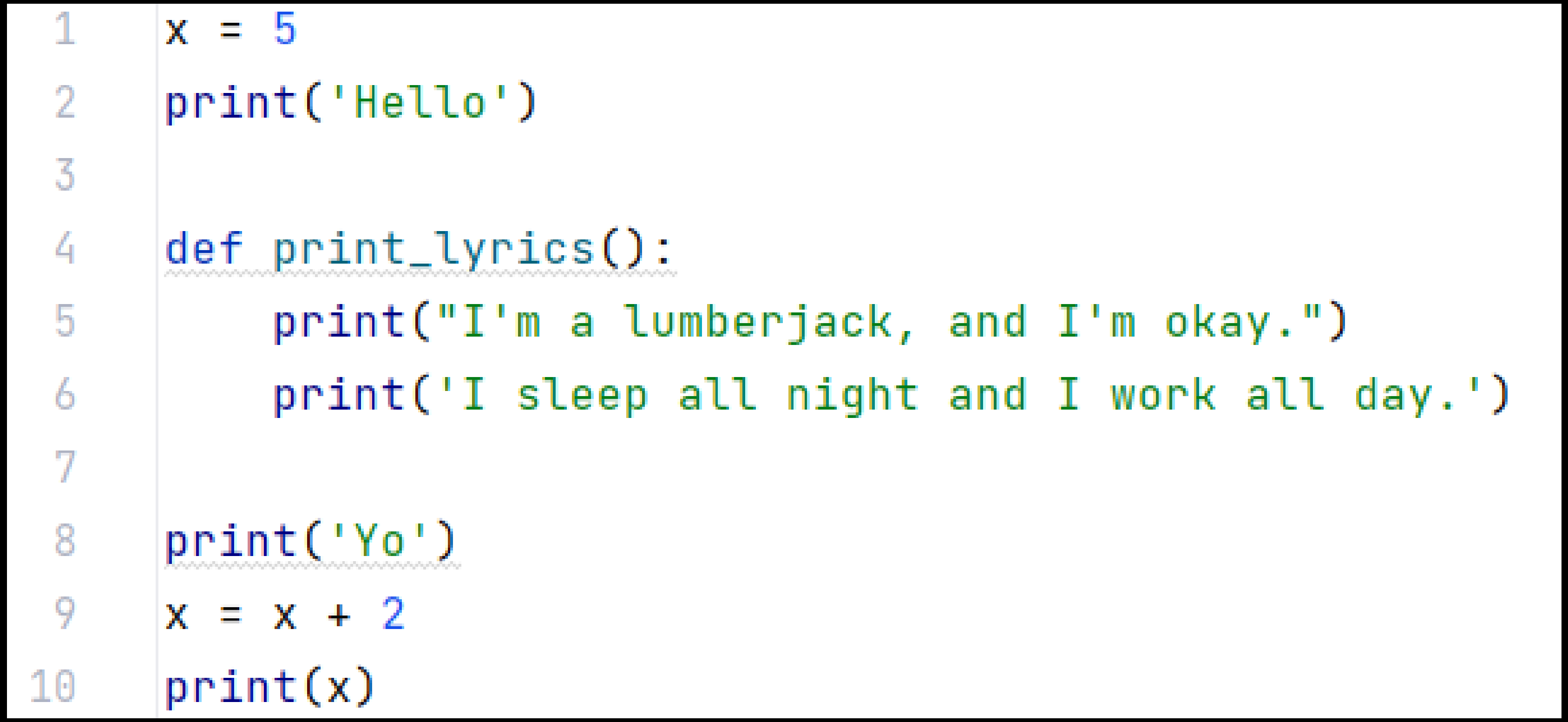
Building our Own Functions

- We create a new function using the def keyword followed by optional parameters in parentheses
- We indent the body of the function
- This defines the function but does not execute the body of the function

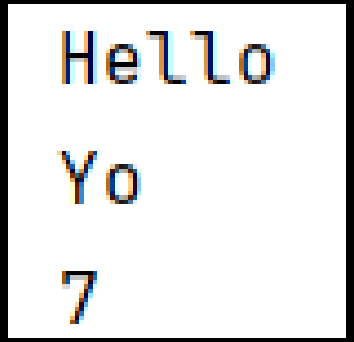
```
def print_lyrics():
    print("I'm a lumberjack, and I'm okay.")
    print('I sleep all night and I work all day.')
```

print_lyrics():

```
print("I'm a lumberjack, and I'm okay.")
print('I sleep all night and I work all day.')
```



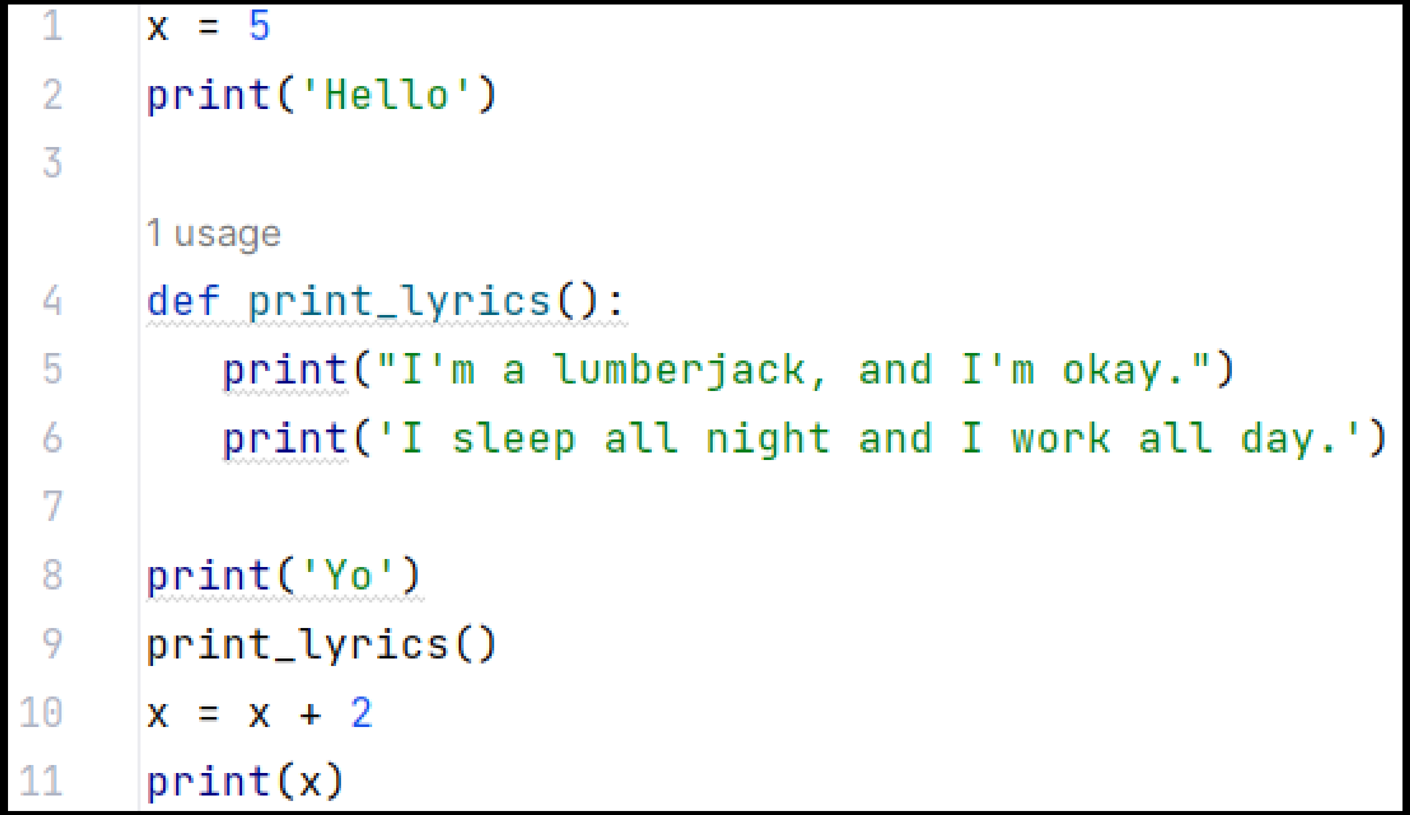
```
x = 5
print('Hello')

def print_lyrics():
    print("I'm a lumberjack, and I'm okay.")
    print('I sleep all night and I work all day.')

print('Yo')
x = x + 2
print(x)
```



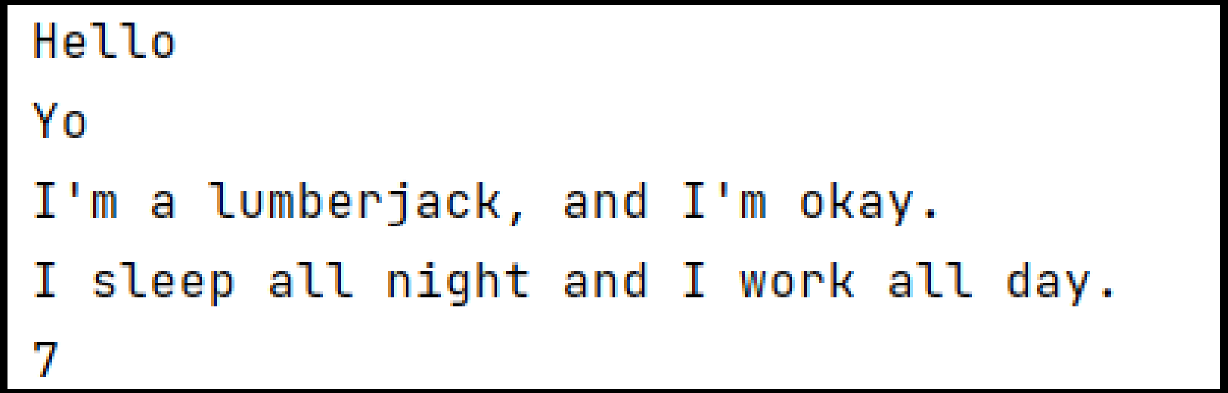
```
Hello
Yo
7
```

Definitions and Uses

- Once we have defined a function, we can call (or invoke) it as many times as we like
- This is the store and reuse pattern



```python
x = 5
print('Hello')

1 usage
def print_lyrics():
    print("I'm a lumberjack, and I'm okay.")
    print('I sleep all night and I work all day.')

print('Yo')
print_lyrics()
x = x + 2
print(x)
```



```
Hello
Yo
I'm a lumberjack, and I'm okay.
I sleep all night and I work all day.
7
```

Arguments

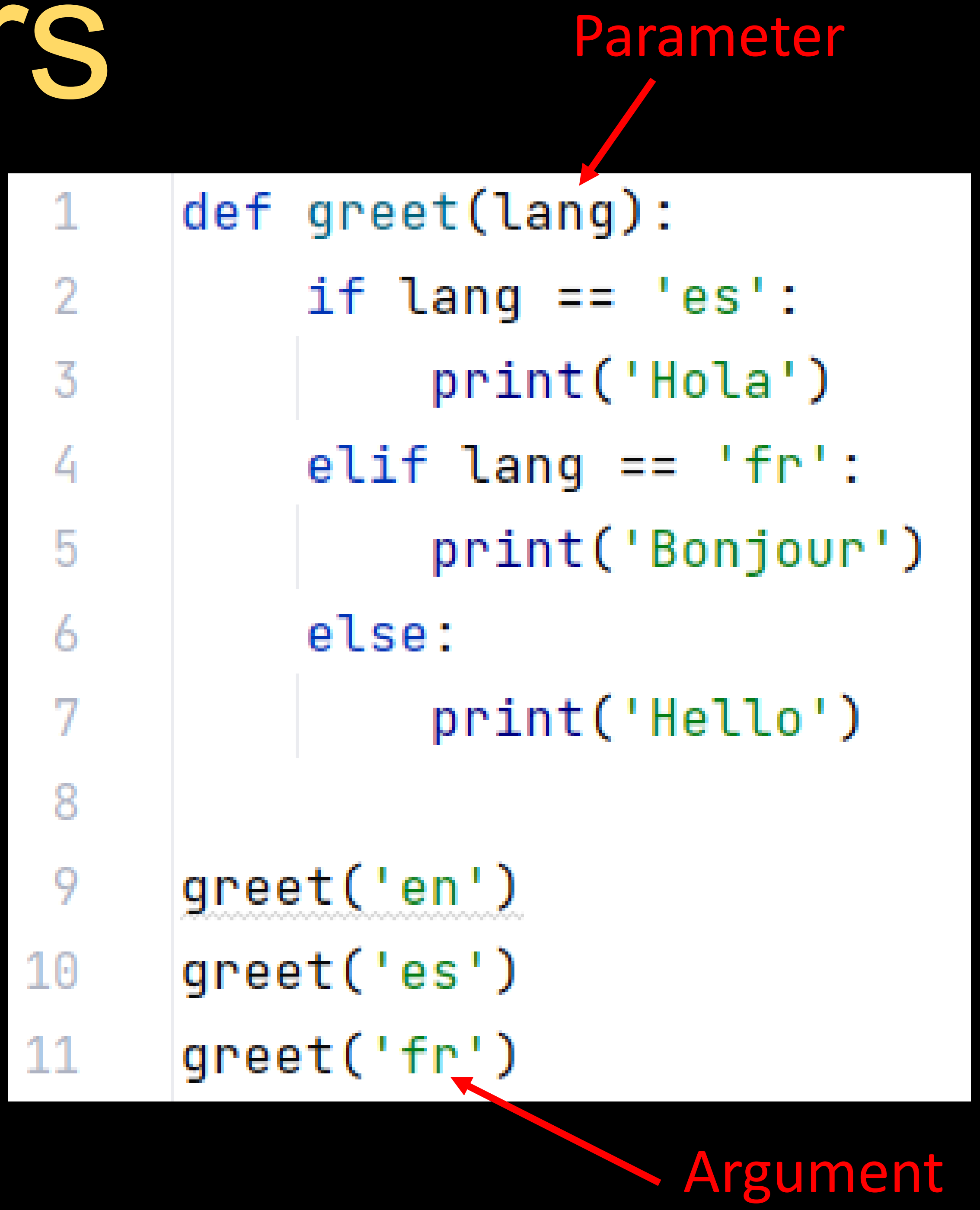
- An argument is a value we pass into the function as its input when we call the function
- We use arguments so we can direct the function to do different kinds of work when we call it at different times
- We put the arguments in parentheses after the name of the function

```
big = max('Hello world')
```

$\nwarrow$ Argument

Parameters

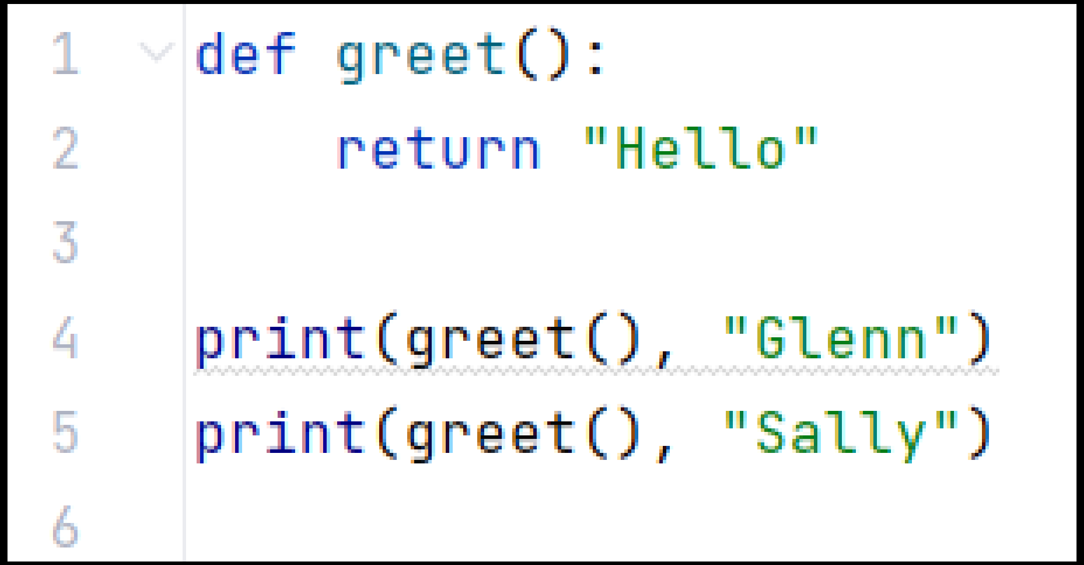
A parameter is a variable which we use in the function definition. It is a "handle" that allows the code in the function to access the arguments for a particular function invocation.



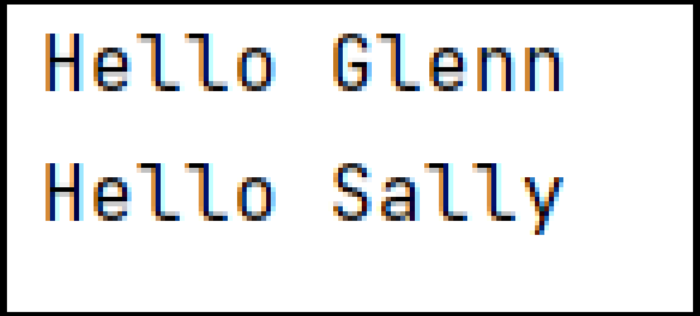
```python
def greet(lang):
    if lang == 'es':
        print('Hola')
    elif lang == 'fr':
        print('Bonjour')
    else:
        print('Hello')

greet('en')
greet('es')
greet('fr')
```

Return Values

Often a function will take its arguments, do some computation, and return a value to be used as the value of the function call in the calling expression. The return keyword is used for this.



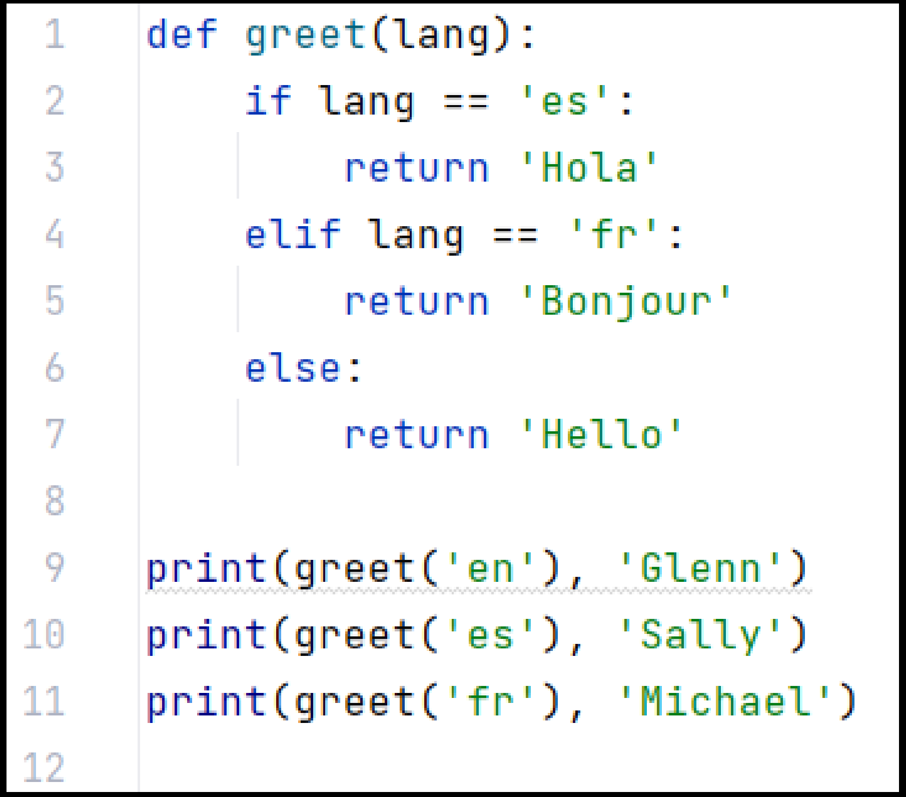
```python
def greet():
    return "Hello"

print(greet(), "Glenn")
print(greet(), "Sally")
```



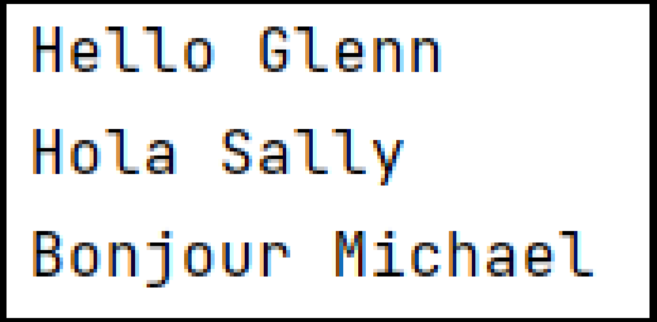
```
Hello Glenn
Hello Sally
```

Return Value

- A “fruitful” function is one that produces a result (or return value)
- The return statement ends the function execution and “sends back” the result of the function

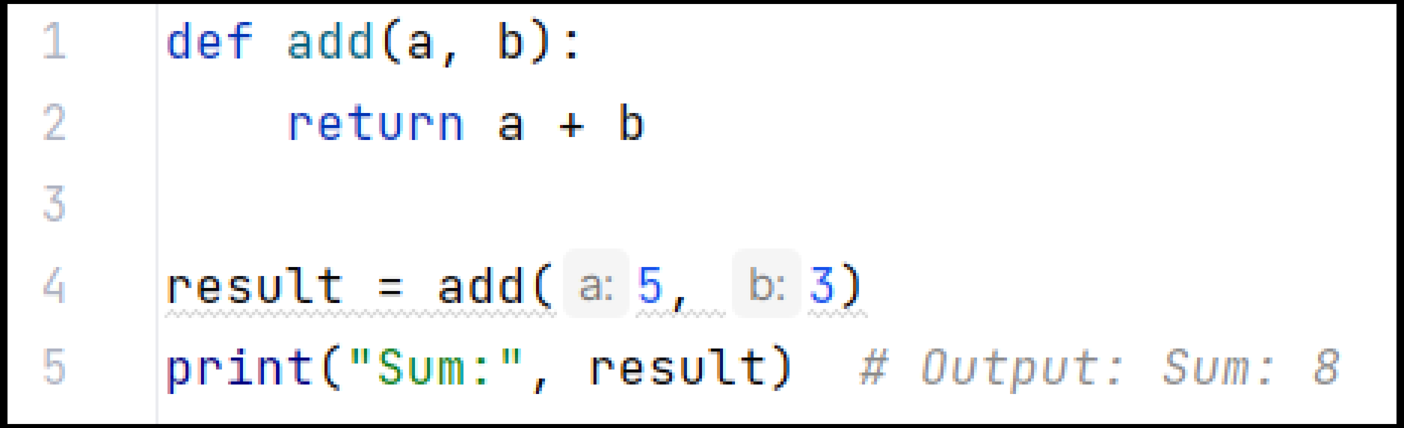


```python
def greet(lang):
    if lang == 'es':
        return 'Hola'
    elif lang == 'fr':
        return 'Bonjour'
    else:
        return 'Hello'

print(greet('en'), 'Glenn')
print(greet('es'), 'Sally')
print(greet('fr'), 'Michael')
```

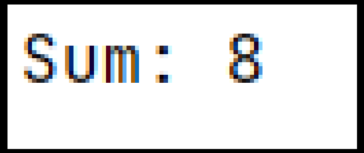


```
Hello Glenn
Hola Sally
Bonjour Michael
```

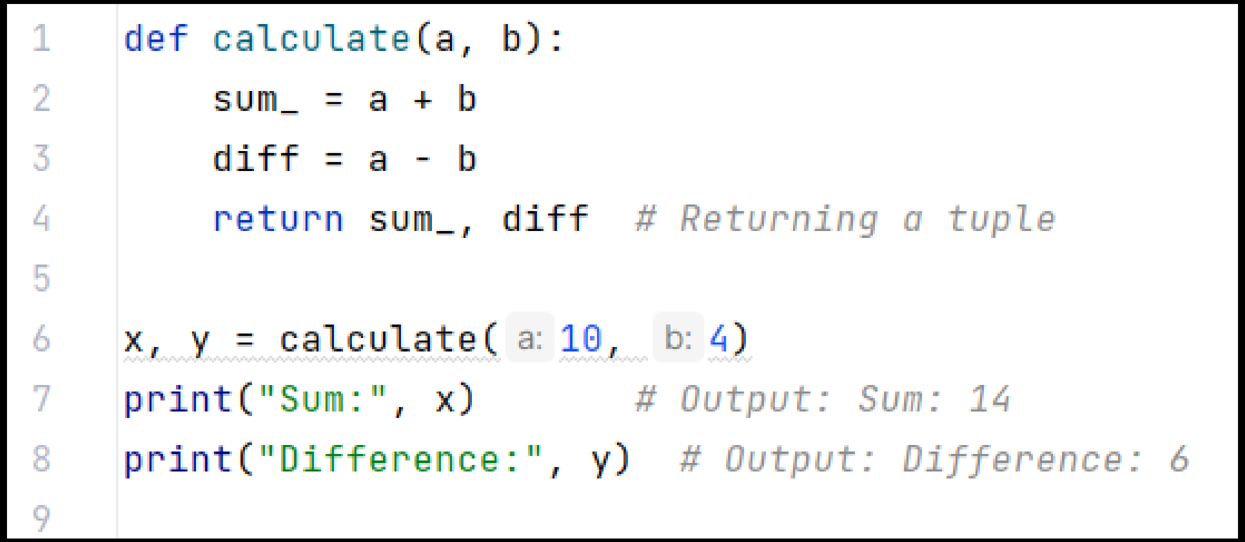
Examples: Function Return Values in Python



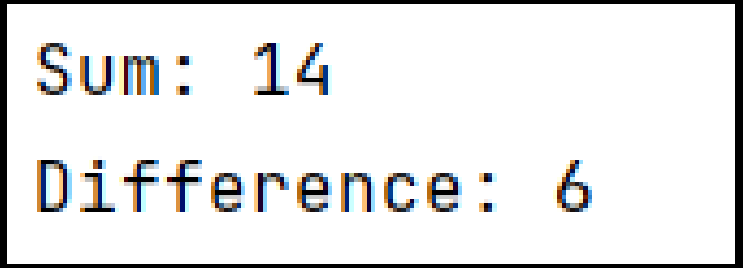
```python
def add(a, b):
    return a + b

result = add( a: 5,  b: 3)
print("Sum:", result)  # Output: Sum: 8
```



```
Sum: 8
```



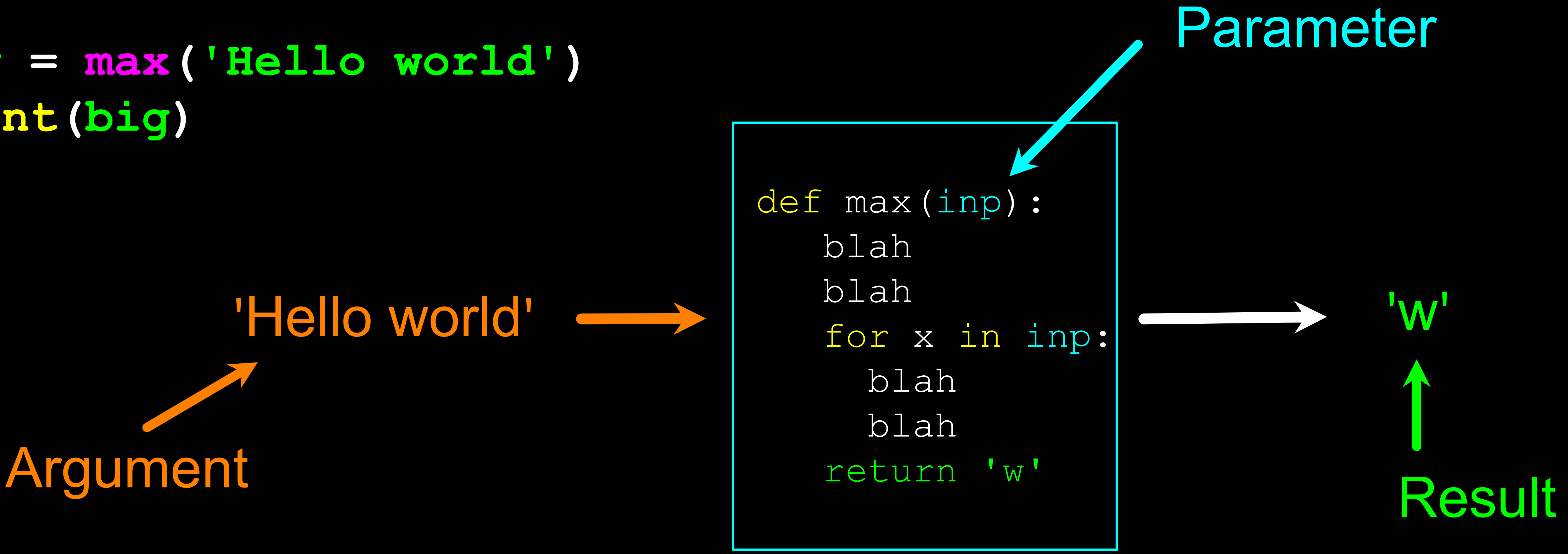
```python
def calculate(a, b):
    sum_ = a + b
    diff = a - b
    return sum_, diff  # Returning a tuple

x, y = calculate( a: 10,  b: 4)
print("Sum:", x)          # Output: Sum: 14
print("Difference:", y)  # Output: Difference: 6

```



```
Sum: 14
Difference: 6
```

Arguments, Parameters, and Results

```
big = max('Hello world')
print(big)
```



```
def max(inp):
    blah
    blah
    for x in inp:
       blah
       blah
    return 'w'
```

Multiple Parameters / Arguments

- We can define more than one parameter in the function definition
- We simply add more arguments when we call the function
- We match the number and order of arguments and parameters

```
def addtwo(a, b):
    added = a + b
    return added

x = addtwo(3, 5)
print(x)

8
```

Void (non-fruitful) Functions

- When a function does not return a value, we call it a “void” function
- Functions that return values are “fruitful” functions
- Void functions are “not fruitful”

To function or not to function...

- Organize your code into “paragraphs” - capture a complete thought and “name it”
- Don’t repeat yourself - make it work once and then reuse it
- If something gets too long or complex, break it up into logical chunks and put those chunks in functions
- Make a library of common stuff that you do over and over - perhaps share this with your friends...

Summary

- Functions
- Built-In Functions
- Type conversion (int, float)
- String conversions
- Parameters
- Arguments
- Results (fruitful functions)
- Void (non-fruitful) functions
- Why use functions?

Example

Rewrite your pay computation with time-and-a-half for overtime and create a function called computepay which takes two parameters (hours and rate).

```
Enter Hours: 45
Enter Rate: 10

Pay: 475.0
```

475 = 40 * 10 + 5 * 15

End (Assignment)