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PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

List Comprehension

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List Comprehension

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Introduction

- List comprehension is a concise way of defining and creating a list.
- It is used to create functionality within a single line of code.
- Return value is always a new list obtained by evaluating the expression in the context of for and if clauses which follows it.
- List comprehension is faster in processing than a list using for loop.

List Comprehension

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Syntax:

list = [expression for <variable> in <iterable> [if condition]]

This is equivalent to:

```
for variable in iterable :
        if condition:
                expression
```

List Comprehension

Consider the code :

```
m=[1,2,3]
n=[4,5,6]
new_li=[]
for x in m:
        for y in n:
                new_li.append(x+y)
print(new_li)
```

The same can be done with a single line of code using list comprehension.

```
print([x+y for x in m for y in n])
```

Output:

5, 6, 7, 6, 7, 8, 7, 8, 9]

[5, 6, 7, 6, 7, 8, 7, 8, 9]

(1+4),(1+5),(1+6)....

List Comprehension

Consider an example where we want to calculate a list with the cube of the first 10 natural numbers:

Method 1: (without using list comprehension)

```
cube=[]
for i in range (0,11):
        cube.append(i**3)
print("result = ",cube)
```

Method 2: (using list comprehension)

```
cube = [x**3 for x in range (11)]
print("result = ", cube)
```

Output: (Both code gives the same output)

result = [0, 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000]

Examples

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Example 2: To print the last letter of every word in the list.

```
Words = ["hi","how","are","you"]
items = [ word[-1] for word in Words ]
print (items)
```

Output:

```
['i', 'w', 'e', 'u']
```

Examples

Example 3: To print the common numbers in two lists.

```
list1 = [1, 2, 3, 4]
list2 = [2, 3, 4, 5]

common_num = [a for a in list1 for b in list2 if a == b]
print(common_num)
```

Output:

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

Examples

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Example 4: To print each city with its length.

```
# list of strings and its length
city = [ (x, len(x)) for x in ['Bangalore', 'Delhi',’Bombay']]
print(city)
```

Output:

```
[('Bangalore', 9), ('Delhi', 5), (‘Bombay', 6)]
```

Examples

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Example 5: To print the squares of first 10 odd numbers.

```
list1=[x*x  for  x  in  range(1,11)]
list2=[x  for  x in list1 if  x%2 != 0]
 print(list2)
```

Output:

```
[1, 9, 25, 49, 81]
```

List comprehension –Practice programs

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1. Using list comprehension find the transpose of a given matrix.

```
matrix = [[1, 2], [3,4], [5,6], [7,8]]
transpose = [[row[i] for row in matrix] for i in range(2)]
print (transpose)
```

Output:

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

List comprehension –Practice programs

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2. Using list comprehension print all the numbers which are divisible by both 2 and 5 in the range of 0 to 100

```
num_list = [y for y in range(100) if y % 2 == 0 if y % 5 == 0]    #Use of nested if
print(num_list)
```

Output:

```
[0, 10, 20, 30, 40, 50, 60, 70, 80, 90]
```

List comprehension –Practice programs

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3.Using list comprehension, find all of the numbers that have a 6 in them.

```
nums=input("Enter the number")
List_with_6 = [num for num in nums if  "6"  in  str(num)]
print(List_with_6)
```

Output:

```
Enter the number76548
['6']
```

List comprehension –Practice programs

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4.Using list comprehension count the number of spaces in a string

```
string=input("Enter the string:  ")
len_spaces = len([char for char in string if char == " "])
print("The length of the spaces is::",len_spaces)
```

Output:

```
Enter the string:  This is a test string
The length of the spaces is:: 4
```

List comprehension –Practice programs

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5.Using list comprehension, remove all of the vowels present in the input string.

```
string=input("Enter the string::")
str_no_vowel = "".join([char for char in string.lower() if char not in ["a","e","i","o","u"]])
print("The  string without vowel::",str_no_vowel)
```

Output:

```
Enter the string:: All welcome
The  string without vowel::  ll wlcm
```

THANK YOU

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