Python List - Basic to Advanced

What is a List?

A list is a collection of ordered, mutable (changeable) items. Lists can contain any data type.

Creating a List

```
fruits = ["apple", "banana", "cherry"]

numbers = [1, 2, 3, 4, 5]

mixed = [1, "hello", 3.14, True]
```

Accessing Elements

```
print(fruits[0])      # apple

print(fruits[-1])     # cherry
```

Looping Through a List

```
for fruit in fruits:
    print(fruit)
```

Add/Modify/Remove Elements

```
fruits.append("orange")

fruits.insert(1, "grapes")

fruits[0] = "mango"

fruits.remove("banana")

popped = fruits.pop()
```

List Membership

```
if "apple" in fruits:
```

```
    print("Yes")
```

Slicing

```
nums = [10, 20, 30, 40, 50]

nums[1:4]     # [20, 30, 40]

nums[:3]      # [10, 20, 30]

nums[::2]     # [10, 30, 50]
```

Useful Functions

```
len(nums), min(nums), max(nums), sum(nums), sorted(nums)
```

List Comprehension

```
squares = [x**2 for x in range(1, 6)]

even = [x for x in nums if x % 2 == 0]
```

Nested Lists

```
matrix = [[1,2,3],[4,5,6],[7,8,9]]

matrix[1][2]  # 6
```

List Unpacking

```
a, b, c = [1, 2, 3]
```

Copying Lists

```
new_list = old_list[:]

new_list = list(old_list)

new_list = old_list.copy()
```

Stack and Queue

```
stack = [1, 2, 3]; stack.append(4); stack.pop()
from collections import deque
queue = deque([1, 2, 3]); queue.append(4); queue.popleft()
```

Enumerate

```
for i, val in enumerate(fruits):
    print(i, val)
```

Zip

```
names = ["Alice", "Bob"]
scores = [85, 90]
zip(names, scores)  # [('Alice', 85), ('Bob', 90)]
```

Flatten Nested List

```
nested = [[1,2],[3,4],[5,6]]
flat = [item for sublist in nested for item in sublist]
```

Remove Duplicates

```
nums = [1, 2, 2, 3]
unique = list(set(nums))
```

Sort with Key

```
words = ['apple', 'banana', 'cherry']
words.sort(key=len)
```

Summary:

List is mutable, ordered, indexable, and supports comprehensions and nesting.