Strings II

Review

- Strings are stored character by character.
- Can access each character individually by using an index:

0	1	2	3	4	5	6	7
"C"	**"o"**	**"m"**	**"p"**	**"u"**	**"t"**	**"e"**	**"r"**

New

- Negative indexing can be used. *(Particularly useful for getting characters near the end of a string.)*

0	1	2	3	4	5	6	7
-8	-7	-6	-5	-4	-3	-2	-1
"C"	**"o"**	**"m"**	**"p"**	**"u"**	**"t"**	**"e"**	**"r"**

The basic string for loop

- Use this whenever you need to process a string one character at a time.

```
# assume string is a string variable
for pos in range(0, len(string)):
  # do something with string[pos]
```

The basic string for loop

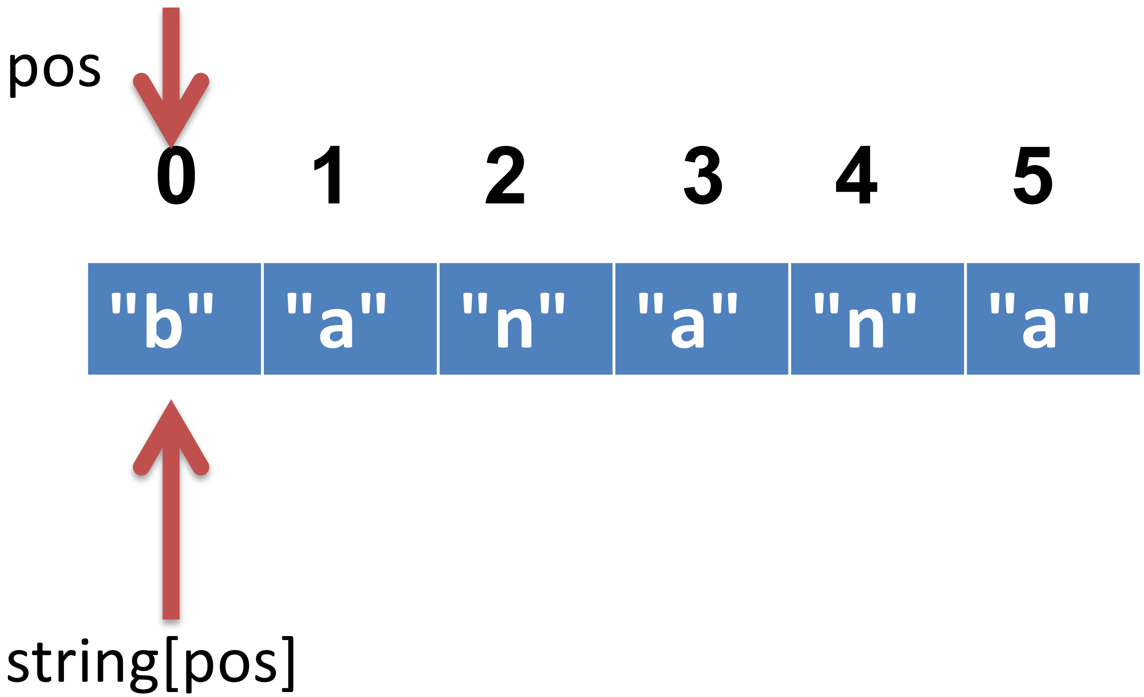
```
# assume string is a string variable
for pos in range(0, len(string)):
  # do something with string[pos]
```

- Hardest thing to remember:
  - **pos** is a counter variable that counts the indices of **string**.
  - **string**[**pos**] refers to the character inside **string** at position **pos**

```
string = "banana"
total = 0
for pos in range(0, len(string)):
    if string[pos] == "a":
        total = total + 1
```

0	1	2	3	4	5
"b"	"a"	"n"	"a"	"n"	"a"

```python
string = "banana"
total = 0
for pos in range(0, len(string)):
  if string[pos] == "a":
    total = total + 1
```



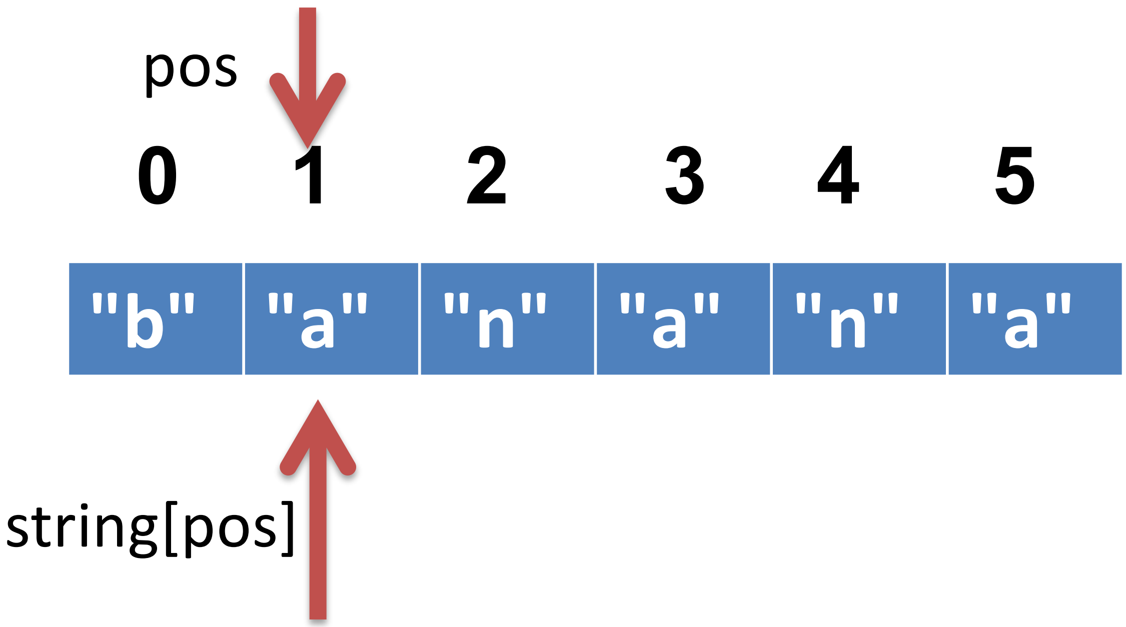
1st iteration

pos: 0

string[pos]: "b"

total: 0

```
string = "banana"
total = 0
for pos in range(0, len(string)):
    if string[pos] == "a":
        total = total + 1
```



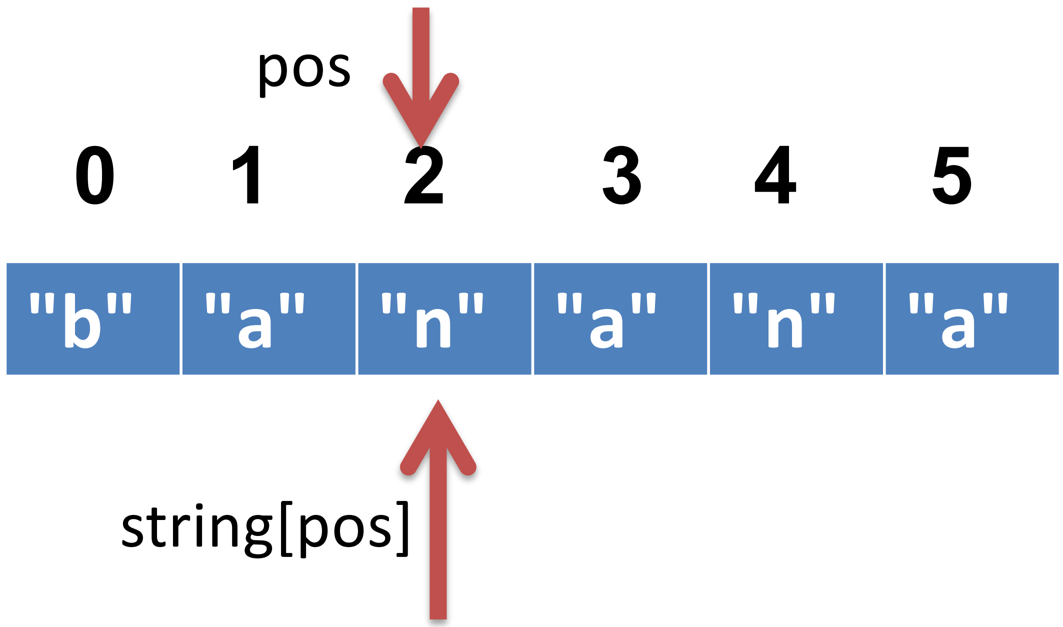
2nd iteration

pos: 1

string[pos]: "a"

total: 1

```
string = "banana"
total = 0
for pos in range(0, len(string)):
   if string[pos] == "a":
     total = total + 1
```



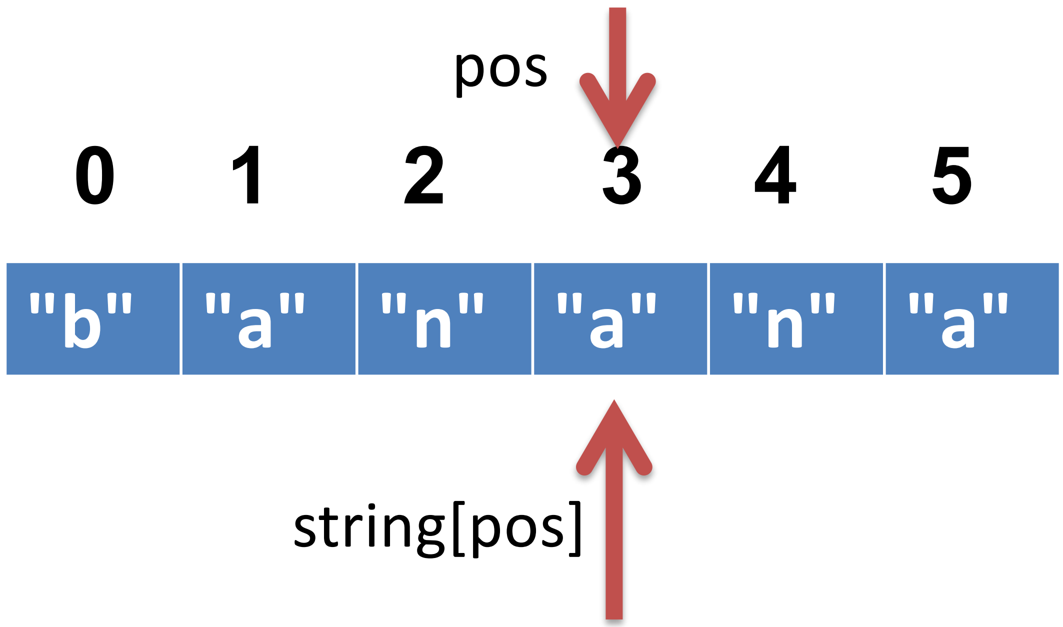
3rd iteration

pos: 2

string[pos]: "n"

total: 1

```
string = "banana"
total = 0
for pos in range(0, len(string)):
   if string[pos] == "a":
      total = total + 1
```



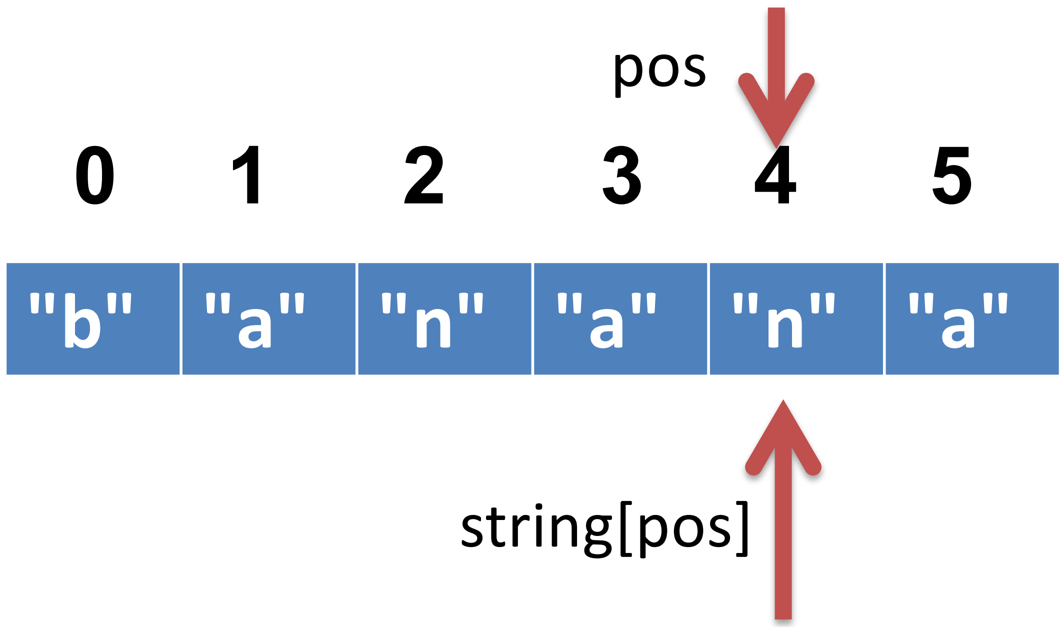
4th iteration

pos: 3

string[pos]: "a"

total: 2

```
string = "banana"
total = 0
for pos in range(0, len(string)):
    if string[pos] == "a":
        total = total + 1
```



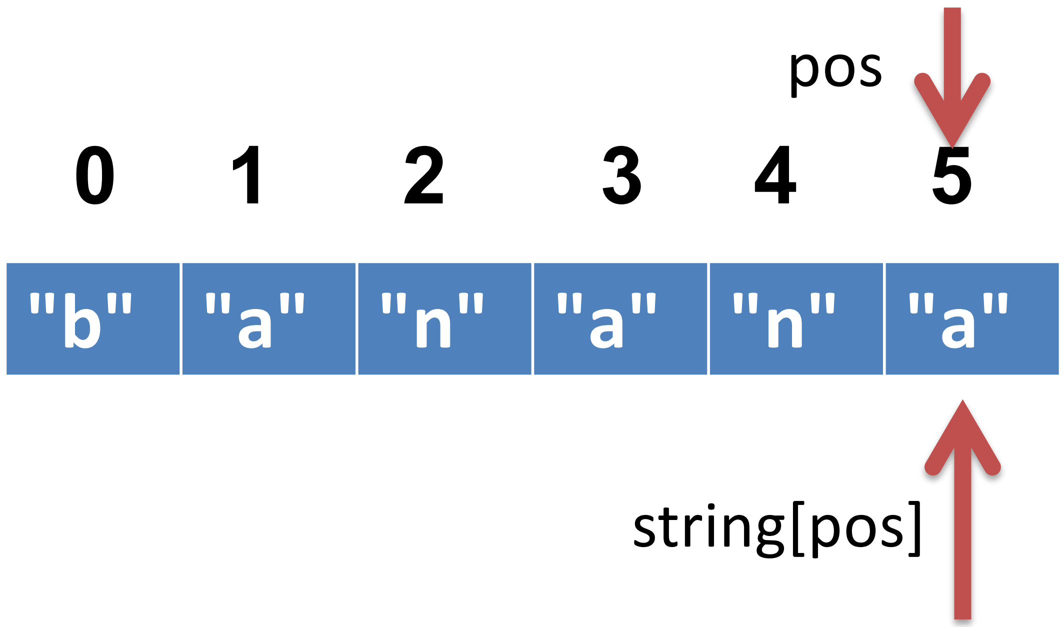
5th iteration

pos: 4

string[pos]: "n"

total: 2

```
string = "banana"
total = 0
for pos in range(0, len(string)):
   if string[pos] == "a":
      total = total + 1
```



6th iteration

pos: 5

string[pos]: "a"

total: 3

Algorithm -> Function

- Counting the number of a certain character in a string seems like a good candidate for a function.

```
def count_a(string):
  total = 0
  for pos in range(0, len(string)):
    if string[pos] == "a":
      total = total + 1
  return total
```

```python
def count_a(string):
  total = 0
  for pos in range(0, len(string)):
    if string[pos] == "a":
      total = total + 1
  return total

def main():
  name = input("What is your name? ")
  freq = count_a(name)
  print("Your name has", freq, "A's in it.")
```

- **Step 1**: Write a new function called count_any that is similar to count_a, except it takes two arguments: the string to count letters in, and the letter you which to count the count function so it takes a second argument called **`letter`**. The function should count the number of times that **`letter`** occurs in the string (instead of only lowercase a's).
- **Step 2**: Change the main function so that the user can type in their name and a letter and the program prints the frequency of that letter in their name.
- **Step 3**: Write a function count_dups that counts (and returns) all occurrences of consecutive duplicated letters in a string.
  - e.g., `count_dups("balloon")` returns 2.

Not all string problems are solved with for loops.

```
def get_initial(firstname):
   first_init = firstame[0]
   return first_init
```

String Concatenation

- Combines two strings into a new, longer string.
- Uses the same plus sign as addition.

```
s1 = "CS141"
s2 = "rocks!"
bigstring = s1 + s2
print(bigstring)
# prints CS141rocks!
```

String Concatenation

- Unlike **`print()`**, string concatenation does not put spaces between your strings.

```
s1 = "CS141"
s2 = "rocks!"
bigstring = s1 + " " + s2
print(bigstring)
# prints CS141 rocks!
```

Sample problem

- All professor email addresses at Rhodes are constructed from the professor's last name, followed by the initial letter of their first name.
- We want to design a function that takes a prof's first and last name and returns their email address.

```
def make_prof_email(first, last):
    init = first[0]
    address = last + init + "@rhodes.edu"
    return address

def main():
    firstname = input("First name: ")
    lastname = input("Last name: ")
    addr = make_prof_email(firstname, lastname)
    print("Email:", addr)
```

You try it

- Write a function `make_student_email` that creates (and returns) a student email address.
- The function should take four parameters: first name, last name, middle name, and class year.
- Challenge: Modify the function so it takes only two parameters: someone's full name (one string with first, middle, and last names within it) and class year.

- A fundamental problem when using strings is computing a ***substring***, or a string ***slice***.
- We want to tell Python
  - take some string,
  - give me all the characters starting from one index,
  - and ending at another index.
- Fortunately, this is built into Python!

- Two ways to use square brackets.
- 1 number inside the brackets:
  - returns ***exactly one*** character of a string.
  - if **`s = "Computer"`**, then **`s[0]`** represents "C"
- 2 numbers inside the brackets:
  - returns a ***substring*** or string ***slice.***

s[a:b] gives you a string slice of string **s** starting from index **a** and ending at index **b-1**.

0	1	2	3	4	5	6	7
"C"	"o"	"m"	"p"	"u"	"t"	"e"	"r"

s[0:1] -> "C" just like **s[0]**

s[0:2] -> "Co"

s[0:7] -> "Compute"

s[3:6] -> "put"

s[0:8] -> "Computer"

More fun with indices

- Indices can also be negative.
- A negative index counts from the right side of the string, rather than the left.

```
s = "Computer"
print(s[-1])            # prints r
print(s[-3:len(s)])  # prints ter
print(s[1:-1])          # prints ompute
```

- Slices don't need both left and right indices.
- Missing left index:
  - Python assumes you meant 0 [far left of string]
- Missing right index:
  - Python assumes you meant `len(s)` [far right of string]

```
s = "Computer"
print(s[1:])            # prints omputer
print(s[:5])            # prints Compu
print(s[-2:])           # prints er
```

Indices don't have to be literal numbers

Say we have this code:

```
name = input("Type in your name: ")
x = int(len(name) / 2)
print(name[0:x])
```

What does this print?