CS 220, Fall 2017
Assignment 1 & 2 – (200 points)
Due date: 10 Sep 2017, 11:59pm.

Instructions

- Answer the questions individually. Group effort is not allowed.
- Solutions must be committed to your respective repositories on github.
- Ensure that your code runs on remote.cs.binghamton.edu.
- Useful resources:
  1. Common linux commands: http://www.informit.com/blogs/blog.aspx?uk=The-10-Most-Important-Linux-Commands
  2. http://c-faq.com/

Questions

1. A Fibonacci sequence is a series of numbers: 0, 1, 1, 2, 3, 5, 8, ... where: The first number is 0, the second number is 1, and each successive number is found by adding the two preceding numbers. Write a function with name "isFib" that accepts an integer i as input and returns n such that i is the n^{th} Fibonacci number. If i is not a Fibonacci number, the function returns -1. Assume $0 \leq i \leq 1000000000$. If i is 1, return 2. Use the prototype: `int isFib(unsigned long i);` (40 points)

2. If the numbers 1 to 5 are written out in words: OnE, twO, thrEE, fOUr, fIvE, then there are 2 + 1 + 2 + 2 + 2 = 9 vowels used in total. Write a function `unsigned int count_vowels(unsigned long num);` that accepts a number as input and returns the sum of all vowels when the number is written out in words. $0 \leq num \leq 1000000000$. Return 0 if input is invalid.

   NOTE: Do not count 'and' in the expansion of the word. For example, 342 (thrEE hUndrEd and fOrty-twO) contains 6 vowels and 115 (OnE hUndrEd and fIftEEn) contains 7 vowels. 1500 is OnE thOUsAnd fIvE hUndrEd (not fifteen hundred) contains 9 vowels. (60 points)

3. Write a function `unsigned int count_ones(long n)` that accepts a 64bit integer n and returns the number of 1's in the binary representation of the number (2's complement representation for negative numbers). (40 points)

4. Write a function `unsigned long swap_bytes(unsigned long n)` that accepts an 8-byte integer, swaps bytes 1 and 2, 3 and 4, 5 and 6, and 7 and 8 and returns the result. (40 points)

   Example: if n = 0x12345678deadbeef, swap_bytes returns 0x34127856addeefbe.

5. Write a function `long a4_minus_b4(int a, int b)` that returns $a^4 - b^4$. Do not use math library. Assume $-100 \leq a, b \leq 100$ (20 points)