Lecture 09: Integer Representations

Assume that the size of an integer in a machine is 1 byte (8 bits). And it uses a 2's complement representation. Answer the following questions with respect to this machine.

1. What is the maximum value of an unsigned integer (in decimal)? 255

2. What is the maximum value of a signed integer (in decimal)? 127

3. What is the minimum value of a signed integer (in decimal)? -128

4. If 8 (eight) bits are used to represent an address on this machine, how

   many unique addresses are there? 256

5. What is the value of the bit pattern 1010 1010 when it is interpreted as:

   a. a hexadecimal integer: 0xAA

   b. an unsigned decimal integer:170

   c. a signed decimal integer:-86

6. Suppose the machine used a 1's complement representation of integers.

   What would the value of the bit pattern 1010 1010 when it is interpreted

   as:

   a. a hexadecimal number: 0xAA

   b. an unsigned decimal integer: 170

   c. a signed decimal integer: -85

7. What is the value of the 0xF2 when it is interpreted as:

   a. a 2's complement binary representation: 1111 0010

   b. a 1's complement binary representation: 1111 0010

   c. a signed magnitude binary representation: 1111 0010

   d. an unsigned decimal integer: 242

   e. a signed decimal integer: -14 (2s complement)

8. Suppose that integers are **signed** and they take up only 1 byte. What is the **binary** representation of the following integers? You may assume that the machine uses two's complement representation to represent negative numbers.

Integer	Binary
-1	1111 1111
42	0010 1010
27	0001 1011
-14	1111 0010
0	0000 0000