**Arrays Part II - Indexing**

**The Index of an Array**

**An index is an integer that indicates (points to) a particular element in an array**.

We use indexing all of the time: "That's the *first book* in the series", "I sit in the *third* row", "He finished in *fifth* place". (Our first finger is called the *index* *finger* because we use it to point to things, i.e. "*Get that guy!! No... that guy!*")

The elements in an array are all indexed, beginning at zero. Consider the following example:

# top five athletes

athlete = ["Mary", "Sarah", "Muna", "Sylvie", "Lisa"]

print()

print (athlete[0], "came in first place!") # index is zero

print (athlete[4], "came in fifth place!") # index is 4

Notice again that the index starts at 0 and goes up.

The following code has a mistake in it. Run it and see if you can spot the mistake:

# top five athletes

athlete = ["Mary", "Sarah", "Muna", "Sylvie", "Lisa"]

print()

i = input("Please enter an index (0-4): ")

print (athlete[i], "is ranked number ", i )

Here's the error message:

builtins.TypeError: list indices must be integers, not str

An index must be an integer, so we must use the int() function to convert it before using it in the array:

i = int(input("Please enter an index (0-4): "))

Now the code works, but it is a little awkward. Humans prefer to use the number 1 (not zero) to indicate the "first" element. Here's how we can adjust the output to make it look better to us:

print (athlete[i], "is ranked number ", i+1 )

**Looping Through a List (Again)**

We can put our list in a FOR loop using the len() function again:

athlete= ["Mary", "Sarah", "Muna", "Sylvie", "Lisa"]

print()

for i in range(len(athlete)): # loop through every index

print (athlete[i], "is ranked number", i+1)

The index becomes really beneficial when we look at two or more lists that are paired. For example, imagine you have two lists with names and ages:

name = ["Mike", "Steve", "Matt", "Scott", "Larry"]

age = [14,15, 14, 17, 18]

These lists are paired - Mike is 14 years old, Steve is 15 and so on.

Now let's use our lists together:

name = ["Mike", "Steve", "Matt", "Scott", "Larry"]

age = [14,15, 14, 17, 18]

n = int(input("Pick an index (0-4): "))

print (name[n], "is", age[n], "years old" )

This works because the 1st age is paired with the 1st name and so on.

Finally, we can use the FOR loop to go through all of the names and ages:

name = ["Mike", "Steve", "Matt", "Scott", "Larry"]

age = [14,15, 14, 17, 18]

for i in range(len(name)):

print (name[i], "is", age[i], "years old" )

**The Len() of a String**

Remember that a String is itself an array of characters. What does this do:

name = input("What is your name? ")

print (name[0])

We can use the **len()** function to give us the length of a string:

name = input("What is your name? ")

print ("Your name has", len(name), "letters.")

Remember this for loop:

myString = "Hey look! A string!"

for letter in myString: # go through every letter in myString

print(letter) # print it

You can also go through a string using an index:

myString = "Hey look! A string!"

for i in range(len(myString)): # use an index to go through myString

print(letter) # print it

This new method does not seem worthwhile, but sometimes you want to know the index. For example, if you want to know where a letter is inside a string:

myString = "Hey look! A string!"

for i in range(len(myString)): # go through every letter in myString

if myString[i] == "k": # look for the letter k

index = i+1 # remember the spot

print ("k is the", index, "th character in: ", myString)

**Identifying a Particular Letter in a String**

What does this do?

myString = "Hey look! A string!"

print(myString[1])

print(myString[4])

print(myString[-1])

**Keywords**: ***array, element, index, list***

**Exercise**

1. Create a program that finds the third letter in a word:

Enter a word: Complicated

m is the third letter in Complicated.

1. Create a program that capitalizes the first letter of a word, like so:

Enter a word: house

House is a nice word.

1. Build on your provincial capitals exercise from last lesson. Add a new array called **province**. Make sure your provinces array matches your **capital** array. Have your program pick a random province and ask the user to name the capital of that province. If the user gets it wrong, give them the correct answer. Have the program loop 5 times and keep a final score.

What is the capital of New Brunswick? New Delhi

I'm sorry, the correct answer is Fredericton.

Your final score is 3 out of 5 questions. You need to do your homework.

Bonus: Keep an array of indices of previous questions to make sure you don't ask the same answer twice!