CS 7A - Spring 2016 - Assignment 2: char, int and bytes. 2/9/16

Background Theory

As we have learned, an ASCII (American Standard Code for Information Interchange) character requires 8 bits ("bit" is short for "binary digit") which is one "byte." (A byte is a deliberate respelling of "bite" to avoid accidental mutation to bit.) Most compilers use four (4) bytes (32 bits) to store an `unsigned int`. As such, a four-letter word requires the same memory space as an `unsigned int`. In this assignment, your job is to interpret a four-byte word (a four-letter word) as an `unsigned int`.
For example, since the ASCII value of 'B' is 66, the ASCII value of 'A' is 65, the ASCII value of 'R' is 82, and the ASCII value of 'K' is 75, the four letter word, "BARK" would be interpreted as $66 \cdot 2^{24} + 65 \cdot 2^{16} + 82 \cdot 2^{8} + 75 = 1111577163$.

1. Write a program that will prompt the user for a four-letter word and then convert that to an `unsigned int` value. Note that you can get individual letters of a `string` by using the bracket operators. So if the string is `fourLetterWord` = "easy", then `fourLetterWord[3]` is 'y', `fourLetterWord[2]` is 's', `fourLetterWord[1]` = 'a', and `fourLetterWord[0]` is 'e'.

   Have the program loop the input and check that the input is a proper four-letter word.

   Here's an example of how the program should interact with the user: produce results like these shown here:

```
Enter a four-letter word (keep it clean!): easiest

That's not a four-letter word.  Try again: easy

The ASCII value of y is 121
The ASCII value of s is 115
The ASCII value of a is 97
The ASCII value of e is 101
If the four bytes of easy were read as an int, its value would be 2037604709
Enter another four-letter word:
```

   Include as a comment at the end of your code the results of a trial run or two like that shown above. Send your `.cpp` file to my email address with the format `<your initials>_fourBytes.cpp` by Tuesday, February 23 at 2:00pm.

   Here's a code shell to get you started:

```cpp
/// G. Hagopian

#include <iostream>
using namespace std;

int main() {
    string fourLetterWord;
    cout << "\nEnter a four-letter word (keep it clean!): ";
    while(cin >> fourLetterWord) {
        if(/* a proper 4-letter word is entered */) {
            //Convert each letter of the word to its ASCII value.
            //Sum up the values of each byte (with its power of 2)
            //and report the summed value.
            //loop around to the prompt
        }
        else {
            //Give an error message and loop around to the prompt
        }
    }
} /*
The ASCII value of E is 69
The ASCII value of R is 82
The ASCII value of O is 79
The ASCII value of F is 70
If the four bytes of FORE were read as an int, its value would be 1163022150
Enter another four-letter word: */
```

2. Use the modulus operator and integer division to reverse the process, taking any 4-byte unsigned integer value and interpreting that as a four-character word. What problems do you encounter?
   Email your code (.cpp file) to me by 2/23 at 2pm.