Looping Statement - II

Session Objectives

- ✅ Understand what looping statements are
- ✅ Understand what a for loop is
- ✅ Shorthand for loop (List Comprehension)
- ✅ Understand is nested for/while loop
- ✅ Understand what a while loop is

Syntax : Shorthand for loop (List Comprehension)

```
new_list = [expression for item in iterable (optional condition)]
or
new_list = [expression1 if condition else expression2 for item in iterable]
```

```
_list = [11,21,23,44,11,221,12,19,22,29,77,10,100,-50,500,51,False,True]
# min_value = _list[0]
min_val = float('inf')
for val in _list:
    if val < min_val:
        min_val = val

print(min_val) # -50
```

```
-50
```

val

Memory

```
min_val = inf 11 10 -50
val = 11 21 ...10 -50
11 < inf : True
10 < 11 : True
-50 < 10 : True
```

```python
# IsPrime or Not?
val = int(input("Enter the value : "))
for i in range(2,val): # [2,3....n-1]
    if val % i == 0:
        print(f"{val} is not a Prime Number")
        break
else:
    print(f"{val} is a Prime Number")
```

Memory

val = 7
range [2,3,4,5,6]
i = 7

loop Run Successfully ->
Else

7 % 6 == 0 [False]

21 % 3 == 0 [True]

Memory

val = 21
range [2,3,4,5...20]
i = 3

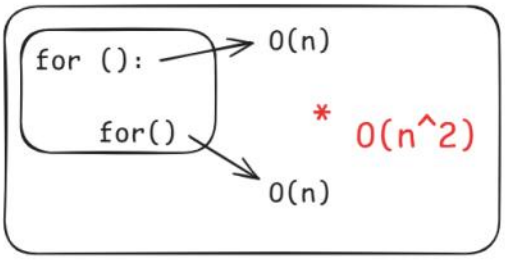
return

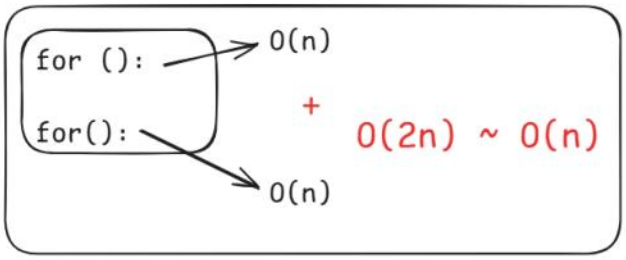
loop Breaks Abruptly ->
Else ❌

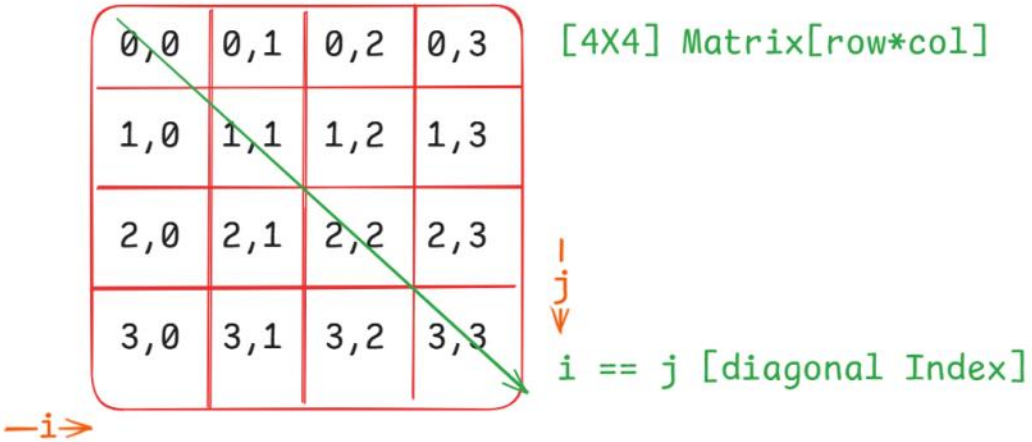
Console:

```
7 is a Prime Number

21 is not a Prime Number
```







```python
# Nested Loop:
for i in range(4): #[0,1,2,3]
    for j in range(4): #[0,1,2,3]
        print(f"{(i,j)}", end = ' ')
    print()
```

```
(0, 0) (0, 1) (0, 2) (0, 3)
(1, 0) (1, 1) (1, 2) (1, 3)
(2, 0) (2, 1) (2, 2) (2, 3)
(3, 0) (3, 1) (3, 2) (3, 3)
```

O(n^2)

```python
# 'max'/'min' -> ASCII
car_list = ['Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
            'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
            'Innova','Baleno','Legender','ScorpioN','Grand Vitara']
max_element = car_list[0] # 'Taigun'
for car in car_list:
    if car > max_element:
        max_element = car

print(max_element) # 'Virtus'
```

```
Virtus
```

```python
# 'max'/'min' -> ASCII
car_list = ['Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
            'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
            'Innova','Baleno','Legender','ScorpioN','Grand Vitara']
min_element = car_list[0] # 'Taigun'
for car in car_list:
    if car < min_element:
        min_element = car

print(min_element) # 'Baleno'
```

```
Baleno
```

```python
_list = [11,21,23,44,11,221,12,19,22,29,77,10,100,-50,500,51,False,True]
# min_value = _list[0]
min_val = float('inf')
for val in _list:
    if val < min_val:
        min_val = val

print(min_val) # -50
```

```
-50
```

```python
_list = [11,21,23,44,11,221,12,19,22,29,77,10,100,-50,500,51,False,True]
# max_val = _list[0]
max_val = float('-inf')
for val in _list:
    if val > max_val:
        max_val = val

print(max_val) # 500
```

```
500
```

```python
_list = [11,21,23,44,11,221,12,19,22,29,77,10,100,-50,500,51,False,True]
# max_val = _list[0]
max_val = float('inf')
for val in _list:
    if val > max_val:
        max_val = val

print(max_val) # inf
```

```
inf
```

```python
# String Iterations : Characters
string = 'Coding Ninjas'
for char in string:
    print(char , end = " ")
```

```
C o d i n g   N i n j a s
```

```python
# String Iterations : Characters
string = 'Python Programming'
for char in string:
    print(char , end = " ")
```

```
P y t h o n   P r o g r a m m i n g
```

```python
# range(start , stop , step) # Slicing
# start = 0 , stop : length(Non-Inclusive) , Step
for i in range(10): # [0,1,2,3,4,10) => [0,1,2,3....9]
    print(i, end = " ")
```

```
0 1 2 3 4 5 6 7 8 9
```

```python
for i in range(1,11): # [1,2,3,4,11) => [1,,2,3....10]
    print(i, end = " ")
```

```
1 2 3 4 5 6 7 8 9 10
```

```python
for i in range(1,11,2):
    print(i, end = " ") # Odd Element [1,3,5,7,9]
```

```
1 3 5 7 9
```

```python
for i in range(0,11,2):
    print(i, end = " ") # Even Element [0,2,4,6,8,10]
```

```
0 2 4 6 8 10
```

```python
car_tuple = ('Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
             'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
             'Innova','Baleno','Legender','ScorpioN','Grand Vitara')
for car in car_tuple:
    print(car , end = " ")
```

```
Taigun Creta Slavia Venue Sierra City Curv Harrier Safari Lord Alto Thar Virtus Defender Innova Baleno Legende
r ScorpioN Grand Vitara
```

```python
car_tuple = ('Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
             'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
             'Innova','Baleno','Legender','ScorpioN','Grand Vitara')
stop = len(car_tuple) # 18
print(stop)
for i in range(stop):
    print(i , end = " ") # [0,1,2,3,4,5....17]
    print(car_tuple[i]) # Indexing [Iterates on Car_tuple]
```

```
18
0 Taigun
1 Creta
2 Slavia
3 Venue
4 Sierra
5 City
6 Curv
7 Harrier
8 Safari
9 Lord Alto
10 Thar
11 Virtus
12 Defender
13 Innova
14 Baleno
15 Legender
16 ScorpioN
17 Grand Vitara
```

```python
# Pick Alternative Cars from car_tuple
car_tuple = ('Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
             'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
             'Innova','Baleno','Legender','ScorpioN','Grand Vitara')
stop = len(car_tuple) # 18
print(stop)
for i in range(0,stop,2):
    print(i , end = " ") # [0,2,4,6,8,10.....16]
    print(car_tuple[i]) # Indexing [Iterates on Car_tuple]
```

```
18
0 Taigun
2 Slavia
4 Sierra
6 Curv
8 Safari
10 Thar
12 Defender
14 Baleno
16 ScorpioN
```

```python
# Pick Odd Alternative Cars from car_tuple
car_tuple = ('Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
             'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
             'Innova','Baleno','Legender','ScorpioN','Grand Vitara')
stop = len(car_tuple) # 18
print(stop)
for i in range(1,stop,2):
    print(i , end = " ") # [1,3,5,7,9,....17]
    print(car_tuple[i]) # Indexing [Iterates on Car_tuple]
```

```
18
1 Creta
3 Venue
5 City
7 Harrier
9 Lord Alto
11 Virtus
13 Innova
15 Legender
17 Grand Vitara
```

```python
# Reverse the car_tuple
car_tuple = ('Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
             'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
             'Innova','Baleno','Legender','ScorpioN','Grand Vitara')
reverse_car_list = []
stop = len(car_tuple) # 18
print(stop)
for i in range(stop-1,-1,-1): # reverse
    print(i , end = " ") # [17,16,15,14....0]
    print(car_tuple[i]) # Indexing [Iterates on Car_tuple]
    reverse_car_list.append(car_tuple[i])

print(reverse_car_list)
```

```
18
17 Grand Vitara
16 ScorpioN
15 Legender
14 Baleno
13 Innova
12 Defender
11 Virtus
10 Thar
9 Lord Alto
8 Safari
7 Harrier
6 Curv
5 City
4 Sierra
3 Venue
2 Slavia
1 Creta
0 Taigun
['Grand Vitara', 'ScorpioN', 'Legender', 'Baleno', 'Innova', 'Defender', 'Virtus', 'Thar', 'Lord Alto', 'Safar
i', 'Harrier', 'Curv', 'City', 'Sierra', 'Venue', 'Slavia', 'Creta', 'Taigun']
```

```python
# Reverse the car_tuple
car_tuple = ('Taigun','Creta','Slavia','Venue','Sierra','City','Curv')
reverse_car_list = []
stop = len(car_tuple) # 7
print(stop)
for i in range(stop-1,-1,-1): # reverse # [7,6,5,4,3,2,1]
    reverse_car_list.append(car_tuple[i])
    print(reverse_car_list)
```

```
7
['Curv']
['Curv', 'City']
['Curv', 'City', 'Sierra']
['Curv', 'City', 'Sierra', 'Venue']
['Curv', 'City', 'Sierra', 'Venue', 'Slavia']
['Curv', 'City', 'Sierra', 'Venue', 'Slavia', 'Creta']
['Curv', 'City', 'Sierra', 'Venue', 'Slavia', 'Creta', 'Taigun']
```

```python
# enumerate() return (idx , item)
# a,b,c = 10,20,30 # a=10,b=20,c=30 [Unpacking a Tuple]
# a,b,*c = 10,20,30,40,50 # a=10,b=20,c=[30,40,50] [Unpacking a Tuple]
car_list = ['Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
            'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
            'Innova','Baleno','Legender','ScorpioN','Grand Vitara']
for idx, car in enumerate(car_list):
    print(idx, end = " ")
    print(car_list[idx] , end = " - ")
    print(car)
```

```
0 Taigun - Taigun
1 Creta - Creta
2 Slavia - Slavia
3 Venue - Venue
4 Sierra - Sierra
5 City - City
6 Curv - Curv
7 Harrier - Harrier
8 Safari - Safari
9 Lord Alto - Lord Alto
10 Thar - Thar
11 Virtus - Virtus
12 Defender - Defender
13 Innova - Innova
14 Baleno - Baleno
15 Legender - Legender
16 ScorpioN - ScorpioN
17 Grand Vitara - Grand Vitara
```

```python
car_tuple = ('Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
             'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
             'Innova','Baleno','Legender','ScorpioN','Grand Vitara')
for idx, car in enumerate(car_tuple):
    print(idx, end = " ")
    print(car_tuple[idx] , end = " - ")
    print(car)
```

```
0 Taigun - Taigun
1 Creta - Creta
2 Slavia - Slavia
3 Venue - Venue
4 Sierra - Sierra
5 City - City
6 Curv - Curv
7 Harrier - Harrier
8 Safari - Safari
9 Lord Alto - Lord Alto
10 Thar - Thar
11 Virtus - Virtus
```

```
12 Defender - Defender
13 Innova - Innova
14 Baleno - Baleno
15 Legender - Legender
16 ScorpioN - ScorpioN
17 Grand Vitara - Grand Vitara
```

```
# Enumerate() not allowed in set() iterable ❌❌
# TypeError: 'set' object is not subscriptable
car_set = {'Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
           'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
           'Innova','Baleno','Legender','ScorpioN','Grand Vitara'}
for idx, car in enumerate(car_set):
    print(idx, end = " ")
    print(car_set[idx] , end = " - ")
    print(car)
```

```
car_list = ['Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
            'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
            'Innova','Baleno','Legender','ScorpioN','Grand Vitara']
enumerate(car_list)
```

```
<enumerate at 0x1d54ee4d350>
```

```
dict(enumerate(car_list))
```

```
{0: 'Taigun',
 1: 'Creta',
 2: 'Slavia',
 3: 'Venue',
 4: 'Sierra',
 5: 'City',
 6: 'Curv',
 7: 'Harrier',
 8: 'Safari',
 9: 'Lord Alto',
 10: 'Thar',
 11: 'Virtus',
 12: 'Defender',
 13: 'Innova',
 14: 'Baleno',
 15: 'Legender',
 16: 'ScorpioN',
 17: 'Grand Vitara'}
```

```
list(enumerate(car_list))
```

```
[(0, 'Taigun'),
 (1, 'Creta'),
 (2, 'Slavia'),
 (3, 'Venue'),
 (4, 'Sierra'),
 (5, 'City'),
 (6, 'Curv'),
 (7, 'Harrier'),
 (8, 'Safari'),
 (9, 'Lord Alto'),
 (10, 'Thar'),
 (11, 'Virtus'),
```

```
 (12, 'Defender'),
 (13, 'Innova'),
 (14, 'Baleno'),
 (15, 'Legender'),
 (16, 'ScorpioN'),
 (17, 'Grand Vitara')]
```

```
list(enumerate(car_list))[0]
```

```
(0, 'Taigun')
```

```
idx , item = list(enumerate(car_list))[0] # (0, 'Taigun')
print(idx) # 0
print(item) # 'Taigun'
```

```
0
Taigun
```

```
_dict = {
    'name' : 'Rajat Singh Thakur',
    'age' : 25,
    'gender' : 'Male',
    'city' : 'Jaipur',
    'state' : 'Rajasthan',
    'country' : 'India'
}
_dict.keys()
```

```
dict_keys(['name', 'age', 'gender', 'city', 'state', 'country'])
```

```
_dict.values()
```

```
dict_values(['Rajat Singh Thakur', 25, 'Male', 'Jaipur', 'Rajasthan', 'India'])
```

```
_dict.items()
```

```
dict_items([('name', 'Rajat Singh Thakur'), ('age', 25), ('gender', 'Male'), ('city', 'Jaipur'), ('state', 'Ra
jasthan'), ('country', 'India')])
```

```
for key, value in _dict.items():
    print((key,value))
```

```
('name', 'Rajat Singh Thakur')
('age', 25)
('gender', 'Male')
('city', 'Jaipur')
('state', 'Rajasthan')
('country', 'India')
```

```
# No Use of adding a dictionary in enumerate : 'Loss of Information' ❌❌
dict(enumerate(_dict))
```

```
{0: 'name', 1: 'age', 2: 'gender', 3: 'city', 4: 'state', 5: 'country'}
```

```python
# enumerate(set) # Shuffled Ordered [No Indexing] ❌❌
car_set = {'Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
           'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
           'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
           'Innova','Baleno','Legender','ScorpioN','Grand Vitara'}
print(car_set)
dict(enumerate(car_set))
```

```
{'Legender', 'Defender', 'Sierra', 'Creta', 'Grand Vitara', 'Lord Alto', 'City', 'Thar', 'Innova', 'Harrier',
'Slavia', 'Virtus', 'ScorpioN', 'Safari', 'Venue', 'Curv', 'Baleno', 'Taigun'}
{0: 'Legender',
 1: 'Defender',
 2: 'Sierra',
 3: 'Creta',
 4: 'Grand Vitara',
 5: 'Lord Alto',
 6: 'City',
 7: 'Thar',
 8: 'Innova',
 9: 'Harrier',
```

```python
# Else in For Loops:
for val in range(1,11): # [1,2,3,...10]
    print(val, end = " ")
else:
    print()
    print("Loop Run Successfully. ✅")
```

```
1 2 3 4 5 6 7 8 9 10
Loop Run Successfully. ✅
```

```python
# Else in For Loops:
for val in range(1,11): # [1,2,3,...10]
    print(val, end = " ")
else:
    print("Loop Run Successfully. ✅")
```

```
1 2 3 4 5 6 7 8 9 10 Loop Run Successfully. ✅
```

```python
# Break Statement -> tries to break the loop abruptly
for val in range(1,11): # [1,2,3,...10]
    print(val, end = " ") # [1,2,3,4,5,6,7]
    if val == 7:
        break
else:
    print()
    print("Loop Run Successfully. ✅")
```

```
1 2 3 4 5 6 7
```

```python
# Break Statement -> tries to break the loop abruptly
for val in range(1,11): # [1,2,3,...10]
    if val == 7:
        break
    print(val, end = " ") # [1,2,3,4,5,6]
else:
    print()
    print("Loop Run Successfully. ✅")
```

```
1 2 3 4 5 6
```

```python
# Break Statement -> tries to break the loop abruptly
for val in range(1,11): # [1,2,3,...10]
    print(val, end = " ") # [1,2,3,4,5,6,7,8,9,10]
    if val == 10:
        break
else:
    print()
    print("Loop Run Successfully. ✅")
```

```
1 2 3 4 5 6 7 8 9 10
```

```python
# Break Statement -> tries to break the loop abruptly
for val in range(1,11): # [1,2,3,...10]
    print(val, end = " ") # [1,2,3,4,5,6,7,8,9,10]
    if val == 11:
        break
else:
    print()
    print("Loop Run Successfully. ✅")
```

```
1 2 3 4 5 6 7 8 9 10
Loop Run Successfully. ✅
```

```python
# Print all the factors of 'n':
n = int(input("Enter the value of n: "))
for i in range(1,n+1): # [1,2,3....n]
    if n % i == 0:
        print(i, end = " ")
```

```
Enter the value of n:  16
1 2 4 8 16
```

```python
# Print all the factors of 'n':
n = int(input("Enter the value of n: "))
for i in range(1,n+1): # [1,2,3....n]
    if n % i == 0:
        print(i, end = " ")
```

```
Enter the value of n:  15
1 3 5 15
```

```python
# Print all the factors of 'n':
n = int(input("Enter the value of n: "))
for i in range(1,n+1): # [1,2,3....n]
    if n % i == 0:
        print(i, end = " ")
```

```
Enter the value of n:  11
1 11
```

```python
# Print all the factors of 'n':
n = int(input("Enter the value of n: ")) # 17
for i in range(2,n): # [2,3....n-1]
    if n % i == 0:
        print(i, end = " ")
```

```
Enter the value of n:  17
```

```python
# IsPrime or Not?
val = int(input("Enter the value : "))
for i in range(2,val): # [2,3....n-1]
    if val % i == 0:
        print(f"{val} is not a Prime Number")
        break
else:
    print(f"{val} is a Prime Number")
```

```
Enter the value :  21
21 is not a Prime Number
```

```python
# IsPrime or Not?
val = int(input("Enter the value : "))
for i in range(2,val): # [2,3....n-1]
    if val % i == 0:
        print(f"{val} is not a Prime Number")
        break
else:
    print(f"{val} is a Prime Number")
```

```
Enter the value :  17
17 is a Prime Number
```

```python
# Print all the factors of 'n': [-ve or +ve]
n = int(input("Enter the value of n: "))
if n < 0: # Negative # -16
    for i in range(n,0): # [-16,-15,-14.....-1]
        if n % i == 0:
            print(i, end = " ")
else: # Postive
    for i in range(1,n+1): # [1,2,3....n]
        if n % i == 0:
            print(i, end = " ")
```

```
Enter the value of n:  -16
-16 -8 -4 -2 -1
```

```python
# Print all the factors of 'n': [-ve or +ve]
n = int(input("Enter the value of n: "))
if n < 0: # Negative # -16
    for i in range(n,0): # [-16,-15,-14.....-1]
        if n % i == 0:
            print(i, end = " ")
else: # Postive
    for i in range(1,n+1): # [1,2,3....n]
        if n % i == 0:
            print(i, end = " ")
```

```
Enter the value of n:  256
1 2 4 8 16 32 64 128 256
```

```
new_list = [expression for item in iterable (optional condition)]
or
new_list = [expression1 if condition else expression2 for item in iterable]
```

```python
# new_list = [expression for item in iterable (optional condition)]
num_list = [1,2,3,4,5,6,7,8,9,10]
squared  = [val **2 for val in num_list]
print(squared)
```

```
[1, 4, 9, 16, 25, 36, 49, 64, 81, 100]
```

```python
# new_list = [expression for item in iterable (optional condition)]
num_list = [1,2,3,4,5,6,7,8,9,10]
add_10  = [val + 10 for val in num_list]
print(add_10)
```

```
[11, 12, 13, 14, 15, 16, 17, 18, 19, 20]
```

```python
# new_list = [expression for item in iterable (optional condition)]
num_list = [1,2,3,4,5,6,7,8,9,10]
even_list  = [val for val in num_list if val % 2 == 0]
even_list
```

```
[2, 4, 6, 8, 10]
```

```
# new_list = [expression for item in iterable (optional condition)]
num_list = [1,2,3,4,5,6,7,8,9,10]
odd_list  = [val for val in num_list if val % 2 != 0]
odd_list
```

```
[1, 3, 5, 7, 9]
```

```
num_list = [1,2,3,4,5,6,7,8,9,10]
odd_list  = []
for val in num_list:
    if val % 2 != 0:
        odd_list.append(val)
odd_list
```

```
[1, 3, 5, 7, 9]
```

```
num_list = [1,2,3,4,5,6,7,8,9,10]
even_list  = []
for val in num_list:
    if val % 2 == 0:
        even_list.append(val)
even_list
```

```
[2, 4, 6, 8, 10]
```

```
# new_list = [expression1 if condition else expression2 for item in iterable]
car_list = ['Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
            'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
            'Innova','Baleno','Legender','ScorpioN','Grand Vitara']
new_car_list = [car if car != 'Harrier' else 'Altroz' for car in car_list]
print(new_car_list, end = " ")
```

```
['Taigun', 'Creta', 'Slavia', 'Venue', 'Sierra', 'City', 'Curv', 'Altroz', 'Safari', 'Lord Alto', 'Thar', 'Vir
tus', 'Defender', 'Innova', 'Baleno', 'Legender', 'ScorpioN', 'Grand Vitara']
```

```
# new_list = [expression1 if condition else expression2 for item in iterable]
car_list = ['Taigun','Creta','Slavia','Venue','Sierra','City','Curv',
            'Harrier','Safari','Lord Alto','Thar','Virtus','Defender',
            'Innova','Baleno','Legender','ScorpioN','Grand Vitara']
new_car_list = []
alt_car = input("Enter the alternative car: ")
for car in car_list:
    if car != 'Harrier':
        new_car_list.append(car)
    else:
        new_car_list.append(alt_car)
print(new_car_list, end = " ")
```

```
Enter the alternative car:  XUV700
```

```
['Taigun', 'Creta', 'Slavia', 'Venue', 'Sierra', 'City', 'Curv', 'XUV700', 'Safari', 'Lord Alto', 'Thar', 'Virtus', 'Defender', 'Innova', 'Baleno', 'Legender', 'ScorpioN', 'Grand Vitara']
```

```
# new_list = [expression for item in iterable (optional condition)]
# Syntax [2D Iteration]
# Syntax : [exp1 for item1 in itr1 for item2 in itr2 .... optional conditions ]
[(i,j) for i in range(4) for j in range(4)] # range(4) # [0,1,2,3]
```

```
[(0, 0),
 (0, 1),
 (0, 2),
 (0, 3),
 (1, 0),
 (1, 1),
 (1, 2),
 (1, 3),
 (2, 0),
 (2, 1),
 (2, 2),
 (2, 3),
 (3, 0),
 (3, 1),
 (3, 2),
 (3, 3)]
```

```
# Nested Loop:
for i in range(4): #[0,1,2,3]
    for j in range(4): #[0,1,2,3]
        print(f"{(i,j)}", end = ' ')
    print()
```

```
(0, 0) (0, 1) (0, 2) (0, 3)
(1, 0) (1, 1) (1, 2) (1, 3)
(2, 0) (2, 1) (2, 2) (2, 3)
(3, 0) (3, 1) (3, 2) (3, 3)
```

```
[(i,j) for i in range(4) for j in range(4) if i == j] # range(4) # [0,1,2,3]
```

```
[(0, 0), (1, 1), (2, 2), (3, 3)]
```

```
# Nested Loop:
for i in range(4): #[0,1,2,3]
    for j in range(4): #[0,1,2,3]
        if i == j:
            print(f"{(i,j)}", end = ' ')
    print()
```

```
(0, 0)
(1, 1)
(2, 2)
(3, 3)
```