Lecture 5 – Strings – Part 1 Name ___________________

A string is a **sequence of characters**. You can access the characters one at a time with the bracket operator:

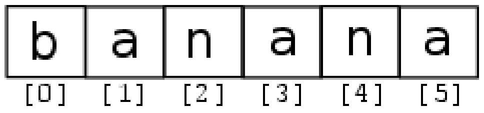
PROGRAM

fruit = 'banana'

letter = fruit[1]

print letter

So `b` is the 0th letter ("zero-eth") of `'banana'`, `a` is the 1th letter ("one-eth"), and `n` is the 2th ("two-eth") letter.



`len` is a built-in function that **returns the number of characters** in a string:

PROGRAM

```
>>>fruit = 'banana'
>>>fruit[:3]
'ban'
>>>fruit[3:]
'ana'
```

What is the error message? _________________________

Why?____

Does this fix it?_____ Change to last = fruit[length-1]

PROGRAMin PyCharm

```
index = 0
fruit = 'banana'
while index < len(fruit):
    letter = fruit[index]
    print (letter)
    index = index + 1
```

Do this - Exercise 1 *Write a* `while` *loop that starts at the last character in the string and works its way backwards to the first character in the string, printing each letter on a separate line, except backwards.*

Try this –

```
fruit = 'banana'
for char in fruit:
    print (char)
```

PROGRAM

```
s = 'Monty Python'
print (s[0:5])
```

Change the values a few times and check the output

If you omit the first index (before the colon), the slice **starts at the beginning of the string**. If you omit the second index, the slice **goes to the end of the string**:

```
fruit = 'banana'
fruit[:3]
'ban'
fruit[3:]
'ana'
```

Exercise 2 *Given that* `fruit` *is a string, what does* `fruit[:]` *mean? (Try it)*

READ

6.5 Strings are immutable

It is tempting to use the `[]` operator on the left side of an assignment, with the intention of changing a character in a string. For example:

```
>>> greeting = 'Hello, world!'
>>> greeting[0] = 'J'
TypeError: object does not support item
assignment
```

The “object” in this case is the string and the “item” is the character you tried to assign. For now, an **object** is the same thing as a value, but we will refine that definition later. An **item** is one of the values in a sequence.

The reason for the error is that strings are **immutable**, which means you can’t change an existing string. The best you can do is create a new string that is a variation on the original:

PROGRAM

```
greeting = 'Hello, world!'
new_greeting = 'J' + greeting[1:]
print (new_greeting)
```

This example concatenates a new first letter onto a slice of greeting. It has no effect on the original string.

```
word = 'banana'
count = 0
for letter in word:
    if letter == 'a':
        count = count + 1
print (count)
```

This program demonstrates another pattern of computation called a **counter**.

Exercise 3

Encapsulate this code in a function named `count`*, and generalize it so that it accepts the string and the letter as arguments.*

(This is a bit of a challenge)

Boolean operator *in* – try in Python editor (Chevron prompt)

```
>>> 'a' in 'banana'
```

```
>>> 'T' in 'banana'
```

PROGRAM

```
word = input('enter a word')
if word < 'banana':
    print ('Your word,' + word + ', comes before banana.')
elif word > 'banana':
    print ('Your word,' + word + ', comes after banana.')
else:
    print ('All right, bananas.')
```

Python does not handle uppercase and lowercase letters the same way that people do. All the **uppercase letters** come before all the **lowercase letters**.

A common way to address this problem is to convert strings to a standard format, such as all lowercase, before performing the comparison.

PROGRAM in PyCharm

```
stuff = 'banana'
print(stuff)
print(str.capitalize(stuff))
print(stuff)
```

TRY THIS IN THE EDITOR (Chevron Prompt)

```
>>> stuff = 'Hello world'
>>> type(stuff)
>>> dir(stuff)

>>> help(str.capitalize)
```

PROGRAM

```
stuff = 'banana'
print(stuff)
print(str.capitalize(stuff))
print(stuff)
print(stuff.upper)

word = 'pomegranate'
print(word.upper())
```

This form of dot notation specifies the name of the method, `upper`, and the name of the string to apply the method to, `word`. The empty parentheses indicate that this method takes no argument.

A method call is called an **invocation**; in this case, we would say that we are invoking `upper` on the `word`.

For example, there is a string method named `find` that searches for the position of one string within another:

```
>>> word = 'banana'
>>> index = word.find('a')
>>> print index
```

```
TRY IN EDITOR
```

```
>>> line = '  Here we go  '
>>> line.strip()
```

```
TRY IN EDITOR
```

```
>>> line = 'Please have a nice day'
>>> line.startswith('p')
False
>>> line.lower()
'please have a nice day'
>>> line.lower().startswith('p')
True
```

```
Do Exercise 4 - See below and play around with it.
```

```
str = "this is string example....wow!!!"

sub = "i"
print ("str.count(sub, 4, 40) : ", str.count(sub, 0, 40))
sub = "wow"
print ("str.count(sub) : ", str.count(sub))
```