In [1]:
```python
emp1 = {'eid':101,'ename':'Raj','edept':'sales'}

emp2 = {'eid':[101,102,103],
        'ename':['Raj','Leo','Paul'],
        'edept':['sales','devops','DE']
        } # dict of list

print(type(emp2['eid']))
# we can add new data to an exist
emp2['eid'].append(104)
emp2['ename'].append('Shiv')
emp2['edept'].append('QA')
```

```
<class 'list'>
```

In [2]:
```python
emp2
```

Out[2]:
```
{'eid': [101, 102, 103, 104],
 'ename': ['Raj', 'Leo', 'Paul', 'Shiv'],
 'edept': ['sales', 'devops', 'DE', 'QA']}
```

In [5]:
```python
print(emp2['eid'][0],emp2['ename'][0],emp2['edept'][0])
```

```
101 Raj sales
```

In [6]:
```python
emp2['edept'][0] = 'Admin' # we can modify an existing value - mutable
```

In [7]:
```python
emp2['edept']
```

Out[7]:
```
['Admin', 'devops', 'DE', 'QA']
```

In [8]:
```python
print(emp2['eid'][0],emp2['ename'][0],emp2['edept'][0])
```

```
101 Raj Admin
```

In [12]:
```python
# Task
#---------
# create an emp records - dict of tuple
# display dict details
# fetch single data
#----------------------------------
emp2 = {'eid':(101,102,103),
        'ename':('Raj','Leo','Paul'),
        'edept':('sales','devops','DE')
        } # dict of tuple

print(type(emp2))
print(type(emp2['eid']))
print(emp2['eid'][0])

emp2['eplace']=('City-1','City-2','City-3','City-4') # We can add new data to an
```

```
<class 'dict'>
<class 'tuple'>
101
```

In [13]:
```python
emp2
```

```
Out[13]:  {'eid': (101, 102, 103),
           'ename': ('Raj', 'Leo', 'Paul'),
           'edept': ('sales', 'devops', 'DE'),
           'eplace': ('City-1', 'City-2', 'City-3', 'City-4')}
```

```python
In [ ]:  # dict of dict
         # ----------------
         emp2={'eid':{'K1':101,'K2':102,'K3':103},'ename':{'K1':'Raj','K2':'Leo','K3':'An
             # -------------------------------/ -----------------------------------
```

```python
In [14]:  d={'K1':'V1','K1':10,'K1':101} # duplicate key
          d
```

```
Out[14]:  {'K1': 101}
```

```python
In [15]:  d={'K1':{'K1':'V1'},'K2':{'K1':10},'K3':{'K1':101}}
          print(d)
```

```
{'K1': {'K1': 'V1'}, 'K2': {'K1': 10}, 'K3': {'K1': 101}}
```

```python
In [16]:  emp2={'eid':{'K1':101,'K2':102,'K3':103},'ename':{'K1':'Raj','K2':'Leo','K3':'An

          print(emp2['eid']['K1'],emp2['ename']['K1'])
```

```
101 Raj
```

```python
In [17]:  L = [ ["D1","D2","D3"],("D4","D5"),{"K1":"V1","K2":"V2"}]
          #      ----0-----------/-----1-----/---------2----------
          print(type(L))
          print(type(L[2]))
```

```
<class 'list'>
<class 'dict'>
```

```python
In [18]:  print(L[2]['K1'])
```

```
V1
```

```python
In [ ]:  d = {'K1':[10,20,30]}  # d['K1'][0] ->10
         L = [{'K1':10}]        # L[0]['K1'] ->10
```

```python
In [ ]:  d={'K1':[{},{},{},{}]}
             | --- |_____||
             |_____|
```

```python
In [25]:  d={}
          d['K1']=[{'K1':'V1'}]
          d['K2']=[{'K1':10},{'K2':20},{'K3':30},{'K4':[40,50,60,{'Kx':'Vx','Ky':'Vy'}]}]
          print(d)
```

```
{'K1': [{'K1': 'V1'}], 'K2': [{'K1': 10}, {'K2': 20}, {'K3': 30}, {'K4': [40, 50,
60, {'Kx': 'Vx', 'Ky': 'Vy'}]}]}
```

```python
In [26]:  import pprint
          pprint.pprint(d)
```

```
{'K1': [{'K1': 'V1'}],
 'K2': [{'K1': 10},
        {'K2': 20},
        {'K3': 30},
        {'K4': [40, 50, 60, {'Kx': 'Vx', 'Ky': 'Vy'}]}]}
```

```
In [ ]:  JSON
          Store and exchange data - between webApplications

         Json                    Python
         int,float               int,float
         str                      str
         Array                   list
         Object                  dict
         true,false              True,False
         nil                     None

         from json data -->python data => json.loads(json_data) ->python_data

         from python data -->json data => json.dumps(python_data) ->json_data

         Client ------->Webserver-------->ServerCode
                                              |
               ------<--------------------|
                     1. Webpage response = <html>+{{data}} ...
                     2. Data response     = json data ****
```

```
In [35]:  netinfo = {}
          netinfo['Types']=['Ethernt','Ring']
          netinfo['onboot']=('True','False')
          netinfo['IP']={'K1':'10.0.30.40','K2':'10.23.44.25'}
          print(netinfo)
          print('') # empty Line
          pprint.pprint(netinfo)
```

```
{'Types': ['Ethernt', 'Ring'], 'onboot': ('True', 'False'), 'IP': {'K1': '10.0.3
0.40', 'K2': '10.23.44.25'}}

{'IP': {'K1': '10.0.30.40', 'K2': '10.23.44.25'},
 'Types': ['Ethernt', 'Ring'],
 'onboot': ('True', 'False')}
```

```
In [36]:  import json
          json_data = json.dumps(netinfo) # converting from python to json
          json_data
```

```
Out[36]:  '{"Types": ["Ethernt", "Ring"], "onboot": ["True", "False"], "IP": {"K1": "10.
          0.30.40", "K2": "10.23.44.25"}}'
```

```
In [37]:  json_data = json.dumps(netinfo,indent=2) # converting from python to json
          json_data
```

```
Out[37]:  '{\n  "Types": [\n    "Ethernt",\n    "Ring"\n  ],\n  "onboot": [\n    "Tru
          e",\n    "False"\n  ],\n  "IP": {\n    "K1": "10.0.30.40",\n    "K2": "10.23.4
          4.25"\n  }\n}'
```

```
In [38]:  print(json_data)
```

```
{
  "Types": [
    "Ethernt",
    "Ring"
  ],
  "onboot": [
    "True",
    "False"
  ],
  "IP": {
    "K1": "10.0.30.40",
    "K2": "10.23.44.25"
  }
}
```

In [39]:
```python
json.loads(json_data)
```

Out[39]:
```
{'Types': ['Ethernt', 'Ring'],
 'onboot': ['True', 'False'],
 'IP': {'K1': '10.0.30.40', 'K2': '10.23.44.25'}}
```

In [41]:
```python
# convert to json
print(json.dumps(True))
print(json.dumps(False))
print(json.dumps(None))
```

```
true
false
null
```

In [ ]:
```python
# Tasks
# create netinfo - complex data
# Convert data ->json
# convert from json ->python
#
```

In [42]:
```python
import requests
requests.get('https://api.github.com/users/hadley/orgs')
```

Out[42]:
```
<Response [200]>
```

In [44]:
```python
r = requests.get('https://api.github.com/users/hadley/orgs')
r.headers
r.headers['Content-Type']
```

Out[44]:
```
'application/json; charset=utf-8'
```

In [46]:
```python
json_data = r.text
```

In [47]:
```python
json.loads(json_data) # Convert from json to python
```

```
Out[47]: [{'login': 'ggobi',
           'id': 423638,
           'node_id': 'MDEyOk9yZ2FuaXphdGlvbjQyMzYzOA==',
           'url': 'https://api.github.com/orgs/ggobi',
           'repos_url': 'https://api.github.com/orgs/ggobi/repos',
           'events_url': 'https://api.github.com/orgs/ggobi/events',
           'hooks_url': 'https://api.github.com/orgs/ggobi/hooks',
           'issues_url': 'https://api.github.com/orgs/ggobi/issues',
           'members_url': 'https://api.github.com/orgs/ggobi/members{/member}',
           'public_members_url': 'https://api.github.com/orgs/ggobi/public_members{/memb
         er}',
           'avatar_url': 'https://avatars.githubusercontent.com/u/423638?v=4',
           'description': ''},
          {'login': 'rstudio',
           'id': 513560,
           'node_id': 'MDEyOk9yZ2FuaXphdGlvbjUxMzU2MA==',
           'url': 'https://api.github.com/orgs/rstudio',
           'repos_url': 'https://api.github.com/orgs/rstudio/repos',
           'events_url': 'https://api.github.com/orgs/rstudio/events',
           'hooks_url': 'https://api.github.com/orgs/rstudio/hooks',
           'issues_url': 'https://api.github.com/orgs/rstudio/issues',
           'members_url': 'https://api.github.com/orgs/rstudio/members{/member}',
           'public_members_url': 'https://api.github.com/orgs/rstudio/public_members{/me
         mber}',
           'avatar_url': 'https://avatars.githubusercontent.com/u/513560?v=4',
           'description': ''},
          {'login': 'rstats',
           'id': 722735,
           'node_id': 'MDEyOk9yZ2FuaXphdGlvbjcyMjczNQ==',
           'url': 'https://api.github.com/orgs/rstats',
           'repos_url': 'https://api.github.com/orgs/rstats/repos',
           'events_url': 'https://api.github.com/orgs/rstats/events',
           'hooks_url': 'https://api.github.com/orgs/rstats/hooks',
           'issues_url': 'https://api.github.com/orgs/rstats/issues',
           'members_url': 'https://api.github.com/orgs/rstats/members{/member}',
           'public_members_url': 'https://api.github.com/orgs/rstats/public_members{/mem
         ber}',
           'avatar_url': 'https://avatars.githubusercontent.com/u/722735?v=4',
           'description': None},
          {'login': 'ropensci',
           'id': 1200269,
           'node_id': 'MDEyOk9yZ2FuaXphdGlvbjEyMDAyNjk=',
           'url': 'https://api.github.com/orgs/ropensci',
           'repos_url': 'https://api.github.com/orgs/ropensci/repos',
           'events_url': 'https://api.github.com/orgs/ropensci/events',
           'hooks_url': 'https://api.github.com/orgs/ropensci/hooks',
           'issues_url': 'https://api.github.com/orgs/ropensci/issues',
           'members_url': 'https://api.github.com/orgs/ropensci/members{/member}',
           'public_members_url': 'https://api.github.com/orgs/ropensci/public_members{/m
         ember}',
           'avatar_url': 'https://avatars.githubusercontent.com/u/1200269?v=4',
           'description': 'Tools and R Packages for Open Science'},
          {'login': 'rjournal',
           'id': 3330561,
           'node_id': 'MDEyOk9yZ2FuaXphdGlvbjMzMzA1NjE=',
           'url': 'https://api.github.com/orgs/rjournal',
           'repos_url': 'https://api.github.com/orgs/rjournal/repos',
           'events_url': 'https://api.github.com/orgs/rjournal/events',
           'hooks_url': 'https://api.github.com/orgs/rjournal/hooks',
           'issues_url': 'https://api.github.com/orgs/rjournal/issues',
```

```
       'members_url': 'https://api.github.com/orgs/rjournal/members{/member}',
       'public_members_url': 'https://api.github.com/orgs/rjournal/public_members{/m
ember}',
       'avatar_url': 'https://avatars.githubusercontent.com/u/3330561?v=4',
       'description': None},
      {'login': 'r-dbi',
       'id': 5695665,
       'node_id': 'MDEyOk9yZ2FuaXphdGlvbjU2OTU2NjU=',
       'url': 'https://api.github.com/orgs/r-dbi',
       'repos_url': 'https://api.github.com/orgs/r-dbi/repos',
       'events_url': 'https://api.github.com/orgs/r-dbi/events',
       'hooks_url': 'https://api.github.com/orgs/r-dbi/hooks',
       'issues_url': 'https://api.github.com/orgs/r-dbi/issues',
       'members_url': 'https://api.github.com/orgs/r-dbi/members{/member}',
       'public_members_url': 'https://api.github.com/orgs/r-dbi/public_members{/memb
er}',
       'avatar_url': 'https://avatars.githubusercontent.com/u/5695665?v=4',
       'description': 'R + databases'},
      {'login': 'RConsortium',
       'id': 15366137,
       'node_id': 'MDEyOk9yZ2FuaXphdGlvbjE1MzY2MTM3',
       'url': 'https://api.github.com/orgs/RConsortium',
       'repos_url': 'https://api.github.com/orgs/RConsortium/repos',
       'events_url': 'https://api.github.com/orgs/RConsortium/events',
       'hooks_url': 'https://api.github.com/orgs/RConsortium/hooks',
       'issues_url': 'https://api.github.com/orgs/RConsortium/issues',
       'members_url': 'https://api.github.com/orgs/RConsortium/members{/member}',
       'public_members_url': 'https://api.github.com/orgs/RConsortium/public_members
{/member}',
       'avatar_url': 'https://avatars.githubusercontent.com/u/15366137?v=4',
       'description': 'The R Consortium, Inc was established to provide support to t
he R Foundation and R Community, using maintaining and distributing R softwar
e.'},
      {'login': 'tidyverse',
       'id': 22032646,
       'node_id': 'MDEyOk9yZ2FuaXphdGlvbjIyMDMyNjQ2',
       'url': 'https://api.github.com/orgs/tidyverse',
       'repos_url': 'https://api.github.com/orgs/tidyverse/repos',
       'events_url': 'https://api.github.com/orgs/tidyverse/events',
       'hooks_url': 'https://api.github.com/orgs/tidyverse/hooks',
       'issues_url': 'https://api.github.com/orgs/tidyverse/issues',
       'members_url': 'https://api.github.com/orgs/tidyverse/members{/member}',
       'public_members_url': 'https://api.github.com/orgs/tidyverse/public_members{/
member}',
       'avatar_url': 'https://avatars.githubusercontent.com/u/22032646?v=4',
       'description': 'The tidyverse is a collection of R packages that share common
principles and are designed to work together seamlessly'},
      {'login': 'r-lib',
       'id': 22618716,
       'node_id': 'MDEyOk9yZ2FuaXphdGlvbjIyNjE4NzE2',
       'url': 'https://api.github.com/orgs/r-lib',
       'repos_url': 'https://api.github.com/orgs/r-lib/repos',
       'events_url': 'https://api.github.com/orgs/r-lib/events',
       'hooks_url': 'https://api.github.com/orgs/r-lib/hooks',
       'issues_url': 'https://api.github.com/orgs/r-lib/issues',
       'members_url': 'https://api.github.com/orgs/r-lib/members{/member}',
       'public_members_url': 'https://api.github.com/orgs/r-lib/public_members{/memb
er}',
       'avatar_url': 'https://avatars.githubusercontent.com/u/22618716?v=4',
       'description': ''},
```

```
    {'login': 'rstudio-education',
     'id': 34165516,
     'node_id': 'MDEyOk9yZ2FuaXphdGlvbjM0MTY1NTE2',
     'url': 'https://api.github.com/orgs/rstudio-education',
     'repos_url': 'https://api.github.com/orgs/rstudio-education/repos',
     'events_url': 'https://api.github.com/orgs/rstudio-education/events',
     'hooks_url': 'https://api.github.com/orgs/rstudio-education/hooks',
     'issues_url': 'https://api.github.com/orgs/rstudio-education/issues',
     'members_url': 'https://api.github.com/orgs/rstudio-education/members{/membe
r}',
     'public_members_url': 'https://api.github.com/orgs/rstudio-education/public_m
embers{/member}',
     'avatar_url': 'https://avatars.githubusercontent.com/u/34165516?v=4',
     'description': ''}]
```

In [48]:
```python
python_data = json.loads(json_data)
pprint.pprint(python_data)
```

```
[{'avatar_url': 'https://avatars.githubusercontent.com/u/423638?v=4',
  'description': '',
  'events_url': 'https://api.github.com/orgs/ggobi/events',
  'hooks_url': 'https://api.github.com/orgs/ggobi/hooks',
  'id': 423638,
  'issues_url': 'https://api.github.com/orgs/ggobi/issues',
  'login': 'ggobi',
  'members_url': 'https://api.github.com/orgs/ggobi/members{/member}',
  'node_id': 'MDEyOk9yZ2FuaXphdGlvbjQyMzYzOA==',
  'public_members_url': 'https://api.github.com/orgs/ggobi/public_members{/membe
r}',
  'repos_url': 'https://api.github.com/orgs/ggobi/repos',
  'url': 'https://api.github.com/orgs/ggobi'},
 {'avatar_url': 'https://avatars.githubusercontent.com/u/513560?v=4',
  'description': '',
  'events_url': 'https://api.github.com/orgs/rstudio/events',
  'hooks_url': 'https://api.github.com/orgs/rstudio/hooks',
  'id': 513560,
  'issues_url': 'https://api.github.com/orgs/rstudio/issues',
  'login': 'rstudio',
  'members_url': 'https://api.github.com/orgs/rstudio/members{/member}',
  'node_id': 'MDEyOk9yZ2FuaXphdGlvbjUxMzU2MA==',
  'public_members_url': 'https://api.github.com/orgs/rstudio/public_members{/memb
er}',
  'repos_url': 'https://api.github.com/orgs/rstudio/repos',
  'url': 'https://api.github.com/orgs/rstudio'},
 {'avatar_url': 'https://avatars.githubusercontent.com/u/722735?v=4',
  'description': None,
  'events_url': 'https://api.github.com/orgs/rstats/events',
  'hooks_url': 'https://api.github.com/orgs/rstats/hooks',
  'id': 722735,
  'issues_url': 'https://api.github.com/orgs/rstats/issues',
  'login': 'rstats',
  'members_url': 'https://api.github.com/orgs/rstats/members{/member}',
  'node_id': 'MDEyOk9yZ2FuaXphdGlvbjcyMjczNQ==',
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r}',
  'repos_url': 'https://api.github.com/orgs/rstats/repos',
  'url': 'https://api.github.com/orgs/rstats'},
 {'avatar_url': 'https://avatars.githubusercontent.com/u/1200269?v=4',
  'description': 'Tools and R Packages for Open Science',
  'events_url': 'https://api.github.com/orgs/ropensci/events',
  'hooks_url': 'https://api.github.com/orgs/ropensci/hooks',
  'id': 1200269,
  'issues_url': 'https://api.github.com/orgs/ropensci/issues',
  'login': 'ropensci',
  'members_url': 'https://api.github.com/orgs/ropensci/members{/member}',
  'node_id': 'MDEyOk9yZ2FuaXphdGlvbjEyMDAyNjk=',
  'public_members_url': 'https://api.github.com/orgs/ropensci/public_members{/mem
ber}',
  'repos_url': 'https://api.github.com/orgs/ropensci/repos',
  'url': 'https://api.github.com/orgs/ropensci'},
 {'avatar_url': 'https://avatars.githubusercontent.com/u/3330561?v=4',
  'description': None,
  'events_url': 'https://api.github.com/orgs/rjournal/events',
  'hooks_url': 'https://api.github.com/orgs/rjournal/hooks',
  'id': 3330561,
  'issues_url': 'https://api.github.com/orgs/rjournal/issues',
  'login': 'rjournal',
  'members_url': 'https://api.github.com/orgs/rjournal/members{/member}',
```

```
    'node_id': 'MDEyOk9yZ2FuaXphdGlvbjMzMzA1NjE=',
    'public_members_url': 'https://api.github.com/orgs/rjournal/public_members{/mem
ber}',
    'repos_url': 'https://api.github.com/orgs/rjournal/repos',
    'url': 'https://api.github.com/orgs/rjournal'},
  {'avatar_url': 'https://avatars.githubusercontent.com/u/5695665?v=4',
    'description': 'R + databases',
    'events_url': 'https://api.github.com/orgs/r-dbi/events',
    'hooks_url': 'https://api.github.com/orgs/r-dbi/hooks',
    'id': 5695665,
    'issues_url': 'https://api.github.com/orgs/r-dbi/issues',
    'login': 'r-dbi',
    'members_url': 'https://api.github.com/orgs/r-dbi/members{/member}',
    'node_id': 'MDEyOk9yZ2FuaXphdGlvbjU2OTU2NjU=',
    'public_members_url': 'https://api.github.com/orgs/r-dbi/public_members{/membe
r}',
    'repos_url': 'https://api.github.com/orgs/r-dbi/repos',
    'url': 'https://api.github.com/orgs/r-dbi'},
  {'avatar_url': 'https://avatars.githubusercontent.com/u/15366137?v=4',
    'description': 'The R Consortium, Inc was established to provide support to '
                   'the R Foundation and R Community, using maintaining and '
                   'distributing R software.',
    'events_url': 'https://api.github.com/orgs/RConsortium/events',
    'hooks_url': 'https://api.github.com/orgs/RConsortium/hooks',
    'id': 15366137,
    'issues_url': 'https://api.github.com/orgs/RConsortium/issues',
    'login': 'RConsortium',
    'members_url': 'https://api.github.com/orgs/RConsortium/members{/member}',
    'node_id': 'MDEyOk9yZ2FuaXphdGlvbjE1MzY2MTM3',
    'public_members_url': 'https://api.github.com/orgs/RConsortium/public_members{/
member}',
    'repos_url': 'https://api.github.com/orgs/RConsortium/repos',
    'url': 'https://api.github.com/orgs/RConsortium'},
  {'avatar_url': 'https://avatars.githubusercontent.com/u/22032646?v=4',
    'description': 'The tidyverse is a collection of R packages that share '
                   'common principles and are designed to work together '
                   'seamlessly',
    'events_url': 'https://api.github.com/orgs/tidyverse/events',
    'hooks_url': 'https://api.github.com/orgs/tidyverse/hooks',
    'id': 22032646,
    'issues_url': 'https://api.github.com/orgs/tidyverse/issues',
    'login': 'tidyverse',
    'members_url': 'https://api.github.com/orgs/tidyverse/members{/member}',
    'node_id': 'MDEyOk9yZ2FuaXphdGlvbjIyMDMyNjQ2',
    'public_members_url': 'https://api.github.com/orgs/tidyverse/public_members{/me
mber}',
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```

```python
In [55]:  print(type(python_data))
          print(len(python_data))
          print(type(python_data[0]))
          print('\nList of keys:')
          for var in python_data[0]:
              print(var,end = ' ')
```

```
<class 'list'>
10
<class 'dict'>

List of keys:
login id node_id url repos_url events_url hooks_url issues_url members_url public
_members_url avatar_url description
```

```python
In [56]:  print(python_data[0]['repos_url'])
```

```
https://api.github.com/orgs/ggobi/repos
```

```python
In [57]:  python_data[0]['repos_url'] = 'https://mylocalhost:5000/myapi/repos' # we can mo
          python_data[0]
```

```
Out[57]:  {'login': 'ggobi',
           'id': 423638,
           'node_id': 'MDEyOk9yZ2FuaXphdGlvbjQyMzYzOA==',
           'url': 'https://api.github.com/orgs/ggobi',
           'repos_url': 'https://mylocalhost:5000/myapi/repos',
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           'issues_url': 'https://api.github.com/orgs/ggobi/issues',
           'members_url': 'https://api.github.com/orgs/ggobi/members{/member}',
           'public_members_url': 'https://api.github.com/orgs/ggobi/public_members{/membe
          r}',
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           'description': ''}
```

In [ ]:
```python
# Task
# 1. https://jsonplaceholder.typicode.com/todos/
# download this url
# 2. headers -> Content-Type
# 3. text ->download json data to localVariable
# 4. Convert to python
# 5. pprint.pprint - display
# |
# 6. display nth data
```

In [60]:
```python
URL = 'https://jsonplaceholder.typicode.com/todos/'

r = requests.get(URL)
r.headers['Content-Type']
```

Out[60]: 'application/json; charset=utf-8'

In [61]:
```python
json_data = r.text
```

In [62]:
```python
python_Data = json.loads(json_data)
pprint.pprint(python_Data)
```

```
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In [64]: `python_Data[0]['title']`

Out[64]: `'delectus aut autem'`

In [65]: `python_Data[0]['title'] = "Sample-Test" # we can modify`

In [66]: `python_Data`

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                     'id': 144,
                     'title': 'ut eum exercitationem sint',
                     'completed': False},
                    {'userId': 8,
                     'id': 145,
                     'title': 'beatae qui ullam incidunt voluptatem non nisi aliquam',
                     'completed': False},
                    {'userId': 8,
                     'id': 146,
                     'title': 'molestiae suscipit ratione nihil odio libero impedit vero totam',
                     'completed': True},
                    {'userId': 8,
                     'id': 147,
                     'title': 'eum itaque quod reprehenderit et facilis dolor autem ut',
                     'completed': True},
                    {'userId': 8,
                     'id': 148,
                     'title': 'esse quas et quo quasi exercitationem',
                     'completed': False},
                    {'userId': 8,
                     'id': 149,
                     'title': 'animi voluptas quod perferendis est',
```

```
         'completed': False},
       {'userId': 8,
        'id': 150,
        'title': 'eos amet tempore laudantium fugit a',
        'completed': False},
       {'userId': 8,
        'id': 151,
        'title': 'accusamus adipisci dicta qui quo ea explicabo sed vero',
        'completed': True},
       {'userId': 8,
        'id': 152,
        'title': 'odit eligendi recusandae doloremque cumque non',
        'completed': False},
       {'userId': 8,
        'id': 153,
        'title': 'ea aperiam consequatur qui repellat eos',
        'completed': False},
       {'userId': 8, 'id': 154, 'title': 'rerum non ex sapiente', 'completed': True},
       {'userId': 8,
        'id': 155,
        'title': 'voluptatem nobis consequatur et assumenda magnam',
        'completed': True},
       {'userId': 8,
        'id': 156,
        'title': 'nam quia quia nulla repellat assumenda quibusdam sit nobis',
        'completed': True},
       {'userId': 8,
        'id': 157,
        'title': 'dolorem veniam quisquam deserunt repellendus',
        'completed': True},
       {'userId': 8,
        'id': 158,
        'title': 'debitis vitae delectus et harum accusamus aut deleniti a',
        'completed': True},
       {'userId': 8,
        'id': 159,
        'title': 'debitis adipisci quibusdam aliquam sed dolore ea praesentium nobi
       s',
        'completed': True},
       {'userId': 8,
        'id': 160,
        'title': 'et praesentium aliquam est',
        'completed': False},
       {'userId': 9,
        'id': 161,
        'title': 'ex hic consequuntur earum omnis alias ut occaecati culpa',
        'completed': True},
       {'userId': 9,
        'id': 162,
        'title': 'omnis laboriosam molestias animi sunt dolore',
        'completed': True},
       {'userId': 9,
        'id': 163,
        'title': 'natus corrupti maxime laudantium et voluptatem laboriosam odit',
        'completed': False},
       {'userId': 9,
        'id': 164,
        'title': 'reprehenderit quos aut aut consequatur est sed',
        'completed': False},
       {'userId': 9,
```

```
 'id': 165,
 'title': 'fugiat perferendis sed aut quidem',
 'completed': False},
{'userId': 9,
 'id': 166,
 'title': 'quos quo possimus suscipit minima ut',
 'completed': False},
{'userId': 9,
 'id': 167,
 'title': 'et quis minus quo a asperiores molestiae',
 'completed': False},
{'userId': 9,
 'id': 168,
 'title': 'recusandae quia qui sunt libero',
 'completed': False},
{'userId': 9,
 'id': 169,
 'title': 'ea odio perferendis officiis',
 'completed': True},
{'userId': 9,
 'id': 170,
 'title': 'quisquam aliquam quia doloribus aut',
 'completed': False},
{'userId': 9,
 'id': 171,
 'title': 'fugiat aut voluptatibus corrupti deleniti velit iste odio',
 'completed': True},
{'userId': 9,
 'id': 172,
 'title': 'et provident amet rerum consectetur et voluptatum',
 'completed': False},
{'userId': 9,
 'id': 173,
 'title': 'harum ad aperiam quis',
 'completed': False},
{'userId': 9, 'id': 174, 'title': 'similique aut quo', 'completed': False},
{'userId': 9,
 'id': 175,
 'title': 'laudantium eius officia perferendis provident perspiciatis asperior
es',
 'completed': True},
{'userId': 9,
 'id': 176,
 'title': 'magni soluta corrupti ut maiores rem quidem',
 'completed': False},
{'userId': 9,
 'id': 177,
 'title': 'et placeat temporibus voluptas est tempora quos quibusdam',
 'completed': False},
{'userId': 9,
 'id': 178,
 'title': 'nesciunt itaque commodi tempore',
 'completed': True},
{'userId': 9,
 'id': 179,
 'title': 'omnis consequuntur cupiditate impedit itaque ipsam quo',
 'completed': True},
{'userId': 9,
 'id': 180,
 'title': 'debitis nisi et dolorem repellat et',
```

```
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                       'id': 181,
                       'title': 'ut cupiditate sequi aliquam fuga maiores',
                       'completed': False},
                      {'userId': 10,
                       'id': 182,
                       'title': 'inventore saepe cumque et aut illum enim',
                       'completed': True},
                      {'userId': 10,
                       'id': 183,
                       'title': 'omnis nulla eum aliquam distinctio',
                       'completed': True},
                      {'userId': 10,
                       'id': 184,
                       'title': 'molestias modi perferendis perspiciatis',
                       'completed': False},
                      {'userId': 10,
                       'id': 185,
                       'title': 'voluptates dignissimos sed doloribus animi quaerat aut',
                       'completed': False},
                      {'userId': 10,
                       'id': 186,
                       'title': 'explicabo odio est et',
                       'completed': False},
                      {'userId': 10,
                       'id': 187,
                       'title': 'consequuntur animi possimus',
                       'completed': False},
                      {'userId': 10, 'id': 188, 'title': 'vel non beatae est', 'completed': True},
                      {'userId': 10,
                       'id': 189,
                       'title': 'culpa eius et voluptatem et',
                       'completed': True},
                      {'userId': 10,
                       'id': 190,
                       'title': 'accusamus sint iusto et voluptatem exercitationem',
                       'completed': True},
                      {'userId': 10,
                       'id': 191,
                       'title': 'temporibus atque distinctio omnis eius impedit tempore molestias pa
                  riatur',
                       'completed': True},
                      {'userId': 10,
                       'id': 192,
                       'title': 'ut quas possimus exercitationem sint voluptates',
                       'completed': False},
                      {'userId': 10,
                       'id': 193,
                       'title': 'rerum debitis voluptatem qui eveniet tempora distinctio a',
                       'completed': True},
                      {'userId': 10,
                       'id': 194,
                       'title': 'sed ut vero sit molestiae',
                       'completed': False},
                      {'userId': 10,
                       'id': 195,
                       'title': 'rerum ex veniam mollitia voluptatibus pariatur',
                       'completed': True},
                      {'userId': 10,
```

```
         'id': 196,
         'title': 'consequuntur aut ut fugit similique',
         'completed': True},
        {'userId': 10,
         'id': 197,
         'title': 'dignissimos quo nobis earum saepe',
         'completed': True},
        {'userId': 10,
         'id': 198,
         'title': 'quis eius est sint explicabo',
         'completed': True},
        {'userId': 10,
         'id': 199,
         'title': 'numquam repellendus a magnam',
         'completed': True},
        {'userId': 10,
         'id': 200,
         'title': 'ipsam aperiam voluptates qui',
         'completed': False}]
```

In [ ]:
```
Collection - more than one items
 str,bytes,list,tuple,dict,set

set - Collection unorderd unique items
    - Set is not index based
    - Set is not key:value based
    - So we won't fetch any nth data
    - We can add newdata to set ; We can delete nth from set , but we can't modi
        In set there is no Index,Key:value
```

In [68]:
```
s={10,20,'K1','K2',10,20,10,10,20,30,'K1','K1','K2'}
print(type(s))
print(len(s))
print(s)
```

```
<class 'set'>
5
{'K1', 20, 'K2', 10, 30}
```

In [69]:
```
s={'D1','D2'}
s
```

Out[69]: {'D1', 'D2'}

In [71]:
```
s.add('D3')
s.update(['D1','D3','D5','D4'])
print(s)
print(len(s))
```

```
{'D2', 'D3', 'D1', 'D4', 'D5'}
5
```

In [72]:
```
s.remove('D3')
```

In [73]:
```
s.remove('D3')
```

```
-------------------------------------------------------------------------
KeyError                                       Traceback (most recent call last)
Cell In[73], line 1
----> 1 s.remove('D3')

KeyError: 'D3'
```

In [74]: `s`

Out[74]: `{'D1', 'D2', 'D4', 'D5'}`

In [75]: `s.discard('D2') # like remove()`

In [76]: `s`

Out[76]: `{'D1', 'D4', 'D5'}`

In [77]: `s.discard('D2')`

In [ ]:
```python
# set operations
# ------------------
#  union,intersection,difference,symmetric_difference
#
#  1. set operators  <or>   2.set methods
#----------------------------------------
#  | & - ^                  union(),intersect(),difference(),symmetric_differe
```

In [78]:
```python
file1 = ['data1','data2','data3','data4','data1','data2','data3']
set(file1) # typecast to set
```

Out[78]: `{'data1', 'data2', 'data3', 'data4'}`

In [79]: `list(set(file1)) # typecast to list`

Out[79]: `['data4', 'data2', 'data1', 'data3']`

In [81]:
```python
file1 = ['data1','data2','data3','data4','data5']
file2 = ['data3','data4','data6','data7']

set(file1)|set(file2) # set(file1).union(set(file2))
```

Out[81]: `{'data1', 'data2', 'data3', 'data4', 'data5', 'data6', 'data7'}`

In [82]:
```python
# filter common data
set(file1) & set(file2) # set(file1).intersection(set(file2))
```

Out[82]: `{'data3', 'data4'}`

In [83]:
```python
# difference -> A-B
set(file1) - set(file2) # set(file1).difference(set(file2))
```

Out[83]: `{'data1', 'data2', 'data5'}`

In [84]:
```python
# difference -> B-A
set(file2) - set(file1) # set(file2).difference(set(file1))
```

```
Out[84]: {'data6', 'data7'}
```

```
In [85]: # Symmetric_difference
         set(file1) ^ set(file2) # set(file1).symmetric_difference(set(file2))
```

```
Out[85]: {'data1', 'data2', 'data5', 'data6', 'data7'}
```

```
In [ ]: # File Handling
        # -----------------
                           input()                 print()
        Keyboard(<STDIN>) ----<------ Python -------->------ Monitor(STDOUT)
                                      ======
                                        |
                                      Storage(FILE)
        1. read data from <FILE> --- python --- display to monitor (not reading input fr
        2. Python -- create a newFile and write data to FILE (not display results to mon
        3. read data from <FILE> --- python --- create a newFile and write data to FILE

         +----------------------------------+
         | Userspace : Python  -<--------------(5)
         +-----------(1)--|------------------|-+
         | OS:         (2)  ..   [d1,d2,d3..dn] 0x1234 (4)
         +--------------|---|-----------------+
         | Hardware : Storage(HDD) (3)
         +----------------------------------+

        1. read data from <FILE> --- python --- display to monitor (not reading input fr
        open a an existing File  ==> Fobj = open('Filename',mode)  # mode - r ; w ; a (a
        read a content                  Fobj.read() -->'d1\n,d2\n,d3\n..dn\n' <-- str
                                         (or)
                                        Fobj.readlines() -->['d1\n','d2\n','d3\n',..'dn\n']
        close a File                    Fobj.close()
```

```
In [86]: open('emp.csv','r')
```

```
Out[86]: <_io.TextIOWrapper name='emp.csv' mode='r' encoding='cp1252'>
```

```
In [88]: # open('r1.txt','r')
         # FileNotFoundError: [Errno 2] No such file or directory: 'r1.txt'
```

```
In [89]: Fobj = open('emp.csv','r')
         Fobj.read()
```

```
Out[89]: 'eid,ename,edept,ecity,ecost\n101,raj,sales,pune,1000\n102,leo,prod,bglore,2301
         \n230,raj,prod,pune,2300\n450,shan,sales,bglore,3401\n542,anu,HR,mumbai,4590\n3
         21,bibu,sales,hyd,5419\n651,ram,hr,bglore,3130\n541,leo,admin,chennai,4913\n65
         2,karthik,sales,bglore,3405\n'
```

```
In [90]: Fobj.read()
```

```
Out[90]: ''
```

```
In [91]: Fobj = open('emp.csv','r')
         s = Fobj.read()
         Fobj.close()
         print(type(s),len(s))
```

```
<class 'str'> 254
```

In [92]:
```python
Fobj = open('emp.csv','r')
L = Fobj.readlines()
Fobj.close()
print(type(L),len(L))
```

```
<class 'list'> 10
```

In [93]:
```python
L
```

Out[93]:
```python
['eid,ename,edept,ecity,ecost\n',
 '101,raj,sales,pune,1000\n',
 '102,leo,prod,bglore,2301\n',
 '230,raj,prod,pune,2300\n',
 '450,shan,sales,bglore,3401\n',
 '542,anu,HR,mumbai,4590\n',
 '321,bibu,sales,hyd,5419\n',
 '651,ram,hr,bglore,3130\n',
 '541,leo,admin,chennai,4913\n',
 '652,karthik,sales,bglore,3405\n']
```

In [94]:
```python
L[-3:] # last 3 lines
```

Out[94]:
```python
['651,ram,hr,bglore,3130\n',
 '541,leo,admin,chennai,4913\n',
 '652,karthik,sales,bglore,3405\n']
```

In [97]:
```python
Fobj = open('C:\\Users\\karth\\emp.csv','r')
s = Fobj.read()
Fobj.close()
```

In [ ]:
```
2. Python -- create a newFile and write data to FILE (not display results to mon
C:\Users\karth>cd Demo2

C:\Users\karth\Demo2>dir
 Volume in drive C is OS
 Volume Serial Number is 3E30-0B4D

 Directory of C:\Users\karth\Demo2

10-09-2025  11:18    <DIR>          .
10-09-2025  11:18    <DIR>          ..
               0 File(s)              0 bytes
               2 Dir(s)  789,572,767,744 bytes free

C:\Users\karth\Demo2>python
Python 3.10.0 (tags/v3.10.0:b494f59, Oct  4 2021, 19:00:18) [MSC v.1929 64 bit (
Type "help", "copyright", "credits" or "license" for more information.
>>> open('r1.log','w')
<_io.TextIOWrapper name='r1.log' mode='w' encoding='cp1252'>
>>>
>>> exit()

C:\Users\karth\Demo2>dir
 Volume in drive C is OS
 Volume Serial Number is 3E30-0B4D

 Directory of C:\Users\karth\Demo2

10-09-2025  11:19    <DIR>          .
10-09-2025  11:18    <DIR>          ..
```

```
10-09-2025  11:19                 0 r1.log
             1 File(s)            0 bytes
             2 Dir(s)  789,573,017,600 bytes free

C:\Users\karth\Demo2>notepad r1.log

C:\Users\karth\Demo2>dir
 Volume in drive C is OS
 Volume Serial Number is 3E30-0B4D

 Directory of C:\Users\karth\Demo2

10-09-2025  11:19    <DIR>          .
10-09-2025  11:19    <DIR>          ..
10-09-2025  11:20                38 r1.log
             1 File(s)           38 bytes
             2 Dir(s)  789,572,833,280 bytes free

C:\Users\karth\Demo2>python
Python 3.10.0 (tags/v3.10.0:b494f59, Oct  4 2021, 19:00:18) [MSC v.1929 64 bit (
Type "help", "copyright", "credits" or "license" for more information.
>>>
>>> open('r1.log','w') # overwrite an existing data
<_io.TextIOWrapper name='r1.log' mode='w' encoding='cp1252'>
>>> exit()

C:\Users\karth\Demo2>dir
 Volume in drive C is OS
 Volume Serial Number is 3E30-0B4D

 Directory of C:\Users\karth\Demo2

10-09-2025  11:19    <DIR>          .
10-09-2025  11:19    <DIR>          ..
10-09-2025  11:21                 0 r1.log
             1 File(s)            0 bytes
             2 Dir(s)  789,573,902,336 bytes free

C:\Users\karth\Demo2>python
Python 3.10.0 (tags/v3.10.0:b494f59, Oct  4 2021, 19:00:18) [MSC v.1929 64 bit (
Type "help", "copyright", "credits" or "license" for more information.
>>>
>>> wobj = open('r1.log','w')
>>>
>>> # wobj.write('Single String\n') <== str(1234) "Str1"+"Str2"
>>> # ----------------------------
>>> #
>>> # wobj.close()
>>>
>>> wobj.write("Data1\n")
6
>>> wobj.write("101,raj,sales,bglore,2000\n")
26
>>> cost=45903.32
>>> wobj.write("Cost is:"+str(cost)+"\n")
17
>>> wobj.write(f'Emp cost is:{cost}\n')
21
>>> wobj.close()
>>>
```

In [98]:
```python
wobj = open('r1.log','w')
wobj.write('test-server LB:0.13\n')
wobj.write('demo-server LB:0.23\n')
wobj.write('-'*20+'\n')
wobj.close()
```

In [99]:
```python
fobj = open('r1.log','r')
s = fobj.read()
fobj.close()
print(s)
```

```
test-server LB:0.13
demo-server LB:0.23
--------------------
```

In [100…]:
```python
wobj = open('r1.log','a') # append
wobj.write('CPU Load Avg 98.32\n')
wobj.write('App Utilization report:343\n')
wobj.write('-'*20+'\n')
wobj.close()
```

In [101…]:
```python
fobj = open('r1.log','r')
s = fobj.read()
fobj.close()
print(s)
```

```
test-server LB:0.13
demo-server LB:0.23
--------------------
CPU Load Avg 98.32
App Utilization report:343
--------------------
```

In [ ]:
```python
3. read data from <FILE> --- python --- create a newFile and write data to FILE
Fobj = open('InputFile','r')
Wobj = open('ResultFile','w')
s = Fobj.read()  # Vs L = Fobj.readlines()
Wobj.write(s)    #    L[-5:] -->for loop - iterate ->wobj.write()
Fobj.close()
Wobj.close()
```

In [ ]:
```python
# Function
#--------------
print()
type()
len()
...
------//pre-defined functions
|
user defined function
    - Code reusability
    - function definition - operation block
      def functionName():
            ........
            ........
    - function call - to invoke a definition
        functionName()
```

```
+--------------------------------+
|   print('list of servers')
|   for var in ['S1','S2','S3']:
|         print(var)
|   print('device details:-')
|   for var in ['D1','D2']:
|         print(var)
|   fobj = open('r1.log','r')
|   s = fobj.read()
|   print(s)
|   fobj.close()
|   print('list of servers')
|   for var in ['S1','S2','S3']:
|         print(var)
|   print('device details:-')
|   for var in ['D1','D2']:
|         print(var)
|   print('list of servers')
|   for var in ['S1','S2','S3']:
|         print(var)
|   print('device details:-')
|   for var in ['D1','D2']:
|         print(var)
+---------------------------------+

        Vs
+---------------------------------+
| def f1():
      print('list of servers')
      for var in ['S1','S2','S3']:
          print(var)
|
|def f2():
      print('device details:-')
      for var in ['D1','D2']:
          print(var)
|
|def f3():
      fobj = open('r1.log','r')
      s = fobj.read()
      print(s)
      fobj.close()
|
| f1() # functionCall
| f2()
| f1()
| f2()
| f1()
| f3()
| f1()
```

In [103…

```python
def display():
    print('this is display block')

display()
```

this is display block

In [104…

```python
if(True):
    display() # we can invoke functionCall
```

```
        this is display block
```

In [105…
```python
for var in [1,2,3]:
    display()
```

```
this is display block
this is display block
this is display block
```

In [107…
```python
def f1():
    fobj = open('emp.csv','r')
    s = fobj.read()
    fobj.close()
    print(s[:25]) # 25chars
    print('Exit from f1 block')

f1()
```

```
eid,ename,edept,ecity,eco
Exit from f1 block
```

In [109…
```python
def f1():
    fobj = open('emp.csv','r')
    s = fobj.read()
    fobj.close()
    print(s[:25]) # 25chars
    print('Exit from f1 block')

def f2():
    fobj = open('r1.log','r')
    s = fobj.read()
    fobj.close()
    print(s[:25])
    print('Exit from f2 block')

f1()
f2()
```

```
eid,ename,edept,ecity,eco
Exit from f1 block
test-server LB:0.13
demo-
Exit from f2 block
```

In [110…
```python
def f1(a1):
    fobj = open(a1,'r')
    s = fobj.read()
    print(s[:25])
    fobj.close()
    print('Exit from f1 block')

f1('emp.csv') # function call with argument
f1('r1.log')  # function call with argument
```

```
eid,ename,edept,ecity,eco
Exit from f1 block
test-server LB:0.13
demo-
Exit from f1 block
```

In [116…
```python
def display(a1,a2): # Required Arguments
    print('display block:',a1,a2)
```

```python
# display() - TypeError: display() missing 2 required positional arguments: 'a1'
# display(10) - TypeError: display() missing 1 required positional argument: 'a2
# display(10,20,30) - TypeError: display() takes 2 positional arguments but 3 we
display(10,20)
display('data',True)
display([],[])
display({},())
```

```
display block: 10 20
display block: data True
display block: [] []
display block: {} ()
```

In [120…
```python
L=[]
L.append('D1')
L.append(10)
# L.append() TypeError: list.append() takes exactly one argument (0 given)
# L.append('Dx','Dy') TypeError: list.append() takes exactly one argument (2 giv

# def append(arg):
#     ...
#     ...
```

In [121…
```python
L=[10,20,30,40,50,60,70,80]
L.pop()
```

Out[121…   80

In [122…
```python
L.pop(3)
```

Out[122…   40

In [123…
```python
L.pop(1,2)
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Cell In[123], line 1
----> 1 L.pop(1,2)

TypeError: pop expected at most 1 argument, got 2
```

In [ ]:
```python
def pop(index=-1):
    ..
pop()
pop(3)
pop(1,2) # error
```

In [124…
```python
def f1(fname='emp.csv'): # default args
    fobj = open(fname,'r')
    s = fobj.read()
    fobj.close()
    print(s)
    print('Exit from f1 block')

f1()
f1('r1.log')
# f1('r1.log','r2.log') # Error
```

```
eid,ename,edept,ecity,ecost
101,raj,sales,pune,1000
102,leo,prod,bglore,2301
230,raj,prod,pune,2300
450,shan,sales,bglore,3401
542,anu,HR,mumbai,4590
321,bibu,sales,hyd,5419
651,ram,hr,bglore,3130
541,leo,admin,chennai,4913
652,karthik,sales,bglore,3405

Exit from f1 block
test-server LB:0.13
demo-server LB:0.23
--------------------
CPU Load Avg 98.32
App Utilization report:343
--------------------

Exit from f1 block
```

In [125…
```python
# def f1(a1,a2,a3,a4,a5=True,a6='data'): # OK

def f1(a1,a2,a3,a4,a5=True,a6):
    print("Hello")
```

  Cell In[125], line 3
    def f1(a1,a2,a3,a4,a5=True,a6):
                                ^
SyntaxError: parameter without a default follows parameter with a default

In [127…
```python
def f1(*a1):
    print(type(a1))
    print(a1,"\n")

f1()
f1('D1','D2')
f1(['D1','D2','d3'],('T1','T2','T3'),{'K1':'V1','K2':'V2'})
```

```
<class 'tuple'>
()

<class 'tuple'>
('D1', 'D2')

<class 'tuple'>
(['D1', 'D2', 'd3'], ('T1', 'T2', 'T3'), {'K1': 'V1', 'K2': 'V2'})
```

In [128…
```python
L=['oracle','sql','influxdb','promql','db2']
L.sort()
L
```

Out[128…   ['db2', 'influxdb', 'oracle', 'promql', 'sql']

In [129…
```python
L=['oracle','sql','influxdb','promql','db2']
L.sort(reverse=True)
L
```

Out[129…   ['sql', 'promql', 'oracle', 'influxdb', 'db2']

In [130...
```python
def fx(*a):
    print(a)

fx(Va=10,Vb=20)
```

```
---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Cell In[130], line 4
      1 def fx(*a):
      2     print(a)
----> 4 fx(Va=10,Vb=20)

TypeError: fx() got an unexpected keyword argument 'Va'
```

In [132...
```python
def fx(**a):
    print(a)

fx(Va=10,Vb=20)
fx()
```

```
{'Va': 10, 'Vb': 20}
{}
```

In [134...
```python
import re
help(re.search)
help(re.sub)
```

```
Help on function search in module re:

search(pattern, string, flags=0)
    Scan through string looking for a match to the pattern, returning
    a Match object, or None if no match was found.

Help on function sub in module re:

sub(pattern, repl, string, count=0, flags=0)
    Return the string obtained by replacing the leftmost
    non-overlapping occurrences of the pattern in string by the
    replacement repl.  repl can be either a string or a callable;
    if a string, backslash escapes in it are processed.  If it is
    a callable, it's passed the Match object and must return
    a replacement string to be used.
```

In [137...
```python
def fx():
    global app,port
    app = 'Flask'
    port = 5000
    config = 'flask.conf'
fx()
print(app,port)
# print(config) # NameError: name 'config' is not defined

def fy():
    print(f'App {app} port number:{port}') # global members

fy()
```

```
Flask 5000
App Flask port number:5000
```

In [139...
```python
def fx():
    app = 'rails'
    port = 5500
    return app

fx()
```

Out[139...   'rails'

In [140...
```python
def fx():
    app = 'rails'
    port = 5500
    return app,port # tuple

fx()
```

Out[140...   ('rails', 5500)

In [ ]:
```
 file: pa.py                                          file: p1.py      file: p2.py
+---------------------------------------+            ------------      =============
| def display():                                      import pa        import pa
|     print('display list of servers')               pa.display()      print(pa.app
|                                                    --------------     if(pa.port >
| def report():                                                            print(
|     print('Generate report')                                         =============
|
| app = 'testApp'
| port = 4940
+---------------------------------------+
 python pa.py ->Empty - there is no result

E:\> dir
pa.py p1.py p2.py Demo\
                    |---> p3.py
                          import pa  ---->ModuleNotFoundError
                          pa.display()
```

In [ ]:
```
import <filename>
          |->python Module

 1. python - refer sys.path ->list - search imported module directory path
 2. pvm -->pyc file ==>  __pycache__/ pa.pyc <== pvm

PYTHONPATH - env
PYTHONPATH

Linux
|-> ~/.bashrc
          |
      export PYTHONPATH=/home/karthik/project/


C:\Users\karth\Demo2>dir
 Volume in drive C is OS
 Volume Serial Number is 3E30-0B4D

 Directory of C:\Users\karth\Demo2
```

```
10-09-2025  11:19    <DIR>              .
10-09-2025  12:47    <DIR>              ..
10-09-2025  11:26                    74 r1.log
               1 File(s)             74 bytes
               2 Dir(s)  790,830,415,872 bytes free

C:\Users\karth\Demo2>notepad pa.py

C:\Users\karth\Demo2>dir
 Volume in drive C is OS
 Volume Serial Number is 3E30-0B4D

 Directory of C:\Users\karth\Demo2

10-09-2025  12:49    <DIR>              .
10-09-2025  12:49    <DIR>              ..
10-09-2025  12:49                    47 pa.py
10-09-2025  11:26                    74 r1.log
               2 File(s)            121 bytes
               2 Dir(s)  790,830,354,432 bytes free

C:\Users\karth\Demo2>python
Python 3.10.0 (tags/v3.10.0:b494f59, Oct  4 2021, 19:00:18) [MSC v.1929 64 bit (
Type "help", "copyright", "credits" or "license" for more information.
>>>
>>> import pa
>>> help(pa)
Help on module pa:

NAME
    pa

FUNCTIONS
    display()

FILE
    c:\users\karth\demo2\pa.py


>>> import sys
>>> sys.path
['', 'C:\\Users\\karth\\AppData\\Local\\Programs\\Python\\Python310', 'C:\\Users
>>> exit()

C:\Users\karth\Demo2>mkdir D1

C:\Users\karth\Demo2>cd D1

C:\Users\karth\Demo2\D1>
C:\Users\karth\Demo2\D1>python
Python 3.10.0 (tags/v3.10.0:b494f59, Oct  4 2021, 19:00:18) [MSC v.1929 64 bit (
Type "help", "copyright", "credits" or "license" for more information.
>>>
>>> import pa
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
ModuleNotFoundError: No module named 'pa'
>>>
>>> import sys
>>> sys.path
```

```
['', 'C:\\Users\\karth\\AppData\\Local\\Programs\\Python\\Python310', 'C:\\Users
>>>
>>> "C:\\Users\\karth\\Demo2" in sys.path
False
>>>
>>> type(sys.path)
<class 'list'>
>>>
>>> sys.path.append("C:\\Users\\karth\\Demo2")
>>>
>>> "C:\\Users\\karth\\Demo2" in sys.path
True
>>> sys.path
['', 'C:\\Users\\karth\\AppData\\Local\\Programs\\Python\\Python310', 'C:\\Users
>>>
>>> import pa
>>> pa.display()
This is display block
>>> exit()

C:\Users\karth\Demo2\D1>dir
 Volume in drive C is OS
 Volume Serial Number is 3E30-0B4D

 Directory of C:\Users\karth\Demo2\D1

10-09-2025  12:50    <DIR>          .
10-09-2025  12:50    <DIR>          ..
               0 File(s)              0 bytes
               2 Dir(s)  790,829,555,712 bytes free

C:\Users\karth\Demo2\D1>
```

In [ ]:
```
Winx
-----
pip install <Module>
(or)
python -m pip install <Module>

Linux
-----
pip install <module> # python2.x
pip3 install <module> # python3.x
```

In [ ]:
```
import sys - python info
import os - os command info
import json - json
```

In [144…]:
```
import sys
#help(sys)
```

In [ ]:
```
Write python program:
 -> modify pin example
 |
 create a newFile - pinHistory.log - append(a) mode
 |
 |-> update user input pin details( Success and Failed )
    update date/time <== import time
                          time.ctime()
```

```
|-> Choice from user -> Yes =>open pinHistory.log file - read the contents
|
|-> def pinTest():
        ....
```

In [145…
```python
import time
time.ctime()
```

Out[145…   'Wed Sep 10 14:08:11 2025'

In [151…
```python
Wobj = open('pinHistory.log','a')
pin = 1234
count = 0
while(count < 3):
    p = input('Enter a pinNumber:')
    count = count + 1
    if(int(p) == pin):
        Wobj.write(f'Success - matched - {count} - Input date/time:{time.ctime()
        print(f'Success - matched - {count} - Input date/time:{time.ctime()}')
        break
    else:
        Wobj.write(f'Failed - User input pinNumber:{p} - Input date/time:{time.c

if(int(p) != pin):
    Wobj.write(f'Pin is Blocked - Entry time is:{time.ctime()}\n')
    print(f'Pin is Blocked')

Wobj.close()
```

```
Pin is Blocked
```

In [152…
```python
def pinTest():
    Wobj = open('pinHistory.log','a')
    pin = 1234
    count = 0
    while(count < 3):
        p = input('Enter a pinNumber:')
        count = count + 1
        if(int(p) == pin):
            Wobj.write(f'Success - matched - {count} - Input date/time:{time.cti
            print(f'Success - matched - {count} - Input date/time:{time.ctime()}
            break
        else:
            Wobj.write(f'Failed - User input pinNumber:{p} - Input date/time:{ti
        if(int(p) != pin):
            Wobj.write(f'Pin is Blocked - Entry time is:{time.ctime()}\n')
            print(f'Pin is Blocked')
        Wobj.close()
```

In [ ]:
```python
# File: pinExample.py
# ------------------
import time
'''This is pin Number validation code'''
def pinTest():
    '''pinTest - simple function call'''
    Wobj = open('pinHistory.log','a')
    pin = 1234
    count = 0
```

```python
    while(count < 3):
        p = input('Enter a pinNumber:')
        count = count + 1
        if(int(p) == pin):
            Wobj.write(f'Success - matched - {count} - Input date/time:{time.cti
            print(f'Success - matched - {count} - Input date/time:{time.ctime()}
            break
        else:
            Wobj.write(f'Failed - User input pinNumber:{p} - Input date/time:{ti
    if(int(p) != pin):
        Wobj.write(f'Pin is Blocked - Entry time is:{time.ctime()}\n')
        print(f'Pin is Blocked')
    Wobj.close()
```

In [ ]:
```
>>>
>>> import sys
>>> sys.path.append("C:\\Users\\karth\\Karthik\\Python-Class\\Cisco-Training")
>>>
>>> import pinExample
>>>
>>> pinExample.pinTest()
Enter a pinNumber:12344
Enter a pinNumber:1234
Success - matched - 2 - Input date/time:Wed Sep 10 14:24:51 2025
>>>
>>> import pinExample as pin
>>> pin.pinTest()
Enter a pinNumber:3343
Enter a pinNumber:3343
Enter a pinNumber:1234
Success - matched - 3 - Input date/time:Wed Sep 10 14:25:23 2025
>>>

if __name__ == '__main__':
    fx()
```

In [ ]:
```
 file: pa.py                                      file: p1.py      file: p2.py
 +--------------------------------------+         ------------     ============
 | def display():                                  import pa        import pa
 |     print('display list of servers')           # both function   |->both
 |                                                 # will execute     will exe
 | def report():
 |     print('Generate report')
 |
 | app = 'testApp'
 | port = 4940
 | display()
 | report()
 +--------------------------------------+
```

In [ ]:
```
File: pa.py
================
def f1():
        print('This is f1 block:',__name__)


if __name__ == '__main__':
        f1()
========================================================
```

```
C:\Users\karth>python
Python 3.10.0 (tags/v3.10.0:b494f59, Oct  4 2021, 19:00:18) [MSC v.1929 64 bit (
Type "help", "copyright", "credits" or "license" for more information.
>>>
>>> __name__
'__main__'
>>> exit()

C:\Users\karth>notepad pa.py

C:\Users\karth>python pa.py
This is f1 block: __main__

C:\Users\karth>python
Python 3.10.0 (tags/v3.10.0:b494f59, Oct  4 2021, 19:00:18) [MSC v.1929 64 bit (
Type "help", "copyright", "credits" or "license" for more information.
>>> import pa
>>> pa.f1()
This is f1 block: pa
>>> __name__
'__main__'
>>> exit()

C:\Users\karth>
C:\Users\karth>python pa.py

C:\Users\karth>
C:\Users\karth>python
Python 3.10.0 (tags/v3.10.0:b494f59, Oct  4 2021, 19:00:18) [MSC v.1929 64 bit (
Type "help", "copyright", "credits" or "license" for more information.
>>>
>>> import pa
>>> pa.f1()
This is f1 block: pa
>>> exit()

C:\Users\karth>python pa.py
This is f1 block: __main__

C:\Users\karth>python
Python 3.10.0 (tags/v3.10.0:b494f59, Oct  4 2021, 19:00:18) [MSC v.1929 64 bit (
Type "help", "copyright", "credits" or "license" for more information.
>>>
>>> import pa
>>> pa.f1()
This is f1 block: pa
>>>
>>> import pa
>>> pa.f1()
This is f1 block: pa
>>> exit()

C:\Users\karth>
```

In [153...
```python
# File: pinExample.py
# -----------------
import time
'''This is pin Number validation code'''
def pinTest():
    '''pinTest - simple function call'''
```

```python
        Wobj = open('pinHistory.log','a')
        pin = 1234
        count = 0
        while(count < 3):
            p = input('Enter a pinNumber:')
            count = count + 1
            if(int(p) == pin):
                Wobj.write(f'Success - matched - {count} - Input date/time:{time.cti
                print(f'Success - matched - {count} - Input date/time:{time.ctime()}
                break
            else:
                Wobj.write(f'Failed - User input pinNumber:{p} - Input date/time:{ti
        if(int(p) != pin):
            Wobj.write(f'Pin is Blocked - Entry time is:{time.ctime()}\n')
            print(f'Pin is Blocked')
        Wobj.close()


if __name__ == '__main__':
    pinTest()
```

```
Success - matched - 2 - Input date/time:Wed Sep 10 14:38:17 2025
```

In [ ]:
```
In Python - class <--> object


10 <== object/value - int class/type


OOPs
- class
- object
- method


class - Template - type
|
class <className>:
    .....
    .....
    ..... attribute
```

In [157…
```python
class deviceInfo:
    deviceID = 1033
    deviceName = 'D1'
    devicestatus = True


print(deviceInfo.deviceID)
print(deviceInfo.deviceName)
print(deviceInfo.devicestatus)
print(deviceInfo.DEVICEId)
```

```
1033
D1
True
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
Cell In[157], line 10
      8 print(deviceInfo.deviceName)
      9 print(deviceInfo.devicestatus)
---> 10 print(deviceInfo.DEVICEId)

AttributeError: type object 'deviceInfo' has no attribute 'DEVICEId'
```

In [158…
```python
class deviceInfo:
    deviceID = 1033
    deviceName = 'D1'
    devicestatus = True


print(deviceInfo.deviceID)
print(deviceInfo.deviceName)
print(deviceInfo.devicestatus)
deviceInfo.deviceName = "LMR1devices" # we can modify an class attribute
```

```
1033
D1
True
```

In [159…
```python
deviceInfo.deviceName
```

Out[159…   'LMR1devices'

In [161…
```python
# python user defined class - mutable structure
# -----------------------------------------------
class box:
    bid = 101

print(box.bid) # we can fetch an existing class attribute
box.bid = 505 # we can modify an existing attribute
box.bname = "Box-1" # we can add new attribute to an existing class
print(box.bid,box.bname)
del(box.bid) # we can delete an existing attribute
print('')
print(box.bid) # AttributeError
```

```
101
505 Box-1
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
Cell In[161], line 12
     10 del(box.bid) # we can delete an existing attribute
     11 print('')
---> 12 print(box.bid)

AttributeError: type object 'box' has no attribute 'bid'
```

In [162…
```python
print(type(int),type(float),type(list),type(bool),type(str),type(dict),type(set)
```

```
<class 'type'> <class 'type'> <class 'type'> <class 'type'> <class 'type'> <class
'type'> <class 'type'> <class 'type'>
```

In [163…
```python
print(type(box))
```

```
<class 'type'>
```

In [ ]:
```
+---------------------+
| [] []          []   | <== blueprint sheet --- class
| (white)             |
+---------|     |------+

   |           |
   |           |
```

```
+========+      +===========+
| [][] []|      | [][]  []|
+----| |-+      +-----| |--+
Building-1      Building-2  <== Real entity - object    className() //Constructor
  |               |
1st main        2nd main <== Address - memory <== each object having own addres
```

```
>>> class box:
...      bid = 101
...
>>> box
<class '__main__.box'>
>>>
>>> box()
<__main__.box object at 0x000001CFAAA010C0>
>>> box()
<__main__.box object at 0x000001CFAAA32350>
>>>
>>>
>>> obj1 = box()
>>> obj2 = box()
>>>
>>> obj1.bid
101
>>> obj2.bid
101
>>> box.bid = 505 # using classname we can overwrite an attribute
>>> obj1.bid
505
>>> obj2.bid
505
>>> box.bid
505
>>> obj1.bid = 'B1-101' # object based initialization
>>> obj1.bid
'B1-101'
>>> box.bid = 504
>>>
>>> obj1.bid
'B1-101'
>>> obj2.bind
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
AttributeError: 'box' object has no attribute 'bind'. Did you mean: 'bid'?
>>>
>>> obj2.bid
504
>>>
```

In [166…
```
class Enrollment:
    Name = ''
    DOB = ''

eobj1 = Enrollment()
eobj1.Name = 'Arun'
eobj1.DOB = '1st Jan'

eobj2 = Enrollment()
```

```python
eobj2.Name = 'Vijay'
eobj2.DOB = '2nd Feb'

print(f'Emp name is:{eobj1.Name}  DOB:{eobj1.DOB}')
print(f'Emp name is:{eobj2.Name}  DOB:{eobj2.DOB}')

# eobj1.place AttributeError: 'Enrollment' object has no attribute 'place'
```

```
Emp name is:Arun   DOB:1st Jan
Emp name is:Vijay  DOB:2nd Feb
```

In [168…
```python
class Enrollment:
    Name = ''
    DOB = ''

eobj1 = Enrollment()
eobj1.Name = 'Arun'
eobj1.DOB = '1st Jan'

eobj2 = Enrollment()
eobj2.Name = 'Vijay'
eobj2.DOB = '2nd Feb'

print(f'Emp name is:{eobj1.Name}  DOB:{eobj1.DOB}')
print(f'Emp name is:{eobj2.Name}  DOB:{eobj2.DOB}')

Enrollment.Place = '' # adding new attribute to an existing class
eobj1.Place = 'City-1' # object based initialization
eobj2.Place = 'City-2' # object based initialization

print(f'''{eobj1.Name} working City:{eobj1.Place}
{eobj2.Name} Working City:{eobj2.Place}''')
```

```
Emp name is:Arun   DOB:1st Jan
Emp name is:Vijay  DOB:2nd Feb
Arun working City:City-1
Vijay Working City:City-2
```

In [170…
```python
def f1():
    print("Hello")

class Box:
    def f2():
        print("Hello")

obj = Box()
print(type(f1)) # f1()
print(type(obj.f2)) # obj.f2()
```

```
<class 'function'>
<class 'method'>
```

In [173…
```python
def f1():
    print("Hello")

f1()
# f1(10) TypeError: f1() takes 0 positional arguments but 1 was given
```

```
Hello
```

In [177…
```python
class Box:
    def f2():
```

```python
        print("Hello")

obj = Box()
# obj.f2() TypeError: Box.f2() takes 0 positional arguments but 1 was given
#
# obj.f2() --> f2(obj)
# obj.f2(10,20,30) --------->f2(obj,10,20,30)
#
class Box:
    def f2(self):
        print("Hello",self)

obj1 = Box()
obj1.f2() ### f2(obj1)
print("obj1=",obj1,"\n")

obj2 = Box()
obj2.f2() ### f2(obj2)
print("obj2=",obj2)
```

```
Hello <__main__.Box object at 0x0000028FAC367E00>
obj1= <__main__.Box object at 0x0000028FAC367E00>

Hello <__main__.Box object at 0x0000028FAD590B90>
obj2= <__main__.Box object at 0x0000028FAD590B90>
```

In [179…
```python
class Enrollment:
    Name = ''
    DOB = ''
    Place = ''
    def f1(self,ename,edob,eplace):
        '''emp initialization '''
        self.Name = ename
        self.DOB = edob
        self.Place = eplace
        print(f'{self.Name} Enrollment is done')
    def f2(self):
        ''' display emp details '''
        print(f'Emp Name:{self.Name} DOB:{self.DOB} Place:{self.Place}')
    def f3(self,eplace):
        ''' update emp working City '''
        self.Place = eplace
        print(f'Emp {self.Name} updated details:-')
        self.f2() # nested methodCall
```

In [180…
```python
eobj1 = Enrollment()
eobj1.f1('Arun','1st Jan','City-1') # f1(eobj1,'Arun','1st Jan','City-1')
```

```
Arun Enrollment is done
```

In [181…
```python
eobj2 = Enrollment()
eobj2.f1('Vijay','2nd Feb','City-2')
eobj3 = Enrollment()
eobj3.f1('Anu','3rd March','City-3')
```

```
Vijay Enrollment is done
Anu Enrollment is done
```

In [184…
```python
eobj1.f2()
eobj2.f2()
```

```
eobj3.f2()
```

```
Emp Name:Arun DOB:1st Jan Place:City-1
Emp Name:Vijay DOB:2nd Feb Place:City-2
Emp Name:Anu DOB:3rd March Place:City-3
```

In [186...
```
for var in [eobj1,eobj2,eobj3]:
    var.f2()
    time.sleep(2) # 1sec delay
```

```
Emp Name:Arun DOB:1st Jan Place:City-1
Emp Name:Vijay DOB:2nd Feb Place:City-2
Emp Name:Anu DOB:3rd March Place:City-3
```

In [187...
```
eobj2.f3('Pune')
```

```
Emp Vijay updated details:-
Emp Name:Vijay DOB:2nd Feb Place:Pune
```

In [ ]:
```
>>> import EmpEnrollment
>>>
>>> import EmpEnrollment as Emp
>>>
>>> Emp
<module 'EmpEnrollment' from 'C:\\Users\\karth\\EmpEnrollment.py'>
>>> help(Emp)
Help on module EmpEnrollment:

NAME
    EmpEnrollment - About Emp enrollment details

CLASSES
    builtins.object
        Enrollment

    class Enrollment(builtins.object)
     |  Enrollment App
     |
     |  Methods defined here:
     |
     |  f1(self, ename, edob, eplace)
     |      emp initialization
     |
     |  f2(self)
     |      display emp details
     |
     |  f3(self, eplace)
     |      update emp working City
     |
     |  ----------------------------------------------------------------------
     |  Data descriptors defined here:
     |
     |  __dict__
     |      dictionary for instance variables (if defined)
     |
     |  __weakref__
     |      list of weak references to the object (if defined)
     |
     |  ----------------------------------------------------------------------
     |  Data and other attributes defined here:
     |
```

```
      |    DOB = ''
      |
      |    Name = ''
      |
      |    Place = ''

 FILE
      c:\users\karth\empenrollment.py


>>> help(Emp.Enrollment)
Help on class Enrollment in module EmpEnrollment:

class Enrollment(builtins.object)
 |   Enrollment App
 |
 |   Methods defined here:
 |
 |   f1(self, ename, edob, eplace)
 |        emp initialization
 |
 |   f2(self)
 |        display emp details
 |
 |   f3(self, eplace)
 |        update emp working City
 |
 |   ----------------------------------------------------------------
 |   Data descriptors defined here:
 |
 |   __dict__
 |        dictionary for instance variables (if defined)
 |
 |   __weakref__
 |        list of weak references to the object (if defined)
 |
 |   ----------------------------------------------------------------
 |   Data and other attributes defined here:
 |
 |   DOB = ''
 |
 |   Name = ''
 |
 |   Place = ''

>>>
```

In [ ]:
```
class
object
method
```

In [188…
```
s='abc'
s.upper()
```

Out[188…   'ABC'

In [189…
```
help(str.upper)
```

        Help on method_descriptor:

        upper(self, /) unbound builtins.str method
            Return a copy of the string converted to uppercase.

In [192…   #help(list)

In [ ]: