CIS 122

Homework Review
Assignment 1

- Part 0 - Stringing Things Together
- Part 1 - Is it Cold in Here?
- Part 2 - Taking it to the Max
- Part 3 - A Shifty Problem (part one)
You are given three strings:
- a = "ARMADILLO"
- b = "BUTTERFLY"
- c = "CHAMELEON"

Your task is to produce different strings
- Use string manipulation techniques
- Store results to variables

For example, to produce the string "MADMADAMELON"
Assignment 1 - Part 0

- You are given three strings:
  - a = "ARMADILLO"
  - b = "BUTTERFLY"
  - c = "CHAMELEON"

- Could select each character individually
  - This is tedious

- As a challenge, find creative string productions
  - I'll share the most interesting ones
Assignment 1 - Part 1

- Write 3 temperature conversion functions
  - FtoC (Fahrenheit to Celsius)
  - CtoK (Celsius to Kelvin)
  - FtoK (Fahrenheit to Kelvin)

- You are given formulas
  - $T_c = \frac{5}{9} (T_f - 32)$
  - $T_k = T_c + 273$

- No formula converting from Fahrenheit to Kelvin
  - Don't compute it yourself!
  - Let Python do your work for you
Assignment 1 Part 2

● Write 3 functions:

● myMax(a,b) returns largest of a and b
  ○ Conditional logic

● myMax3(a,b,c) returns largest of a, b, and c

● myMax5(a,b,c,d,e) returns largest of a, b, c, d, and e
def myMax5(a, b, c, d, e):
    if a > b:
        if a > c:
            if a > d:
                if a > e:
                    return a
                else:
                    return e
        else:
            return e
    if d > e:
        return d
    else:
        return 3

augh!
def myMax5(a, b, c, d, e):
    f = myMax3(a, b, c)

Reduce your problem to ones you've already solved
Assignment 1 - Part 3

- Cryptosystems
  - Used for sending secret messages
  - Sender enciphers message into ciphertext
  - Receiver deciphers message recovering plaintext

- Caesar Cipher
  - A system for sending secret messages
  - Enciphering:
    - shift each character forward the same distance
  - Deciphering:
    - shift each character back the same distance
Suppose we want to shift 3 spaces forward
  ○ With paper and pencil...

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
DEFGHIJKLMNOPQRSTUVWXYZABC
ABCDEF
```

```
GHJKLMNOPQRSTUVWXYZ
```

```
DEF
```

```
GHJKLMNOPQRSTUVWXYZABC
```
Suppose we want to shift 3 spaces forward

- With paper and pencil...

```
ABCDFGHIJKLMNOPQRSTUVWXYZ
DEFGHIJKLMNOPQRSTUVWXYZABC
```

A → D
Assignment 1 - Part 3

- Suppose we want to shift 3 spaces forward
  - With paper and pencil...

\[
\begin{align*}
A & \rightarrow D \\
B & \rightarrow E \\
CDEFGHIJKLMNOPQRSTUVWXYZ & \\
D & \rightarrow E \\
EFGHIJKLMNOPQRSTUVWXYZABC & \\
F & \rightarrow G \\
GHIJKLMNOPQRSTUVWXYZABCDEF & \\
H & \rightarrow I \\
IJKLMNOPQRSTUVWXYZABCDEF & \\
J & \rightarrow K \\
KLMNOPQRSTUVWXYZABCDEF & \\
L & \rightarrow M \\
MNOPQRSTUVWXYZABCDEF & \\
N & \rightarrow O \\
NOPQRSTUVWXYZABCDEF & \\
O & \rightarrow P \\
PQRSTUVWXYZABCDEF & \\
PQRSTUVWXYZABCDEF & \\
Q & \rightarrow R \\
QRSTUVWXYZABCDEF & \\
R & \rightarrow S \\
QRSTUVWXYZABCDEF & \\
S & \rightarrow T \\
QRSTUVWXYZABCDEF & \\
T & \rightarrow U \\
QRSTUVWXYZABCDEF & \\
U & \rightarrow V \\
QRSTUVWXYZABCDEF & \\
V & \rightarrow W \\
QRSTUVWXYZABCDEF & \\
W & \rightarrow X \\
QRSTUVWXYZABCDEF & \\
X & \rightarrow Y \\
QRSTUVWXYZABCDEF & \\
Y & \rightarrow Z \\
QRSTUVWXYZABCDEF & \\
Z & \rightarrow A \\
A & \rightarrow D \\
B & \rightarrow E
\end{align*}
\]
Suppose we want to shift 3 spaces forward

- With paper and pencil...

\[
\begin{align*}
ABCDEF & GHIJKLMNOPQRSTUVWXYZ \\
DEF & GHIJKLMNOPQRSTUVWXYZABC \\
A & \rightarrow D \\
B & \rightarrow E \\
C & \rightarrow F
\end{align*}
\]
Assignment 1 - Part 3

- Suppose we want to shift 3 spaces forward
  - With paper and pencil...

  ABCDEFGHIJKLMNOPQRSTUVWXYZ
  DEFGHIJKLMNOPQRSTUVWXYZABC

- Use single character shifts to encode message

  ATTACK AT DAWN
Assignment 1 - Part 3

● Suppose we want to shift 3 spaces forward
  ○ With paper and pencil...

ABCDEFGHIJKLMNOPQRSTUVWXYZ
DEFGHIJKLMNOPQRSTUVWXYZ

DEF

● Use single character shifts to encode message

ATTACK AT DAWN
D
• Suppose we want to shift 3 spaces forward
  ○ With paper and pencil...

  ABCDEFGHIJKLMNOPQRSTUVWXYZ
  DEFGHIJKLMNOPQRSTUVWXYZ

• Use single character shifts to encode message

  ATTACK AT DAWN
  DW
Assignment 1 - Part 3

● Suppose we want to shift 3 spaces forward
  ○ With paper and pencil...

  ABCDEFGHIJKLMNOPQRSTUVWXYZ
  DEFGHIJKLMNOPQRSTUVWXYZ

● Use single character shifts to encode message

  ATTACK AT DAWN
  DWWDFN DW GDZQ
Assignment 1 - Part 3

- How would we approach this problem programmatically?
- Break it down into simpler pieces
  - How do we shift a single character?
  - Given the ability to shift a single character, how do we shift an entire string?
- We'll tackle the first question this week
  - Stay tuned for part two...
Your task is to write a character shifter
- Takes character and number as input
- Return character shifted forward by number
- Non-alphabetic characters should return unchanged

```python
>>> caesarShift('A', 3)
'D'
```

```python
>>> caesarShift('z', 7)
'g'
```

```python
>>> caesarShift('7', 3)
'7'
```
But how do we shift a character?
- Characters are strings
- String addition just merges strings together
- If only we could work with numbers...
Assignment 1 - Part 3

- Under the surface, strings are just numbers!
  - ord function converts a character to a number
  - chr function converts a number to a character

- A few useful encodings:
  - 'A' = 65, 'B' = 66, ..., 'Y' = 89, 'Z' = 90
  - 'a' = 97, 'b' = 98, ..., 'y' = 121, 'z' = 122

- Given some character c with encoding n
  - What can we determine about c?
  - What character comes right after c?
Assignment 1 - Part 3

● You may assume that the $0 \leq \text{shiftNum} \leq 25$
  ○ But you don't have to
  ○ Feel free to handle very large shifts
  ○ May find the % operator useful...
Assignment 1 - Part 3

- The rest is up to you
- Try to figure this out on your own
- If you get stumped, I include a more detailed breakdown
  - White text
  - Highlight to read it
Assignment 1 - Notes

- Avoid excessive nesting
- Don't forget your docstrings
- Don't forget to comment your code