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Date _____
Page _____

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6. tuple

- Ordered collection of elements that cannot be changed after creation.

Once created → cannot modify
But, → can read values

• Creation of tuple

$t = (1, 2)$

$t = \text{tuple}([1, 2])$ # from list

Imp: $t = (5)$ # not a tuple

$t = (5,)$ # tuple

• Key properties of tuple

1. Ordered

$t = (10, 20, 30)$

$\text{print}(t[0])$ # 10

- Indexing works
- Traversal works
- Order is preserved

2. Immutable - cannot modify a tuple after creation

$t = (1, 2, 3)$

$t[0] = 10$

error → 'tuple' object does not support item assignment.

$\text{print}(t[1])$

works

- Why immutability matters
Because tuples are :

- safe
- memory efficient
- hashable (important)

3. Hashable

- Tuples can be used as dictionary keys
- Lists cannot

Example :

$d = \{[1, 2]: "hello"\}$ # error

↑
list as key is not allowed.

$d = \{(1, 2): "hello"\}$

print(d[(1, 2)])

Because tuple is immutable, Python can safely hash it.

4. faster than list

- Because tuple is immutable \rightarrow Python optimizes them.

Tuple is faster during

iteration

storage

fixed data

Time complexity

Access $\rightarrow O(1)$

Search $\rightarrow O(n)$

Iteration $\rightarrow O(n)$

grid problems

BFS

co-ordinates

returning multiple values

* Tuple will appear.