**Module 10 –** Tuples

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# Tuples

A [tuple](https://www.w3schools.com/python/python_tuples.asp) is a built-in Python data structure used to store multiple items in a single variable. Tuples are ordered, immutable, and allow duplicates. They are often used when you want to group related data and ensure that the data cannot be changed.

## 10.1 How to Create a Tuple?

A [tuple](https://www.geeksforgeeks.org/python/python-tuples/) is created by [placing values inside parentheses ()](https://www.programiz.com/python-programming/tuple):

|  |
| --- |
| my\_tuple = (1, 2, 3)  print(my\_tuple) # Output: (1, 2, 3) |

You can also omit parentheses:

|  |
| --- |
| my\_tuple = 1, 2, 3 |

If you have only one item in your [tuple](https://brainstation.io/learn/python/tuple), you should include a comma after that item; otherwise, it won't be considered a tuple.

|  |
| --- |
| one\_item = (5,) # This is a tuple  not\_a\_tuple = (5) # This is just an integer |

## 10.2 Tuples Are Immutable

[Tuples are immutable](https://www.geeksforgeeks.org/python/are-tuples-immutable-in-python/), meaning their contents cannot be changed after they are created. If you need to make changes, convert it to a list, modify it, then convert it back to a tuple.

|  |
| --- |
| t = (1, 2, 3)  # t[0] = 10 # This would raise a TypeError  tList = list(t)  tList[0]=10  t = tuple(tList) |

## 10.3 Accessing Tuple Elements

Like lists, [tuple elements can be accessed](https://www.tutorialspoint.com/python/python_access_tuple_items.htm) via indexing and slicing:

|  |
| --- |
| t = (10, 20, 30, 40)  print(t[1]) # Output: 20  print(t[-1]) # Output: 40  print(t[1:3]) # Output: (20, 30) |

## 10.4 Tuple Operation

[Tuples support operations](https://www.index.dev/blog/python-tuple-methods-operations-guide#tuple-operations) like concatenation, repetition, and membership testing:

|  |
| --- |
| t1 = (1, 2)  t2 = (3, 4)  print(t1 + t2) # Output: (1, 2, 3, 4)  print(t1 \* 2) # Output: (1, 2, 1, 2)  print(3 in t2) # Output: True |

## 10.5 Tuple Methods

Here are some of the common [built-in tuple methods](https://www.analyticsvidhya.com/blog/2024/01/tuple-methods-and-operations/):

count(): Returns the number of times the value x appears in the tuple. Useful for checking how often an element occurs.

|  |
| --- |
| t = (1, 2, 2, 3)  print(t.count(2)) # Output: 2 |

index(): Returns the index of the first occurrence of value x. Raises a ValueError if the value is not in the tuple.

|  |
| --- |
| t = ('a', 'b', 'c', 'b')  print(t.index('b')) # Output: 1 |

len(): Returns the number of elements in the tuple t.

|  |
| --- |
| t = (10, 20, 30)  print(len(t)) # Output: 3 |

sorted(): Returns a new list with the elements of the tuple arranged in ascending order. Convert back to a tuple if needed.

|  |
| --- |
| t = (3, 1, 2)  print(sorted(t)) # Output: [1, 2, 3]  print(tuple(sorted(t))) # Output: (1, 2, 3) |

min(): Returns the smallest value in the tuple.

|  |
| --- |
| t = (5, 1, 9)  print(min(t)) # Output: 1 |

max(): Returns the largest value in the tuple.

|  |
| --- |
| t = (5, 1, 9)  print(max(t)) # Output: 9 |

tuple(): Converts an iterable (list, string, set, etc.) into a tuple. If already a tuple, it returns it unchanged.

|  |
| --- |
| lst = [1, 2, 3]  print(tuple(lst)) # Output: (1, 2, 3)  s = 'abc'  print(tuple(s)) # Output: ('a', 'b', 'c') |

Programming Exercises:

1. **Create a Tuple:**

Create a tuple named nums containing the numbers 5, 10, and 15.

Print the tuple.

1. **Single Element Tuple**

Create a tuple with only one element: the value 42.

Verify that it is a tuple by printing type().

1. **Accessing Elements**

Given the tuple:

t = (4, 8, 12, 16)

Print the first and last elements.

1. **Tuple Slicing**

Given the tuple:

letters = ('a', 'b', 'c', 'd', 'e')

Print the slice that contains ('b', 'c', 'd').

1. **Tuple Concatenation**

Concatenate these two tuples and print the result:

t1 = (1, 2)

t2 = (3, 4)

1. **Membership Test**

Given the tuple:

values = (10, 20, 30, 40)

Check whether 30 is in the tuple and print the result.

1. **Using count()**

Given the tuple:

t = (1, 2, 2, 3, 2, 4)

Use count() to find how many times 2 appears.

1. **Using index()**

Given the tuple:

colors = ('red', 'blue', 'green', 'blue')

Find the index of the first occurrence of 'blue'.

1. **Modify a Tuple Using List Conversion**

Given the tuple:

t = (10, 20, 30, 40)

Change the second element (20) to 200.

1. **Mixed Operations Challenge**

Given the tuple:

data = (7, 3, 9, 3, 5, 1, 3)

Perform all of the following:

1. Use count() to find how many times 3 appears.
2. Create a new tuple that contains the sorted version of data.
3. Print the smallest and largest values from data.
4. Check whether 8 is in the tuple.

Programming Exercise Solutions:

**1.**

|  |
| --- |
| nums = (5, 10, 15)  print(nums) # (5, 10, 15) |

**2.**

|  |
| --- |
| one = (42,)  print(type(one)) # <class 'tuple'> |

**3.**

|  |
| --- |
| t = (4, 8, 12, 16)  print(t[0]) # 4  print(t[-1]) # 16  print(car) |

**4.**

|  |
| --- |
| letters = ('a', 'b', 'c', 'd', 'e')  print(letters[1:4]) # ('b', 'c', 'd') |

**5.**

|  |
| --- |
| t1 = (1, 2)  t2 = (3, 4)  print(t1 + t2) # (1, 2, 3, 4) |

**6.**

|  |
| --- |
| values = (10, 20, 30, 40)  print(30 in values) # True |

**7.**

|  |
| --- |
| t = (1, 2, 2, 3, 2, 4)  print(t.count(2)) # 3 |

**8.**

|  |
| --- |
| colors = ('red', 'blue', 'green', 'blue')  print(colors.index('blue')) # 1 |

**9.**

|  |
| --- |
| t = (10, 20, 30, 40)  temp = list(t)  temp[1] = 200  t = tuple(temp)  print(t) # (10, 200, 30, 40) |

**10.**

|  |
| --- |
| data = (7, 3, 9, 3, 5, 1, 3)  # 1. Count occurrences of 3  print(data.count(3)) # 3  # 2. Sorted version as a tuple  sorted\_data = tuple(sorted(data))  print(sorted\_data) # (1, 3, 3, 3, 5, 7, 9)  # 3. Smallest and largest values  print(min(data)) # 1  print(max(data)) # 9  # 4. Membership test  print(8 in data) # False |