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CHAPTER-2
OOP Using Python

- **Handling Exception**

- **Exception as Control Flow**

- **Assertion**

- **Abstract Data Type**

- **Class**

- **Inheritance**

- **Encapsulation**

- **Information hiding**

- **Search Algorithm**

- **Sorting Algorithm**

- **Hash table**

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Q-1 What is Exception ? How to handle Exception?

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Detail :-

➢ An exception is event that available during execution of a program.
➢ python have many built-in exception.
➢ Python provide two very important features to handle an unexpected error in your program.

      1. Exception handling
      2. Assertion

✓ Exception handling

➢ If you have some doubtful code that create exception at that time you need to handle the exception.
➢ Python provide try ,except else and finally keyword to store and solve the error.

Try and exception:

➢ Try block support the code that you want to execute.
➢ Single try statement can have multiple except statement. Except statement can support handling of any exception.
➢ Try block contains the statement that must be thrown different type of exception.
➢ You can use except clause after try statement which can be multiple.
➢ At last you can include else clause , the code in else statement will be execute if the code in try block do not raised any error.

o **Syntax :-**

Try :

    Do your operations here
   Except Exception1:
     If there is exception1 , than execute this block
   Except Exception2:
     If there is exception2 , then execute this block

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Else:

> If there is no exception , than execute this block

o **Example:-**

Try :

> **F=open("testfile","w")**
> **f.write("hello friends")**

Except:

> **print ("error , can not find file")**

Else:

> **print("written successfully")**
> **f.close()**

1 Word Question – Answer

| SR.NO.	QUESTION	ANSWER
1	_____block support the code that you want to be execute.	try
2	_____statement can support handling of any execption.	except
3	if the code in try block do not raised any error,than the statement following _____will be execute.	else

Q-2 Explain Assertion in brief.

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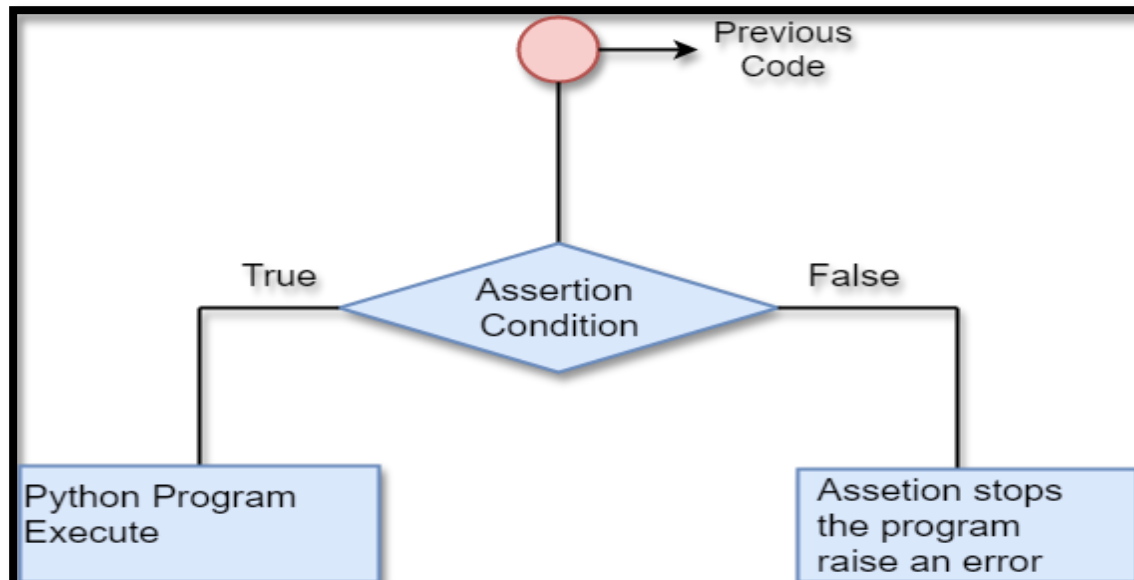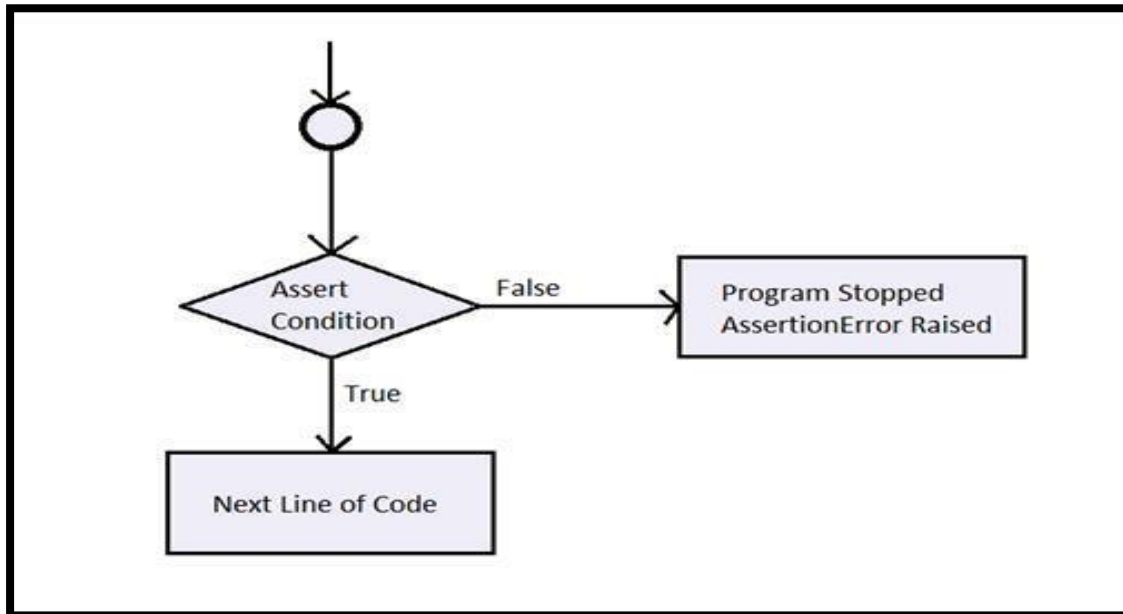
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Detail :-

- An Assertion is rule based checking that you can turn on and turn off when you done with your testing of program.
- Assertions are carried out by assert statement.
- You have to place assert statement at the starting of your optionto check for valid input.

▢ Assert Statement:

- When interpreter encounter asserts statement , python execute the given expression which is true.
- But if the expression is false then python raised AssertionError Exception.
  - o **Syntax :-**

    Assert Expression [, arguments]

- If assertion fail , python use ArgumentExpression as argument for AssertionError.
- AssertionError exception can be handle like any other exception using try , catch , except statement.
- If the exceptions are not handle than terminate the program and produce the Trackback.
- Consider following example that indicate how AssertionException raised , if expression is false.
  - o **Example :-**

    def no(i)
    Assert (i>=0) , "no is less than zero"Return (i)

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#calling function
Print (no(5))
Print (no(-5))

1 Word Question – Answer

SR.NO.	QUESTION	ANSWER
1	Assertions are carried out by_____ statement.	assert
2	If the exceptions are not handle than terminate the program and produce_____.	Trackback

Q-3 Explain Abstract Data type with class.
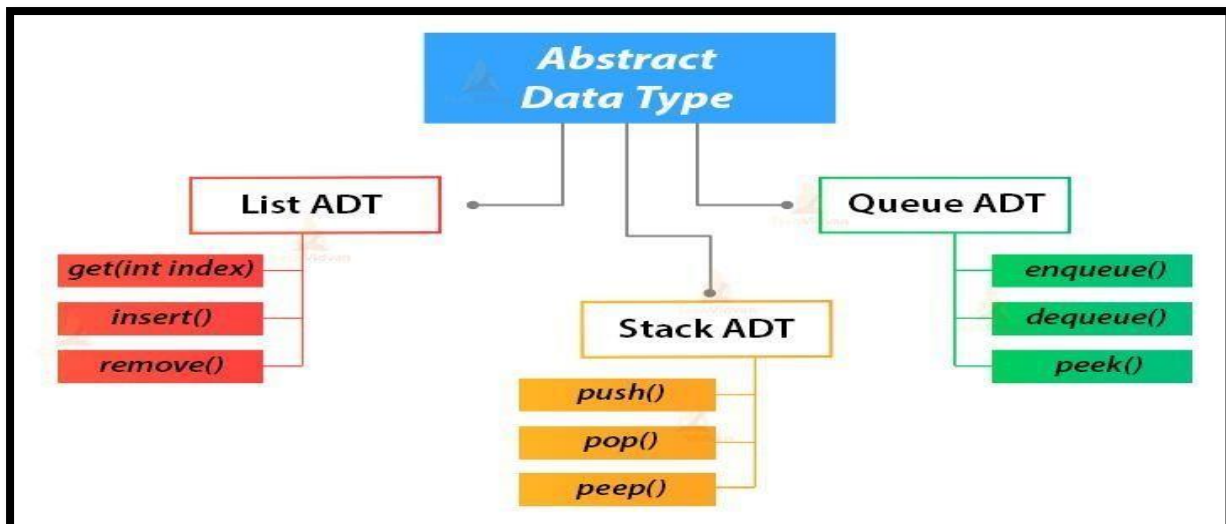
Detail :-

☐ Abstract data type is a type or class for the object whose behavior is define d by set of values.

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- ➢ Abstract data type indicate "what's operations are to be perform but not how the operations will be implemented.
- ➢ Abstractions is most powerful idea in python.
- ➢ Abstract data type provide very important feature called "modularity".
- ➢ Classes are python representation for abstract data type.
- ➢ Abstract data type include both data and operation at the same time.
- ➢ There are following abstract data type available in python :
    - o **Stack ADT**
    - o **Queue ADT**
    - o **List ADT**

✓ **Stack ADT**

  - ➢ A stack contains elements of same type arranged in sequential order. Stack all the operations are performed at top of the stack.

  - ➢ Stack is performed operation by LIFO[last in first out]. Stack support following operation or method.

1. **Stack():-**

    - ➢ Stack create a new sta ck that is empty.
    - ➢ it needs no parameter and return an empty stack.

2. **Push(item):-**

    - ➢ Add new item to the top of the stack it needs the item and return nothing.

3. **Pop ()**

    - ➢ Remove the top item from the stack. Return the item The stack is modified.

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o **Example:-**

```
class Stack:
  def __init__(self):

    self.items = []
    def isEmpty(self):
        return  self.items == []
def push(self, item):
  self.items.insert(0,item)
def peek(self):
      return  self.items[0]
def pop(self):
        return self.items.pop(0)
def front(self):
        return   self.item[(self.items)]
def size(self):
        return len(self.item s)


  s    =    Stack()
s.push('hello')
s.push('true')
s.push('bca6b')
print(s.items)
print(s.size())
print(s.peek())
print(s.pop())
print(s.items)
```

✓ **Queue ADT:-**

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➢ Queue contains element of some type arranged in sequential o rder.

➢ Operation can be take place at both ends insertion is done at the end and deletions is done at front.

1. Queue()

➢ Create a new queue that is empty.

➢ It need no parameters and return an empty queue.

2. Enqueue(items)

➢ Add a new item to the rear of the queue.

➢ It need the item and returns nothing.

3. Dequeue()

➢ Remove the item from the front of the queue.

➢ The queue is modified.

Example:-

```
class Queue:
def __init__(self):

self.items = []
def isEmpty(self):
        return  self.items  ==  []
def enqueue(self, it em):
   self.items.insert(0,item)
   return self.item[len(self.items)-1]

def size(self):
        return len(self.it ems)
```

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q=Queue()
q.enqueue(4)
q.enqueue('dog')
q.enqueue(True)
print(q.size())

✓ List ADT:-

> List contains elements if same type arranged in sequential ord er. List contain following operation.

1.get()
It return eleme nt from the list at given position.

2
2.Insert()
Insert a new el ement of any position of list.

3. Remove ()
It remove first element from non empty list.

4. Replace()
Replace element of any position by other element.

1 Word Question -Answer

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SR.NO.	QUESTION	ANSWER
1	ADT stands for_____.	Abstarct Data Type
2	Abstract data type provide very important feature called_____.	Modularity
3	_____contains elements of some type arranged in sequential order.	Queue
4	_____Remove the top item from the stack.	Pop
5	_____is used to remove first element from non empty list.	remove

Q -4 Explain Encapsulation with information hiding.

❖ If an identifier is only preceded by one underscore character, it is a protected member.

❖ Protected members can be accessed like public members from outside of class

Example:

```
class Encapsulation(object):
    def __init__(self, a, b, c):
        self.public = a
        self._protected = b
        self.__private = c
```

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Detail :-

➢ The object variable should not always access directly.

➢ The object variable sometimes changed with object method which known as private members.

➢ Python does not have private keyword unlike oop language but encapsulation can be take place.

➢ A class variable that should not directly access must be prefixed with __(Double underscore).

➢ Using encapsulation we can restrict access to methods and variable , which prevent data from direct modification.

➢ In python we can represent private attributes using____(Double Underscore)

- o **Example :-**

  Class
  abc(object): Def_____init (self):
      Self.a = 123
      Self.b=123
      Self__c=123
  Return

    Obj = abc()
    Print(obj.a)
    Print(obj.b)
    Print(obj.__c)

➢ **When above code is execute the following output should be display:-123**
    123
    Trackback
    Attribute Error : 'abc' object has no attribute '___c'.

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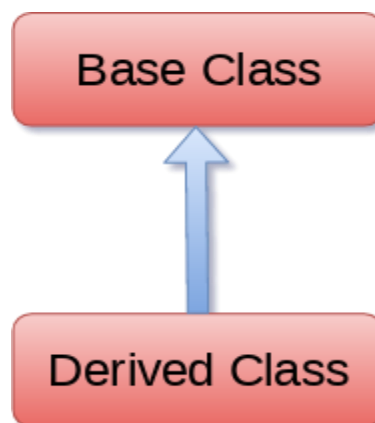|	
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➢ **Encapsulation prevent accessing of data accidently not intencially.**

➢ **In Encapsulation :-**

-Public Method – Accessible from anywhere.

-Private Method – Accessible only with its own class that start with __(double underscore).

-Public Variable – Accessible from anywhere.

-Private Variable – Accessible only with its own class that starts with ___(double underscore).

1 Word Question – Answer

SR.NO.	QUESTION	ANSWER
1	Using_____we can restrict access to methods and variable.	encapsulation
2	In python we can represent private attributes using_____.	__(double Underscore

Q-5 Explain Inheritance with example

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Detail :-

➢ Inheritance is a feature of object oriented programming.

➢ It is use to specify that one class will get all the features of other class.

➢ It is a powerful feature that provide facility to create new class with few modification to existing class.

➢ The Main class from which child class inherit the property is called parent class or base class.

➢ The class that get all the features of parent class or base class is called Child class or derived class.

➢ The main purpose of inheritance is re-usability.

o **Syntax :-**

Class derivedclass (baseclass name):

<statement 1>

<statement 2>

……

……

<statement N>

o **Example :-**

Class animal :
Def eat(self):
Print   ('eating……')
Class dog(animal):
Def break(self):
Print('barking……')
#calling
d.dog()
d.eat()
d.bark()

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✓ **Multiple inheritance:-**

➢ Python support multiple inheritance which allow us to inherit multiple parent classes.
➢ We can derive child class from more than one parent or base classes.
➢ Python provides us the flexibility to inherit multiple base classes in the child class.
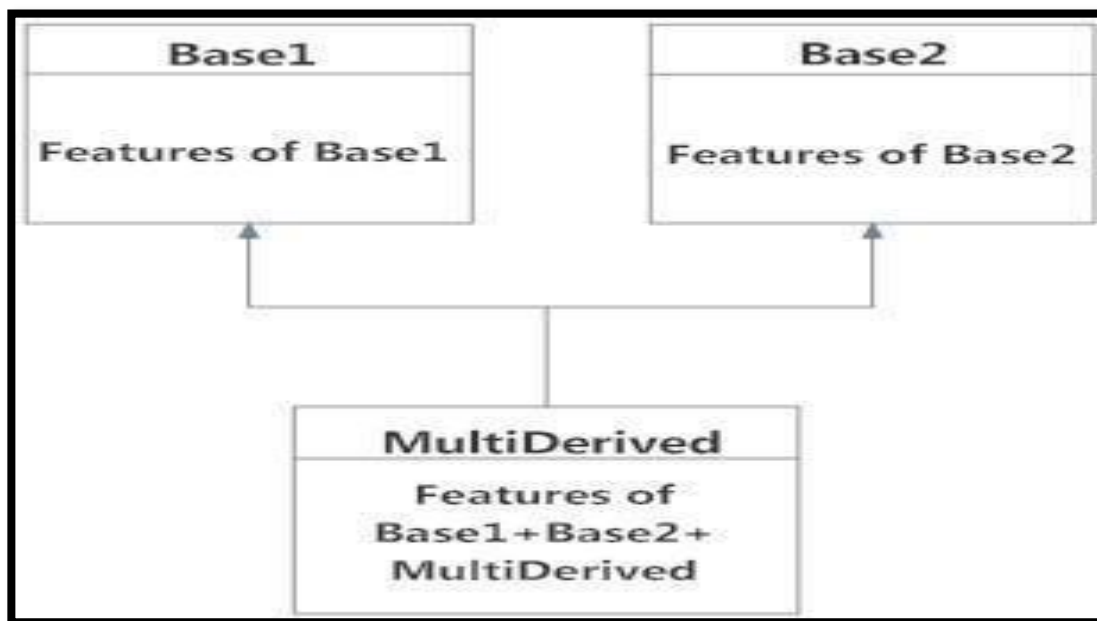
✓ **Multilevel inheritance:-**

➢ In multilevel inheritance , we can inherit derived class from another derived class.

➢ Multi-level inheritance is archived when a derived class inherits another derived class.
➢   There is no limit on the number of levels up to which, the multi-level inheritance is archived in python.
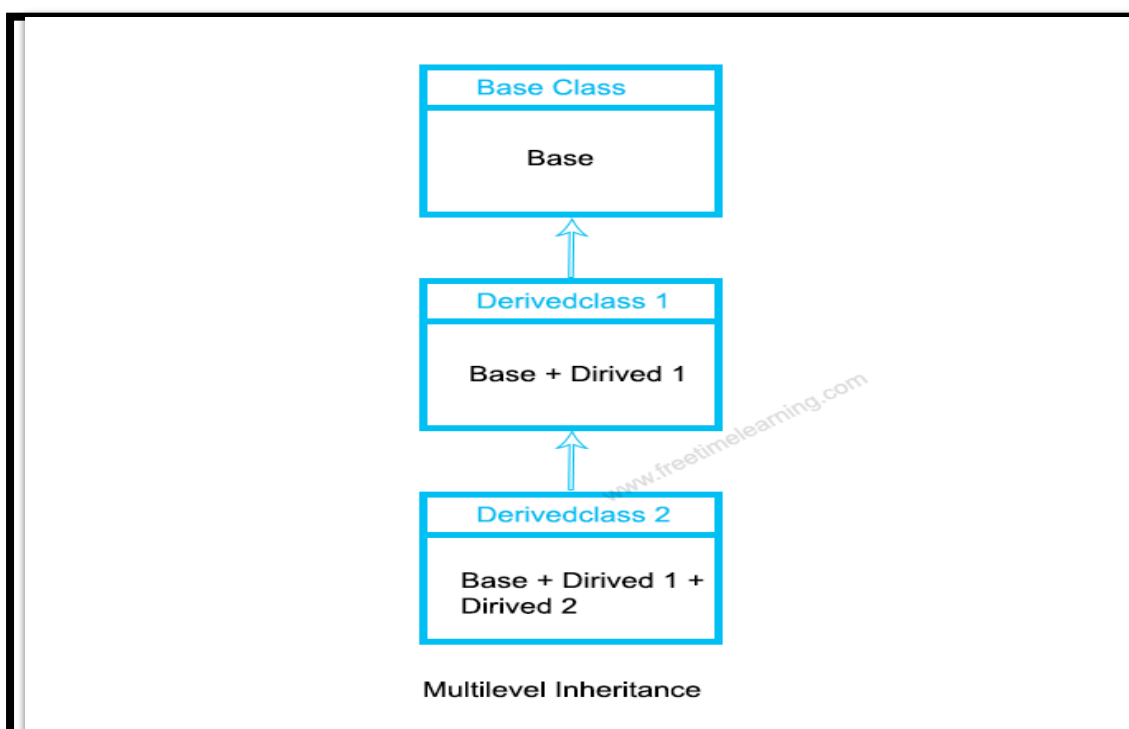
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Multilevel Inheritance

1 Word Question – Answer

SR.NO.	QUESTION	ANSWER
1	The main purpose of inheritance is _____.	Re-usability
2	In _____inheritance ,We can derive child class from more than one parent or base classes.	__(double Underscore)

Q-5 Explain Searching Algorithm.

Detail :-

➢ Searching is very necessary when you store the data in different data structure.

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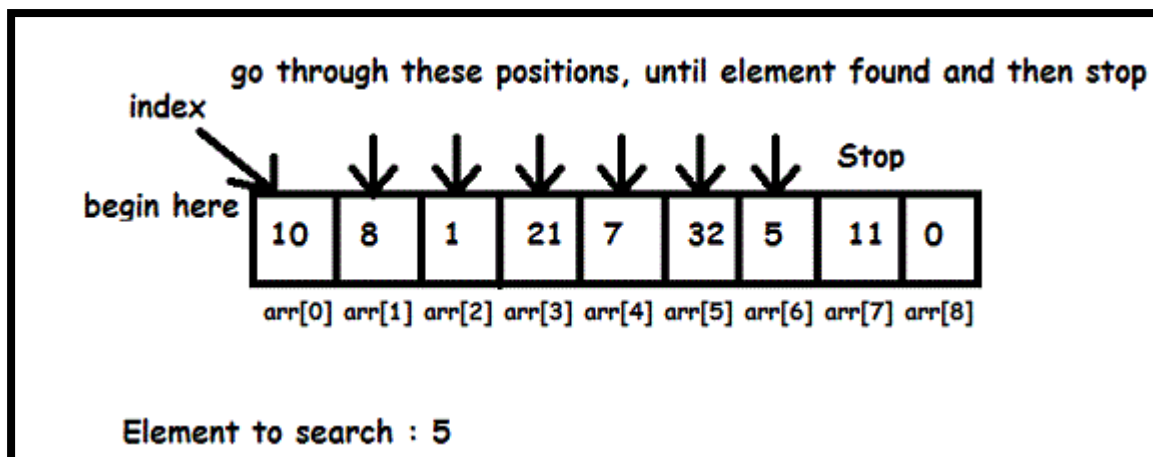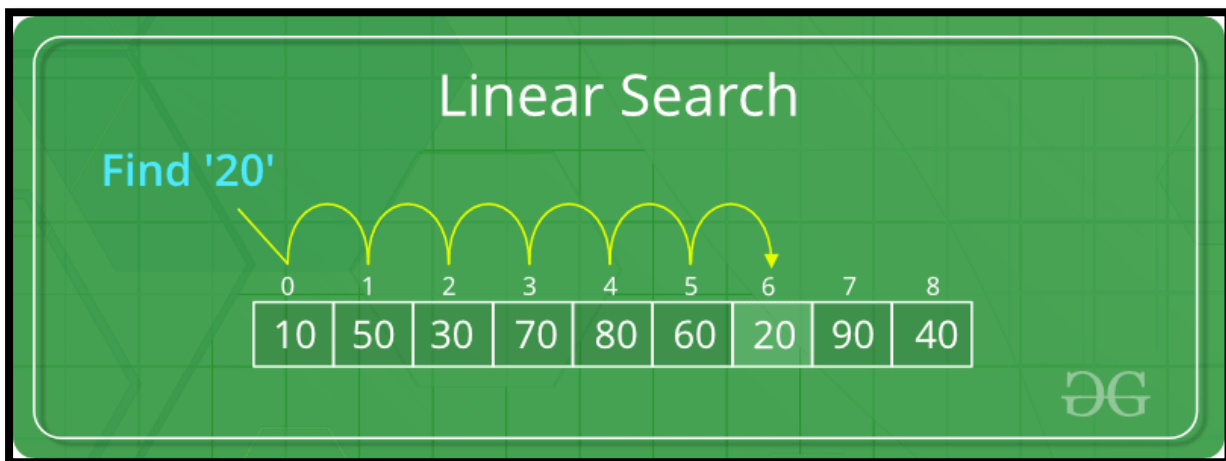### (AFFILIATED TO SAURASHTRA UNIVERSITY)

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> The main purpose of searching is to go for every elements in the data structure and match it with the value , you are searching for.
> There are two types of searching algorithm available in python:-
> > o Linear search
> > o Interpolation search

✓ **Linear search:-**

> In this type of search , the sequential order must be follow by all the elements.
> Every list item is checked , if match is found then the particular list item willbe return.

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➢ Otherwise the search continue till the end of data structure.

   o **Example :-**

```
Def linear_search(values , search_for):

        Search_at      =0
        Search_Res=false
#match value with element
        While (search_at < len(values) and search_res is false):
        If (value[search_at]==search_for ):
                        search_res = true
                else:
                        search_at=search_at  +  1
                        return search_res
        l = [64,34,25, 12,22,10,90]
                print(linear_search(l,12))
                print(linear_search(l,91))
```

   o **Output :-**
      True
      False

✓ <mark>**Interpolationsearch**</mark>

Interpolation search

- Motivated by the phonebook search
- In previous example

7	12	31	49	56	62	85	91	97

- 1st Round

$$I_{Estimated} = \frac{62}{97-7} \times 9 = 6.2 \approx 6$$

A[6-1]=62   Found!

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Interpolation Search

❑ **Algorithm:**

- **Step1:** In a loop, calculate the value of "pos" using the position formula.
- **Step2:** If it is a match, return the index of the item, and exit.
- **Step3:** If the item is less than arr[pos], calculate the position of the left sub-array. Otherwise calculate the same in the right sub-array.
- **Step4:** Repeat until a match is found or the sub-array reduces to zero.

Analysis and Design of Algorithms

➢ This search technique works on particular position of needed value.
➢ For this searching data collection must be in sorted order.
➢ In this search there may be probe position , it is the position of middle most list item of the collection.
➢ If middle item is > greater than search item then probe position is again calculated.

o **Example :-**
```
Def  inter_search(values  ,  x):
        idx =0
        idxn = (len(values)-1)

While  (idx  <  =  idxn  and  x>=values[idx]  and  x<=value[idxn]):
#find mid point
        Mid  =  idx
#compare value
            If (values[mid]==x):
                    Return "found" + str(x) + "at index" + str(mid)
                    If values [mid] < x:
                    idx = mid+1
                    return "search element not in the
list"l = [2,6,11,19,27,31,45,121]
            print(inter_search(l,2))
```

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o **Output :-**

Found 2 at index 0

1 Word Question – Answer

SR.NO.	QUESTION	ANSWER
1	_____ &_____are the types of searching algorithm in python.	Linear Interpolation
2	In_____type of search , the sequential order must be follow by all the elements.	Linear
3	In_____ search there may be probe position , which return middle most list item of the collection.	interpolation

Q -7 Explain Sorting Algorithm.
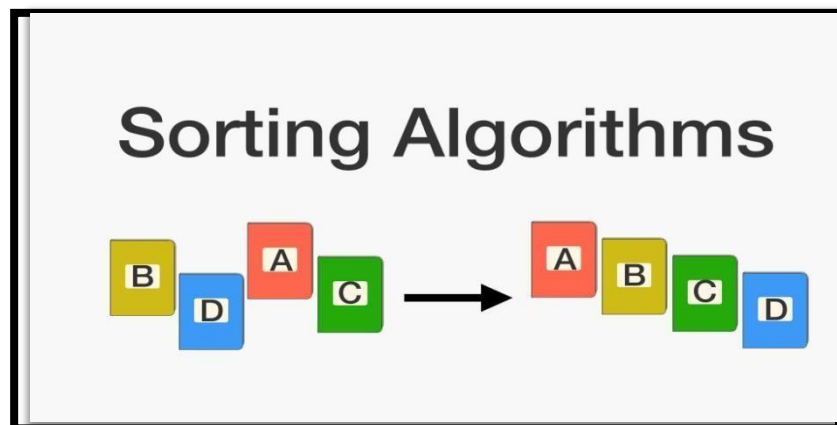
Detail :-

- ➤ Sorting is used to arrange data in particular format.
- ➤ Sorting algorithm specify a way to arrange data in particular order.
- ➤ Sorting support following implementation in python.
  - o Bubble Sort
  - o Merge Sort

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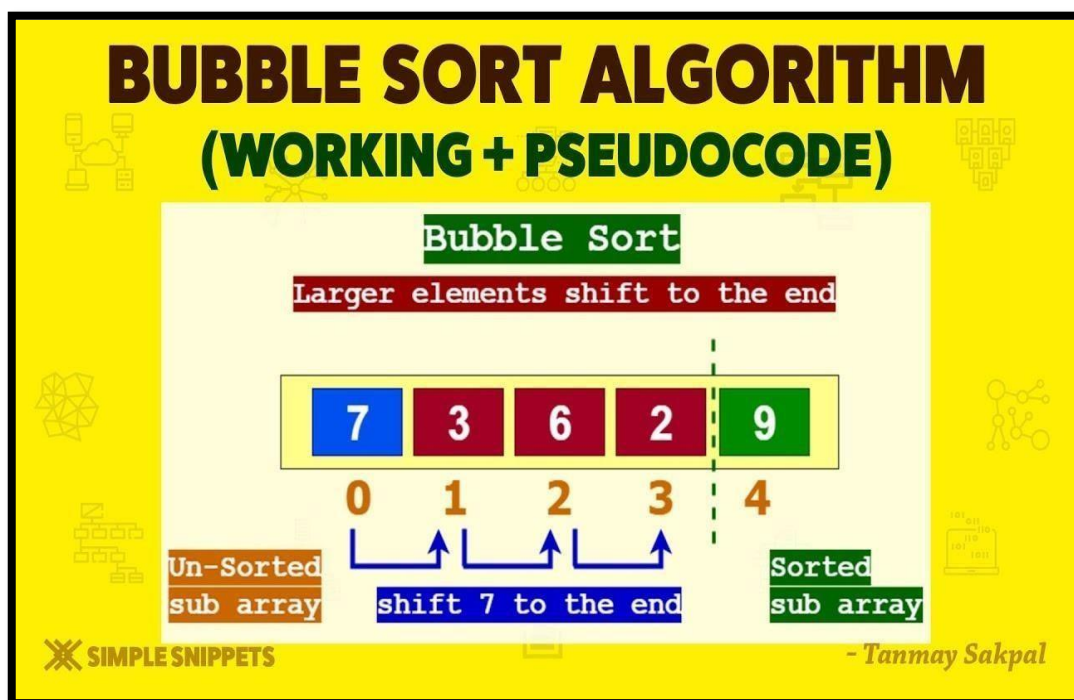|	
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- o Selection Sort
- o Shell Sort
- o Intertion Sort

✓ **Bubble Sort:-**

➢ It is comparison based algorithm in which each pair of elements will be compare and the elements are swapped if they are not in the order.

- o **Example :-**

```
Def bubblesort(list):
        For item_num in range(len(list1)-1,0,-1):
        If list[idx] > list[idx+1]:
                Temp = list[idx]

                List[idx]=   list[idx+1]
                List[idx+1] = temp
```

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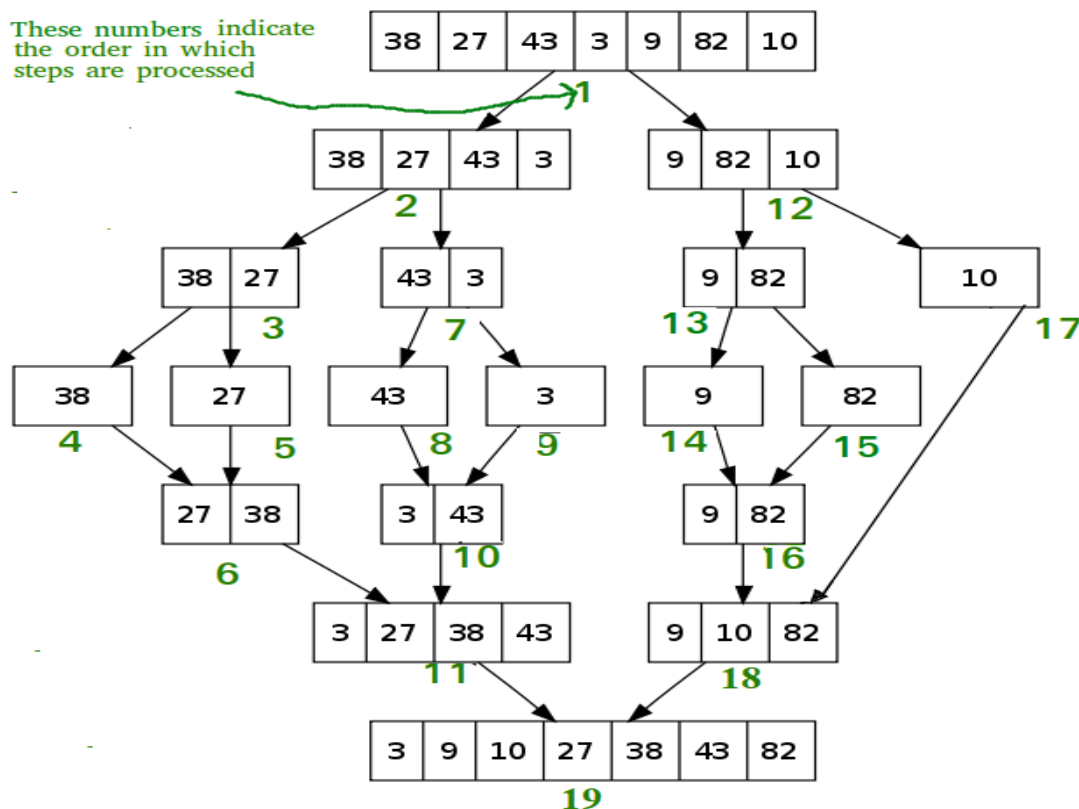| 2 – Vaishalinagar	3 – Vaishalinagar
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List=[19,2,31,45,6,11,121,27]
Bubblesort(list)
Print(list)
o/p :- 2,6,11,19,27,31,45,121

✓ **Merge Sort:-**

➢ Merge sort first devide the array into equal parts then combine them into sort manner.

➢ Merge Sort is divide and conquer algorithm.
➢ It divides input array in two halves, calls itself for the two halves and then merges the two sorted halves.

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o **Example :-**

```
def        mergeSort(nlist):
  print("Splitting ",nlist)
if len(nlist)>1:
    mid = len(nlist)//2
    lefthalf = nlist[:mid]
    righthalf = nlist[mid:]

    mergeSort(lefthalf)
    mergeSort(righthalf)
    i=j=k=0

    while i < len(lefthalf) and j < len(righthalf):
    if lefthalf[i] < righthalf[j]:
        nlist[k]=lefthalf[i]
      i=i+1
    else:
      nlist[k]=righthalf[j]
      j=j+1
    k=k+1

    while  i  <  len(lefthalf):
      nlist[k]=lefthalf[i]
      i=i+1
      k=k+1


    while   j   <   len(righthalf):
      nlist[k]=righthalf[j]
    j=j+1
    k=k+1
  print("Merging   ",nlist)
```

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✓ **Selection Sort:-**

> In selection sort we can start sorting of elements by finding minimum value.
> Then we can move it to the sortest list.
> We can repeat the process for each of the remaining element from unsorted
> List.

o **Example :-**

```
def  selectisn_sort(input_list):
        for idx in range (len(input_list)):
        min_idx = idx
        for j in range(idx+1 , len(input_list)):
                if        input_list[min_idx]<input_list[1]:
        input_list[min_idx] = input_list[idx]
         l=[19,2,31,45,30,11,121,27]
        selection_sort(l)
        print(l)
```

1 Word Question – Answer

| SR.NO.	QUESTION	ANSWER
1	_____algorithm specify a way to arrange data in particular order.	sorting
2	_____ is divide and conquer algorithm.	Merge sort
3	In_____we can start sorting of elements by finding minimum value.	Selection sort

Q-8 Explain Hash Table with Example.

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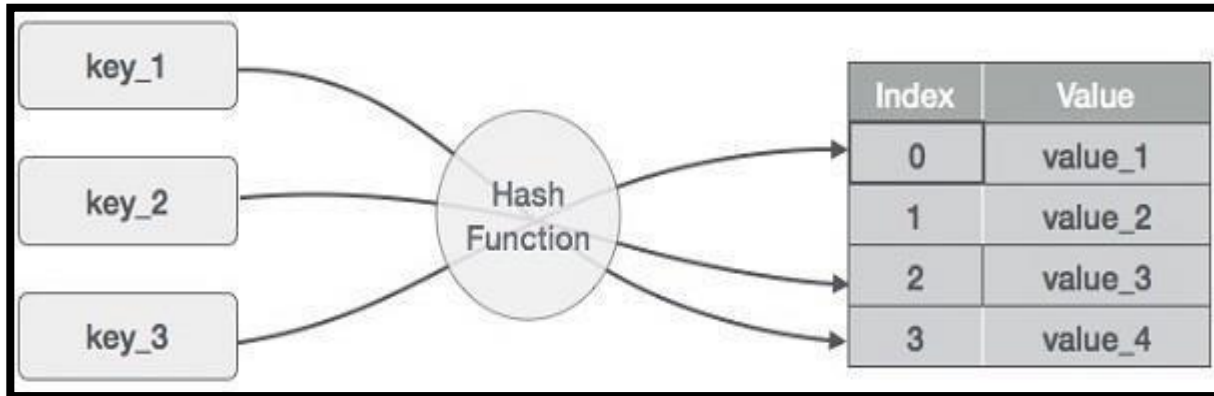
Detail :-

- Hash tables are type of data structure in which index value of data isgenerated from hash table.
- It makes data accessing faster because index value behave as a key.
- In other words hash table store key-value pair but key will be generate dfrom hash function.
- In hashtable key-value pair become the index of array which store thevalue.
- In python dictionary data type represent implementation of hash table.
- The key of dictionary are known as hash table , which generates uniqu e result for each unique value supplied to the hash function.
- The order of data elements in a dictionary is not fixed.

✓ Performing Operations on Hash tables using Dictionaries:

- There are a number of operations that can be performed on has tables in Python through dictionaries such as:

  - o Accessing Values
  - o Updating Values
  - o Deleting Element

Using key values:

✓ Accessing Values:

- The values of a dictionary can be accessed in many ways such as:

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- o Using key values
- o Using Functions

➢ Dictionary values can be accessed using the key values as follows:

```
1  my_dict={'Dave':  '001',  'Ava':  '002',  'Joe':  '003'}my_dict['Dave']
2
```

o **EXAMPLE:**

OUTPUT: '001′

✓ **Using functions:**

➢ There are a number of built-in functions that can be used such as get(), keys(), values(), etc.

EXAMPLE:

```
1
2  my_dict={'Dave' : '001' , 'Ava': '002' , 'Joe':'003'}
3  print(my_dict.keys())print(my_dict.values())
   print(my_dict.get('Dave'))
```

OUTPUT:

dict_keys(['Dave', 'Ava', 'Joe'])

✓ **Updating Values:**

➢ Dictionaries are mutable data type and therefore, you can update them as and when required.
➢ For example, if I want to change the ID of the employee named Dave from '001' to '004' and if I want to add another key-value pair to my dictionary, Ican do as follows:

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o **EXAMPLE:**

```
1  my_dict={'Dave' : '001' , 'Ava': '002' , 'Joe':'003'}
2  my_dict['Dave'] = '004'              #Updating the value ofDave
3  my_dict['Chris'] = '005' #adding a key-valuepair
4  print(my_dict)
```

OUTPUT: {'Dave': '004', 'Ava': '002', 'Joe': '003', 'Chris': '005'}

✓ **Deleting items from a dictionary:**

➢ There a number of functions that allow you to delete items from a dictionary such as *del(), pop(), popitem(), clear(),* etc. For example:

o **EXAMPLE:**

```
1  my_dict={'Dave': '004', 'Ava': '002', 'Joe':
2  '003', 'Chris': '005'}
3  del my_dict['Dave'] #removes key-value pair of'Dave'
4  my_dict.pop('Ava')             #removes the value of 'Ava'
5  my_dict.popitem()             #removes the last inserted item
   print(my_dict)
```

OUTPUT: {'Joe': '003'}

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1 Word Question – Answer

SR.NO.	QUESTION	ANSWER
1	_____are type of data structure in which index value of data is generated from hash table.	Hash tables
2	In hash table , the index value always behave as a_____.	key
3	In hash table ,key will be generated from _____.	hash()