CPS 109 - Lab 3

Agenda

1 - lab3

2 - Exhaustive Enumeration

3 - Indexing Lists

4 - Iterating

5 - Binary Numbers

Your Lab 3 Submission

You'll notice this week there is no CodingBat. Instead, you are to answer the 10 questions posted on D2L, and submit them.

There is a format that we suggest you follow: https://github.com/ChrisKolios/CPS109_Fall2022/blob/master/Lab3/lab3_submission_template.py

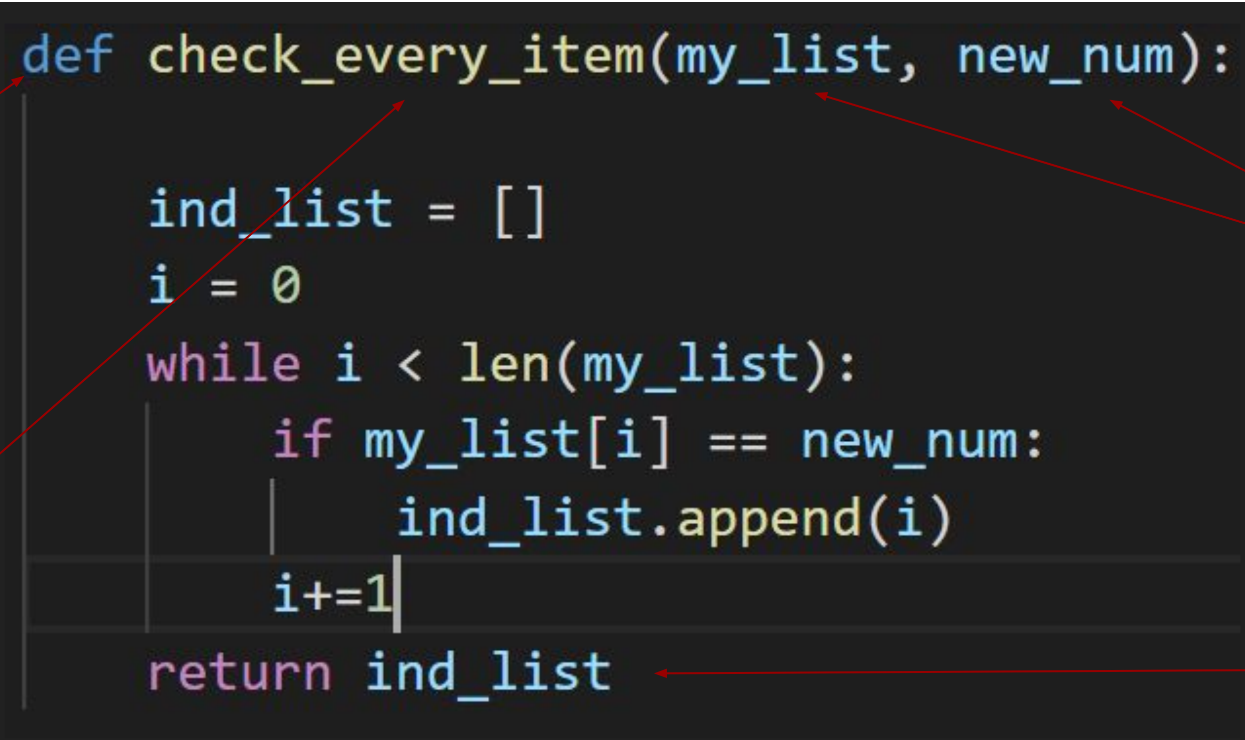
You <u>MUST</u> submit your work as a .txt!!!!

Add comments explaining your thought process / anything that you believe to be unclear.

But First A Word on Functions

Short for “define”. Defines the function.

Function name. This can be anything you want.



```
def check_every_item(my_list, new_num):

    ind_list = []
    i = 0
    while i < len(my_list):
        if my_list[i] == new_num:
            ind_list.append(i)
        i+=1
    return ind_list
```

Function arguments. These are local variables.

Return statement. Gives you a value to use later.

A Handy Definition

Exhaustive Enumeration:

- Also known as “brute force” (most people call it this)
- Simply means you search through/compute *all* possibilities/items in a list or set.

Indexing Lists

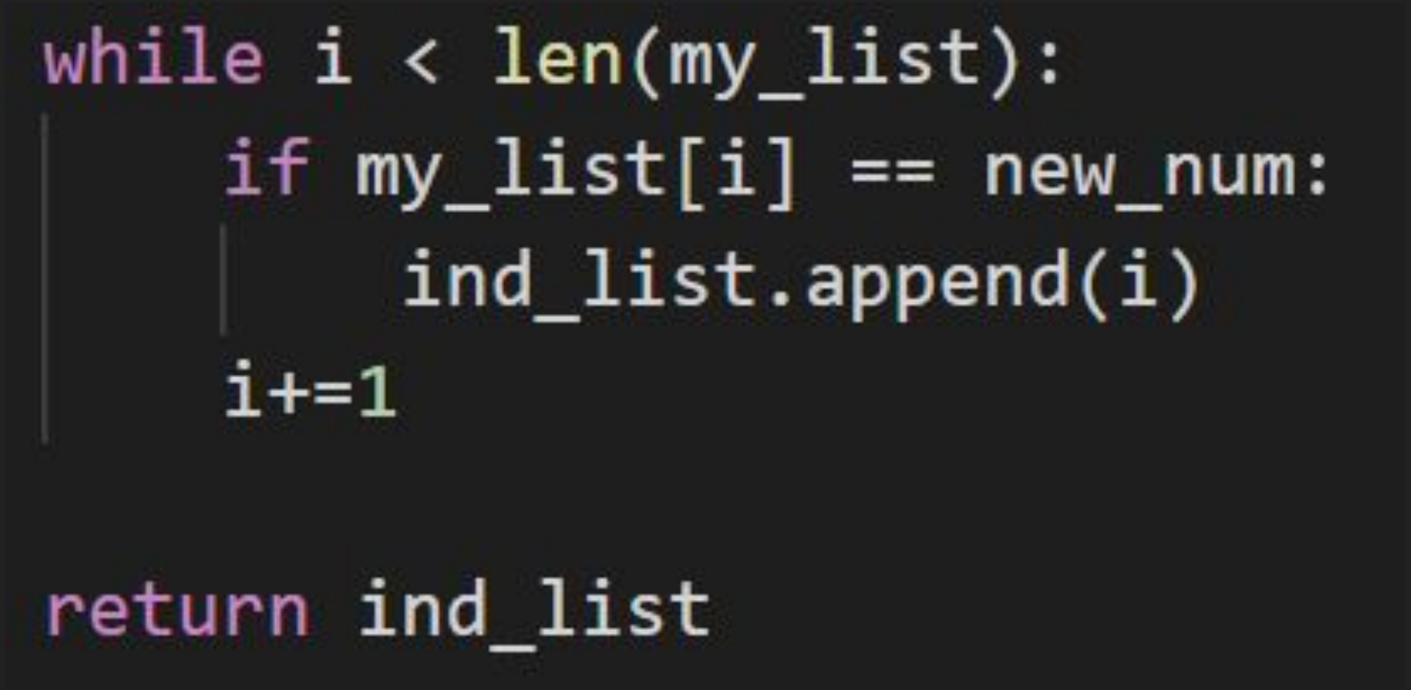
Remember how we went over loops last week? And we just talked about exhaustive enumeration? It’s handy in the context of indexing lists.

What’s an index? An index is the integer location of an item in a list or string.

Iterating

To iterate through something (usually a list or a string), you are simply accessing it by jumping from one index to the next.

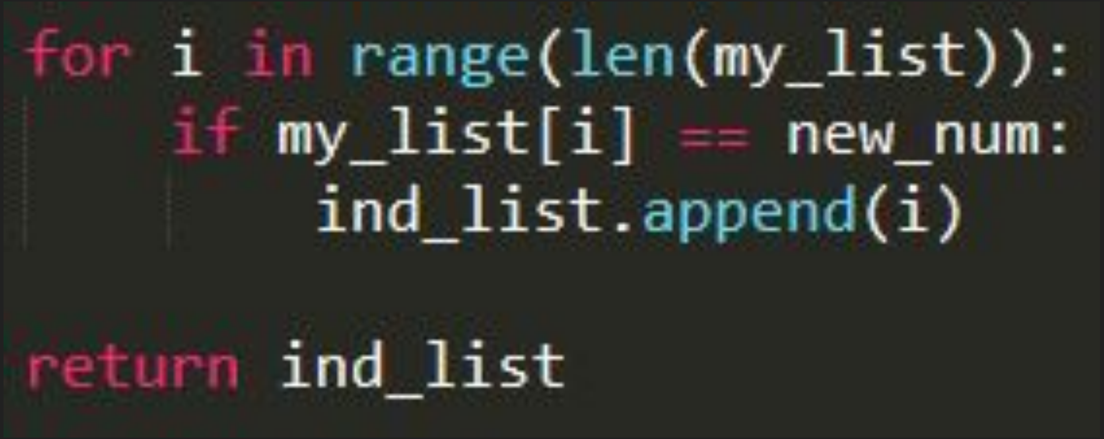
Example of Iterating/Indexing



```
while i < len(my_list):
    if my_list[i] == new_num:
        ind_list.append(i)
    i+=1

return ind_list
```

Prev. Example with “for” loop



```
for i in range(len(my_list)):
    if my_list[i] == new_num:
        ind_list.append(i)

return ind_list
```

Binary Numbers

Author’s Note: No one works with binary numbers in Python.

Binary numbers are representations of real numbers in base 2.

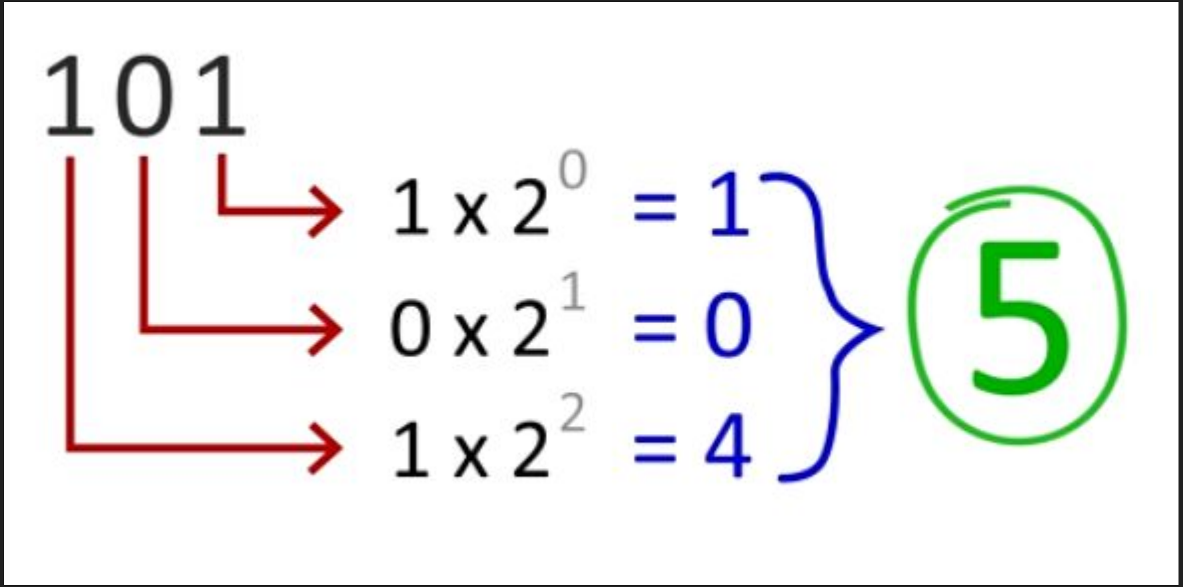
Side note: “Decimal” now refers to numbers in base 10.

Binary Numbers

You know those fancy numbers when they show computers on TV? 10101010… Those are binary numbers.

Converting between decimal and binary is pretty easy!

Binary Numbers



Binary Numbers

That last slide shows us how the 1s and 0s correspond with powers of 2. So, here is, essentially, how to count:

1 = 1

10 = 2

11 = 3

100 = 4

101 = 5

110 = 6

Binary Numbers Practice

Why don’t we try some examples together?

Binary: 101

Decimal: 5

Binary: 111001

Decimal: 57

2**0 + 2**3 + 2**4 + 2**5

=

1 + 8 + 16 + 32 = 57

Decimal: 69

Binary: 1000101

What’s the largest exponent of 2 that goes into 69?: 2**6
= 64 (Total: 64, Rem: 5)

What’s the next largest that goes into 5?: 2**2
= 4 (Total: 64 + 4 = 68, Rem: 1)

What’s the next largest that goes into 1?: 2**0
= 1 (Total: 68 + 1) = 69