1. Write down the following integers in base 7:
   (a) 245
   (b) 98
   (c) 2014

2. What is the representation of the number $[2402]_5$ in base 2?

3. What is $[111111]_2 + [1]_2$?

4. What is $[32132]_4 + [22]_4$?

5. Let $n$ be an integer. Let the remainder when $n$ is divided by $b$ is $a$. Prove that if $n$ is written in the base $b$ representation as

   \[ n = x_0 * b^0 + x_1 * b^1 + \cdots + x_k * b^k, \]

   then $x_0$ must be equal to $a$.

6. What is the maximum integer that can be represented in base 2 using only 10 bits (that is, what is the largest integer which when represented in base 2 has at most length 10 representation).

7. (a) Show that if $a$ and $b$ are integers in the range 1 through 256, and the sum of $a$ and $b$ is also in this range, then

   \[ 2^9 \leq (2^9 - a) + (2^9 - b) < 2^{10}. \]

   (b) Explain why it follows that the binary representation of $(2^9 - a) + (2^9 - b)$ has a leading term in the $2^9$th position.