Algorithms and Data Structures

String, Stack and Queue

Part I: String

String As a Data Type

- String is a primitive data type in Python
  - Four primitive data types: String, int, float, boolean
- String is the most widely used argument in I/O
- String is different than other primitive data type:
  - It is a data type
  - It is a data structure - a sequence of characters.
  - It is immutable.

String Representation

- You can use a pair of ‘’, “”, or ‘’’ ‘’’ interchangeably.
- Depends on the actual context, you can use a combination of them for different purpose.
- Let’s try to print:
- “Hi.”
- “Hi, how’re you?”
- ‘’’ Good.
- You?’’’

String As an Array

- String's underlying data structure is an Array of bytes of unicode characters.
- In Python, a character is a length = 1 String.
- So, we can treat a String as we are dealing with a List.

Access A Character

- a = “Hello, world”
- What is len(a)
- What is a[0]?
- What is a[10]?
- What is a[11]?

Modify A Character

- a = “Hello, world”
- What will be if a[0] = ‘h’
- Nope! Strings are immutable! To do that, we need to assign a new String to a:
  - a = “hello, world”
  - A new string is a new array fo characters, in a new memory location.

Search in Strings

- Since Strings are Arrays, we can use the same search method in Lists.
  - Use a for loop to iterate a string: for x in “hello, world”
  - Use a build in method in to check existence:
    - “h” in “hello, world” #will return True
    - “H” in “hello, world” #will return False
  - Use a build in method in to check NOT present:
    - ‘H’ not in “hello, world” #will return True
    - ‘h’ not in “hello, world” #will return False

Slicing Strings

- Since Strings are Arrays, we can use the same search method in Lists.
  - a = “Hello, world”
  - b = a[1:]
  - c = a[:5]
  - d = a[1:5]
  - e = a[-5:]
  - f = a[-5:-2]

Manipulate Strings

- Strings is a special character array, and has build-in method for convenience.
  - Convert to UPPER case: .upper()
  - Convert to lower case: .lower()
  - Remove spaces in the beginning or at then end: .strip()
  - Replace characters in a string: .replace({the substring to be replaced}, {the substring to replace})
  - Split a string to sub strings using a separator: .split({separator}

Concatenate Strings

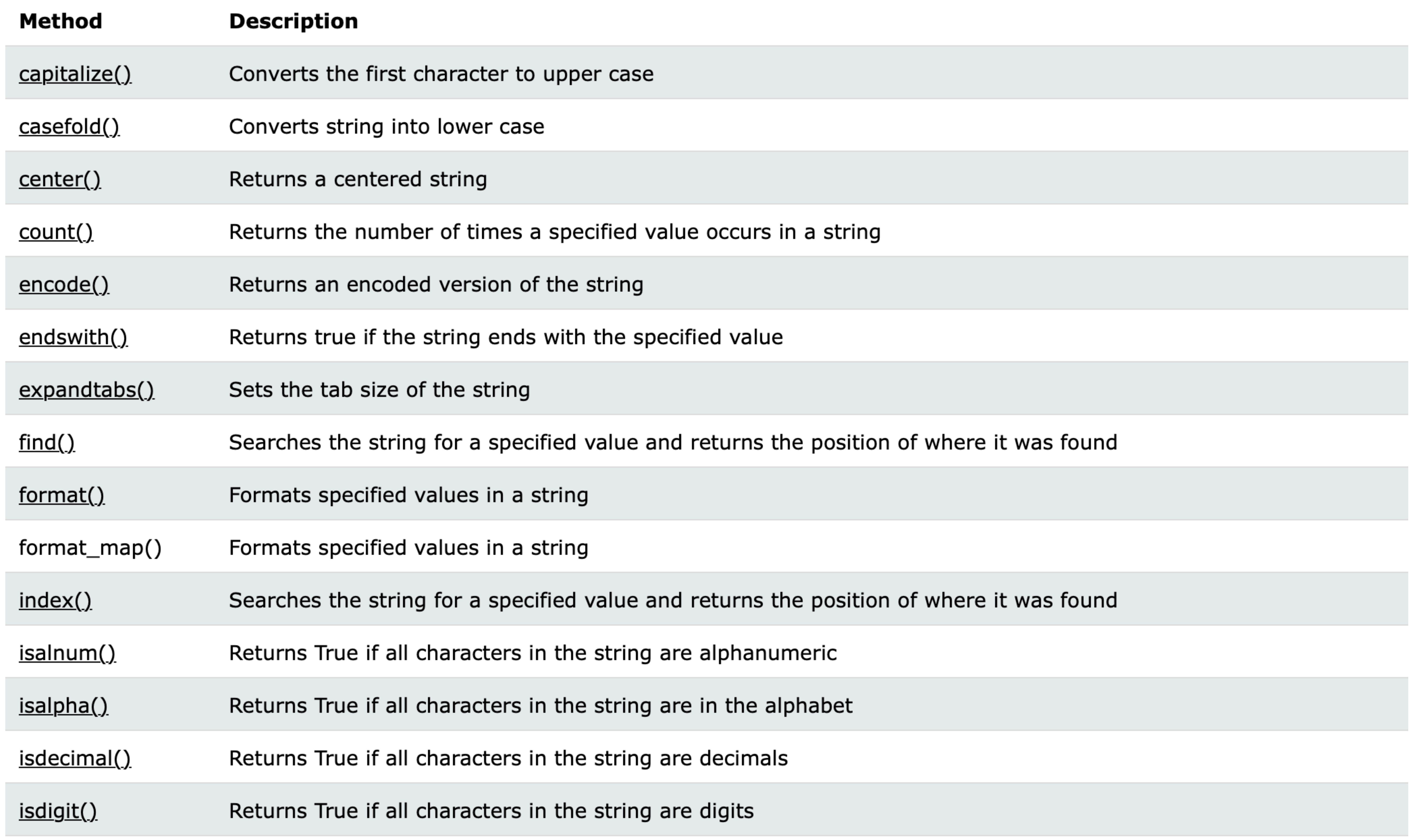
- A polymorphic operator “+” will be used to concatenate two Strings
- Both side of the operator must be Strings, otherwise there will be type error exception.
- To satisfy above requirements, you should convert other data types to String before concatenation.
  - “Integer ” + str(3) + “ must be converted to a string before concatenation.”

Format Strings

- Another way to get round String + integer situation, is using format()
- Use placeholders {} to pass arguments in format() to the string.
- var1= 1, var2 = 2, var3 = 3
- result="variable 3 is {2}, variable 2 is {1{, variable 1 is {0}
- print(result.format(var1, var2, var3)

Other String methods

- You can visit:
  - For documentation: shorturl.at/qyACY
  - For tutorials: shorturl.at/lvKZ5
  - For source code: shorturl.at/hxOTX



Method	Description
capitalize()	Converts the first character to upper case
casefold()	Converts string into lower case
center()	Returns a centered string
count()	Returns the number of times a specified value occurs in a string
encode()	Returns an encoded version of the string
endswith()	Returns true if the string ends with the specified value
expandtabs()	Sets the tab size of the string
find()	Searches the string for a specified value and returns the position of where it was found
format()	Formats specified values in a string
format_map()	Formats specified values in a string
index()	Searches the string for a specified value and returns the position of where it was found
isalnum()	Returns True if all characters in the string are alphanumeric
isalpha()	Returns True if all characters in the string are in the alphabet
isdecimal()	Returns True if all characters in the string are decimals
isdigit()	Returns True if all characters in the string are digits

Challenges

- How to check 2 Strings have the same identity?
- How to find duplicate characters from a string (composed by all lower [a-z])
- How to find duplicate characters from a string (composed by any chars)
- How to check if a String is palindrome?
- How to check if a String is a valid shuffle of two other Strings(i.e., ‘abcde’ is a valid shuffle of ‘ac’, ‘bde’)
- How to mask a String for certain keywords, for example ‘secret’ as ’s****t’’, without using build-in methods

Thank you!