

### INTRODUCTION TO PYTHON PROGRAMMING

## UNIT III



### For loops

- A for loop is used for iterating over a particular sequence (can be a list, a tuple, a dictionary, a set, or a string).
- This is less like the for keyword in other programming languages
- Similar to an iterator method as found in other object-orientated programming languages.
- With the for loop a set of statements, once for each item in a list, tuple, set etc can be executed.
- Used for sequential traversal.



## A simple 'for' loop

### Syntax:

```
for iterator_var in sequence:
    statements(s)
```

#### Example 1:

```
n = 4
for i in range(0, n):
    print(i)
```

#### Example 2:

```
for i in [4, 3, 2, 1] :
    print(i)
print('stop!')
```

output: 0 1 2 3

output: 4 3 2 1 stop!



### Example 3

```
friends = ['Joseph', 'Glenn', 'Sally']
for friend in friends:
   print('Hello:', friend)
print('Done!')
Output:
Hello: Joseph
Hello: Glenn
Hello: Sally
```

Done!



### **Example 4**

```
fruits = ["apple", "banana", "cherry"]
for x in fruits:
    print(x)
```

### Loop through the letters in the word "banana":

```
for x in "banana":
  print(x)
```



### Nested Loops

Loops Inside Loops

A nested loop is a loop inside a loop.

The "inner loop" will be executed one time for each iteration of the "outer loop":

```
adj = ["red", "big", "tasty"]
fruits = ["apple", "banana", "cherry"]
for x in adj:
  for y in fruits:
    print(x, y)
```



### Nested Loops

Using the Nested Loops print the following pattern

#### 1.Decide the number of rows and columns

\*

<del>\*</del> \*

<del>\* \* \*</del>

<del>\* \* \* \*</del>

- 2.The outer loop tells us the number of rows, and the inner loop tells us the column needed to print the pattern.
- 3. Iterate rows

Next, write an outer loop to Iterate the number of rows using a for loop and range() function

Iterate columns

Next, write the inner loop or nested loop to handle the number of columns. The internal loop iteration depends on the values of the outer loop.

Print star or number
Use the print() function in each iteration of nested for loop to
display the symbol or number of a pattern (like a star (asterisk \*) or number).

Add new line after each iteration of outer loop

Add a new line using the print() function after each iteration of the outer loop so that the pattern display appropriately



## Nested Loops

Using the Nested Loops print the following pattern

```
*
*
*
*
*
*
*
*
*
*
```

```
rows = int(input('Enter the number of rows'))
# outer loop
for i in range(1,rows+1):
    # nested loop
    for j in range(1, i+1):
        # display number
        print('*', end=' ')
    # new line after each row
    print('')
```



### **Control Statements**

- Break
- Continue
- Pass



### Break Statement

The break statement is used to terminate the loop immediately when it is encountered.

The syntax of the break statement is

```
for val in sequence:
    # code
    if condition:
    break

# code

while condition:
    # code
    if condition:
    break

# code
```



### Break Statement

With the break statement we can stop the loop before it has looped through all the items:

```
fruits = ["apple", "banana", "cherry"]
for x in fruits:
 if x == "banana":
  break
 print(x)
fruits = ["apple", "banana", "cherry"]
for x in fruits:
 print(x)
 if x == "banana":
  break
```



### Break Statement

# program to find first 5 multiples of 6

```
i = 1
while i <= 10:
    print('6 * ',(i), '=',6 * i)

if i >= 5:
    break

i = i + 1
```



```
→ for val in sequence:
   # code
   if condition:
      continue
   # code
→ while condition:
   # code
    if condition:
      continue
   # code
```



### **Python continue Statement with for Loop**

We can use the continue statement with the for loop to skip the current iteration of the loop.

Then the control of the program jumps to the next iteration. For example,

```
for i in range(5):
    if i == 3:
        continue
    print(i)
```



### **Python continue Statement with While Loop**

We can use the continue statement with the While loop to skip the current iteration of the loop.

Then the control of the program jumps to the next iteration. For example,

```
num = 0
while num < 10:
   num += 1

if (num % 2) == 0:
   continue

print(num)</pre>
```



#### While Loop

```
i = 1
while i < 6:
    print(i)
    i += 1

1
2
3</pre>
```

```
i = 0
while i < 6:
    i += 1
    if i == 3:
        continue
    print(i)</pre>
```

#### for Loop

```
names = ["Arun", "Raju", "Charan"]
for x in names:
   print(x)
```

Arun Raju Charan

```
names = ["Arun", "Raju", "Charan"]
for x in names:
   if x == "Raju":
      continue
   print(x)
```

Arun Charan

### Pass Statement

- In Python programming, the pass statement is a null statement
- which can be used as a placeholder for future code.
- Suppose we have a loop or a function that is not
- implemented yet, but we want to implement it in the future.
- In such cases, we can use the pass statement.
- The syntax of the pass statement is: pass
- n = 10
- # use pass inside if statement
- if n > 10:
- pass
- print('Hello')



- Accessing Strings
- Basic Operations
- String slices
- Function and Methods



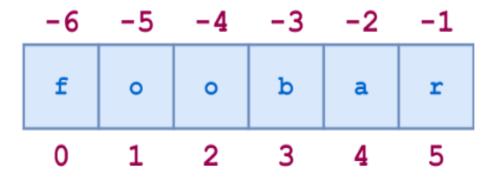
String Initialization
 a='Welcome, to RVCE!'
 b = "Welcome, to RVCE!"
 c="""Welcome,
 to RVCE!"""

Accessing characters in a string a[1]



- String Indexing
- Let us say we have word "foobar"

String indexing in Python is zero-based: the first character in the string has index 0, the next has index 1, and so on

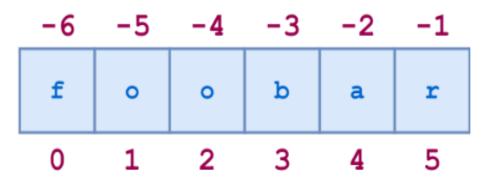


Positive and Negative String Indices



- The individual characters can be accessed by index as follows:
- >>> s = 'foobar'
- s[0]
- 'f'

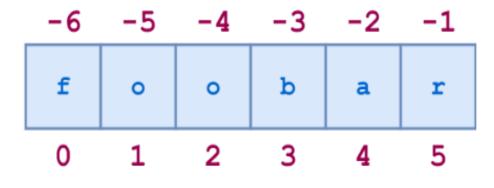
- 'o'
- s[-1]
- 'r'



Positive and Negative String Indices



- The individual characters can be accessed by index as follows:
- >>> s = 'foobar'
- >>> s[0]
- 'f'
- >>> s[1]
- 'o'
- >>> s[-1]
- 'r'



Positive and Negative String Indices



## String Slicing

- Python also allows a form of indexing syntax that extracts <u>substrings</u> from a string, known as **string slicing**.
- If s is a string, an expression of the form s[m:n] returns the portion of s starting with position m, and up to but not including position n:
- a='Welcome, to RVCE!'
- print(a)
- print(a[2:11])
- print(a[2:]) -- if you omit the second index as in s[n:], the slice extends from the first index through the end of the string.
- print(a[:3]) -- If you omit the first index, the slice starts at the beginning of the string. Thus, s[:m] and s[0:m] are equivalent



```
strip() -- removes whitespace from the beginning
or end
a = " Welcome, to RVCE! "
print(a.strip())
```

```
#The strip() method removes any whitespace from the beginning or the end:
a = " Welcome, to RVCE! "
print(a.strip()) # returns "Hello, World!"
print(a)
```

```
Welcome, to RVCE!
Welcome, to RVCE!
```



• len() -- returns the length of a string

a = " Welcome, to RVCE! "
print(len(a))

```
#The len() method returns the length of a string:
a='Welcome, to RVCE!'
print(len(a))
```

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- The split() method splits a string into a list.
- You can specify the separator, default separator is any whitespace.
- Syntax
- string.split('separator', maxsplit)

Parameter	Description
separator	Optional. Specifies the separator to use when splitting the string. By default any whitespace is a separator
maxsplit	Optional. Specifies how many splits to do.

• string.split ()



```
# Defining both Separator and MaxSplit
a = " Welcome, to, RVCE! "
print(a)
print(a.split(',',1))
#No Maxsplit is Specified
a = "Welcome,to, RVCE!"
print(a)
print(a.split(','))
#No Sepreator and Maxsplit are specified
a = "Welcome,to, RVCE!"
print(a)
print(a.split())
```



```
lower() -- returns the lower case of
the string
```

upper() -- returns the upper case
of the string

replace() -- returns the replaced
string

```
#The lower() method returns the string in lower case:
a='Welcome, to RVCE!'
print(a.lower())
```

welcome, to rvce!

```
#The upper() method returns the string in upper case:
a='Welcome, to RVCE!'
print(a.upper())
```

WELCOME, TO RVCE!

```
#The replace() method replaces a string with another string:
a='Welcome, to RVCE!'
print(a.replace("e", "i"))
```

Wilcomi, to RVCE!



- capitalize() Capitalizes first letter of string
- Eg: Syntax: string\_name.capitalize()
- Parameter: The capitalize() function does not takes any parameter.
- **Return:** The capitalize() function returns a string with the first character in the capital.
- Eg: name = "geeks FOR geeks" print(name.capitalize())

Output:

Geeks for geeks



- center(width, fillchar)
- Python String center() method creates and returns a new string that is padded with the specified character.
- Syntax: string.center(length[, fillchar])
- Parameters:
- length: length of the string after padding with the characters.
- fillchar: (optional) characters which need to be padded. If it's not provided, space is taken as the default argument.
- Returns: Returns a string padded with specified fillchar and it doesn't modify the original string.



- centre (width, fillchar)
- Python String center() method creates and returns a new string that is padded with the specified character.
- Syntax: string.center(length[, fillchar])
- string = "geeks for geeks"
- new\_string = string.center(24, '#')
- print(new\_string)

• If the length argument value is less than original String length, then the string is unchanged



- Count: The count() method returns the number of times a specified value appears in the string.
- Syntax
- string.count(value, start, end)

#### Parameter Values

Parameter	Description
value	Required. A String. The string to value to search for
start	Optional. An Integer. The position to start the search. Default is 0
end	Optional. An Integer. The position to end the search. Default is the end of the string



• txt = "I love apples, apple are my favorite fruit"

• x = txt.count("apple", 10, 24)

print(x)



#### endswith:

The endswith() method returns True if a string ends with the specified suffix. If not, it returns False.

The syntax

str.endswith(suffix[, start[, end]])

**Example** 

message = 'Python is fun'

# check if the message ends with fun print(message.endswith('fun'))



- Find: The find() method returns the index of first occurrence of the substring (if found). If not found, it returns -1.
- The syntax of the find() method is:

str.find(sub[, start[, end]])

- The find() method takes maximum of three parameters:
- sub It is the substring to be searched in the str string.
- start and end (optional) The range str[start:end] within which substring is searched.
- Eg: message = 'Python is a fun programming language'
- # check the index of 'fun'
- print(message.find('fun'))
- # Output: 12



- <u>isalnum()</u>Returns true if string has at least 1 character and all characters are alphanumeric and false otherwise.
- # string contains either alphabet or number
- name1 = "Python3"
- print(name1.isalnum()) #True
- # string contains whitespace
- name2 = "Python 3"
- print(name2.isalnum()) #False
- isdigit() Returns true if string contains only digits and false otherwise.
- <u>islower()</u>Returns true if string has at least 1 cased character and all cased characters are in lowercase and false otherwise.
- <u>isspace()</u>Returns true if string contains only whitespace characters and false otherwise.



## String manipulation functions

- <u>isdigit()</u>Returns true if string contains only digits and false otherwise.
- Example:
- str1 = '342'
- print(str1.isdigit())
- str2 = 'python'
- print(str2.isdigit())
- # Output: True and False respectively



## String manipulation functions

- <u>islower()</u> The islower() method returns True if all alphabets in a string are lowercase alphabets. If the string contains at least one uppercase alphabet, it returns False
- s = 'this is good'
- print(s.islower())
- s = 'th!s is aLso g00d'
- print(s.islower())
- s = 'this is Not good'
- print(s.islower())



## String manipulation functions

- <u>isspace()</u>Returns true if string contains only whitespace characters and false otherwise.
- str1 = ' '
- print(str1.isspace())



#### String Formatting Operator

- %c for character
- %s for strings
- %d for numbers
- %x for hexadecimal numbers
- %f for floating point numbers

print('Joe stood up and %s to the crowd.' %'spoke')

print('There are %d dogs.' %4)

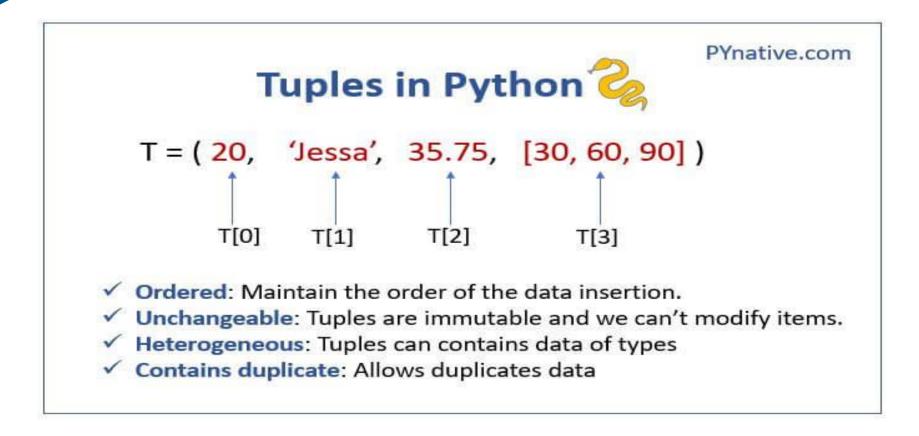


## Tuples in Python

- Tuples are ordered collections of heterogeneous data that are unchangeable. Heterogeneous means tuple can store variables of all types.
  - Tuple has the following characteristics
- Ordered: Tuples are part of sequence data types, which means they hold the order of the data insertion. It maintains the index value for each item.
- **Unchangeable**: Tuples are unchangeable, which means that we cannot add or delete items to the tuple after creation.
- Heterogeneous: Tuples are a sequence of data of different data types (like integer, float, list, string, etc;) and can be accessed through indexing and slicing.
- Contains Duplicates: Tuples can contain duplicates, which means they can have items with the same value



## Tuples in Python



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## Creating tuple

A tuple is created by placing all the items (elements) inside **parentheses** (), separated by commas. The parentheses are optional, however, it is a good practice to use them.

A tuple can have any number of items and they may be of different types (integer, float, list, string, etc.).

```
Eg : my_tuple = (1, "Hello", 3.4)
print(my_tuple)
```

In Python, creating a tuple with one element is a bit tricky. Having one element within parentheses is not enough.

We will need a trailing comma to indicate that it is a tuple,

```
var1 = ("Hello") # This is string
var2 = ("Hello",) # This is tuple
```



## Accessing Values in Tuple

 You can access tuple items by referring to the index number, inside square brackets:

- thistuple = ("apple", "banana", "cherry")
- print(thistuple[1])
- print(thistuple[-3])
- Print(thistuple[0:2])



## Updating values in Tuple

- Tuples are immutable which means you cannot update or change the values of tuple elements.
  - But there are some Hacks
- Add tuple to a tuple. You are allowed to add tuples to tuples, so if you
  want to add one item, (or many), create a new tuple with the item(s), and
  add it to the existing tuple:
- Example :

```
thistuple = ("apple", "banana", "cherry")
y = ("orange",)
thistuple += y
print(thistuple)
```



## Updating values in Tuple

```
#take portions of existing tuples to create new tuples
Tup1=('Amit', 'Anu', 'Akshay')
Tup2 = (1, 2, 3, 4, 5)
Tup3=Tup1+Tup2
print(Tup3)
```

('Amit', 'Anu', 'Akshay', 1, 2, 3, 4, 5)



#### Delete Tuple Elements

We will be using the operator called del

thistuple = ("apple", "banana", "cherry")
print(thistuple)
del thistuple # This deletes the tuple
print(thistuple)



### **Basic Tuples Operations**

Tuples respond to the + and \* operators much like strings; they mean concatenation and repetition here too, except that the result is a new tuple, not a string.

Python Expression	Results	Description	
len((1, 2, 3))	3	Length	
(1, 2, 3) + (4, 5, 6)	(1, 2, 3, 4, 5, 6)	Concatenation	
('Hi!',) * 4	('Hi!', 'Hi!', 'Hi!', 'Hi!')	Repetition	
3 in (1, 2, 3)	True	Membership	
for x in (1, 2, 3): print x,	123	Iteration	

#### **Example Code**

```
thistuple = ("apple", "banana", "cherry")
y = (1,2,3)
print(len(thistuple))
print (thistuple+y)
print(y*2)
print(2 in y)
for x in y:
    print(x)
```



#### **Basic Tuples Operations**

```
Tup1=('Amit', 'Anu', 'Akshay')
Tup2 = (1, 2, 3, 4, 5)
                                   ('Amit', 'Anu', 'Akshay', 1, 2, 3, 4, 5)
#Length
                                   (1, 2, 3, 4, 5, 1, 2, 3, 4, 5, 1, 2, 3, 4, 5)
print(len(Tup1))
print(len(Tup2))
                                   True
#Concatenation
                                   False
Tup3=Tup1+Tup2
                                   True
print(Tup3)
                                   Amit
#Repetition
print(Tup2*3)
                                   Anu
#Membership
                                   Akshay
print("Anu" in Tup3)
print("A" in Tup3)
print(5 in Tup2)
#iteration
for x in Tup3:
    print(x)
```



## Indexing, Slicing, and Matrixes

```
Tup = ("Apple", "Ball", "Camera", "Doll")
print(Tup[3])
print(Tup[-3])
print(Tup[1:])
print(Tup[:3])
```

```
Doll
Ball
('Ball', 'Camera', 'Doll')
('Apple', 'Ball', 'Camera')
```



# **Built-in Tuple Functions**

Sr.No.	Function with Description	Code			
1	<a href="mailto:cmp(tuple1, tuple2)">cmp(tuple1, tuple2)</a> Compares elements of both tuples.				
2	len(tuple) Gives the total length of the tuple.				
3	max(tuple) Returns item from the tuple with max value.				
4	min(tuple)Returns item from the tuple with min value.				
5	tuple(seq)Converts a list into tuple.				
<b>6</b> 12-08-2023	tuple(reversed(my_tuple))  Prof Somesh Nandi, Dept. of AIN	1L			



#### **Built-in Tuple Functions**

```
Tup1=('Amit', 'Anu', 'Akshay')
Tup2 = (1, 2, 3, 4, 5)
#print(cmp(Tup1,Tup2))
print(len(Tup1))
print(len(Tup2))
print(max(Tup1))
print(max(Tup2))
print(min(Tup1))
print(min(Tup2))
list=[1,2,3,'a']
lis=tuple(list)
print(lis)
```

```
3
5
Anu
5
Akshay
1
(1, 2, 3, 'a')
```



#### Lists in Python

- Lists are used to store multiple items using a single variable.
- Lists is a built-in data types
- Lists are used to store collections of data,
- List items are ordered, changeable, and allow duplicate values.
- List items are indexed, the first item has index [0], the second item has index [1] and so on
- List items can be of any data type
- Example : list1 = ["abc", 34, True, 40, "male", "abc"]



Sno	LIST	TUPLE
1	<u>Lists</u> are <u>mutable</u>	<u>Tuples</u> are immutable
2	The implication of iterations is Time- consuming	The implication of iterations is comparatively Faster
3	The list is better for performing operations, such as insertion and deletion.	A Tuple data type is appropriate for accessing the elements
4	Lists consume more memory	Tuple consumes less memory as compared to the list
5	Lists have several built-in methods	Tuple does not have many built-in methods.
6	Unexpected changes and errors are more likely to occur	In a tuple, it is hard to take place.



#### Lists in Python

```
list = [ 'abcd', 786 , 2.23, 'john', 70.2 ]
tinylist = [123, 'john']
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
```



## Lists in Python

#### **Output:**

```
['abcd', 786, 2.23, 'john', 70.2]
abcd
[786, 2.23]
[2.23, 'john', 70.2]
[123, 'john', 123, 'john']
['abcd', 786, 2.23, 'john', 70.2, 123, 'john']
```



#### Basic Operations of Lists in Python

#### **Add Elements to a Python List**

1. The append() method adds an item at the end of the list

```
numbers = [21, 34, 54, 12]
numbers.append(32)
print(numbers)
```

2. The insert() method inserts an element to the list at the specified index

Syntax : list.insert(postion, item)

Eg:

```
numbers = [21, 34, 54, 12]
numbers.insert(0, 32)
print(numbers)
```



#### Basic Operations of Lists in Python

#### To Remove Elements

The syntax of the remove() method is:

list.remove(element)

Eg: numbers = [21, 34, 54, 12]

numbers.remove(34)

print(numbers)

If a list contains duplicate elements, the remove() method only removes the first matching element.

If you need to delete elements based on the index (like the fourth element), you can use the <a href="mailto:pop()">pop()</a> method. Eg: numbers.pop(0)



#### Dictionary

- Dictionaries are used to store data values in key:value pairs.
- A dictionary is a collection which is ordered\*, changeable and do not allow duplicates
- Key is separated from its value by a colon (:)
- Items are separated by commas
- Dictionary is enclosed in curly braces
- Keys are unique within a dictionary while values may not be.

```
thisdict = {"brand": "Ford", "model": "Mustang", "year": 1964}
```



#### Accessing Values in Dictionary

To access dictionary elements, you can use the familiar square brackets along with the key to obtain its value. Following is a simple example –

```
dict = {'Name': 'Zara', 'Age': 7, 'Class': 'First'}
print (dict['Name'])
print (dict['Age'])
```

If we attempt to access a data item with a key, which is not part of the dictionary, we get an error as follows

print (dict['Height'])



#### **Updating Dictionary**

You can update a dictionary by adding a new entry or a key-value pair, modifying an existing entry, or deleting an existing entry as shown below in the simple example

```
dict = {'Name': 'Zara', 'Age': 7, 'Class': 'First'}
dict['Age'] = 8; # update existing entry
dict['School'] = "DPS School"; # Add new entry
```



#### Delete Dictionary Elements

You can either remove individual dictionary elements or clear the entire contents of a dictionary. You can also delete entire dictionary in a single operation

- 1. To remove individual dictionary elements
- : We will use del on Key element which has to be removed

#### Eg:

```
dict = {'Name': 'Zara', 'Age': 7, 'Class': 'First'}
del dict['Name']; # remove entry with key 'Name'
```

- 2. To Clear the contents of dictionary: I will use the function clear
- dict.clear(); # remove all entries in dict
- 3. To delete entire dictionary : **del dict**



## Clear Dictionary elements

```
#Clear Dictionary elements
D = {'Name': 'Raghu', 1:28, 'Designation': 'Manager'}
print(D)
D.clear()
print("After deleting\n",D)
{'Name': 'Raghu', 1: 28, 'Designation': 'Manager'}
After deleting
```



## Properties of Dictionary Keys

- Dictionary values have no restrictions. They can be any arbitrary Python object, either standard objects or user-defined objects.
- There are two important points to remember about dictionary keys –
- (a) More than one entry per key not allowed. Which means no duplicate key is allowed. When duplicate keys encountered during assignment, the last assignment wins.
- For example dict = {'Name': 'Zara', 'Age': 7, 'Name': 'Manni'}
- print (dict['Name'])



## Properties of Dictionary Keys

Keys must be immutable. Which means you can use strings, numbers or tuples as dictionary keys but something like ['key'] is not allowed.

```
Following is a simple example dict = {['Name']: 'Zara', 'Age': 7} print (dict['Name']) # You will get the error
```



#### **Built-in Dictionary Functions**

 len(dict) Gives the total length of the dictionary

dict = {'Name': 'Zara', 'Age': 7};
print(len (dict))

 str(dict) Produces a string representation of dictionary dict = {'Name': 'Zara', 'Age': 7};
print(str (dict))

• type(variable) Returns the type of the passed variable.

dict = {'Name': 'Zara', 'Age': 7};
print(type (dict))



## Built-in dictionary methods

Function	Explanation	Syntax	Example /Code
copy()	returns a shallow copy of the dictionary.	dict.copy()	<pre>dict1 = {'Name': 'Zara', 'Age': 7}; dict2 = dict1.copy() print(dict2)</pre>
get()	returns a value for the given key	dict.get(key)	<pre>dict1 = {'Name': 'Zara', 'Age': 7} print(dict.get('Name'))</pre>
has_key() (No more in python3, use <i>in</i> )	returns true if a given <i>key</i> is available in the dictionary, otherwise it returns a false.	dict.has_key(ke y)	<pre>dict1 = {'Name': 'Zara', 'Age': 7} print(dict.has_Key('Name'))</pre>
update()	adds dictionary dict2's key- values pairs in to dict		<pre>dict = {'Name': 'Zara', 'Age': 7} dict2 = {'School': 'ABC' } dict.update(dict2) print(dict)</pre>
keys()	returns a list of all the available keys in the dictionary.	dict.keys	<pre>dict = {'Name': 'Zara', 'Age': 7} print(dict.keys())</pre>



# THANK YOU