Lists in Python

Introduction

- A **list** is a collection of **ordered**, **mutable**, and **indexed** elements.
- It can store items of **different data types**.
- Defined using **square brackets []**.

```
fruits = ["apple", "banana", "cherry"]
numbers = [10, 20, 30, 40]
mixed = [1, "two", 3.0]
```

Indexing

- **Positive indexing** starts from 0.
- **Negative indexing** starts from -1 (from the end).

```
fruits = ["apple", "banana", "cherry"]
print(fruits[0])   # apple
print(fruits[-1])  # cherry
```

List Operations

1. Concatenation (+)

```
a = [1, 2]
b = [3, 4]
print(a + b)  # [1, 2, 3, 4]
```

2. Repetition (*)

```
a = [1, 2]
print(a * 3)  # [1, 2, 1, 2, 1, 2]
```

3. Membership (in, not in)

```
print(2 in [1, 2, 3])     # True
print(5 not in [1, 2, 3]) # True
```

4. Slicing

```
a = [0, 1, 2, 3, 4, 5]
print(a[1:4])     # [1, 2, 3]
print(a[-3:])     # [3, 4, 5]
```

Traversing a List Using Loops

Using for loop:

```
for item in [1, 2, 3]:
    print(item)
```

Using while loop:

```
lst = [10, 20, 30]
i = 0
while i < len(lst):
    print(lst[i])
    i += 1
```

Built-in Functions / Methods for Lists

Function/Method	Description	Example
len()	Returns number of elements	len([1, 2, 3]) → 3
list()	Converts other sequences to list	list('abc') → ['a', 'b', 'c']

append()	Adds element to end of list	a.append(4)
extend()	Appends another list	a.extend([5, 6])
insert(i, x)	Inserts x at index i	a.insert(1, 100)
count(x)	Counts how many times x appears	a.count(2)
index(x)	Returns index of first occurrence	a.index(3)
remove(x)	Removes first occurrence of x	a.remove(2)
pop()	Removes and returns last item	a.pop()
reverse()	Reverses the list in-place	a.reverse()
sort()	Sorts the list in ascending order	a.sort()
sorted()	Returns a sorted list (original unchanged)	sorted(a)
min()	Smallest element	min([4, 1, 7]) → 1
max()	Largest element	max([4, 1, 7]) → 7
sum()	Total of all numeric values	sum([1, 2, 3]) → 6

Nested Lists

- A list within another list.

```
matrix = [[1, 2, 3], [4, 5, 6]]
print(matrix[0][1])  # 2
```

Find Maximum, Minimum, and Mean of List

```
marks = [78, 65, 89, 90]
print("Max:", max(marks))
print("Min:", min(marks))
print("Mean:", sum(marks)/len(marks))
```

Linear Search in a List

```
nums = [10, 20, 30, 40]
x = 30
found = False
for item in nums:
    if item == x:
        found = True
        break
if found:
    print("Element found")
else:
    print("Not found")
```

Count Frequency of Elements

```
lst = [1, 2, 2, 3, 1, 2]
num = 2
print("Frequency of", num, ":", lst.count(num))
```