Lab 7

- Feedback on Lab 6
- Review for Lab 7

Lab Musings

- As we learn more computer science, we're moving toward a **much higher ratio of *thinking* to *coding***
  - Give yourself the time and room to think
  - Discuss, reinforce your understanding
- Going beyond simply correctness in solutions
  - Looking for understanding of good coding practices
    - Testing, readability, usability, documentation, organization, efficiency
      - (not necessarily in that order)

Lab Musings

- Lab benefit: access to lab assistants and instructor to help
- Lab limitation: may not be the best environment
  - Seems to cause a competitive atmosphere, increased anxiety for some students
  - You have until Friday to complete the lab
  - Work at your pace, **think clearly** and **deeply**

LAB 6 FEEDBACK

Inefficiency in `while` loops

```
num = 0
while num<500 or num>1000:
    num=eval(input("What is your number?"))

    if num<=1000 and num>=500:
        print("Eureka!")
    else:
        print("Please try again.")
```

Written as a hybrid between
"when should I stop?" and "when should I keep going?"

Know that the while loop's condition will *never* be false
→ Doing an extra check every time through loop

As a while True loop

```
num = 0                                  True
while num<500 or num>1000:               No unnecessary check
    num=eval(input("What is your number?"))

    if num<=1000 and num>=500:
        print("Eureka!")                 <-- break
    else:
        print("Please try again.")
```

Using the Sentinel Design Pattern

```
num = eval(input("What is your number?"))

while num<500 or num>1000:
    print("Please try again.")

    num=eval(input("What is your number?"))

print("Eureka!")
```

Initialize value

Sentinel check

Update value

After loop completes, you know you have your number

Inefficiency in Craps

```
while True:
    if roll == 7 or roll == 11:
        …
    elif roll == 2 or …:
        …
    else:
        point = roll
        …
```

These steps only happen once, so they should *not* be in the `while` loop.

We can add code to ensure that they only execute once, but it's easier/less error-prone to not have them in the loop at all.

Reminder: doc strings on all* functions

- Template:
  - What function does
  - Precondition: what parameters are, their types, any restrictions on them
  - Postcondition: what is true after function executes, e.g., what is returned or displayed

* Not main or test functions

Programmatically Testing Functions

- Trying to help you become more efficient testers
  - Don't worry about user input
  - Just make the test calls
    - Think about input and expected output
- Example: `test.testEqual( stretchString("cs"), "c.s..")`
- Can still print in function during debugging
  - Then remove print statements

Checking if a str contains a substring

Instead of using a method, could use `in` operator because didn't care where in the string it was:

```
if "r" in phrase:
```

Over `string`

- Why do you ***not*** need to use `str` in the following code segment?

```
origString = str( input("What is your string? ") )
```

Over `string`

- Why do you ***not*** need to use `str` in the following code segment?

```
origString = str( input("What is your string? ") )
```

  - Because `input` returns a string; no need to cast

- Preferred:

```
origString = input("What is your string? ")
```

Goal: Simplify/reduce code
→ Less code → easier to understand, less error-prone

When to Compute

- Don’t do computation until it is needed

```
fileName = input("What is the name of your file? ")

lastPeriod = fileName.rfind(".")

if lastPeriod != -1 and lastPeriod != len(fileName) - 1 :
                                                Find extension here
    extension = fileName[lastPeriod+1:]
    print(fileName, "is a(n)", extension, "file.")

else:
    print(fileName, "does not have an extension")
```

Adding to Development Process

- After your program works, consider
  - Is it readable?
  - Can I simplify?
  - Is it efficient?
- Modify, test again

Problem Solving: Smaller Pieces

We implement and test functions separately from the user interaction

User Interaction

- Easy to implement
- Shows results
- But slows down development process

Test Function

- Focus on the "hard" part (typically, the new stuff we're learning)
- Speeds up development process
  - No need to type in input (and make mistakes)
- But, can't see progress as easily

Easy fix: print out result of the called function with hard-coded parameter(s)

Problem Solving: Smaller Pieces

- Example development process for myFunction

1. Initial development

```
print(myFunction("example"))
```

Problem Solving: Smaller Pieces

- Example development process for myFunction

1. Initial development

```
print(myFunction("example"))
```

2. Add tests in test function

```
#print(myFunction("example"))
testMyFunction()
```

Problem Solving: Smaller Pieces

- Example development process for myFunction

1. Initial development

```
print(myFunction("example"))
```

2. Add tests in test function

```
#print(myFunction("example"))
testMyFunction()
```

3. Add in user input in main

```
main()
#testMyFunction()
```

str Review

Review on your own

- How can we combine strings?
  - How can you repeat a string multiple times?
- How can we find out how long a string is?
- How can you tell if one string is contained in another string?
- How can we find out the character at a certain position?
- How can we iterate through a string?
- How do you call a method on a string?
- Can we change a string after it's been initialized?

Review

- What is the special name for characters that start with "\"?
  - Give examples of those special characters
- How do you format strings?
  - What does a format specifier look like?
  - What questions should you ask when formatting strings/creating the format specifier?
- How can we find the ASCII value for a character?
- How can we find the character associated with an ASCII value?
- How can we check if a character belongs to a character *class*? (reviewing from textbook)
- How do you encode a lowercase letter in the Caesar Cipher?
- What is your algorithm to encrypt a message?

Review: String Formatting

- Use the format method
  - `"templatestring".format(replacementvalues)`
- Format specifiers syntax:
  `{[flags][width][.precision][code]}`
- When determining format specifiers, consider
  - Data type of the replacement value
    - If float, how many decimal places desired
  - Desired width
  - Justification, other flags

Review: Translating to/from ASCII

- Translate a character into its ASCII numeric code using **built-in function** `ord`
  - `ord('a') ==> 97`
- Translate an ASCII numeric code into its character using **built-in function** `chr`
  - `chr(97) ==> 'a'`

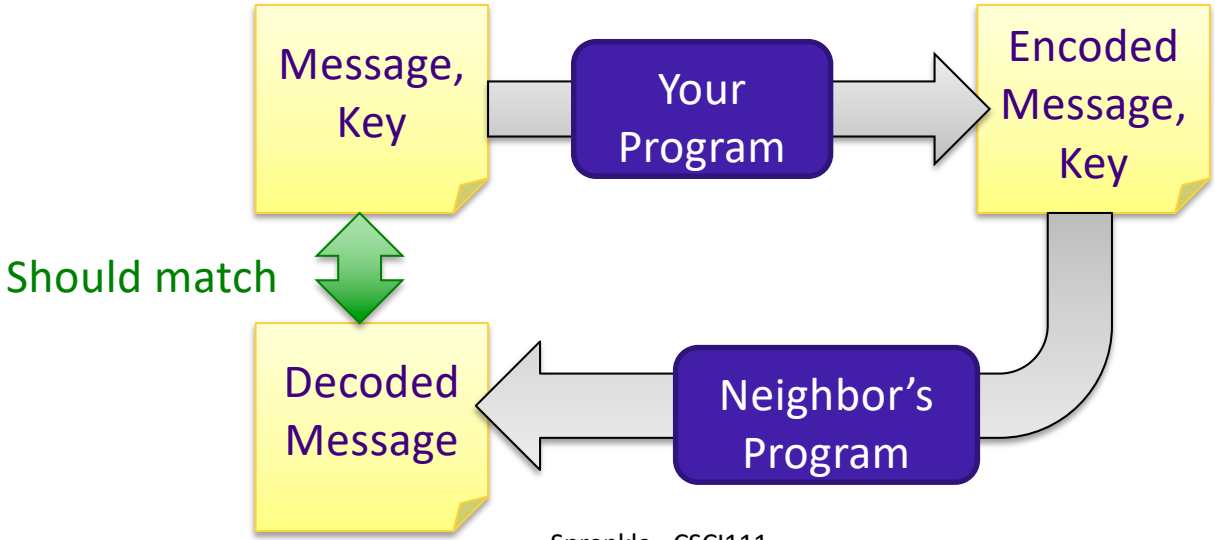
`ascii_table.py`
`ascii.py`

Review: Character Classification

- From `string` module
- Classifications:
  - `string.ascii_lowercase`
  - `string.ascii_uppercase`
  - `string.digits`
  - `string.punctuation`

Caesar Cipher

- Write an encoding/decoding program
  - Encode a message
  - Give to a friend to decode



What is the algorithm for encoding a letter?

- Assuming a lowercase letter

- Example Test Cases:
  - `test.testEqual(encryptLetter('a', 1), 'b' )`
  - `test.testEqual(encryptLetter('y', 1), 'z' )`
  - `test.testEqual(encryptLetter('z', 5), 'e' )`
  - `test.testEqual(encryptLetter('b', -4), 'x’ )`
  - `test.testEqual(encryptLetter('s', 0), 's' )`

What is the algorithm for encoding a letter?

(Assuming a lowercase letter)

1. Convert the character to its ASCII value
2. Add the key to that value
3. Make sure that the new value is a "valid" ASCII value, i.e., that that new value is in the range of lowercase letter ASCII values
   a. If not, "wrap around" to adjust that value so that it's in the valid range
4. Convert the ASCII value into a character

What is the algorithm for encoding a message?

- Assuming message made up of only lowercase letters, spaces, and punctuation
- Examples:

```
test.testEqual(encryptMessage('cat', 1), 'dbu' )
test.testEqual(encryptMessage('w and l!', 5), 'b fsi q!' )
```

Encrypt a Message

- Accumulate a new encrypted message
- For each character in the message
  - Check if the character is lowercase letter
    - if it is, encrypt it
    - otherwise, the character doesn't change
  - Add [encrypted] character to the encrypted message

We need to accumulate the encrypted message in a new string rather than change the message because strings are ***immutable***

Honor System Review

- Person who needs help should *never* look at the code of the person who is helping
- No sharing code
  - No emailing, printing, …
- Cite the help you're receiving outside of lab
- Pledge your assignments
- Report suspicious behavior

Lab 7

- Caesar Cipher
- Strings
  - Escape sequences
  - Formatting