Modules in Python

Aka libraries in C++.

The build-in module is "Python standard library". Just like libraries in C++, there exists a LOT of modules in Python, much more than C++.

```
import math
import sys # https://docs.python.org/3/library/sys.html
```

and the code below is identical to the one above

```
import math, sys
```

Namespace (Namespace - Wikipedia):

A namespace is a space (understood in a non-physical context) in which some names exist and the names don't conflict with each other. Inside each namespace, each name must remain **unique**. If the module is valid (exists and accessible), Python imports its contents, all the names defined in the module become known, but they don't enter the code's namespace.

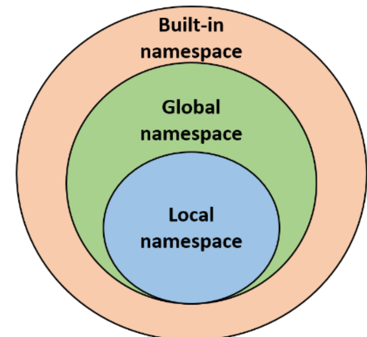


Photo: Geeks for geeks

This program shows that two namespaces (local and math module) can coexist.

```
import math
pi = 3.14
print(math.pi) # this is pi from the math module
print(pi) # this is local variable pi
# output:
# 3.141592653589793
# 3.14
```

This imports the name / list (if there are more than one argument) into the namespace. The names of the imported entities are accessible without qualification.

```
from math import pi
print(pi) # 3.141592653589793
```

Multiple names imported

```
from math import sin, pi
print(sin(pi / 2)) # 1.0
```

The imported names supersede the local ones.

```
pi = 3.14
def sin(x):
    if 2 * x == pi:
        return 0.99999999
    else:
        return None

print(sin(pi / 2)) # local variables and functions, output: 0.99999999

from math import sin, pi
print(sin(pi / 2)) # imported names, output: 1.0
```

This imports all entities from the indicated module

```
from math import *
```

This may not be able to avoid name conflicts

Import a module: the "as" keyword (it can be anything you'd like)

```
import math as sth
print(sth.pi) # 3.141592653589793
```

However, after successful execution of an aliased import, the original module name becomes inaccessible and must not be used.

```
from module import name as
```

```
from math import pi as PI, sin as sine
print(sine(PI/2)) # 1.0
```

WAIIIIIIIIIIIIIIT,
does this also mean that I can import from my own codes?
YES!!

```
from testing_2 import hello_world
hello_world(2)
# Hello World
# Hello World
```

Where testing_2.py is created within the same directory, its program is as followed.

```
def hello_world (n: int):
    for i in range(n):
        print("Hello World")
```

We will dig deeper into this in "Packages in Python".

The `dir()` function
This function returns an alphabetically sorted list containing all the entities' names in the module.

```
import math
for name in dir(math):
    print(name, end = " ")
# __doc__ __loader__ __name__ __package__ __spec__ acos acosh
# asin asinh atan atan2 atanh ceil comb copysign cos cosh
# degrees dist e erf erfc exp expm1 fabs factorial floor
# fmod frexp fsum gamma gcd hypot inf isclose isfinite
# isinf isnan isqrt lcm ldexp lgamma log log10 log1p
# log2 modf nan nextafter perm pi pow prod radians
# remainder sin sinh sqrt tan tanh tau trunc ulp
```

Math module was briefly introduced before, another one worth mentioning is random

It delivers some mechanisms allowing people to operate with pseudorandom numbers, pseudo- means fake.
So, how are "random" numbers generated? They are all calculated using very refined algorithms, they are deterministic and predictable.

A random number generator tasks a value “seed”, calculates the next “random” value and replace it as the “seed” value.
So, this is a cycle after all? The answer is positive, but it may be very long.
But how is the initial “seed” value decided? It is augmented by setting the seed with a number taken from the current time.

```
#include <bits/stdc++.h>
using namespace std;

int main () {
    srand(time(NULL));
    cout << RAND_MAX << "\n";
    cout << rand() << '\n';
}
```

Here is a simple C++ sample of random number generator, the 4th line resets the seed value (as C++ doesn’t reset it automatically).

The seed() function allows the programmer to reset the seed, either to an integer value, or to the current time.

```
from random import random, seed
seed(0) # sets seed to 0
seed() # sets seed to current time
for i in range(5):
    print(random())
```

Random integers (right-sided exclusion)

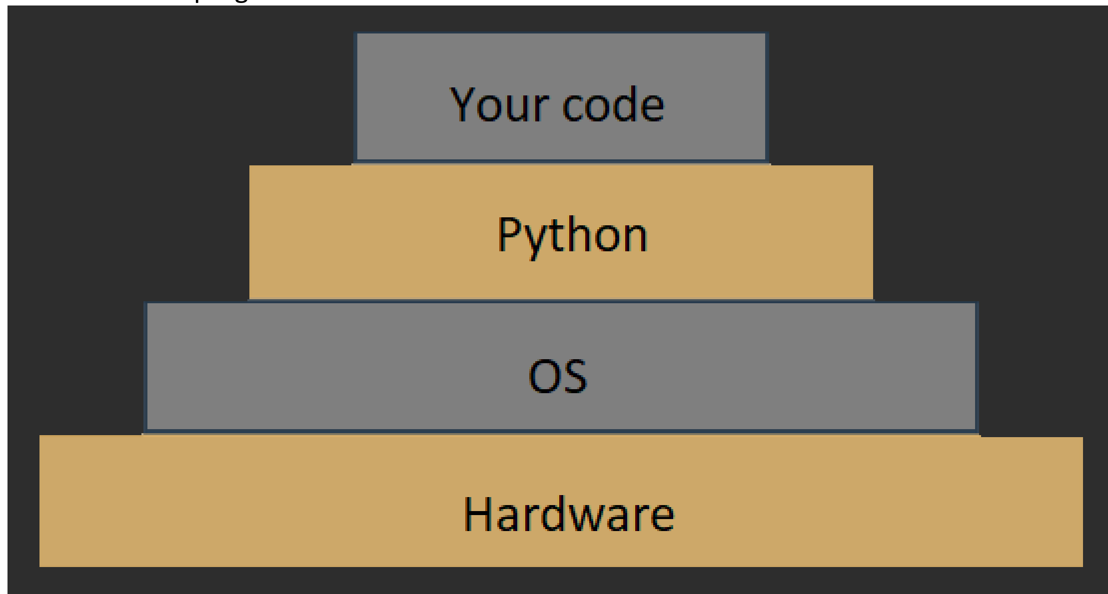
```
from random import randrange, randint
print(randrange(5), end=' ') # randrange(end)
print(randrange(0, 1), end=' ') # randrange(begin, end)
print(randrange(0, 5, 2), end=' ') # randrange(begin, end, step)
print(randint(0, 1)) # randint(left, right)
```

What about choosing from a list?

```
from random import choice, sample
my_list = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
print(choice(my_list)) # choose a random element
# output: 7
print(sample(my_list, 5)) # choose 5 elements randomly
# output: [5, 2, 3, 9, 10]
print(sample(my_list, 10)) # choose 10, all
# output: [6, 9, 3, 4, 2, 10, 7, 1, 8, 5]
# samples may not be sorted
```

Obviously, as the sample() and choice() functions work on random algorithms, the printed result may not be the same.

Unrelated to Python:
Location of the programme.



Platform module

```
from platform import platform
```

Platform, it lets the user access the underlying platform's data, as described above, hardware, operating system, and interpreter version information.

The **platform()** function within the platform module returns a string describing the environment, its output is addresses to humans rather than automated processing.

```
platform(aliased = False, terse = False)
```

Aliased, when set to True, it may cause the function to present the alternative underlying layer names instead of the common ones.
Terse, when set to True, it may convince the function to present a briefer from of the result, if possible (like in the case below)

```
from platform import platform
print(platform()) # Windows-10-10.0.19043-SP0
print(platform(False, True)) # Windows-10
print(platform(True, False)) # Windows-10-10.0.19043-SP0
print(platform(True, True)) # Windows-10
```

Sometimes Terse is not possible, like the case below

```
from platform import platform
print(platform()) # Linux-5.13.0-1017-aws-x86_64-with-glibc2.29
print(platform(False, True)) # Linux-5.13.0-1017-aws-x86_64-with-
glibc2.29
print(platform(True, False)) # Linux-5.13.0-1017-aws-x86_64-with-
glibc2.29
print(platform(True, True)) # Linux-5.13.0-1017-aws-x86_64-with-
glibc2.29
```

The **machine()** function returns a string about the generic name of the processor which runs you OS together with Python.

```python
from platform import machine
print(machine()) # AMD64
```

It differs by machines

```python
from platform import machine
print(machine()) # x86_64
```

The **processor()** function returns a string about the real processor name (if possible)

```python
from platform import processor
print(processor()) # Intel64 Family 6 Model 158 Stepping 11,
GenuineIntel
```

The **system()** function returns a string about the operating system

```python
from platform import system
print(system()) # Linux
```

```python
from platform import system
print(system()) # Windows
```

The **version()** function returns the OS version

```python
from platform import version
print(version()) # #242-Ubuntu SMP Fri Apr 16 09:57:56 UTC 2021
```

```python
from platform import version
print(version()) # 10.0.19043
```

The **python_implementation()** and **python_version_tuple()** functions. The former one returns a string of the Python implementation (expect "CPython" here). The later one returns a three-element tuple, the **major** part of Python's version, the **minor** part and the **patch** level number

```python
from platform import python_implementation, python_version_tuple
print(python_implementation()) # Cpython
for atr in python_version_tuple():
    print(atr)
# 3
# 7
# 10
```

You can read about all the standard Python modules here:
[Python Module Index — Python 3.10.4 documentation]()