Session- 5

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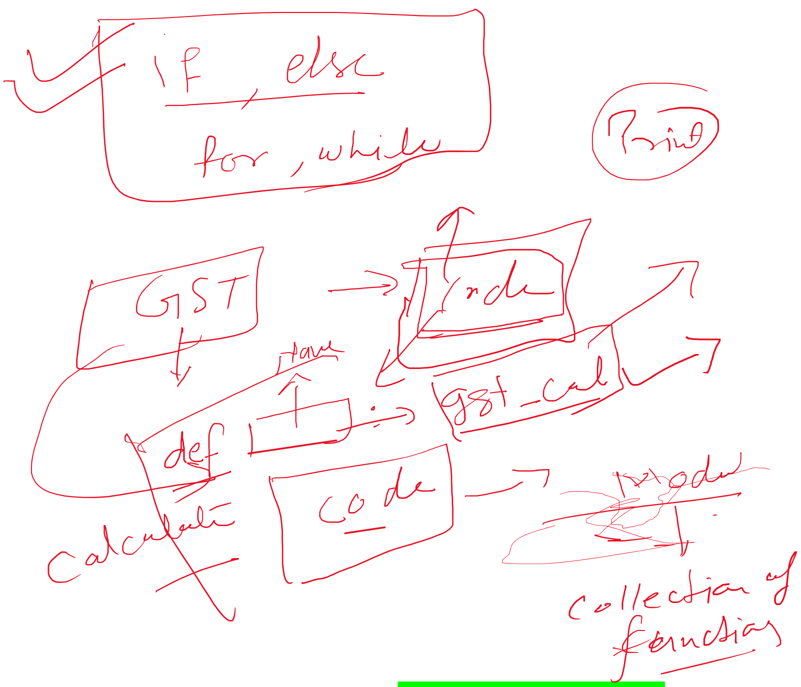
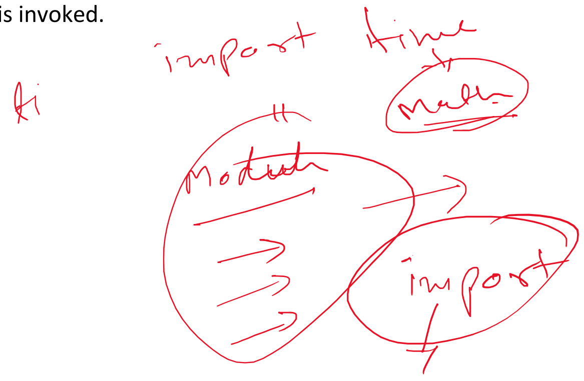


min
max
sum
len
Type

Agenda

- Functions in Python
- User-defined function
- Built-in functions
- Lambda functions

FUNCTIONS In programming, the use of function is one of the means to achieve modularity and reusability. Function can be defined as a named group of instructions that accomplish a specific task when it is invoked.



A function is a block of code which only runs when it is called.
You can pass data, known as parameters, into a function.
A function can return data as a result.

Creating a Function

In Python a function is defined using the `def` keyword:

Example

```
def my_function():
  print("Hello from a function")
```

Calling a Function

To call a function, use the function name followed by parenthesis:

Example

```
def my_function():
  print("Hello from a function")

my_function()
```

Arguments

Information can be passed into functions as arguments.
Arguments are specified after the function name, inside the parentheses. You can add as many arguments as you want, just separate them with a comma.
The following example has a function with one argument (fname). When the function is called, we pass along a first name, which is used inside the function to print the full name:

Example

```
def my_function(fname):
  print(fname + " Refsnes")

my_function("Emil")
my_function("Tobias")
my_function("Linus")
```

Arguments are often shortened to *args* in Python documentations.

Parameters or Arguments?

The terms *parameter* and *argument* can be used for the same thing: information that are passed into a function.
From a function's perspective:
A parameter is the variable listed inside the parentheses in the function definition.
An argument is the value that is sent to the function when it is called.

Number of Arguments

By default, a function must be called with the correct number of arguments. Meaning that if your function expects 2 arguments, you have to call the function with 2 arguments, not more, and not less.

Example

This function expects 2 arguments, and gets 2 arguments:

```
def my_function(fname, lname):
  print(fname + " " + lname)

my_function("Emil", "Refsnes")
```

If you try to call the function with 1 or 3 arguments, you will get an error:

Example

This function expects 2 arguments, but gets only 1:

```
def my_function(fname, lname):
  print(fname + " " + lname)

my_function("Emil")
```

Arbitrary Arguments, *args

If you do not know how many arguments that will be passed into your function, add a * before the parameter name in the function definition.
This way the function will receive a *tuple* of arguments, and can access the items accordingly:

Example

If the number of arguments is unknown, add a * before the parameter name:

```
def my_function(*kids):
  print("The youngest child is " + kids[2])

my_function("Emil", "Tobias", "Linus")
```

Arbitrary Arguments are often shortened to **args* in Python documentations.

Keyword Arguments

You can also send arguments with the *key* = *value* syntax.
This way the order of the arguments does not matter.

Example

```
def my_function(child3, child2, child1):
  print("The youngest child is " + child3)

my_function(child1 = "Emil", child2 = "Tobias", child3 = "Linus")
```

The phrase *Keyword Arguments* are often shortened to *kwargs* in Python documentations.

Arbitrary Keyword Arguments, **kwargs

If you do not know how many keyword arguments that will be passed into your function, add two asterisk: ** before the parameter name in the function definition.
This way the function will receive a *dictionary* of arguments, and can access the items accordingly:

Example

If the number of keyword arguments is unknown, add a double ** before the parameter name:

```
def my_function(**kid):
  print("His last name is " + kid["lname"])

my_function(fname = "Tobias", lname = "Refsnes")
```

Arbitrary Kword Arguments are often shortened to ***kwargs* in Python documentations.

Default Parameter Value

The following example shows how to use a default parameter value.
If we call the function without argument, it uses the default value:

Example

```
def my_function(country = "Norway"):
  print("I am from " + country)

my_function("Sweden")
my_function("India")
my_function()
my_function("Brazil")
```

Passing a List as an Argument

You can send any data types of argument to a function (string, number, list, dictionary etc.), and it will be treated as the same data type inside the function.
E.g. if you send a List as an argument, it will still be a List when it reaches the function:

Example

```
def my_function(food):
  for x in food:
    print(x)

fruits = ["apple", "banana", "cherry"]

my_function(fruits)
```

Return Values

To let a function return a value, use the `return` statement:

Example

```
def my_function(x):
  return 5 * x

print(my_function(3))
print(my_function(5))
print(my_function(9))
```

The pass Statement

`function` definitions cannot be empty, but if you for some reason have a `function` definition with no content, put in the `pass` statement to avoid getting an error.

Example

```
def myfunction():
  pass
```

Positional-Only Arguments

You can specify that a function can have ONLY positional arguments, or ONLY keyword arguments.
To specify that a function can have only positional arguments, add `, /` after the arguments:

Example

```
def my_function(x, /):
  print(x)

my_function(3)
```

Without the `, /` you are actually allowed to use keyword arguments even if the function expects positional arguments:

Example

```
def my_function(x):
  print(x)

my_function(x = 3)
```

But when adding the `, /` you will get an error if you try to send a keyword argument:

Example

```
def my_function(x, /):
  print(x)

my_function(x = 3)
```

Keyword-Only Arguments

To specify that a function can have only keyword arguments, add `*,` *before* the arguments:

Example

```
def my_function(*, x):
  print(x)

my_function(x = 3)
```

Without the `*,` you are allowed to use positionale arguments even if the function expects keyword arguments:

Example

```
def my_function(x):
  print(x)

my_function(3)
```

But when adding the `*, /` you will get an error if you try to send a positional argument:

Example

```
def my_function(*, x):
  print(x)

my_function(3)
```

Combine Positional-Only and Keyword-Only

You can combine the two argument types in the same function.
Any argument *before* the `/ ,` are positional-only, and any argument *after* the `*,` are keyword-only.

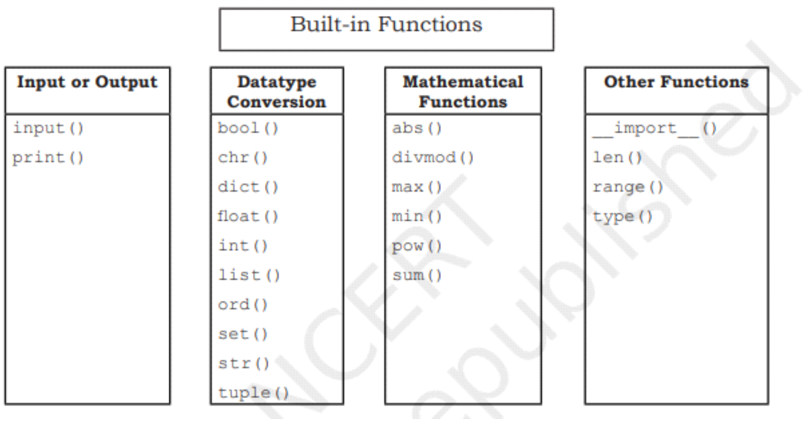
Example

```
def my_function(a, b, /, *, c, d):
  print(a + b + c + d)

my_function(5, 6, c = 7, d = 8)
```

Built-in functions

Built-in functions are the ready-made functions in Python that are frequently used in programs



Built-in Functions

Input or Output	Datatype Conversion	Mathematical Functions	Other Functions
input()	bool()	abs()	__import__()
print()	chr()	divmod()	len()
	dict()	max()	range()
	float()	min()	type()
	int()	pow()	
	list()	sum()	
	ord()		
	set()		
	str()		
	tuple()		

Module

Other than the built-in functions, the Python standard library also consists of a number of modules. While a function is a grouping of instructions, a module is a grouping of functions. As we know that when a program grows, function is used to simplify the code and to avoid repetition. For a complex problem, it may not be feasible to manage the code in one single file. Then, the program is divided into different parts under different levels, called modules. Also, suppose we have created some functions in a program and we want to reuse them in another program. In that case, we can save those functions under a module and reuse them. A module is created as a python (.py) file containing a collection of function definitions.

Built-in Modules

Python library has many built-in modules that are really handy to programmers. Let us explore some commonly used modules and the frequently used functions that are found in those modules:
• math
• random
• statistics

Python Lambda

A lambda function is a small anonymous function.
A lambda function can take any number of arguments, but can only have one expression.

Syntax

lambda *arguments* : *expression*

The expression is executed and the result is returned:

Example

Add 10 to argument a, and return the result:

```
x = lambda a : a + 10

print(x(5))
```

Lambda functions can take any number of arguments:

Example

Multiply argument a with argument b and return the result:

```
x = lambda a, b : a * b

print(x(5, 6))
```

Summarize argument a, b, and c and return the result:

```
x = lambda a, b, c : a + b + c
print(x(5, 6, 2))
```

Why Use Lambda Functions?

The power of lambda is better shown when you use them as an anonymous function inside another function.
Say you have a function definition that takes one argument, and that argument will be multiplied with an unknown number:

```
def myfunc(n):
  return lambda a : a * n
```

Use that function definition to make a function that always doubles the number you send in:

Example

```
def myfunc(n):
  return lambda a : a * n

mydoubler = myfunc(2)

print(mydoubler(11))
```

Or, use the same function definition to make a function that always *triples* the number you send in:

Example

```
def myfunc(n):
  return lambda a : a * n

mytripler = myfunc(3)

print(mytripler(11))
```

Or, use the same function definition to make both functions, in the same program:

Example

```
def myfunc(n):
  return lambda a : a * n

mydoubler = myfunc(2)
mytripler = myfunc(3)

print(mydoubler(11))
print(mytripler(11))
```