Python Basics!

lists and loops

CS101 Lecture #7

2016-10-19

Administrivia

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- Homework #2 is due Wed Oct. 19 today.
- Homework #3 is due Wed Oct. 26.
- Midterm #1 will be on the day of the 12th lecture, covering through Lecture #11.

Container Data Types

Example

```
colors = [ 'red', 'yellow', 'blue',
           'jale', 'ulfire' ]
for color in colors:
    print( color.title() )
```

list data type

- The list type represents an ordered collection of items.
- list is an *iterable* and a *container*.
- Containers hold values of any type (doesn't have to be the same).

`list` statement

- We create a `list` as follows:
  - opening bracket [
  - one or more comma-separated data values
  - closing bracket]

`list` statement

- `list`s work a bit like strings:

  ```
  x = [ 10, 3.14, "Ride" ]
  ```

  ```
  print( x[1] )
  print( x[1:3] )
  print( len(x) )
  ```

list statement

- But strings are *immutable* (we cannot change contents without creating a new string):

```
s = "good advise"
s[9] = 'c'                      # nope

s = s[:9] + 'c' + s[9:]         # this way
```

`list` statement

- We *can* change `list` content—they are *mutable*.

```
x = [ 4,1,2,3 ]
x[3] = -2
x.append(5)
del x[1]
x.sort()
```

← item assignment

Loops

Loops

- We frequently need to process each value in a set of values.
- Two kinds: `while` and `for`

Example: *while* Loop

```
number = 10
while number > 0:
    print(number)
    number = number - 1
print('Blast off!')
```

Defining loops: `while`

- A `while` loop has only:
  - the keyword `while`
  - a logical comparison (`bool`-valued result)
  - a **block** of code

Example

```
x = 3
while x > 0:
    print("Hello")
    x -= 1
```

How many times is `'Hello'` printed?

A zero
B once
C twice
D thrice
E four times

String comparison methods

- These produce Boolean output.

  `isdigit()` Does a string contain only numbers (digits); >= 1 character?

  `isalpha()` Does a string contain only text (alphabetic); >= 1 character?

  `islower()` Does a string contain only lower-case letters; >= 1 character?

  `isupper()` Does a string contain only upper-case letters; >= 1 character?

Example: String comparison methods

```
answer = input( 'How do you feel?  ' )
if not answer.isalpha():
    print( "I don't understand." )
else:
    print( "Ah, you feel %s." % answer )
```

Exercise

Write a program for a user to create a new password. The program should accept a password attempt from the user and check it with the function `validate_password`. If the password is valid, the program ends. If the password is invalid, the program asks for a new attempt, repeating until the user enters a valid password.

Solution

```
pwd = input("Enter a password:  ")
while not validate_password(pwd):
    pwd = input("INVALID!  Try again:  ")
print("Your password is valid.")
```

Infinite loops

- Make sure that your code always has a way to end!

```
while True:
    print('Hello!')
```

Infinite loops

- Make sure that your code always has a way to end!

  ```
  while True:
      print('Hello!')
  ```

- Use `Ctrl+C` to break free.

Accumulator pattern

- *Design patterns* are common structures we encounter in writing code.
- The *accumulator* pattern uses an accumulator variable to track a result inside of a loop:

```
i = 0
sum = 0
while i <= 4:
    sum += i
    i += 1
```

Example

```
i = 0
sum = 0
while i <= 4:
    sum += i
    i += 1
```

What is the value of `sum`?

A 6
B 10
C 15
D None of the above.

Example

```
i = 0
sum = 0
while i < 7:
    if (i % 2) == 1:
        sum += i
    i += 1
```

What is the value of `sum`?

A 9

B 12

C 16

D 21

Exercise

Write a function to sum all of the digits in a number.

`12145` → `1 + 2 + 1 + 4 + 5` → `13`

Solution (*while*)

```
def sum_digits( n ):
    s = str( n )
    i = 0
    result = 0
    while i < len( s ):
        result = result + int( s[i] )
        i = i + 1
    return result
```

Example

The following code should increment x if the hundreds place contains a zero:

```
def fun(x):
   if x < 100 or ???:
      return x+1
   return x
```

What should replace the ??? to complete the code? Assume x is an integer.

A `x.string(3) == '0'`

B `str(x)[-3] == '0'`

C `((x//100) % 10) == 0`

D None of the above.

Reminders

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