

UNIT – IV

LISTS, TUPLES, DICTIONARIES

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters, list comprehension; **Tuples:** tuple assignment, tuple as return value, tuple comprehension; **Dictionaries:** operations and methods, comprehension;

Lists, Tuples, Dictionaries:

List:

- It is a general purpose most widely used in data structures
- List is a collection which is ordered and changeable and allows duplicate members. (Grow and shrink as needed, sequence type, sortable).
- To use a list, you must declare it first. Do this using square brackets and separate values with commas.
- We can construct / create list in many ways.

Ex:

```
>>> list1=[1,2,3,'A','B',7,8,[10,11]]
```

```
>>> print(list1)
```

```
[1, 2, 3, 'A', 'B', 7, 8, [10, 11]]
```

```
>>> x=list()
```

```
>>> x
```

```
[]
```

```
>>> tuple1=(1,2,3,4)
```

```
>>> x=list(tuple1)
```

```
>>> x
```

```
[1, 2, 3, 4]
```

List operations:

These operations include indexing, slicing, adding, multiplying, and checking for membership

Basic List Operations:

Lists respond to the + and * operators much like strings; they mean concatenation and repetition here too, except that the result is a new list, 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,	1 2 3	Iteration

Indexing, Slicing, and Matrixes

Because lists are sequences, indexing and slicing work the same way for lists as they do for strings.

Assuming following input –

L = ['mrcet', 'college', 'MRCET!']

Python Expression	Results	Description
L[2]	MRCET	Offsets start at zero

L[-2]	college	Negative: count from the right
L[1:]	['college', 'MRCET!']	Slicing fetches sections

List slices:

```
>>> list1=range(1,6)
>>> list1
range(1, 6)
>>> print(list1)
range(1, 6)
>>> list1=[1,2,3,4,5,6,7,8,9,10]
>>> list1[1:]
[2, 3, 4, 5, 6, 7, 8, 9, 10]
>>> list1[:1]
[1]
>>> list1[2:5]
[3, 4, 5]
>>> list1[:6]
[1, 2, 3, 4, 5, 6]
>>> list1[1:2:4]
[2]
>>> list1[1:8:2]
[2, 4, 6, 8]
```

List methods:

The list data type has some more methods. Here are all of the methods of list objects:

- Del()

- Append()
- Extend()
- Insert()
- Pop()
- Remove()
- Reverse()
- Sort()

Delete: Delete a list or an item from a list

```
>>> x=[5,3,8,6]

>>> del(x[1])      #deletes the index position 1 in a list

>>> x

[5, 8, 6]

-----

>>> del(x)

>>> x              # complete list gets deleted
```

Append: Append an item to a list

```
>>> x=[1,5,8,4]

>>> x.append(10)

>>> x

[1, 5, 8, 4, 10]
```

Extend: Append a sequence to a list.

```
>>> x=[1,2,3,4]

>>> y=[3,6,9,1]

>>> x.extend(y)

>>> x

[1, 2, 3, 4, 3, 6, 9, 1]
```

Insert: To add an item at the specified index, use the insert () method:

```
>>> x=[1,2,4,6,7]
```

```
>>> x.insert(2,10) #insert(index no, item to be inserted)
```

```
>>> x
```

```
[1, 2, 10, 4, 6, 7]
```

```
-----
```

```
>>> x.insert(4,['a',11])
```

```
>>> x
```

```
[1, 2, 10, 4, ['a', 11], 6, 7]
```

Pop: The pop() method removes the specified index, (or the last item if index is not specified) or simply pops the last item of list and returns the item.

```
>>> x=[1, 2, 10, 4, 6, 7]
```

```
>>> x.pop()
```

```
7
```

```
>>> x
```

```
[1, 2, 10, 4, 6]
```

```
-----
```

```
>>> x=[1, 2, 10, 4, 6]
```

```
>>> x.pop(2)
```

```
10
```

```
>>> x
```

```
[1, 2, 4, 6]
```

Remove: The remove() method removes the specified item from a given list.

```
>>> x=[1,33,2,10,4,6]
```

```
>>> x.remove(33)
```

```
>>> x
```

```
[1, 2, 10, 4, 6]
```

```
>>> x.remove(4)
```

```
>>> x
```

```
[1, 2, 10, 6]
```

Reverse: Reverse the order of a given list.

```
>>> x=[1,2,3,4,5,6,7]
```

```
>>> x.reverse()
```

```
>>> x
```

```
[7, 6, 5, 4, 3, 2, 1]
```

Sort: Sorts the elements in ascending order

```
>>> x=[7, 6, 5, 4, 3, 2, 1]
```

```
>>> x.sort()
```

```
>>> x
```

```
[1, 2, 3, 4, 5, 6, 7]
```

```
-----
```

```
>>> x=[10,1,5,3,8,7]
```

```
>>> x.sort()
```

```
>>> x
```

```
[1, 3, 5, 7, 8, 10]
```

List loop:

Loops are control structures used to repeat a given section of code a certain number of times or until a particular condition is met.

Method #1: For loop

#list of items

```
list = ['M','R','C','E','T']
```

```
i = 1
```

```
#Iterating over the list  
for item in list:  
    print ('college ',i,' is ',item)  
    i = i+1
```

Output:

```
C:/Users/MRCET/AppData/Local/Programs/Python/Python38-32/pyyy/lis.py  
college 1 is M  
college 2 is R  
college 3 is C  
college 4 is E  
college 5 is T
```

Method #2: For loop and range()

In case we want to use the traditional for loop which iterates from number x to number y.

```
# Python3 code to iterate over a list  
list = [1, 3, 5, 7, 9]
```

```
# getting length of list  
length = len(list)
```

```
# Iterating the index  
# same as 'for i in range(len(list))'  
for i in range(length):  
    print(list[i])
```

Output:

```
C:/Users/MRCET/AppData/Local/Programs/Python/Python38-32/pyyy/listloop.py  
1  
3  
5  
7  
9
```

Method #3: using while loop

```
# Python3 code to iterate over a list  
list = [1, 3, 5, 7, 9]
```

```
# Getting length of list
```

```
length = len(list)
i = 0
```

```
# Iterating using while loop
while i < length:
    print(list[i])
    i += 1
```

Tuples:

A tuple is a collection which is ordered and unchangeable. In Python tuples are written with round brackets.

- Supports all operations for sequences.
- Immutable, but member objects may be mutable.
- If the contents of a list shouldn't change, use a tuple to prevent items from accidentally being added, changed, or deleted.
- Tuples are more efficient than list due to python's implementation.

We can construct tuple in many ways:

```
X=() #no item tuple
```

```
X=(1,2,3)
```

```
X=tuple(list1)
```

```
X=1,2,3,4
```

Example:

```
>>> x=(1,2,3)
```

```
>>> print(x)
```

```
(1, 2, 3)
```

```
>>> x
```

```
(1, 2, 3)
```

```
-----
>>> x=()
```

```
>>> x
```

```
()
```

```
-----
>>> x=[4,5,66,9]
```

```
>>> y=tuple(x)
```

```
>>> y
```


(4, 5, 66, 9)

>>> x=1,2,3,4

>>> x

(1, 2, 3, 4)

Some of the operations of tuple are:

- Access tuple items
- Change tuple items
- Loop through a tuple
- Count()
- Index()
- Length()

Access tuple items: Access tuple items by referring to the index number, inside square brackets

>>> x=('a','b','c','g')

>>> print(x[2])

c

Change tuple items: Once a tuple is created, you cannot change its values. Tuples are unchangeable.

>>> x=(2,5,7,'4',8)

>>> x[1]=10

Traceback (most recent call last):

File "<pyshell#41>", line 1, in <module>

x[1]=10

TypeError: 'tuple' object does not support item assignment

>>> x

(2, 5, 7, '4', 8) # the value is still the same

Loop through a tuple: We can loop the values of tuple using for loop

>>> x=4,5,6,7,2,'aa'

>>> for i in x:

print(i)

```
4
5
6
7
2
aa
```

Count (): Returns the number of times a specified value occurs in a tuple

```
>>> x=(1,2,3,4,5,6,2,10,2,11,12,2)
>>> x.count(2)
4
```

Index (): Searches the tuple for a specified value and returns the position of where it was found

```
>>> x=(1,2,3,4,5,6,2,10,2,11,12,2)
>>> x.index(2)
1
```

(Or)

```
>>> x=(1,2,3,4,5,6,2,10,2,11,12,2)
>>> y=x.index(2)
>>> print(y)
1
```

Length (): To know the number of items or values present in a tuple, we use len().

```
>>> x=(1,2,3,4,5,6,2,10,2,11,12,2)
>>> y=len(x)
>>> print(y)
12
```

Dictionary:

A dictionary is a collection which is unordered, changeable and indexed. In Python dictionaries are written with curly brackets, and they have keys and values.

- Key-value pairs
- Unordered

We can construct or create dictionary like:

```
X={1:'A',2:'B',3:'c'}
```

```
X=dict([('a',3) ('b',4)])
```

```
X=dict('A'=1,'B'=2)
```

Example:

```
>>> dict1 = {"brand": "mrcet", "model": "college", "year": 2004}
```

```
>>> dict1
```

```
{'brand': 'mrcet', 'model': 'college', 'year': 2004}
```

Operations and methods:

Methods that are available with dictionary are tabulated below. Some of them have already been used in the above examples.

Below are some dictionary operations:

Method	Description
<u>clear()</u>	Remove all items form the dictionary.

<u>copy()</u>	Return a shallow copy of the dictionary.
<u>fromkeys(seq[, v])</u>	Return a new dictionary with keys from seq and value equal to v (defaults to None).
<u>get(key[,d])</u>	Return the value of key. If key doesnot exit, return d (defaults to None).
<u>items()</u>	Return a new view of the dictionary's items (key, value).
<u>keys()</u>	Return a new view of the dictionary's keys.
<u>pop(key[,d])</u>	Remove the item with key and return its value or d if key is not found. If d is not provided and key is not found, raises KeyError.
<u>popitem()</u>	Remove and return an arbitrary item (key, value). Raises KeyError if the dictionary is empty.
<u>setdefault(key[,d])</u>	If key is in the dictionary, return its value. If not, insert key with a value of d and return d (defaults to None).
<u>update([other])</u>	Update the dictionary with the key/value pairs from other, overwriting existing keys.
<u>values()</u>	Return a new view of the dictionary's values

Below are some dictionary operations:

To access specific value of a dictionary, we must pass its key,

```
>>> dict1 = {"brand":"mrcet","model":"college","year":2004}
>>> x=dict1["brand"]
>>> x
'mrcet'
```

To access keys and values and items of dictionary:

```
>>> dict1 = {"brand":"mrcet","model":"college","year":2004}
>>> dict1.keys()
dict_keys(['brand', 'model', 'year'])
>>> dict1.values()
dict_values(['mrcet', 'college', 2004])
>>> dict1.items()
dict_items([('brand', 'mrcet'), ('model', 'college'), ('year', 2004)])
```

```
>>> for items in dict1.values():
    print(items)
```

```
mrcet
college
2004
```

```
>>> for items in dict1.keys():
    print(items)
```

```
brand
model
year
```

```
>>> for i in dict1.items():
    print(i)
```

```
('brand', 'mrcet')
('model', 'college')
('year', 2004)
```

Some more operations like:

- Add/change
- Remove
- Length
- Delete

Add/change values: You can change the value of a specific item by referring to its key name

```
>>> dict1 = {"brand":"mrcet","model":"college","year":2004}
>>> dict1["year"]=2005
>>> dict1
{'brand': 'mrcet', 'model': 'college', 'year': 2005}
```

Remove(): It removes or pop the specific item of dictionary.

```
>>> dict1 = {"brand":"mrcet","model":"college","year":2004}
>>> print(dict1.pop("model"))
college
>>> dict1
{'brand': 'mrcet', 'year': 2005}
```

Delete: Deletes a particular item.

```
>>> x = {1:1, 2:4, 3:9, 4:16, 5:25}
>>> del x[5]
>>> x
```

Length: we use len() method to get the length of dictionary.

```
>>> {1: 1, 2: 4, 3: 9, 4: 16}
{1: 1, 2: 4, 3: 9, 4: 16}
>>> y=len(x)
>>> y
4
```

Iterating over (key, value) pairs:

```
>>> x = {1:1, 2:4, 3:9, 4:16, 5:25}
>>> for key in x:
    print(key, x[key])
```

```
2 4
3 9
4 16
5 25
>>> for k,v in x.items():
    print(k,v)
```

```
1 1
2 4
3 9
4 16
5 25
```

List of Dictionaries:

```
>>> customers = [{"uid":1,"name":"John"},
    {"uid":2,"name":"Smith"},
    {"uid":3,"name":"Andersson"},
    ]
>>> >>> print(customers)
[{'uid': 1, 'name': 'John'}, {'uid': 2, 'name': 'Smith'}, {'uid': 3, 'name': 'Andersson'}]
```

Print the uid and name of each customer

```
>>> for x in customers:
    print(x["uid"], x["name"])
```

```
1 John
2 Smith
3 Andersson
```

Modify an entry, This will change the name of customer 2 from Smith to Charlie

```
>>> customers[2]["name"]="charlie"
>>> print(customers)
[{'uid': 1, 'name': 'John'}, {'uid': 2, 'name': 'Smith'}, {'uid': 3, 'name': 'charlie'}]
```

Add a new field to each entry

```
>>> for x in customers:
    x["password"]="123456" # any initial value
```

```
>>> print(customers)
```

```
[{'uid': 1, 'name': 'John', 'password': '123456'}, {'uid': 2, 'name': 'Smith', 'password':  
'123456'}, {'uid': 3, 'name': 'charlie', 'password': '123456'}]
```

Delete a field

```
>>> del customers[1]
```

```
>>> print(customers)
```

```
[{'uid': 1, 'name': 'John', 'password': '123456'}, {'uid': 3, 'name': 'charlie', 'password':  
'123456'}]
```

```
>>> del customers[1]
```

```
>>> print(customers)
```

```
[{'uid': 1, 'name': 'John', 'password': '123456'}]
```

Delete all fields

```
>>> for x in customers:  
    del x["uid"]
```

```
>>> x
```

```
{'name': 'John', 'password': '123456'}
```