**Python Lab 12a Finding Factors**

A. RSA Encryption (discussed in Section 12.6) is based on the idea that it is easy to multiply two prime numbers, but difficult to factor a large number that is the product of two prime numbers.

Write a program that asks the user to enter a positive integer. Using a loop, try every integer between 1 and that number, to see if that integer is a factor. Your program will print out a message such as the following:

**the factors of 42 are [1, 2, 3, 6, 7, 14, 21]**

You will want to use the mod operator. As a reminder, if one number is a factor of another, then the % operator will produce a result of 0.

**print (45 % 5) #prints out 0**

B. One way to make this algorithm faster is to realize that once you get to the halfway point there are no other factors of N between N/2 and N. Modify your algorithm to use this fact.

C. Are there other ways you can modify this code to make it more efficient? To test your code, search the Web for a list of prime numbers. Choose two numbers from the list and multiply them together. See if your program can find the two factors.

**Python Lab 12b RSA encryption and decryption**

A. Section 12.6 gives the mathematical formulas for encrypting and decrypting using the RSA system. Using the section as a guide, write a Python program that solves questions such as the following:

In binary, 101 represents the number 5.

Using the public keys n = 91 and e = 5, encrypt the (decimal) message 5.

Use code similar to the following:

**m = 5**

**e = 5**

**n = 91**

**print ((m\*\*e) % n)**

In binary, 10 represents the number 2.

Using the private keys n = 91 and d = 29, decrypt the (decimal) message 2.

B. In Python, it is possible to change a character into an integer with the chr( ) command. Use this idea to change a string into a series of characters, change each character into an integer, and then encode each integer into a number using the encryption code you wrote above.

C. After you have figured out part B above, try to place all the numbers into a list. Then take this list as input, and using the decryption keys, turn these numbers into characters. Write your output as a string.

D. The text explains how to start with two prime numbers p and q, and then use p and q to create the values for e and d. Perform a web search to find an algorithm to computer e and d. Try to write Python code to implement the algorithm.