香港中文大學（深圳）
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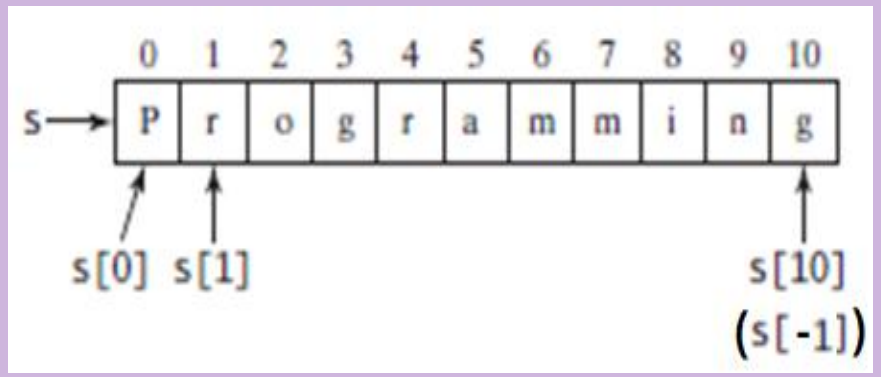
INTRODUCTION TO COMPUTER SCIENCE: PROGRAMMING METHODOLOGY

TUTORIAL 6

STRINGS AND FILES

String-Index operator

- 1. Index operator []: used to visit the elements in a string s, $s[i], i = 0, 1, 2, \dots, len(s) - 1$ represents the (i+1)th element, or $s[i], i = -1, -2, \dots, -len(s)$ represents the (len(s)+i+1)th element. Notice: string's indexes start from 0.



- 2. Slicing operator [start:end](start->end-1): s[start:end] cuts the string s beginning from elements with index start to end-1.

Manipulating strings

- 3. A way to delete an element in a string s: s=s[:i]+s[i+1:] can delete the element with index i.
- 4. A way to change an element in a string s: example: s= ‘Walcome’, then s=s[:1]+’ e’ +s[2:] will change s to ‘Welcome’. Notice: Strings’ elements cannot be directly changed. So here it is wrong to write s[1]= ‘e’.
- 5. len(s) returns the length of string s.
- 6. “in” operator: character ch is included in string s, ch in s->True, otherwise ch in s->False.
- 7. Strings can also act as a collection of elements in for loop: for i in s:.

Some methods of strings-I

- 8. Methods in str class to judge types of characters in strings.
  - i)s.isalnum(), ii)s.isalpha(), iii)s.isdigit(), iv)s.islower(), v)s.isupper() judge whether s contains i)only letters and numbers, ii) only letters, iii)only numbers, iv)all letters in s are lowercase, v)all letters in s are uppercase. True or False will be returned.
- 9. Methods in str class to manipulate substrings.
  - i)s.endswith(s1) returns True if the string s ends with substring s1.
  - ii)s.startswith(s1) returns True if the string s starts with substring s1.
  - iii)s.find(s1) returns the lowest index where s1 starts in the string s, or -1 if s1 is not found; similarly, s.rfind(s1) returns the highest index.
  - iv)s.count(s1) returns the number of non-overlapping occurrences of the substring s1.

Some methods of strings-II

- 10. Methods in str class to convert strings.
  - i) s.lower(): returns a copy of the string s with all letters converted to lowercase. Similarly, s.upper() uppercase.
  - ii) s.swapcase(): returns a copy of the string s in which lowercase letters are converted to uppercase and uppercase to lowercase.
  - iii) s.replace(old,new): returns a new string that replaces all the occurrences of the old substring in s with a new substring.
- 11. Splitting a string into a list: examples:
  - i) items= 'Jane John Peter Susan'.split() ->['Jane' ,' John' ,' Peter' , 'Susan']
  - ii) items=' 03/07/2019'.split('/')->['03' ,' 07' ,' 2019'].

Text input and output-I

fileVariable = open(filename, mode)

- **Three modes:**

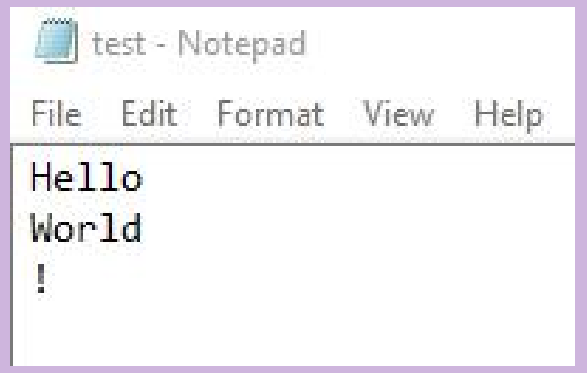
"r" – Opens a file for reading
"w" – Opens a file for writing
"a" – Opens a file for appending data from the end of the file

read([number.int): str	Returns the specified number of characters from the file. If the argument is omitted, the entire remaining contents in the file are read.
readline(): str	Returns the next line of the file as a string.
readlines(): list	Returns a list of the remaining lines in the file.
write(s: str): None	Writes the string to the file.
close(): None	Closes the file.

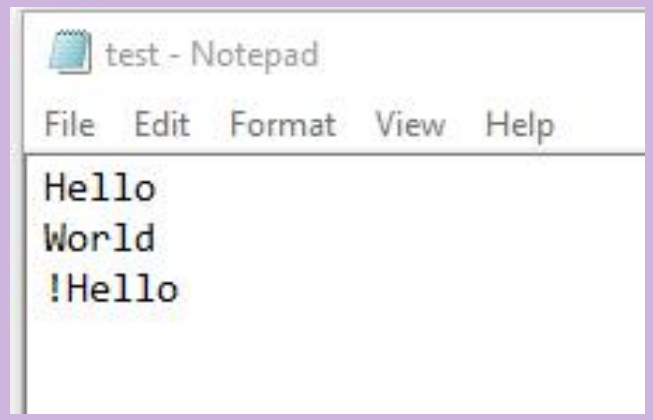
Text input and output-II

- Write function will write strings to a file. If it does not exist, a new file will be created.

```
file=open("test.txt",'w')
file.write('Hello\nWorld\n!')
file.close()
```




```
file=open("test.txt",'a')
file.write('Hello')
file.close()
```



Text input and output-III

```
file=open("test.txt",'r')
print(file.read())
file.close()
```

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

- Return all the content.

```
file=open("test.txt",'r')
print(file.read(3))
file.close()
```

```
Hel
>>>
```

- Return 3 characters.

```
file=open("test.txt",'r')
print(file.readline())
print(file.readline())
file.close()
```

```
Hello

World

>>>
```

- Return a line.

```
file=open("test.txt",'r')
print(file.readlines())
file.close()
```

```
['Hello\n', 'World\n', '!Hello']
>>>
```

- Return every line as a list.

Q1: Check substrings

- You can check whether a string is a substring of another string by using the find method in the str class. Write your own function to implement find. Write a program that prompts the user to enter two strings and then checks whether the first string is a substring of the second string.

```
first = input('Please enter the first string: ')

second = input('Please enter the second string: ')
if second.find(first) != -1:
    print('first is a sbustring of second')
else:
    print('first is not a sbustring of second')
```

Write your own program to realize the function of find method.

Q2: Check password

- Some Web sites impose certain rules for passwords. Write a function that checks whether a string is a valid password. Suppose the password rules are as follows:

  - A password must have at least eight characters. `len()`
  - A password must consist of only letters and digits. `isalnum()`
  - A password must contain at least two digits. `isdigit()`

    Hint: You need a Count to count the number of digits.

Let's practice now!

Q3: Longest common prefix

- Write a method that returns the longest common prefix of two strings. For example, the longest common prefix of distance and disinfection is dis. The header of the method is def prefix(s1,s2): . If the two strings have no common prefix, the method returns an empty string. Write a main method that prompts the user to enter two strings and display their longest common prefix.

```
Enter the first string:distance
Enter the second string:disinfection
The longest common prefix of the two strings is "dis".
```

Hint: Use an S to hold the prefix and enlarge it using length.
The key function: starts with

Q4: Handling files

- i) Write a program that will count the number of characters, words, and lines in a file. Words are separated by a whitespace character. Your program should prompt the user to enter a filename.

```
Enter a filename:JaneEyre.txt
In the file JaneEyre.txt, there are
10807 characters,
1930 words,
46 lines.
```

- ii) In the file "JaneEyre.txt", there are some typos "amd" which should actually be "and", find how many of them and replace all, then write the correct version into a new file.