

CS 150 Lab 11

Functions

The purpose of today's lab is for you to get some hands-on experience with functions!

- **Be sure to answer the given questions before you start**
- Be sure your output looks exactly like the specified output
- Be sure to submit your solution to CS150-02 Drop when you are done (By Friday, Nov 12, 5pm)
- Show the instructor or TA your solution before submitting it

Lab 11.1 Basic Functions

For this lab, you will need to create a new Visual Studio project that will contain your source code. Name this project "11Lab_1_XXXXXXXX", replacing the XXXXXXXX with your PUNetID. This project will need to convert between various temperature scales. You will need to write a function to perform each type of conversion.

Fahrenheit = $(9/5) * \text{Celsius} + 32$
Kelvin = $(\text{Celsius} + 273.15)$

Celsius = $(5/9) * (\text{Fahrenheit} - 32)$
Celsius = $(\text{Kelvin} - 273.15)$

The functions you need to define are:

```
double FahrenheitToCelsius(double fahrenheit);  
double KelvinToCelsius(double kelvin);  
double CelsiusToFahrenheit(double celsius);  
double CelsiusToKelvin(double celsius);
```

Produce the following using the functions defined above.

Sample Output

```
-----  
 / Temperature Converter /  
-----  
  
Give me a temperature in Fahrenheit: 98.6  
98.60 degrees Fahrenheit is 37.00 in Celsius.  
98.60 degrees Fahrenheit is 310.15 in Kelvin.  
  
Give me a temperature in Celsius: 100.00  
100.00 degrees Celsius is 212.00 in Fahrenheit.  
100.00 degrees Celsius is 373.15 in Kelvin.
```

1. Write an English language algorithm for each function you need to write, including main().

Challenge

You do not need to submit this challenge.

Cryptography is the science of hiding information. Often this means taking plain text and encrypting the text, using a Key, into gibberish. The Key is then required to decrypt the gibberish back to plain text. An early form of encryption was the Caesar cipher. http://en.wikipedia.org/wiki/Caesar_cipher In this system, a Key is used to shift a plain text alphabetic character to a new encrypted character.

Encryption of character is: $(\text{character} + \text{key}) \% 26$.

Decryption of character is: $(\text{character} - \text{key}) \% 26$.

The modulus allows the characters to *wrap around* if the arithmetic produces a value outside the range of characters

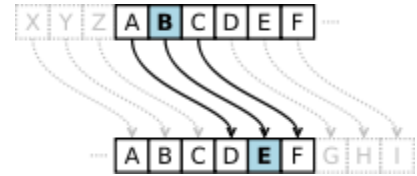


Figure 1
<http://en.wikipedia.org/wiki/File:Caesar3.svg>

You need to write two functions, encrypt and decrypt, that encrypt and decrypt a **single character**, respectively. Use the above algorithms as a guide, but you will need to remember that the modulus of a negative number is negative! *Look for other places that a third or fourth function would be useful.*

Use these functions to encrypt and decrypt text data in a file. Only encrypt and decrypt alphabetic characters, leave the non-alphabetic characters the same. Be sure to keep the case of the letter the same.

Sample Screen input/output

```
Encrypt or Decrypt (E/D)? E  
Key: 101  
Input filename: plain.txt  
Output filename: secret.txt
```

You need to make your own test files. Test your code by encrypting and then decrypting a file.

1. What parameters and return type will each function need?

2. Write an English language algorithm for each function, including main().