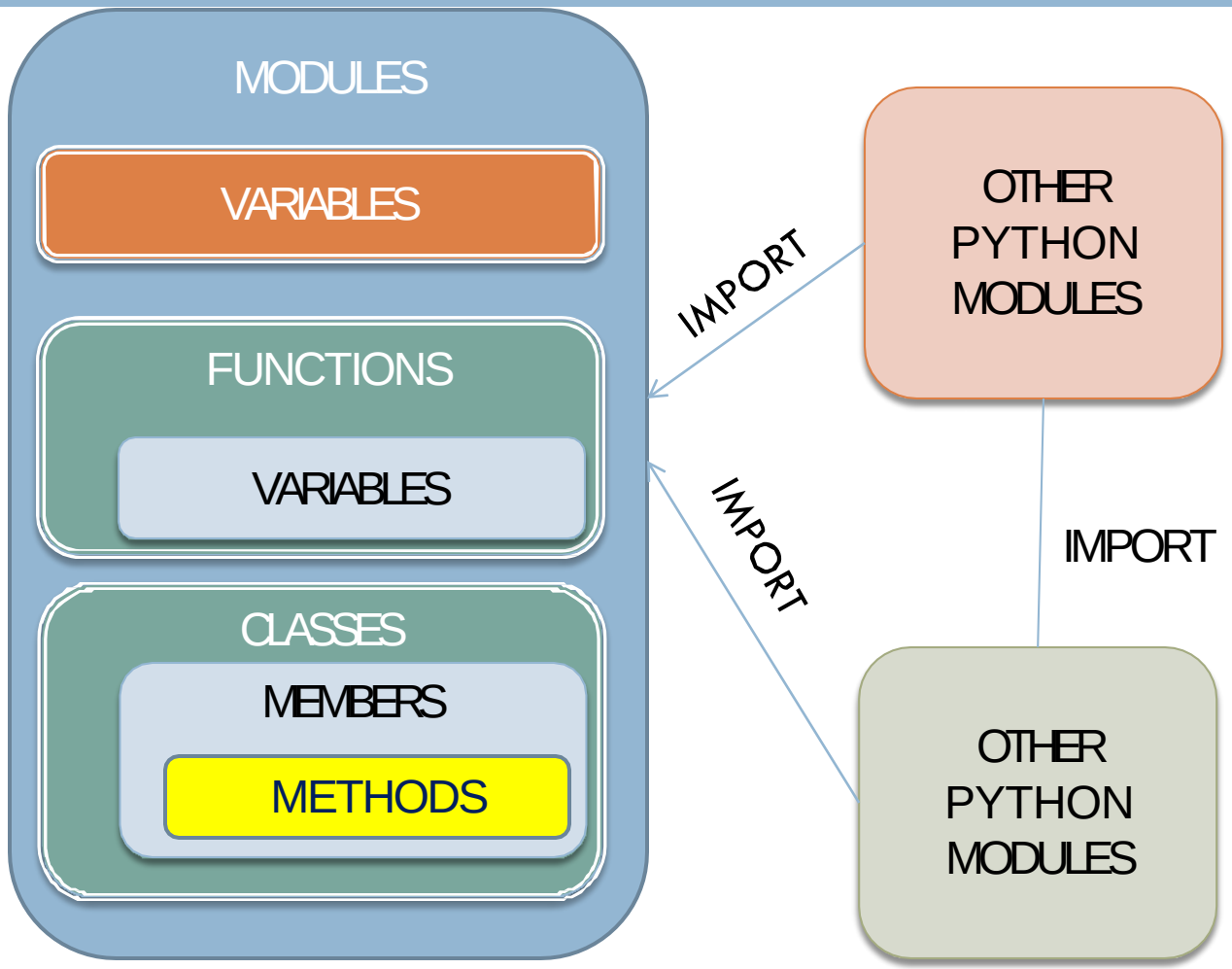
PYTHON MODULES

What is Python Module

- A Module is a file containing Python definitions (docstrings) , functions, variables, classes and statements.
- Act of partitioning a program into individual components(modules) is called modularity. A module is a separate unit in itself.
  - It reduces its complexity to some degree
  - It creates numbers of well-defined, documented boundaries within program.
  - Its contents can be reused in other program, without having to rewrite or recreate them.

Composition/Structure of python module



Importing Python modules

- To import entire module
  - **import <module name>**
  - **Example: import math**
- To import specific function/object from module:
  - **from <module_name> import <function_name>**
  - **Example: from math import sqrt**
- **import *** : can be used to import all names from module into current calling module

Accessing function/constant of imported module

- To use function/constant/variable of imported module we have to specify module name and function name separated by dot(.). This format is known as dot notation.
  - **<module_name>.<function_name>**
  - **Example: print(math.sqrt(25))**
- How ever if only particular function is imported using **from** then module name before function name is not required. We will se examples with next slides.

Types of Modules

- There are various in-built module in python, we will discuss few of them
  - Math module
  - Random module
  - Statistical module

Math module

- This module provides various function to perform arithmetic operations.
- Example of functions in math modules are:

sqrt	ceil	floor	pow
fabs	sin	cos	tan

- Example of variables in math modules are:
  - pi
  - e

Math module functions

- **sqrt(x) :** this function returns the square root of number(x).

```
>>> import math
>>> print(math.sqrt(49))
7.0
```

module name is required before function name here

- **pow(x,y) :** this function returns the $(x)^y$

```
>>> from math import pow
>>> print(pow(2,6))
64.0
```

module name is not required before function name here

- **ceil (x) :** this function return the x rounded to next integer.

```
>>> import math
>>> print(math.ceil(45.25))
46
```

Math module functions

- **floor(x) :** this function returns the x rounded to previous integer.

```
>>> import math
>>> print(math.floor(5.9))
5
```

- **fabs(x) :** this function returns absolute value of float x. absolute value means number without any sign

```
>>> import math
>>> a=-8.5
>>> print(math.fabs(a))
8.5
```

- **sin (x) :** it return sine of x (measured in radian)

```
>>> import math
>>> print(math.sin(30))
-0.9880316240928618
```

```
>>> import math
>>> print(math.sin(30*math.pi/180))
0.49999999999999994
```

```
>>> import math
>>> print(round(math.sin(30*math.pi/180),1))
0.5
```

RANDOM MODULE

random() function

- It is floating point random number generator between 0.0 to 1.0. here lower limit is inclusive where as upper limit is less than 1.0.
- 0<=N<1
- Examples:

```
>>> import random
>>> a = random.random()
>>> print(a)
0.0888880146536
>>>
```

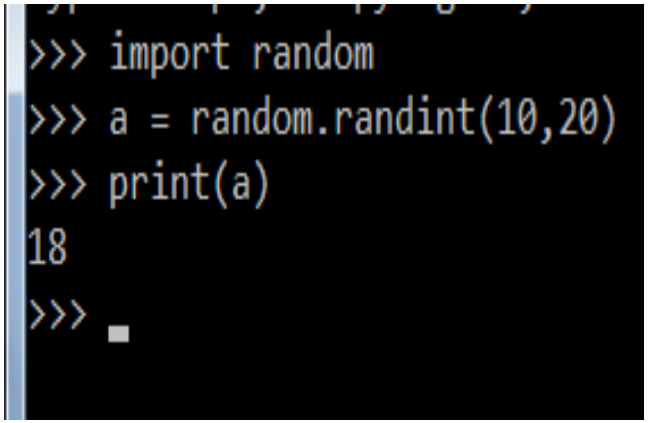
Output is less than 1

random() function

- To generate random number between given range of values using random(), the following format should be used:
  - Lower_range + random() * (upper_range-lower_range)
  - For example to generate number between 10 to 50:
    - 10 + random() * (40)

randint() function

- Another way to generate random number is randint() function, but it generate integer numbers.
- Both the given range values are inclusive i.e. if we generate random number as :
  - randint(20,70)
    - In above example random number between 20 to 70 will be taken. (including 20 and 70 also)



randrange() function

```
import random
for i in range(20):
            n1 = random.randrange(1,30,2)
            print(n1, end='\t')
```

It will generate random number between 1 to 29 with stepping of 2 i.e. it will generate number with gap of 2 i.e. 1,3,5,7 and so on

```
25      11      15      9       3       7       19      13      17      7
27      11      27      5       21      7       17      9       25      7
```

STATISTICAL MODULE

Statistical Module

- This module provides functions for calculating mathematical statistics of numeric (Real-valued) data.
- We will deal with 3 basic function under this module
  - Mean
  - Median
  - mode

Mean

- The mean is the average of all numbers and is sometimes called the arithmetic mean.

```
>>> import statistics
>>> mynum = [10,20,30,40,50,60,70,80,90,100]
>>> mymean = statistics.mean(mynum)
>>> print(mymean)
55
```

55, is the average of all numbers in the list

Median

- The median is the middle number in a group of numbers.

```
>>> import statistics
>>> mynum = [10,20,30,40,50,60,70,80,90]
>>> mymedian = statistics.median(mynum)
>>> print(mymedian)
50
```

With odd number of elements it will simply return the middle position value

```
>>> import statistics
>>> mynum = [10,20,30,40,50,60,70,80,90,100]
>>> mymedian = statistics.median(mynum)
>>> print(mymedian)
55.0
```

With even number of elements, it will return the average of value at mid + mid-1 i.e. (50+60)/2 = 55.0

Mode

- The mode is the number that occurs most often within a set of numbers i.e. most common data in list.

```
>>> import statistics
>>> mynum = [10,20,10,40,20,10,70,80,90]
>>> mymode = statistics.mode(mynum)
>>> print(mymode)
10
```

Here, 10 occurs most in the list.