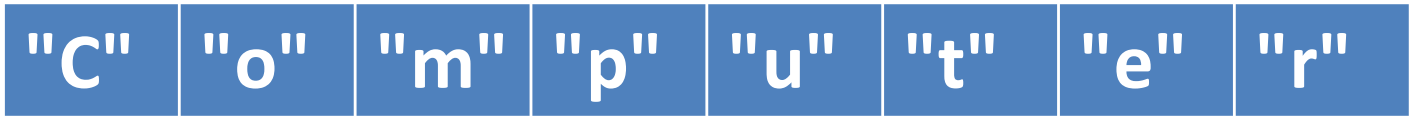
Strings I

Strings are built from characters

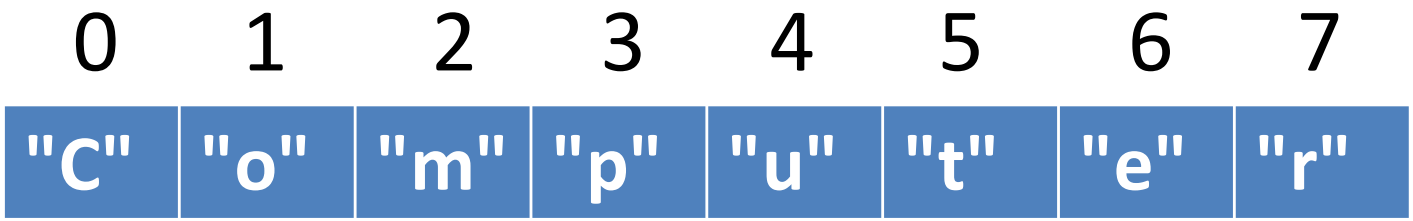
The string "Computer" is represented internally like this:



- Each piece of a string is called a ***character***.
- A character is a special kind of string that is made up of exactly one letter, number, or symbol.

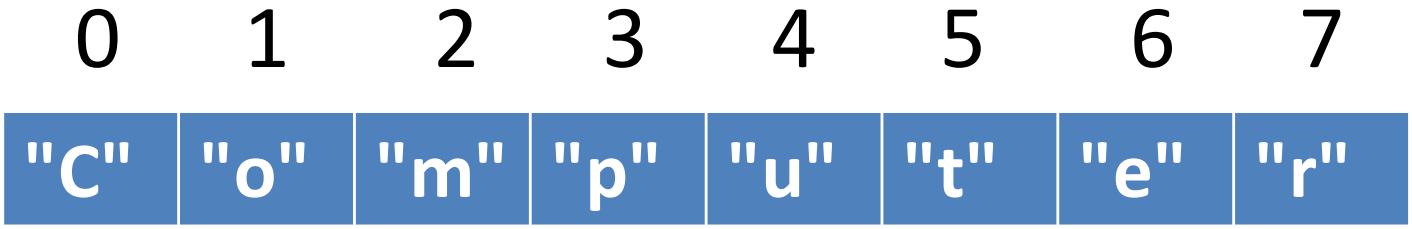
Accessing characters

Each character in a string is numbered by its position:



The numbers above the characters are called ***indices*** (singular: ***index***) or ***positions***.

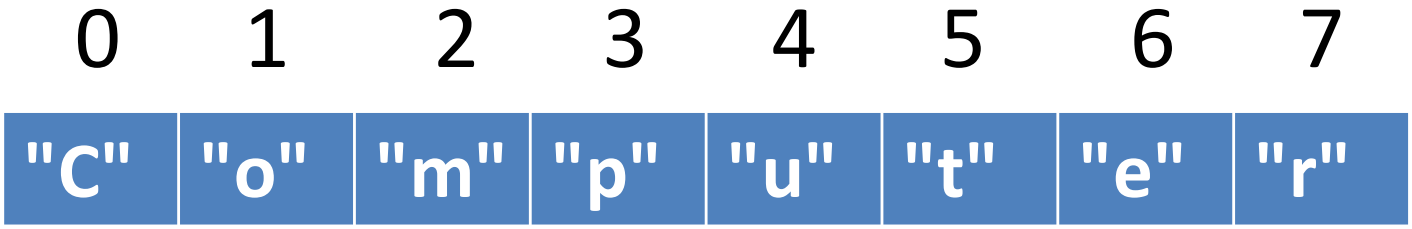
Accessing characters



- There is a separate variable for each character in the string, which is the string variable followed by **[ ]** with an integer in the middle.

```
my_string = "Computer"
my_string[0]                    # prints C
my_string[7]                    # prints r
```

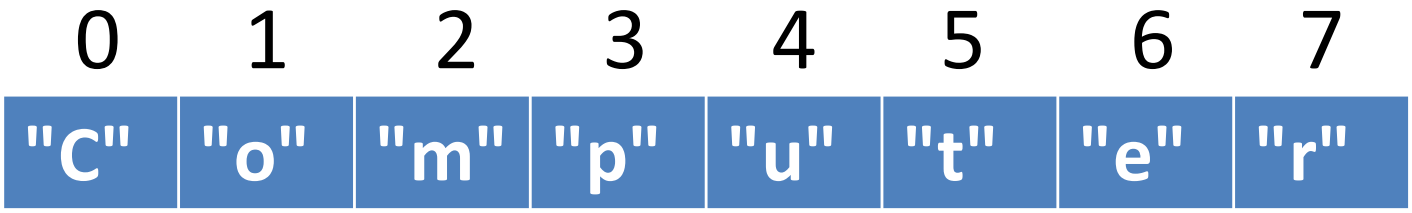
Accessing characters



- These individual variables can be used just like regular variables, ***except*** **you cannot assign to them**.

```
my_string = "Computer"
my_string[0] = "B"  # illegal!
```

- Think of the notation ***variable*[*i*]** as meaning "Give me the ***i***'th letter of ***variable***."



- You can print them, assign them to variables, pass them to functions, etc.

```
my_string = "Computer"
first = my_string[0]
third = my_string[2]
print(first, third, my_string[4])
```

Another Example

```
name = input("What is your name? ")
initial = name[0]
print("The first initial of your name
is", initial)
```

Sample output

```
What is your name? Phil
The first initial of your name is P
```

```
witch = "McGonagall"
wizard = "Dumbledore"
x = 1
y = 2
print(witch[x], wizard[y])
print(witch[x+y])
if wizard[y] > wizard[y+1]:
  print("Yes")
else:
  print("No")
```

Getting the length of a string

- Assume **`string`** is a string variable
- **`len(string)`** returns the length of **`string`**
- **`len("Computer")`** `returns 8`
- **`len("A B C")`** `return ??? 5`
- **`len("")`** `returns ??? 0`
- **`len`** uses **`return`**, meaning if you want to capture the length, you should save the return value in a variable.

```
length_of_string = len(string_variable)
```

What if we wanted to print all the characters in a string separately?

```
greeting = "hello"
print(greeting[0])
print(greeting[1])
print(greeting[2])
print(greeting[3])
print(greeting[4])
```

What if we wanted to print all the characters in a string separately?

```
city = "Memphis"
print(city[0])
print(city[1])
print(city[2])
print(city[3])
print(city[4])
print(city[5])
print(city[6])
```

Loops over strings

- Accessing characters via numbers naturally leads to using a for loop to process strings.
- What is the first numerical position in **`string`**? **`0`**
- What is the last numerical position in **`string`**? **`len(s)-1`**

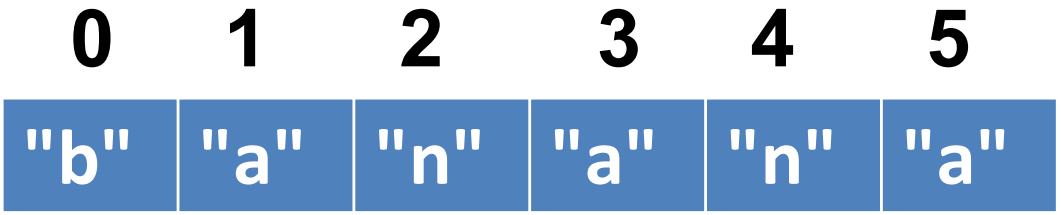
```
# assume string is a string variable
for pos in range(0, len(string)):
    # do something with string[pos]
```

Loops over strings

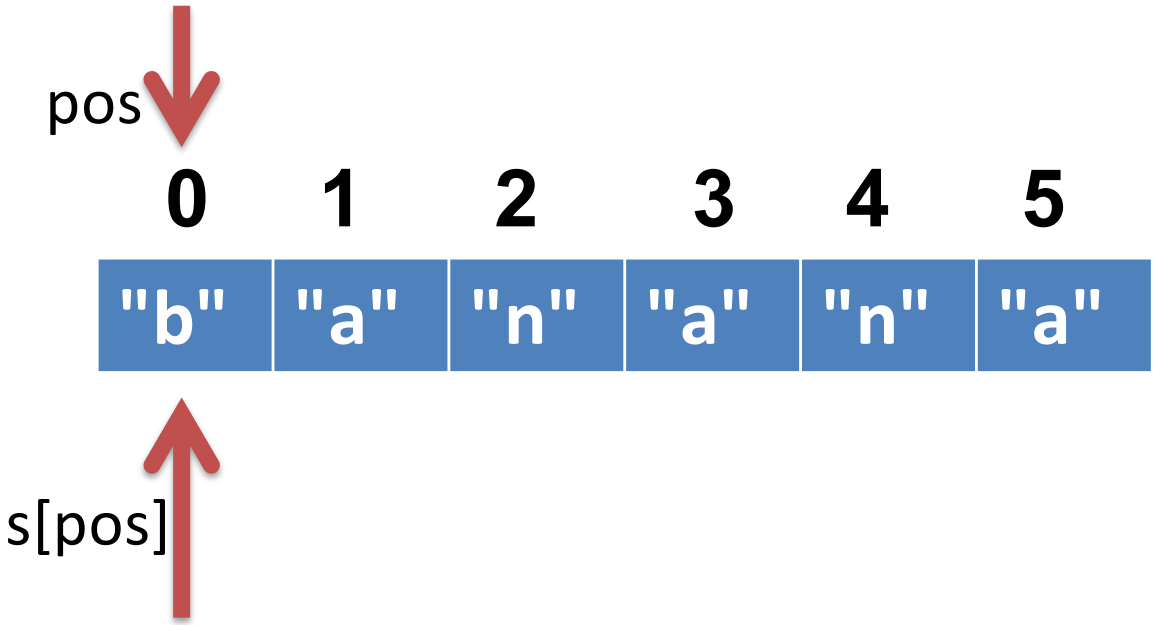
- Accessing characters via numbers naturally leads to using a for loop to process strings.

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

```
s = "banana"
for pos in range(0, len(s)):
  print(s[pos])
```



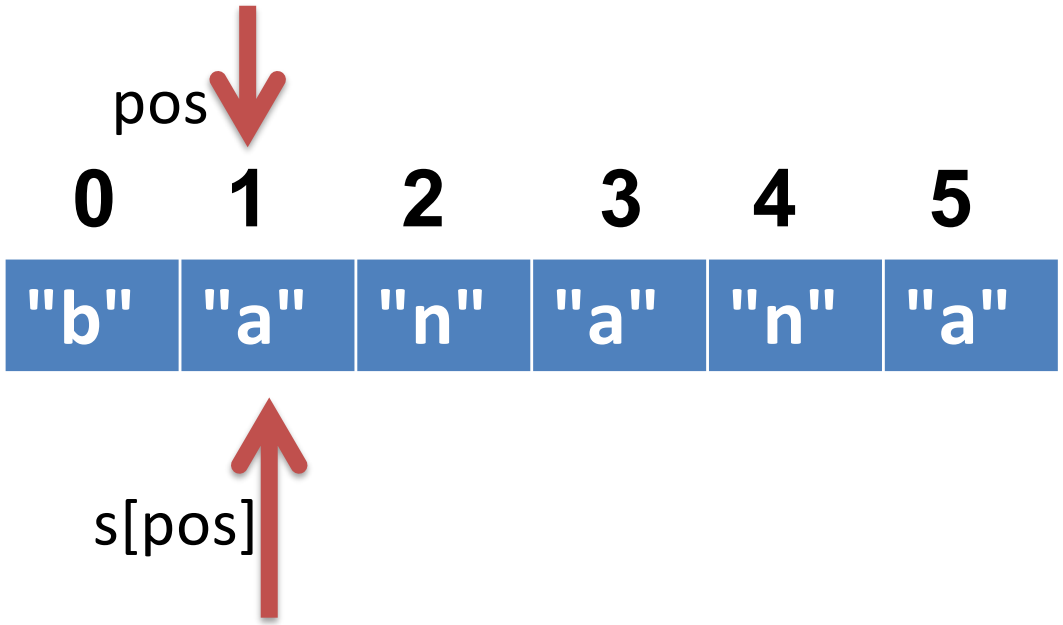
```
s = "banana"
for pos in range(0, len(s)):
    print(s[pos])
```



1st iteration
pos: 0
s[pos]: "b"

OUTPUT
b

```
s = "banana"
for pos in range(0, len(s)):
    print(s[pos])
```



2nd iteration

pos: 1

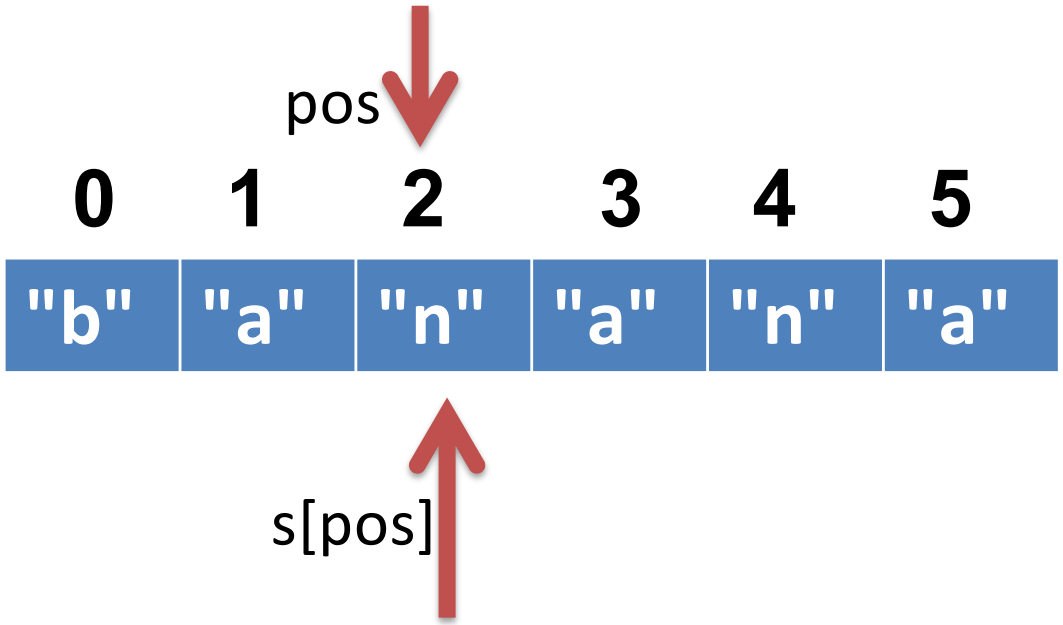
s[pos]: "a"

OUTPUT

b

a

```
s = "banana"
for pos in range(0, len(s)):
    print(s[pos])
```



3rd iteration

pos: 2

s[pos]: "n"

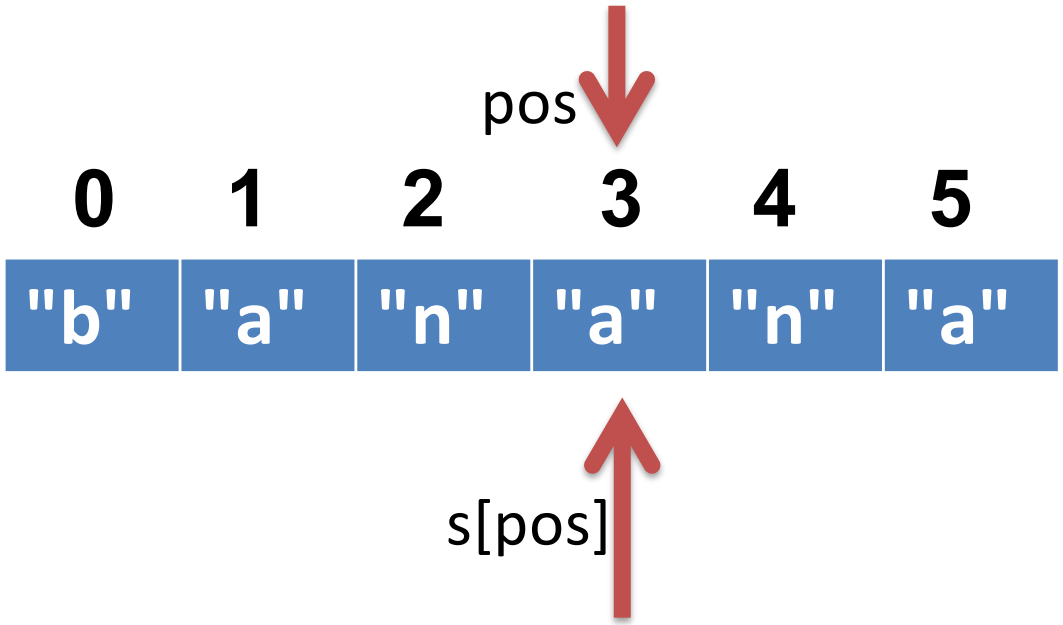
OUTPUT

b

a

n

```
s = "banana"
for pos in range(0, len(s)):
    print(s[pos])
```



4th iteration

pos: 3

s[pos]: "a"

OUTPUT

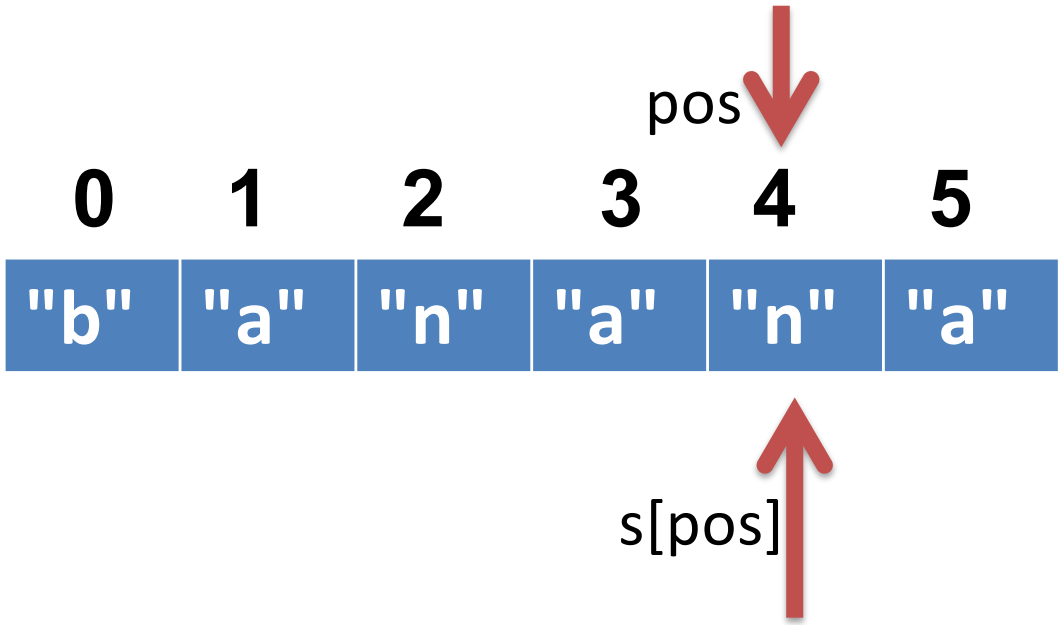
b

a

n

a

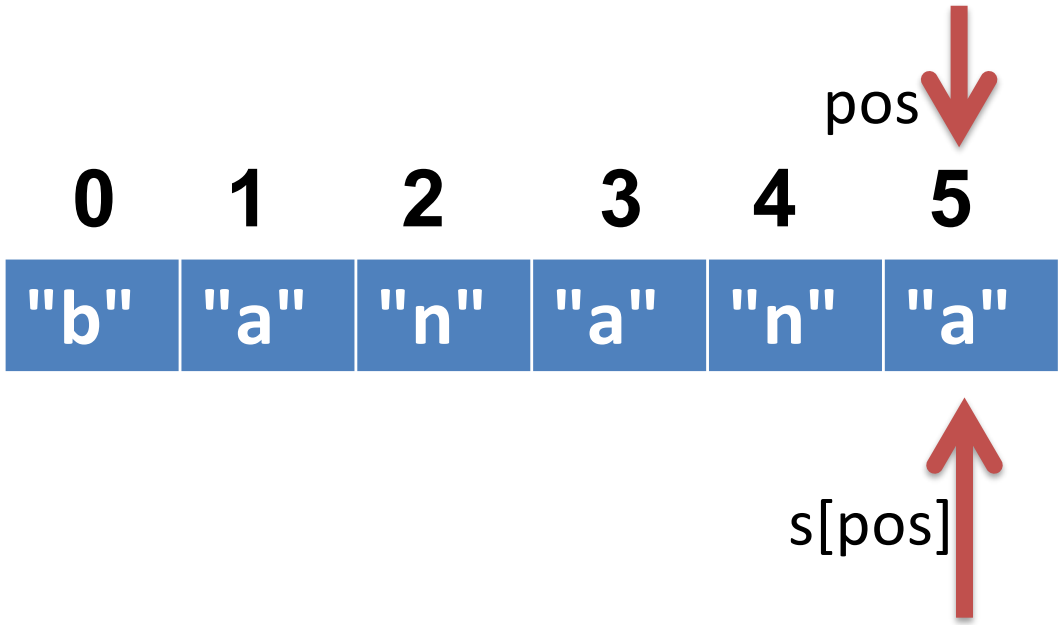
```
s = "banana"
for pos in range(0, len(s)):
    print(s[pos])
```



5th iteration
pos: 4
s[pos]: "n"

OUTPUT
b
a
n
a
n

```
s = "banana"
for pos in range(0, len(s)):
    print(s[pos])
```



6th iteration

pos: 5

s[pos]: "a"

OUTPUT

b
a
n
a
n
a

- Make a program that prompts the user to type in a string, then does the following on that string:
- Write a loop to print every other character in the string, starting with the first.
- Write a loop to print the letters in a string in reverse order.
- Write a loop to count and print the number of capital letter A's in a string.
- Write a loop to count and print the number of capital or lowercase A's.
- **Challenge**: Write a loop to print the letters of a string in forward order intermixed with backward order (alternating between forward/backward).

  e.g., for "`abcde`" you would print `aebdccdbea`