Some more exercise for weeks 1 & 2

Hopefully the lectures helped you to understand how numbers are represented in a computer.

Here are a few questions you might want to work through. They are not, meant to be a practice quiz – they are to help you check your understanding.

1. The 32 bit (4 byte) value $10110210310 4_8$ is used to represent the 4 ASCII characters 'ABCD'
   a. What would be the result if you added that value to 001002003004_8?
   b. What would be the interpretation of that result as ASCII characters?
2. If a floating point number is represented in 8 bits. The leftmost bit represents the sign of the exponent, the next bit the sign of the mantissa, the next 2 bits represent the magnitude of the exponent and the final four bits the magnitude of the mantissa. Convert the following into that representation:
   a. 1.741
   b. -1.741
   c. 17412245
   d. 5.741
   e. 1.741×2^{-3}
3. In base 5, what is the result of the following operations:
   a. $21321_5 + 3241_5$
   b. $32021_5 - 022_5$
4. What would be the maximum address space if you used:
   a. 36 bits
   b. 12 bits
5. If a processor runs at 1GHz, and (at best) takes 5 ticks to execute instructions
   a. Without pipelining how many instructions could be executed in a second?
   b. With pipelining, how many instructions would you hope to execute per second?
6. If you need to store 5 million records each containing 150 bytes
   a. How many bytes of data would you need to store?
   b. How many bits would you need in an address to be able to address this many bytes?
7. In MIPS:
   a. What does a shift left instruction have as its operands and what does it do?
   b. What is the difference between a register operand and an immediate operand?
8. What is the relationship between binary machine code and assembly code?
9. What does the instruction register hold?
10. What is a register?
11. What is a bus?

Let me stress – these are NOT examples of questions you should expect to find in the quiz. They are to help you check whether you understand and help focus your study.