

PYTHON LISTS

Objects, Data Types, Heterogeneous Lists and Nested Lists

Student Notes with Simple Python Examples

Core idea: A Python list is an ordered, mutable collection of objects. **Mutable** means we change the value of an object.

1. What is a Python List?

A list is one of the most useful built-in data structures in Python. It is used to store multiple objects in a single variable. A list is ordered, so its objects have positions (indexes), and it is mutable, so its contents can be changed.

```
numbers = [10, 20, 30, 40, 50]
print(numbers)
```

Output: [10, 20, 30, 40, 50]

2. A List Can Contain Integer Objects

A list can contain integer objects.

```
numbers = [10, 20, 30, 40, 50]
print(numbers)
```

Output: [10, 20, 30, 40, 50]

The list contains five integer objects: 10, 20, 30, 40 and 50.

3. A List Can Contain Float Objects

A list can also contain floating-point numbers.

```
temperatures = [25.5, 26.2, 27.8, 28.1, 29.4]
print(temperatures)
```

Output: [25.5, 26.2, 27.8, 28.1, 29.4]

Each value in this example is a float object.

4. A List Can Contain String Objects

A list can contain strings. Each string is a separate string object.

```
names = ["Ram", "John", "Ali", "Ravi", "David"]  
  
print(names)
```

Output: ['Ram', 'John', 'Ali', 'Ravi', 'David']

5. A List Can Contain Boolean Objects

Lists can also contain Boolean objects. Python has two Boolean values: True and False.

```
values = [True, False, True, True, False]  
  
print(values)
```

Output: [True, False, True, True, False]

Remember: The Boolean values are True and False. Their spelling and capitalization are important in Python.

6. A List Can Contain Different Types of Objects

One useful feature of Python lists is that a single list can contain objects of different types.

```
data = [10, 3.14, "Python", True, 25]  
  
print(data)
```

Output: [10, 3.14, 'Python', True, 25]

Here the list contains:

Object	Type
10	integer object
3.14	float object
"Python"	string object
True	Boolean object
25	integer object

Key term: Such a list is called a heterogeneous list because it contains objects of different types.

7. The List Itself Is Also an Object

It is important to understand that the objects inside a list are objects, and the list itself is also an object.

```
data = [10, 3.14, "Python", True]
```

In this example, the list contains four objects. The list that holds those objects is itself a Python list object.

Important: Thinking in terms of objects helps explain why a Python list can store integers, floats, strings, Boolean values, and even other lists.

8. A List Can Even Contain Other Lists

A list can contain another list as one of its objects. This leads to the idea of a nested list.

```
numbers = [[10, 20], [30, 40], [50, 60]]

print(numbers)
```

Output: [[10, 20], [30, 40], [50, 60]]

Here, the outer list contains three list objects.

Nested lists are useful when representing information in rows and columns, such as a matrix or a table.

9. Example: A Matrix Using a Nested List

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

print(matrix)
```

Output: [[1, 2, 3], [4, 5, 6], [7, 8, 9]]

The matrix contains three inner lists. Each inner list can be viewed as a row, and the elements within the row represent columns.

Next topic: Nested lists can be studied separately to learn indexing, accessing rows and columns, and modifying elements.

10. Quick Review of List Contents

Example	Object Type	Can a List Contain It?
10	Integer	Yes
3.14	Float	Yes
"Python"	String	Yes
True / False	Boolean	Yes
[10, 20]	Another list	Yes

11. Final Understanding

The most important idea to remember about a Python list is:

A list is an ordered, mutable collection of objects.

```
data = [10, 3.14, "Python", True]
```

The list contains four objects:

10	→ integer object
3.14	→ float object
"Python"	→ string object
True	→ Boolean object

The list itself is also an object.

12. Key Points to Remember

- A list can store multiple objects in one variable.
- A list is ordered, so its objects have positions (indexes).
- A list is mutable, so its contents can be changed.
- A list can contain integer objects.
- A list can contain float objects.
- A list can contain string objects.
- A list can contain Boolean objects such as True and False.
- A single list can contain objects of different types; this is called a heterogeneous list.
- A list can contain another list, producing a nested list.
- The list itself is also a Python object.

13. Simple Practice Programs

Try these short programs after studying the notes.

```
# Example 1: Integer list
numbers = [5, 10, 15, 20]
print(numbers)

# Example 2: Mixed data types
student = ["Ravi", 18, 85.5, True]
print(student)

# Example 3: Nested list
marks = [[80, 75], [90, 88], [70, 82]]
print(marks)
```

14. One-Line Summary

Summary: Python lists are flexible collections of objects: they can store values of different types and can even contain other lists.

