Indian Institute of Technology, Delhi
EEL 201: Digital Electronic Circuits
Tutorial 1, 3rd August, 2009

1. Express the following unsigned decimal numbers in binary, octal, and hexadecimal:
   225.5, 67.25, 49, 10.1, 0.2

2. Convert the following hexadecimal numbers into decimal:
   FF, A5, CD, AB.CD, 12.FF

3. Find out the 8-bit 2's complement signed binary representation of the following decimal numbers:
   +125, -57, -128, +255, -1

4. Work out the following additions using 1's complement signed representation: (the numbers are all expressed in hexadecimal)
   FA+8C, 7A+9B, 25+78, 80+7F

5. Work out the same additions as above assuming that the numbers are in the 2's complement notation.

6. If $A_3A_2A_1A_0$ is a positive signed number, its 2's complement is given by $\overline{A_3A_2A_1A_0} + 0001$. Prove that the above statement is true even if $A_3A_2A_1A_0$ is a negative number.

7. Is $A \oplus (B \oplus C) = (A \oplus B) \oplus C$? Show that if A, B, C are three binary variables that need to be added, the sum of the three is given by $S = A \oplus B \oplus C$, with a carry of $C = AB + BC + CA$.

8. *Additional fun problem:* Based on your observations in question 1, can you now prove Fermat's Little Theorem? Fermat's Little Theorem states that if p is a prime number, then for any integer, a, $a^p - a$ is exactly divisible by p.