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Lists and List Operators

Programming and Algorithms

Lecture by

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```
n = 3
for i in range(1,n+1):
    print("Hello World!")
```

```
Hello World!
Hello World!
Hello World!
```

What will we Cover?

- Using the list data structure
- List operators

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List Operator +

+ is the concatenation operator

- Used to combine lists together
- Operator is used between two values of type list
- Result is a list containing all values from the two original lists

Example	Result

`list1 = [2, 4]`
`list2 = [3, 5]`
`list1 + list2`
	`[2, 4, 3, 5]`

Concatenation Examples

List and list

```
list1 = [1, 2]
list2 = [3, 4]
print(list1 + list2)
```

```
[1, 2, 3, 4]
```

List and empty list

```
list1 = []
list2 = [3, 4]
print(list1 + list2)
```

```
[3, 4]
```

Assignment

```
list1 = []
list1 = list1 + [3, 4]
print(list1)
```

```
[3, 4]
```

List within a list

```
list1 = [1, 2, [3, 4]]
list1[2] = list1[2] + [3, 4]
print(list1)
```

```
[1, 2, [3, 4, 3, 4]]
```

List Operator [:]

[:] is the slice operator

- Used to extract a slice from a list
- Operator is used similarly to accessing an element of a list
- Result is a list containing values between two indices specified before and after : within []

Example	Result
`list1 = [3, 2, 7, 8]` `list1[1:3]`	`[2, 7]`

Slice Examples

From 1 to 4

```
list1 = [1, 2, 3, 4, 5]
print(list1[1:4])
```

```
[2, 3, 4]
```

From 1 to the end

```
list1 = [1, 2, 3, 4, 5]
print(list1[1:])
```

```
[1, 2, 3, 4]
```

From start to 4

```
list1 = [1, 2, 3, 4, 5]
print(list1[:4])
```

```
[1, 2, 3, 4]
```

Assignment

```
list1 = [1, 2, 3, 4, 5]
list1 = list1[2:3]
print(list1)
```

```
[3]
```

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List Operator *

* is the replication operator

- Used to duplicate the elements of a list
- Operator is used between a list and an `int`
- Result is a list containing several copies of the elements of the original list. Number of copies depends on the `int` value

Example	Result
`list1 = ["a", "b"]` `list1 * 2`	`["a", "b", "a", "b"]`

Replication Examples

List of ints

```
list1 = [1, 2]
print(list1 * 3)
```

```
[1, 2, 1, 2, 1, 2]
```

Empty list

```
list1 = []
print(list1 * 3)
```

```
[]
```

List of empty lists

```
list1 = [[]]
print(list1 * 3)
```

```
[[], [], []]
```

List within a list

```
list1 = [[1]]
list1[0] = list1[0] * 2
print(list1 * 3)
```

```
[[1, 1], [1, 1], [1, 1]]
```

List Operator IN

- Used to check if a value is found in a list
- Operator is used between a variable of any type and a list
- Result is a Boolean value
  - `True` if the value is found in the list
  - `False` if the value is not found in the list

Example	Result
`list1 = [9, 8, 7, 6]` `6 in list1`	`True`

IN Examples

String in a list

```
list1 = ["a", "b", "c"]
str1 = "a"
print(str1 in list1)
```

```
True
```

Sum in a list

```
list1 = [4, 3, 6]
print(2 + 2 in list1)
```

```
True
```

List in a list

```
list1 = [[1]]
list2 = [1]
print(list2 in list1)
```

```
True
```

Empty string in an empty list

```
list1 = []
str1 = ""
print(str1 in list1)
```

```
False
```

List Operator NOT IN

- Used to check if a value is not in a list
- Operator is used between a variable of any type and a list
- Result is a Boolean value
  - `True` if the value is not found in the list
  - `False` if the value is found in the list

Example	Result
`list1 = [9, 8, 7, 6]` `6 not in list1`	`False`

NOT IN Examples

String not in a list

```
list1 = ["a", "b", "c"]
str1 = "abc"
print(str1 not in list1)
```

```
True
```

Product not in a list

```
list1 = [4, 2, 6]
num1 = 2 * 3
print(num1 not in list1)
```

```
False
```

List not in a list

```
list1 = [[1]]
list2 = [2]
print(list2 not in list1)
```

```
True
```

Empty string not in an empty list

```
list1 = []
str1 = ""
print(str1 not in list1)
```

```
True
```

Try It Yourself

Enter and run the following statements in the python environment:

```
list1 = [2, 3]
list2 = [4]
print(list1 + list2 * 2)
```

```
list3 = [1, 2, 3, 4, 5]
list3 = list3[3:]
print(1 in list3)
```

```
list4 = [1, 2, 3, 4, 5]
list4 = list4[3:]
print(1 not in list4)
```

```
list5 = [1, 2, 3, 4, 5]
if 2 in list5:
 print(list5[3:4] * 4)
```

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