Due: beginning of Lab 3

1. Most people can count to 10 on their fingers; computer scientists can do better. Write answers to these expressions as simple arithmetic expressions or exact numbers in base ten.
   a. If you regard each finger as one bit, with finger extended as 1 and finger curled as 0, how high can you count in base 2 using ten fingers and starting at zero?
   b. With both ten fingers and ten toes?
   c. Now use just ten toes, with the left pinky toe as a sign bit for two’s (toes) complement numbers. What is the minimum expressible number? (10-bit two’s complement)
   d. What is the maximum fingers-and-toes-complement (20-bit two’s complement) number?

2. Perform the following conversions:
   o Show the 8-bit two’s complement representation of -107_{10} and 107_{10}.
   o Show the decimal (base 10) notation of the signed integers whose 16-bit two’s-complement representations are given in hexadecimal notation as 0x5F8C and 0xCAFE.

3. Perform the following calculations on the 8-bit representation of unsigned integers. Show your work and do the calculations in binary. Write the 8-bit result value below the line. Indicate for each calculation whether or not overflow has occurred.

   4. \(00101101\) + \(11111111\) + \(00000000\)
   5. \(+01101111\) + \(+11111111\) - \(11111111\)
   6. \(--\) + \(--\) + \(--\)

7. Repeat all parts of problem 3 assuming the 8-bit values represent signed integers in two’s complement representation.