COMP1021
Introduction to Computer Science

More on Lists and Strings

David Rossiter

Outcomes

- After completing this presentation, you are expected to be able to:
  1. Manipulate a string as a collection of characters
  2. Use *len* to know how many items are in a list or a string
  3. Use negative indicies for a list or string
  4. Apply slicing techniques to a string
  5. Use the + operator and the * operator on strings, lists and tuples

A String in Python

- A *string* is the computer word for a piece of text
- In Python, a string can be thought of as a collection of letters/digits/symbols, which we generally call *characters*
- For example, the string ‘funny’ in Python is a collection of five characters: ‘f’, ‘u’, ‘n’, ‘n’, ‘y’
- As mentioned before,
  Python code treats `"` exactly the same as `'`

Simple Handling of Strings

- So you can write a string using either single or double quotes:

  `'funny'` or `"funny"` are both OK
- A string can be stored in a variable, e.g.

```
myword = "funny"
```

- You can add strings together to produce a new string e.g:

```
two_words = "pretty" + " umbrellas"
```

- The word for sticking text together is *concatenate*
- Python thinks of a string as a list of letters, so some of the techniques for handling lists also work for strings

Reminder of Handling Lists

- Creating a list:
  list_name = [*first_thing*, *second_thing*, …]
- Reading a value from the list:
  list_name [*item_number*]
- Changing a value in the list:
  list_name [*item_number*] = *new_thing*

Works for strings as well

- Inserting a value into the list:
  list_name`.insert`(*position*, *new_thing*)
- Removing something from the list (once):
  list_name`.remove`(*thing_you_want_to_remove*)

- Adding something new at the end:
  list_name`.append(` *thing_you_want_to_append* `)`
- Sorting the list:
  list_name`.sort()`
- Reversing the order of the things in the list:
  list_name`.reverse()`
- Counting something in the list:
  list_name`.count(` *thing_you_want_to_count* `)`
- Searching for something in the list:
  list_name`.index(` *thing_you_are_searching_for* `)`
- Adding another list at the end of the list:
  list_name`.extend(` *another_list* `)`

Works for strings as well

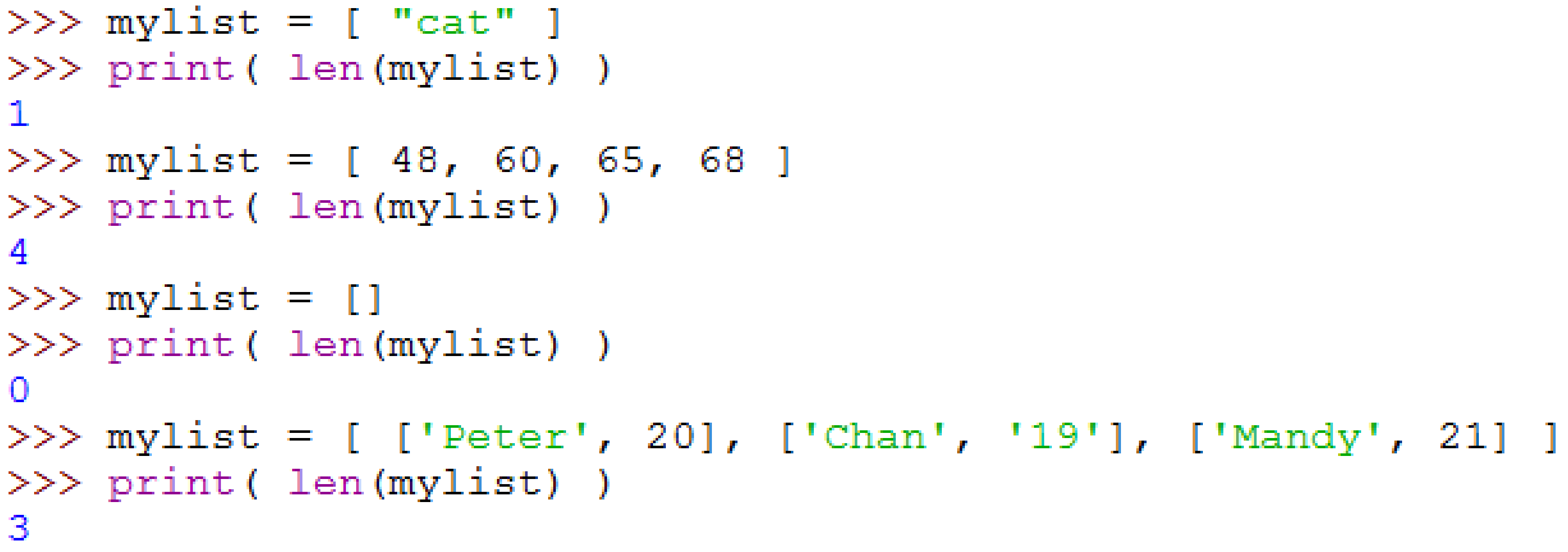
General Methods We Know Which Can be Used to Handle a List

- Manipulating the list in a `while` loop
- Manipulating the list in a `for` loop
  - Usually with `range`
- Using slicing to take values from a list

- These 3 methods can be applied to strings also (as long as you don’t try to change the string)

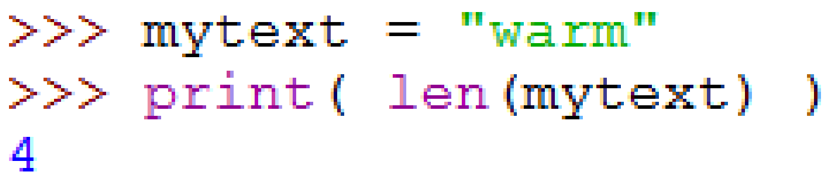
How to Know the Length of a List

- `len(` *name_of_the_list* `)`
  - tells you how many things are in the list



```
>>> mylist = [ "cat" ]
>>> print( len(mylist) )
1
>>> mylist = [ 48, 60, 65, 68 ]
>>> print( len(mylist) )
4
>>> mylist = []
>>> print( len(mylist) )
0
>>> mylist = [ ['Peter', 20], ['Chan', '19'], ['Mandy', 21] ]
>>> print( len(mylist) )
3
```

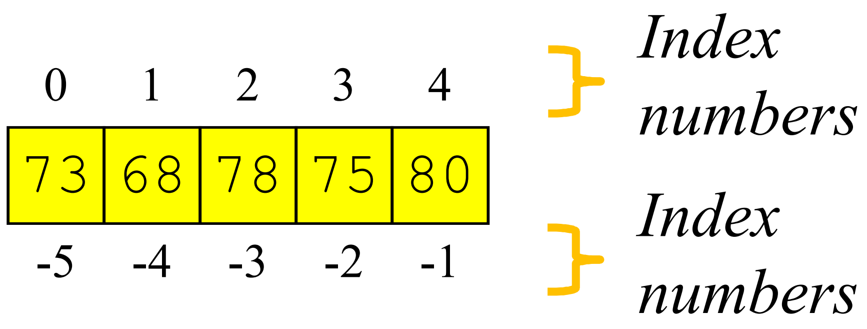
- It’s the same idea for strings:



```
>>> mytext = "warm"
>>> print( len(mytext) )
4
```

Negative List Indices

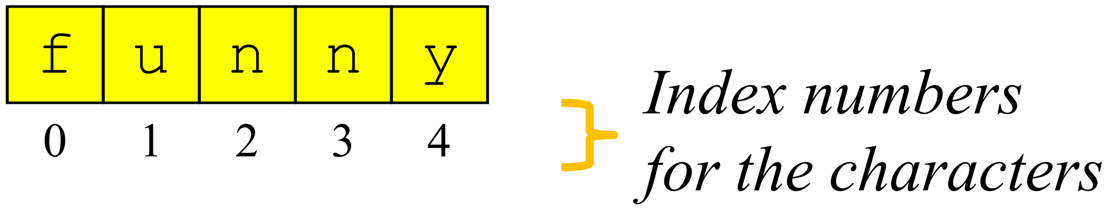
- You can use a negative number to refer to items
- For example, `x=[ 73, 68, 78, 75, 80 ]`



- *list_name*`[-1]` means the last one (here, it is 80)
- *list_name*`[-2]` means the second from last one (here, it is 75)
- In this example `x[0]` and `x[-5]` are both 73

Individual Items in a String

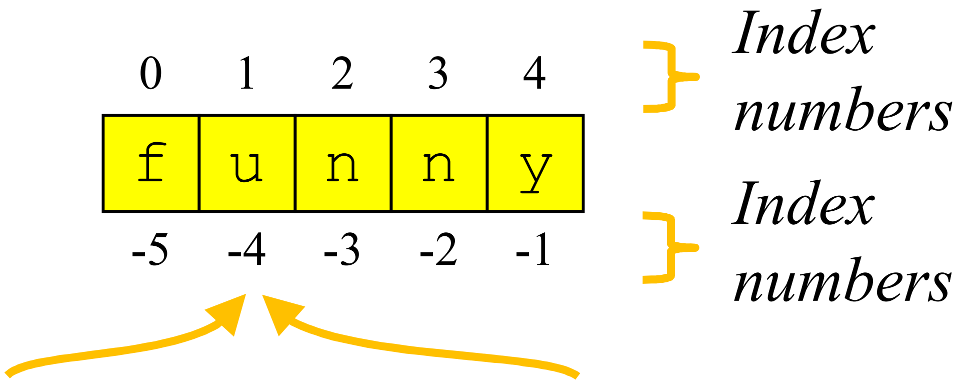
- Handling a string is like handling a list
- For example, the string ‘funny’ has indexing like this:



- If `myword` is the variable storing the above string, `print(myword[1])` will produce ‘u’

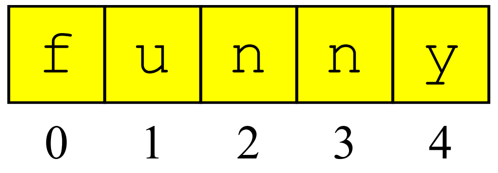
Using a Negative Index

- Like a list, you can use negative indices for strings



- For example, `myword[1]` and `myword[-4]` refer to the same character ‘u’, in this example

Slicing for Strings



- You can do slicing for strings, just like lists
- Some examples:
  - Printing the second and third characters:

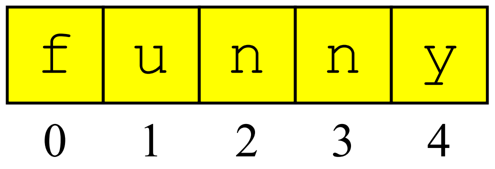
```
print(myword[ 1 : 3 ]) # This is "un"
```

  - Printing all the characters except the last one:

```
print(myword[ 0 : 4]) # This is "funn"
```

Remember when you do slicing the ending number is not included in the result

Omitting Numbers with Slicing



- As you know, you can omit numbers with slicing
- Examples:
  - From the start of the string:

```
print(myword[ : 3 ])   # This is "fun"
```

  - To the end of the string:

```
print(myword[ 3 : ])   # This is "ny"
```

Slicing Using a Step Value

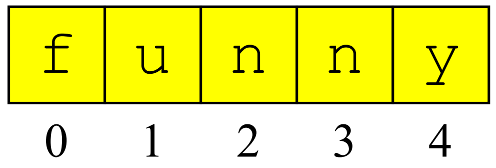
- Like lists, you can include a step value:

  name_of_string[*start* : *target* : *step*]

- As you know, a step value means you do not move one step at a time but move *step* characters at a time

Slicing Using a Step Value

- The following examples use this:



  - To print the second and the fifth characters:

```
print(myword[1:5:3]) # outputs "uy"
```

  - To print alternate characters:

```
print(myword[::2]) # outputs "fny"
```

  - To print the string in reverse order:

```
print(myword[::-1])# outputs "ynnuf"
```

You Can't Change Letters in a String

- You can ‘read’ one or more characters in a string using the techniques we have just looked at
- You can’t *change* the content of a string using these techniques
- For example:

```
lunch = "I love to eat a pineapple bun!"
lunch[-2] = "g"     # Not allowed!
lunch[2:6] = "hate" # Also not allowed!
```

More List and String Operations

- These techniques work with lists, tuples and strings:

```
s + t  # Concatenate two lists/strings
```

- String example: `"so " + "funny" = "so funny"`
- List example: `[2,4,6] + [8,10] = [2,4,6,8,10]`

```
s * n  # Concatenate n copies of a list/string
```

- String example: `"fun" * 3 = "funfunfun"`
- List example: `[2,4,6] * 2 = [2,4,6,2,4,6]`