



Loading Modules



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1

Fundamentals of Modules

What is the **module** and
what is it **used for**?





Fundamentals of Modules

- ▶ We give some explanations about the subject by staying within the frame drawn by related Python documents. *Scripts* and *modules* have essentially identical structures in terms of creation and are the files with a **.py** extension, containing some Python codes, statements, operations, and functions.

Tips :

The difference between these two terms :

- In fact, the difference between them depends on **how** and **for what purpose** you use this file with **.py** extension.



Fundamentals of Modules



script.py

```
python codes  
python codes code block1  
python codes  
python codes
```

```
python codes  
python codes code block2  
python codes  
python codes
```

```
python codes  
python codes code block3  
python codes
```

-A python file.

-You can open
and edit then run
it as a whole.

-You can import
(load) it and then
call a function or
a variable and
use it partially.

module.py

```
python codes  
python codes code block1  
python codes  
python codes
```

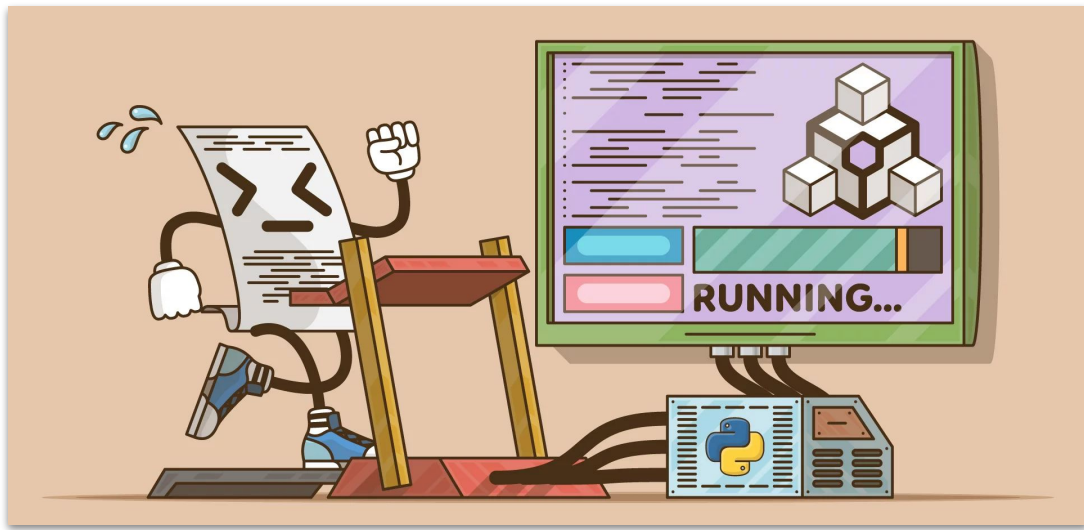
```
python codes  
python codes code block2  
python codes  
python codes
```

```
python codes  
python codes code block3  
python codes
```



What is Script? (review)

- ▶ The file you created consisting of codes, definitions and a list of operations that can be read and interpreted in the future is known as **script**.





What is Module? (review)

- ▶ As your program gets longer, you may want to split it into several files for easier maintenance. You may also want to use a handy function that you've written in several programs without copying its definition into each program.
- ▶ To support this, Python has a way to put definitions in a file and use them in a **script** or in an **interactive instance** of the interpreter. Such a file is called a **module**.

What is Module?

- ▶ The example of built-in module of Python. → `math` module

Python » English » 3.8.2 » Documentation » The Python Standard Library » Numeric and Mathematical Modules »

Table of Contents

`math` — Mathematical functions

- Number-theoretic and representation functions
- Power and logarithmic functions
- Trigonometric functions
- Angular conversion
- Hyperbolic functions
- Special functions
- Constants

Previous topic

`numbers` — Numeric abstract base classes

`math` — Mathematical functions

This module provides access to the mathematical functions defined by the C standard.

These functions cannot be used with complex numbers; use the functions of the same name from the `cmath` module if you require support for complex numbers. The distinction between functions which support complex numbers and those which don't is made since most users do not want to learn quite as much mathematics as required to understand complex numbers. Receiving an exception instead of a complex result allows earlier detection of the unexpected complex number used as a parameter, so that the programmer can determine how and why it was generated in the first place.

The following functions are provided by this module. Except when explicitly noted otherwise, all return values are floats.



What is Module?

- ▶ These simple files, usually with a **.py** extension and containing Python statements and definitions, are called **modules**. The ability to **load** or **import** one module from another in Python is a unique feature that significantly reduces our programming processes, and that is what makes the **Module system really powerful**.

Tips :

- If you open and use this file (with a **.py** extension) *directly*, that is **script**, and
- If you *load* (import) this file (with a **.py** extension) and call any function from it, that's a **module** this time.



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How to Load a Module?



How to Load a Module? (review)

- ▶ `my_module` is the name of the module we imported. When loading a module you can also use an **abbreviated nickname** for modules by using a keyword `as`. Let's give a nickname to `my_module` to load it:

```
1 import my_module as mym # loads my_module, we give a nickname to it
2
3 mym.my_function() # we can use it the same way
4
5 print(mym.my_variable)
```

- ▶ In the example above, `mym` stands for the module `my_module`. For instance, imagine that there is a file called `my_module.py` named `my_module`. And for being importable, this file should be placed in the same directory as the file you are working on.



How to Load a Module? (review)

- ▶ You can also use keyword as here the same way as well. Consider this example :

```
1 from my_module import my_function as mfnc # we've imported my_function named  
    mfnc  
2  
3 mfnc() # we use the my_function's alias directly
```

- ▶ It is traditionally best to type each import syntax in separate lines and put them all at the beginning of the current module. Let's see it in an example :

```
1 import module_1  
2 import module_2  
3 import module_3  
4  
5 # The code stream of the current module starts here
```



How to Load a Module? (review)

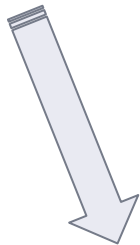
- Initially, the Python importing mechanism **searches for** a module in the **current directory**, then the built-in modules are inspected and an error will be raised if nothing is found. The module becomes available under its name or alias after **importing** and you can use the *dot notation* to access the *functions* and *variables* defined in it.
- Importing a function or variable defined in a module is a very common and useful method. We use the *keyword* **from** to use this option. Let's see how it works :

```
1 from my_module import my_function # we've loaded only my_function from  
   my_module  
2  
3 my_function() # my_function can be used directly now at the current module
```



3

Built-in Modules



<https://docs.python.org/3/py-modindex.html>



Built-in Modules

- ▶ Python comes with a huge library of standard modules many of which are built into the interpreter.
- ▶ These modules make our code more effective by providing useful functions and data structures.
- ▶ Another advantage of built-in modules which is invaluable to the user is that you can access these standard libraries from all operating systems in which Python is installed.
- ▶ Let's have a look at some of them if you want :



Built-in Modules (math)

- ▶ `math` is one of the most known and used modules. This module allows us to work with mathematical functions.

```
1 import math
2
3 print(dir(math)) # you can find out all names defined in this module
```

```
1 ['__doc__', '__loader__', '__name__', '__package__', '__spec__', 'acos',
  'acosh', 'asin', 'asinh', 'atan', 'atan2', 'atanh', 'ceil', 'copysign',
  'cos', 'cosh', 'degrees', 'e', 'erf', 'erfc', 'exp', 'expm1', 'fabs',
  'factorial', 'floor', 'fmod', 'frexp', 'fsum', 'gamma', 'gcd', 'hypot',
  'inf', 'isclose', 'isfinite', 'isinf', 'isnan', 'ldexp', 'lgamma', 'log',
  'log10', 'log1p', 'log2', 'modf', 'nan', 'pi', 'pow', 'radians', 'sin',
  'sinh', 'sqrt', 'tan', 'tanh', 'tau', 'trunc']
```



Built-in Modules

► Task :

- Let's import `pi`, `factorial` and `log10` functions from `math` module,
- Print the value of `pi`, `4!` and `log10` of `1000` using these functions.





Built-in Modules

- ▶ The code block that you should type is as follows :

```
1 from math import pi, factorial, log10 # we'll use the functions directly
2
3 print(pi) # it also contains several arithmetic constants
4 print(factorial(4)) # gives the value of 4!
5 print(log10(1000)) # prints the common logarithm of 1000
```

```
1 3.141592653589793
2 24
3 3.0
```



Built-in Modules (string)

- ▶ `string` module is used for common string operations.
- ▶ **Task :**
 - ▶ Let's import `punctuation` and `digits` function from `string` module
 - ▶ Print the all *punctuation marks* and *digits chars* using these functions.



Built-in Modules

- ▶ The code block that you should type is as follows :

```
1 import string as stg # we've used alias for 'string' module
2
3 print(stg.punctuation) # prints all available punctuation marks
4 print(stg.digits) # prints all the digits
```

```
1 !"#$%&'()*+,-./:;<=>?@[\]^_`{|}~
2 0123456789
```



Built-in Modules (datetime)

- ▶ `datetime` is commonly used when working with date and time types.
- ▶ **Task :**
 - ▶ Let's import `today` function from `date` object and `now` function from `datetime` object all from `datetime` module,
 - ▶ Print the current ***date*** (yyyy-mm-dd) and ***time*** using these functions.



Built-in Modules

- ▶ The syntax of importing modules and calling functions are as follows :

```
1 import datetime
2
3 print(datetime.date.today()) # prints today's date (yyyy-mm-dd)
4 print(datetime.datetime.now()) # prints the current time in microseconds
```

```
1 2019-12-31
2 2019-12-31 15:03:31.303994
```

A sample output



Built-in Modules

- ▶ **Task** : Using `datetime` module, write a program to calculate the following.
 - ▷ According to the general acceptance, the Prophet Muhammad was born on **22th April 571** AD, and died on **8th June 632** AD.
 - ▷ How many days have he lived in his life?



Built-in Modules

- ▶ The code and the output should be as follows :

Creating **date**
object

```
1 from datetime import date
2 birth = date(571, 4, 22)
3 death = date(632, 6, 8)
4 life_day = (death - birth).days
5 print(life_day)
```

Output

22327

Converting **date** to day format (Between **-999999999** and **999999999** inclusive)



Built-in Modules (calendar)

- ▶ `calendar` is module allows you to output calendars like the Unix `cal` program, and provides additional useful functions related to the calendar.
- ▶ By default, these calendars have Monday as the first day of the week, and Sunday as the last (the European convention).

▶ Task :

- ▶ Let's use the `calendar` module to get the following output.

2023											
January				February				March			
Mo	Tu	We	Th	Fr	Sa	Su		Mo	Tu	We	Th
						1					1
2	3	4	5	6	7	8		1	2	3	4
9	10	11	12	13	14	15		6	7	8	9
16	17	18	19	20	21	22		13	14	15	16
23	24	25	26	27	28	29		20	21	22	23
30	31							27	28	29	30
April				May				June			
Mo	Tu	We	Th	Fr	Sa	Su		Mo	Tu	We	Th
						1					1
3	4	5	6	7	8	9		1	2	3	4
10	11	12	13	14	15	16		5	6	7	8
17	18	19	20	21	22	23		12	13	14	15
24	25	26	27	28	29	30		19	20	21	22
								26	27	28	29
July				August				September			
Mo	Tu	We	Th	Fr	Sa	Su		Mo	Tu	We	Th
						1					1
3	4	5	6	7	8	9		4	5	6	7
10	11	12	13	14	15	16		11	12	13	14
17	18	19	20	21	22	23		18	19	20	21
24	25	26	27	28	29	30		25	26	27	28
31											
October				November				December			
Mo	Tu	We	Th	Fr	Sa	Su		Mo	Tu	We	Th
						1					1
2	3	4	5	6	7	8		4	5	6	7
9	10	11	12	13	14	15		11	12	13	14
16	17	18	19	20	21	22		18	19	20	21
23	24	25	26	27	28	29		25	26	27	28
30	31										



Built-in Modules

- `prcal()` method: Prints the calendar for an entire year as returned by `calendar()`

```
import calendar
```

```
print(calendar.prcal(2023))
```

2023

January							February							March						
Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su
						1						1	2	3	4	5				
2	3	4	5	6	7	8	6	7	8	9	10	11	12	6	7	8	9	10	11	12
9	10	11	12	13	14	15	13	14	15	16	17	18	19	13	14	15	16	17	18	19
16	17	18	19	20	21	22	20	21	22	23	24	25	26	20	21	22	23	24	25	26
23	24	25	26	27	28	29	27	28						27	28	29	30	31		
30	31																			

April							May							June								
Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su		
						1						1	2	3					1	2	3	4
3	4	5	6	7	8	9	8	9	10	11	12	13	14	5	6	7	8	9	10	11		
10	11	12	13	14	15	16	15	16	17	18	19	20	21	12	13	14	15	16	17	18		
17	18	19	20	21	22	23	22	23	24	25	26	27	28	19	20	21	22	23	24	25		
24	25	26	27	28	29	30	29	30	31					26	27	28	29	30				

July							August							September							
Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	
						1						1	2	3					1	2	3
3	4	5	6	7	8	9	7	8	9	10	11	12	13	4	5	6	7	8	9	10	
10	11	12	13	14	15	16	14	15	16	17	18	19	20	11	12	13	14	15	16	17	
17	18	19	20	21	22	23	21	22	23	24	25	26	27	18	19	20	21	22	23	24	
24	25	26	27	28	29	30	28	29	30	31				25	26	27	28	29	30		
31																					

October							November							December							
Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	
						1						1	2	3					1	2	3
2	3	4	5	6	7	8	6	7	8	9	10	11	12	4	5	6	7	8	9	10	
9	10	11	12	13	14	15	13	14	15	16	17	18	19	11	12	13	14	15	16	17	
16	17	18	19	20	21	22	20	21	22	23	24	25	26	18	19	20	21	22	23	24	
23	24	25	26	27	28	29	27	28	29	30				25	26	27	28	29	30	31	
30	31																				

Discuss! How to bring only October!

<https://docs.python.org/3/library/calendar.html#module-calendar>



Built-in Modules



► Task :

- ▷ Find out if a given year is a "leap" year.
- ▷ Use calendar module and **isleap()** methods

<https://www.calendar.best/leap-years.html>



Built-in Modules

- ▶ The code and the output should be as follows :

```
1  import calendar
2  def yeap_year(year):
3      |   return calendar.isleap(year)
4
5  # main program
6  year = int(input("Year..: "))
7  if yeap_year(year):
8      |   print(f"{year} is a leap year")
9  else:
10     |   print(f"{year} is not a leap year")
```

```
Year..: 2044
2044 is a leap year
```



Built-in Modules (random)

- ▶ `random` is a module that contains functions that allow us to select randomly from various data types.
- ▶ **Task :**
 - ▶ Let's import `choice` function from `random` module,
 - ▶ Print one of the element of the following `list` randomly.

```
1 | city = ['Stockholm', 'Istanbul', 'Seul', 'Cape Town']  
2 |
```



Built-in Modules

- ▶ The code and the output should be as follows :

```
1 from random import choice
2
3 city = ['Stockholm', 'Istanbul', 'Seul', 'Cape Town']
4 print(choice(city))
```

```
1 Istanbul
```



Built-in Modules

- ▶ `random` is a module that contains functions that allow us to select randomly from various data types.
- ▶ **Task :**
 - ▶ Let's import `sample` function from `random` module,
 - ▶ Let's randomly select six items from a list of numbers between 1-50.



Built-in Modules

- ▶ The code and the output should be as follows :

```
1 from random import sample
2 lotto = [i for i in range(1, 50)]
3 print(sample(lotto, 6))
```

out

```
[9, 22, 8, 20, 28, 3]
```



THANKS!

Any questions?

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