DATA ALLOCATION:

Data Allocation refers to how memory is assigned to variables, objects, and data structures during program execution. Understanding this is crucial for writing efficient code and managing memory effectively.

There Are @ Types of DATA ALLOCATIONS

1. Static allocation:

   Static allocation is when memory is assigned at compile-time and remains fixed throughout the program's execution. This type of allocation is commonly used for global variables, constants, and class attributes. And it is also called as Direct allocation.

2. Dynamic allocation:

   Dynamic allocation is when memory is assigned at runtime, allowing objects and data structures to grow or shrink as needed. This provides flexibility but requires garbage collection to manage memory efficiently. And it is also called as User Defined allocation.

* Python provides four built-in collection data types:

LIST - Ordered, mutable, allows duplicates.
TUPLE - Ordered, immutable, allows duplicates.
SET - Unordered, mutable, does not allow duplicates.
DICTIONARY - Key-value pairs, mutable, does not allow duplicate keys.

1. LIST (ORDERED & MUTABLE):

A list is a dynamic array that can store multiple items of different data types.

CHARACTERISTICS OF LISTS

*Ordered (maintains the order of elements).
* Mutable (elements can be changed).
* Allows duplicate values.
* Indexed (supports positive & negative indexing)

EXAMPLE:

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

2. TUPLE (ORDERED & IMMUTABLE):

A tuple is similar to a list but immutable (cannot be modified after creation).

CHARACTERISTICS OF TUPLES

* Ordered (maintains order).
* Immutable (cannot be changed after creation).
* Allows duplicate values.
* Indexed (supports positive & negative indexing).

EXAMPLE:

```
    colors = ("red", "green", "blue", "green")
     print(colors)
```

3. SET (UNORDERED & NO DUPLICATES):

A set is an unordered collection of unique elements.

CHARACTERISTICS OF SETS

* Unordered (does not maintain order).
* Mutable (can add or remove elements).
* Does not allow duplicate values.
* Unindexed (elements cannot be accessed using an index).

EXAMPLE:

```
    unique_numbers = {1, 2, 3, 4, 4, 5}
      print(unique_numbers)
```

4. DICTIONARY (KEY-VALUE PAIRS):

A dictionary is an unordered collection that stores key-value pairs.

CHARACTERISTICS OF DICTIONARIES

* Unordered (Python 3.7+ maintains insertion order).
* Mutable (can add, modify, or remove key-value pairs).
* Does not allow duplicate keys.
* Fast lookups using keys.

EXAMPLE:

```
    student = { "name": "John","age": 21,"grade": "A"}
      print(student)
```

KEY POINTS:

LIST: Ordered, mutable, allows duplicates. Use for dynamic data storage.

TUPLE: Ordered, immutable, allows duplicates. Use for fixed, unchangeable data.

SET: Unordered, mutable, no duplicates. Use for unique elements and fast lookups.

DICTIONARY: Key-value pairs, mutable, unique keys. Use for mapping and fast data retrieval.