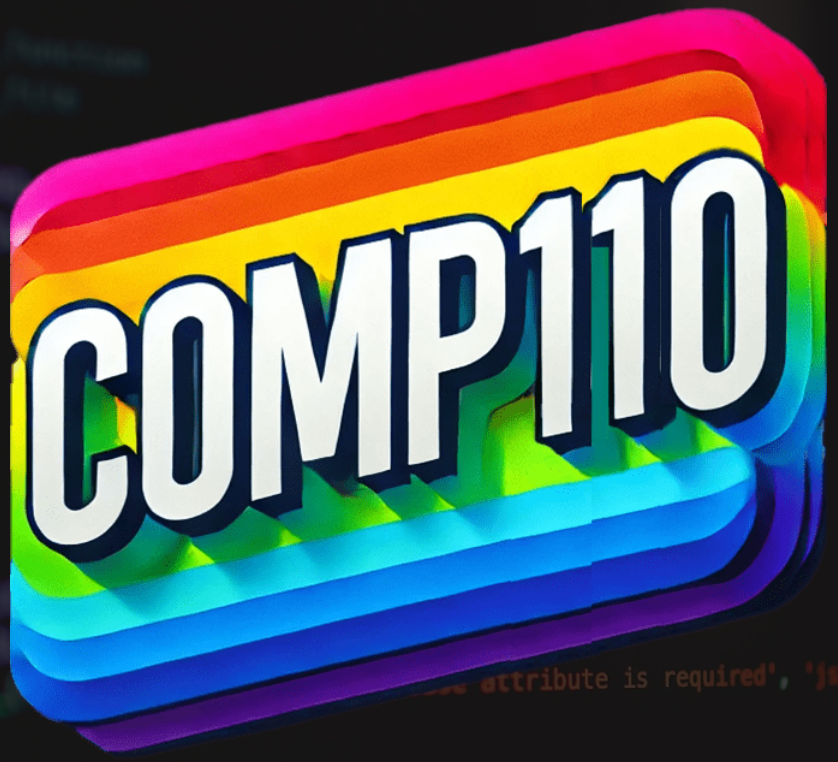


CL03: Intro to Functions

Functions by Intuition

Consider the following **function definition** (a new concept!):

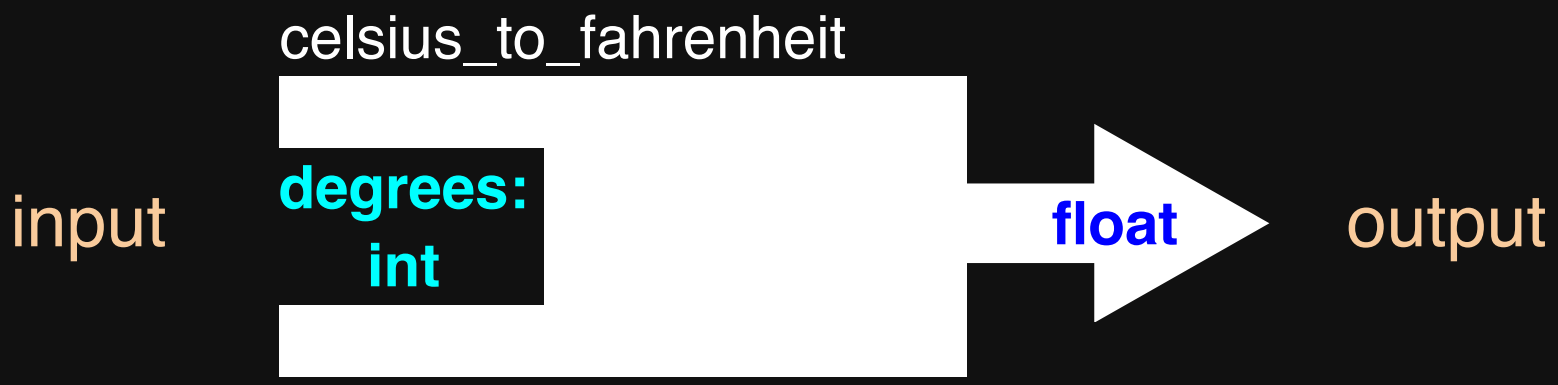
```
1 def celsius_to_fahrenheit(degrees: int) -> float:
2     """Convert degrees Celsius to degrees Fahrenheit."""
3     return (degrees * 9 / 5) + 32
```

Now, consider the following **function call expressions**, which use the definition:

```
1 celsius_to_fahrenheit(degrees=0)
2
3 celsius_to_fahrenheit(degrees=10)
```

What **value** and **type** does each function call expression evaluate to? How many connections between the ***definition*** and the ***call*** can you identify intuitively?

The fundamental pattern of functions




```
1 celsius_to_fahrenheit(degrees=10)
```

↓

50.0

Function definitions are like recipes

- A **recipe** in a book *does not result in a meal until you cook it*
- A **function definition** in your program *does not result in a value until you call it*
- An **adaptable recipe** is one where you can substitute ingredients, follow the same steps, and get different, but intentional, results
- A **parameterized function definition** is one where you can substitute input *arguments*, follow the same steps, and get different, but intentional, results.
  - Such as converting Celsius degree values to Fahrenheit!
- **Recipes** and **function definitions** are written down once with dreams of being cooked (called) tens, hundreds, thousands, ... billions of times over!

The anatomy of a function definition

define...

a function named this...

with this parameter list of "inputs"

which will return a value of this return type

```
def name_of_function(parameter: type) -> returnType:
    """Docstring description of the function."""
    return expression_of_type_returnType
```

function signature specifies how you and others will make use of the function from elsewhere in a program

- What is its **name**?
- What input **parameter(s) type(s)** does it need?
  - (Think: ingredients)
- What **type of return value** will calling it result in?
  - (Think: meal)

The anatomy of a function definition

define... a function named this... with this parameter list of "inputs" which will return a value of this return type

```
def name_of_function(parameter: type) -> returnType:
    """Docstring description of the function."""
    return expression_of_type_returnType
```

function body specifies the subprogram, or set of steps, which will be carried out every time a function calls the definition:

- Each statement in the body is **indented** by (at least) one level
- The **Docstring** describes the purpose and, often, usage of a function *for people*
- The function body contains one or more **statements**. For now, our definitions will be simple, one-statement functions
- **Return statements** are special and written inside of function definitions
  - When a function definition is called, a return statement indicates, **"stop following this function here and send my caller the result of evaluating this return expression!"**

The anatomy of a function definition

define... a function named this... with this parameter list of "inputs" which will return a value of this return type

```
def name_of_function(parameter: type) -> returnType:
    """Docstring description of the function."""
    return expression_of_type_returnType
```

function body

The anatomy of a function call

function name

argument list (a list of the input values for the parameters)

```
name_of_function(argument=value)
```

Fill in the blank to complete the missing expression

Say you want to hang string lights around your dorm room. How long of a strand of string lights will you need?

```
1 def perimeter(length: float, width: float) -> float:
2     """Calculate the perimeter of a rectangle."""
3     return _____
```

This is an example function call expression that calls the perimeter function definition above. What value and type will this expression evaluate to?

```
1 perimeter(length=10.0, width=8.0)
```