Python Basics!

CS101 Lecture #7

lists and loops
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() )
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).
We create a list as follows:
- opening bracket [
- one or more comma-separated data values
- closing bracket ]
lists work a bit like strings:

```python
x = [ 10, 3.14, "Ride" ]
print( x[1] )
print( x[1:3] )
print( len(x) )
```
But strings are *immutable* (we cannot change contents without creating a new string):

\[
\begin{align*}
s &= "good advise"
s[9] &= 'c' & \# \text{ nope} \\
s &= s[0:9] + 'c' + s[9:] & \# \text{ this way}
\end{align*}
\]
We can change list content—they are mutable.

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

→ item assignment
Loops

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

```python
number = 10
while number > 0:
    print(number)
    number = number - 1
print('Blast off!')
```
A while loop has only:
- the keyword while
- a logical comparison (bool-valued result)
- a **block** of code
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
These produce Boolean output.

- `isdigit()` Does a string contain only numbers (digits); \( \geq 1 \) character?
- `isalpha()` Does a string contain only text (alphabetic); \( \geq 1 \) character?
- `islower()` Does a string contain only lower-case letters; \( \geq 1 \) character?
- `isupper()` Does a string contain only upper-case letters; \( \geq 1 \) character?
answer = input( 'How do you feel? ' )
if not answer.isalpha():
    print( "I don't understand." )
else:
    print( "Ah, you feel %s." % answer )
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!

  ```python
  while True:
      print('Hello!')
  ```
Infinite loops

- Make sure that your code always has a way to end!
  ```python
  while True:
    print('Hello!')
  ```

- Use Ctrl+C to break free.
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:

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

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

What is the value of \(\text{sum}\)?

A 6  
B 10  
C 15  
D None of the above.
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
```python
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
```
The following code should increment \( x \) if the hundreds place contains a zero:

```python
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 \( \text{str}(x)[-3] == '0' \)
C \( ((x//100) \% 10) == 0 \)
D None of the above.
Reminders
Reminders

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