Python: programming language

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Textbooks

- “Python 3” from tutorialspoint.com, 2016.
- “Çocuklar için Uygulamalarla Python” from Ahmet Aksoy (abaküs), 2018.

History

- Python was developed by Guido van Rossum in the late eighties and early nineties at the National Research Institute for Mathematics and Computer Science in the Netherlands.
- Python 1.0 (November 1994), Python 2.0 (2000), Python 3 (2008).
- Latest versions: Python 2.7.16, Python 3.7.3.
- Python 3 has no backward compatibity to Python 2.

Some differences between Phython 2 and Python 3

- Printing with use of parantheses

```
print "Hello World"      #is acceptable in Python 2
print("Hello World")     # in Python 3, print must be followed by ()
```

- Printing with no line-feeding

```
print x,      # Trailing comma suppresses newline in Python 2
print(x,end=" ")     # Appends a space instead of a newline in Python 3
```

Features

- Easy-to-learn
- Easy-to-read
- Easy-to-maintain
- A broad standard library
- Interactive Mode
- Portable
- Extendable
- Databases
- GUI Programming
- Scalable

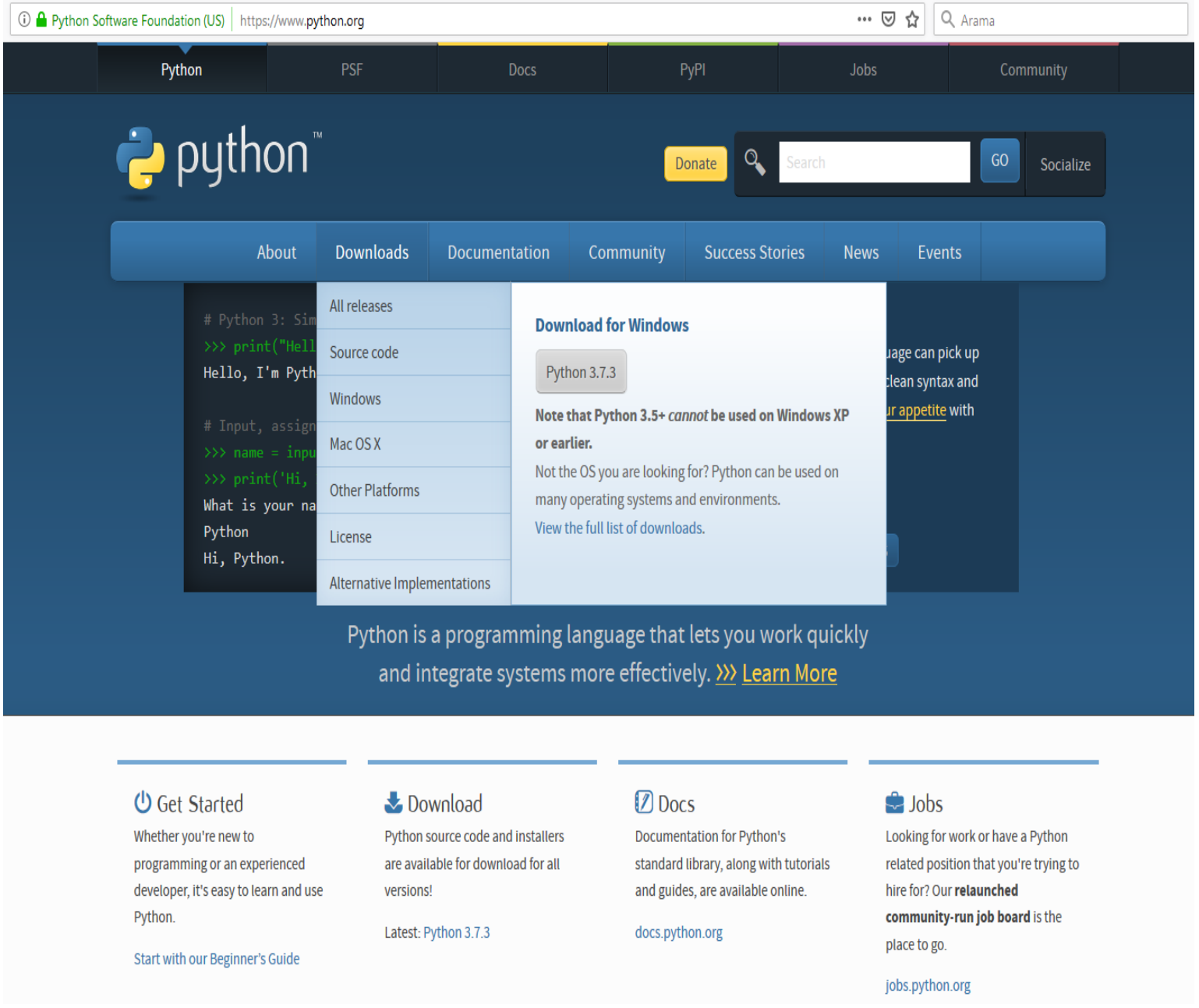
Why we should prefer

- It supports functional and structured programming methods as well as OOP.
- It can be used as a scripting language or can be compiled to byte-code for building large applications.
- It provides very high-level dynamic data types and supports dynamic type checking.
- It supports automatic garbage collection.
- It can be easily integrated with C, C++, COM, ActiveX, CORBA, and Java.

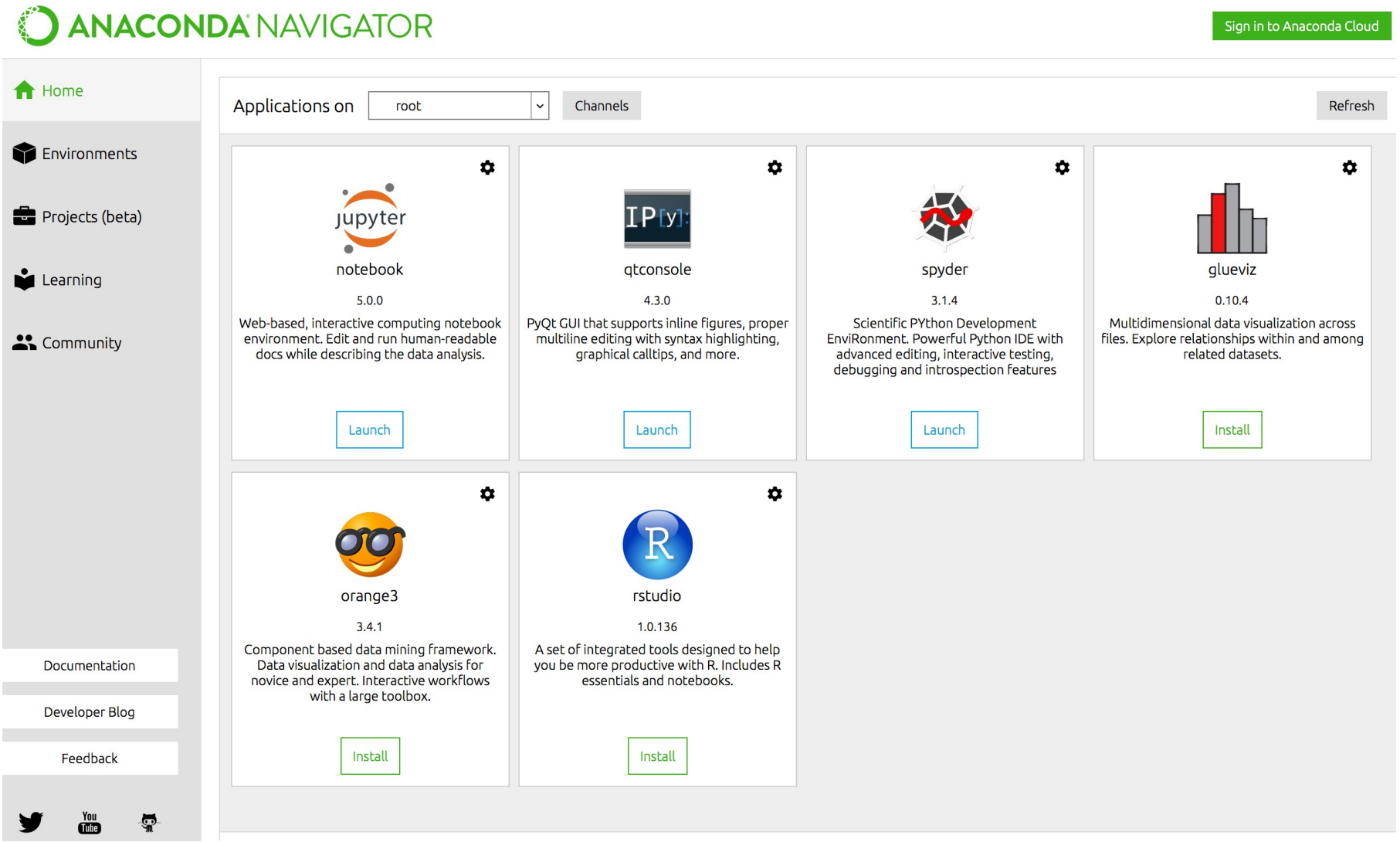
Applications

- Basic arithmetic calculations
- Complex calculations, problem solving
- Scientific computing, Statistics
- Artificial intelligence, Machine learning, Deep learning
- Desktop applications
- Web applications
- Mobile applications
- Database applications
- Game development
- Electronic board programming (Raspberry PI, Arduino, ...)

Download: www.python.org



Anaconda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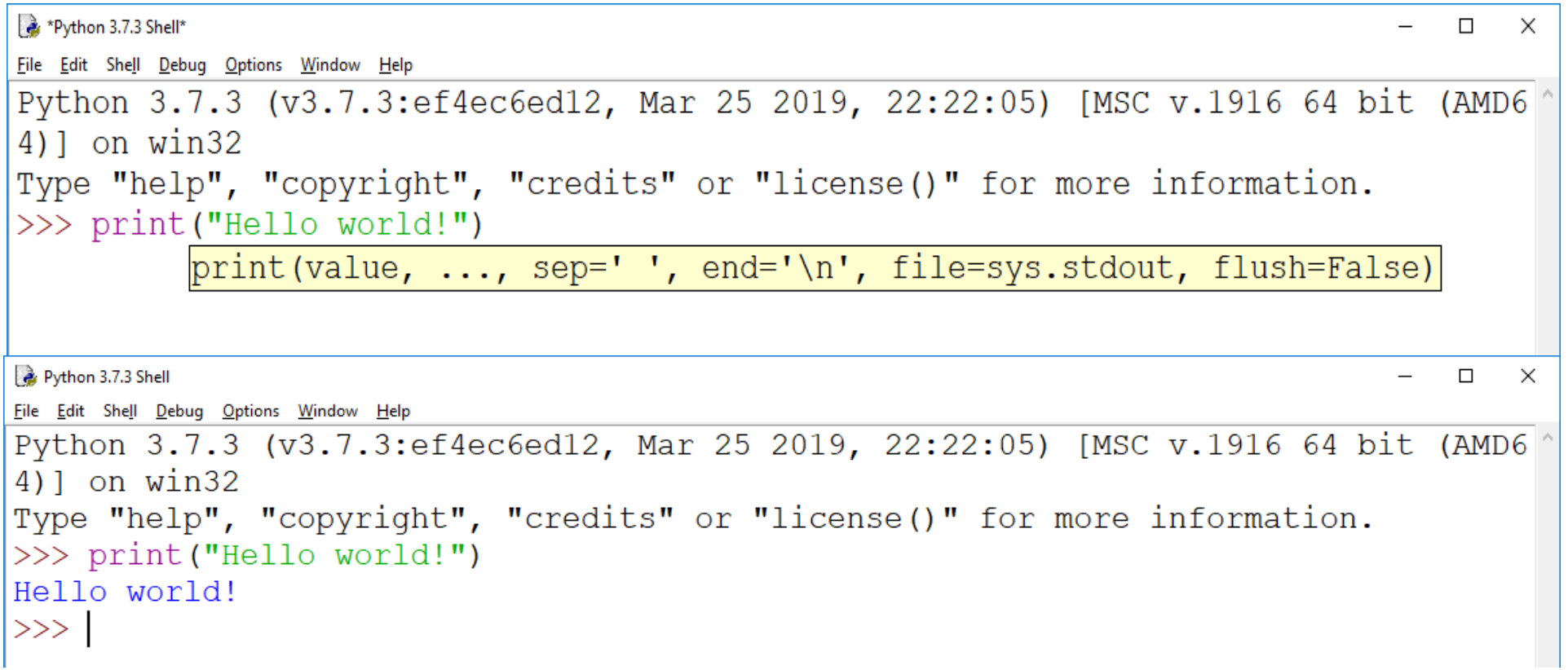
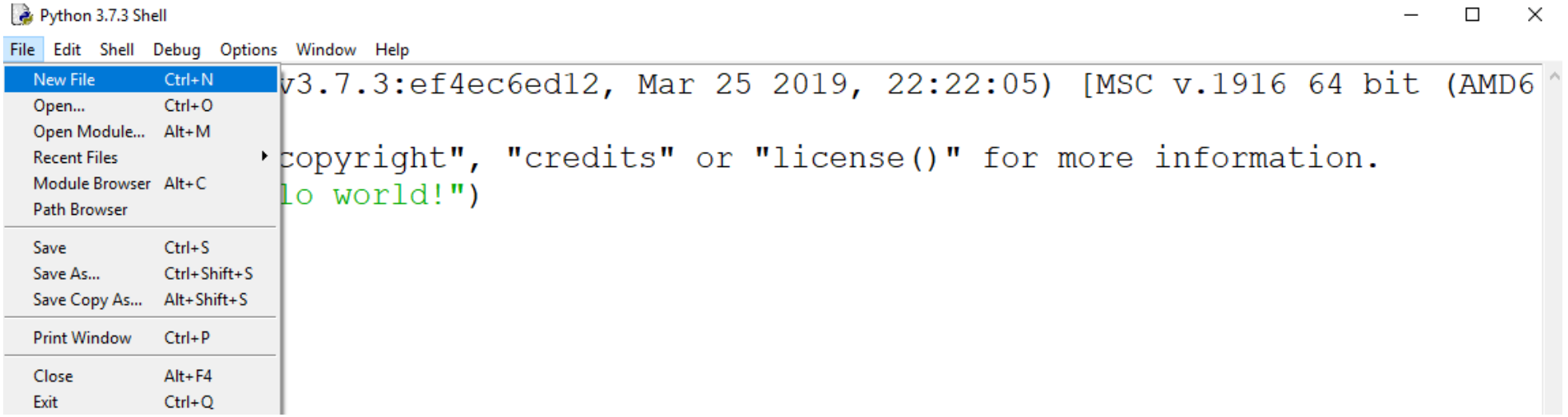
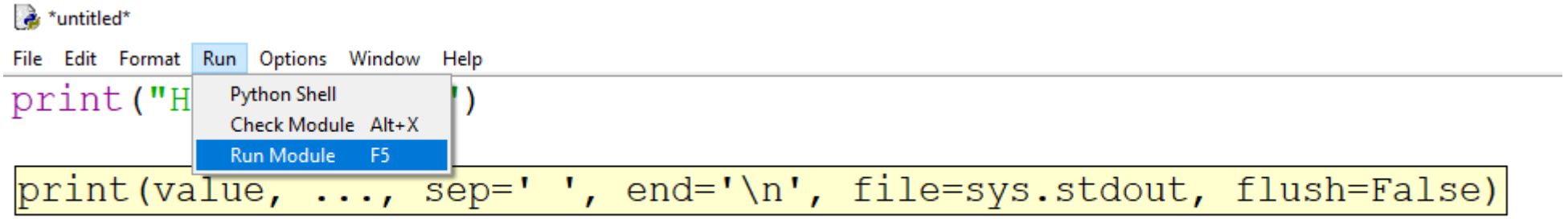
Interactive mode programming: python



If you are running the older version of Python (Python 2.x), use of parenthesis as in print function is optional.

Script mode programming: IDLE





- python say_hello.py

Linux trick:

- Assuming that you have Python interpreter available in the /usr/bin directory. Now, try to run this program as follows:
- # This is to make file executable:

$ chmod +x say_hello.py

$ ./say_hello.py

- This produces the following result:

Hello, Python!

Identifiers

- An identifier is a name used to identify a variable, function, class, module or other Python object. An identifier starts with a letter A to Z or a to z or an underscore (_) followed by zero or more letters, underscores and digits (0 to 9).
- Python does not allow punctuation characters such as @, $, and % within identifiers.
- Python is a case sensitive programming language. Thus, x and X are different in Python.

Naming convention

- Class names start with an uppercase letter. All other identifiers start with a lowercase letter.
- Starting an identifier with a single leading underscore indicates that the identifier is private.
- Starting an identifier with two leading underscores indicates a strong private identifier.
- If the identifier also ends with two trailing underscores, the identifier is a language-defined special name.

Identation & blocks

- No braces “ { and } “ to indicate blocks of code and definitions or flow control.
- Similarly no Begin and End.
- The number of spaces in the indentation is variable, but all statements within the same block must be indented the same amount.

Identation examples

```
if True:
    print ("True")
else:
    print ("False")
```

```
if True:
    print ("True")
else:
  print ("False")
```

```
if True:
    print ("Answer")
    print ("True")
else:
    print "(Answer")
  print ("False")
```

Multi-line statements

- Statements in Python typically end with a new line. Python, however, allows the use of the line continuation character (\) to denote that the line should continue.
- The statements contained within the [ ], { }, or () brackets do not need to use the line continuation character.

- total = item_1 + \
  item_2 + \ item_3
- days = ['Monday',
  'Tuesday',
  'Wednesday',
  'Thursday', 'Friday']

Quotations

- Python accepts single ('), double (") and triple ''' or """) quotes to denote string literals, as long as the same type of quote starts and ends the string.
- The triple quotes are used to span the string across multiple lines.

- word = 'word'
- sentence = "This is a sentence."
- paragraph = """This is a paragraph. It is made up of multiple lines and sentences."""

Commenting

- A hash sign (#) that is not inside a string literalis the beginning of a comment. All characters after the #,up to the end of the physical line,are part of the comment and the Python interpreter ignores them:

```
# First comment
print("Hello, Python!") # second comment
url ="www.islerya.com" # This is again comment
```

- Python does not have multiple-line commenting feature :(. You have to comment each line individually:

```
# This is a comment.
# This is a comment, too.
# This is a comment, too.
# I said that already.
```

Blank lines

- A line containing only whitespace, possibly with a comment, is known as a blank line and Python totally ignores it.
- In an interactive interpreter session, you must enter an empty physical line to terminate a multiline statement.

User input, semicolon

- Displaying “Press the enter key to exit”, and then waits for the user to take action:

```
#!/usr/bin/python3

input("\n\nPress the enter key to exit.")
```

- Here, "\n\n" is used to create two new lines before displaying the actual line. Once the user presses the key, the program ends. This is a nice trick to keep a console window open until the user is done with an application.

- The semicolon (;) allows multiple statements on a single line given that no statement starts a new code block:

```
import sys; x ='foo'

sys.stdout.write(x +'\n')
```

Assigning values

```
counter =100 # integer
miles   =1000.0 # float
name    ="Yalcin" # string
print(counter)
print(miles)
print(name)
del name
```

```
a =b =c =1
```

- Here, an integer object is created with the value 1, and all the three variables are assigned to the same memory location.

```
a,b,c =1,2,"Yalcin"
```

- Here, two integer objects with values 1 and 2 are assigned to the variables a and b respectively,and one string object with the value "Yalcin" is assigned to the variable c.

Numbers and strings

```
>>> Var1 = 10 #integer
>>> Var2 = 10.0 #float
>>> Var3 = 2+3j #complex
>>> print(Var1)
10
>>> print(Var2)
10.0
>>> print(Var3)
(2+3j)
```

```
>>> str ='Hello World!'
>>> print(str)
Hello World!
>>> print(str[0])
H
>>> print(str[2:5])
llo
>>> print(str[2:])
llo World!
>>> print(str*2)
Hello World!Hello World!
>>> print("Yalcin said '"+str+"'")
Yalcin said 'Hello World!'
>>>
```

Lists

```
list = [ 'abcd', 786 , 2.23, 'yalcin', 70.2 ]
tinylist = [123, 'isler']
print (list)     # Prints complete list
print (list[0]) # Prints first element of the list
print (list[1:3])  # Prints elements starting from 2nd till 3rd
print (list[2:])   # Prints elements starting from 3rd element
print (tinylist * 2)  # Prints list two times
print (list + tinylist) # Prints concatenated lists
```

```
Hello world!
['abcd', 786, 2.23, 'yalcin', 70.2]
abcd
[786, 2.23]
[2.23, 'yalcin', 70.2]
[123, 'isler', 123, 'isler']
['abcd', 786, 2.23, 'yalcin', 70.2, 123, 'isler']
```

Dictionaries

```
>>> tinydict ={'name':'YALCIN','code':1234,'dept':'BIOMEDICAL'}
>>> print(tinydict)
{'name': 'YALCIN', 'code': 1234, 'dept': 'BIOMEDICAL'}
>>> print(tinydict.keys())
dict_keys(['name', 'code', 'dept'])
>>> print(tinydict.values())
dict_values(['YALCIN', 1234, 'BIOMEDICAL'])
>>> print(tinydict['name'])
YALCIN
```

- Dictionaries are enclosed by curly braces { } and values can be assigned and accessed using square braces [ ]

Arithmetic & Comparison operators

- addition + subtraction - multiplication * division / modulus % power ** floor division //

- equal == not equal != greater > less < greater-equal >= less-equal <=

Assignment & Bitwise & Logical operators

- = += -= *= /= %= **= //=

- And & Or | Ex-or ^
- Not (1’s complement) ~
- Shift-Left << Shift-Right >>

- X and Y X or Y not X