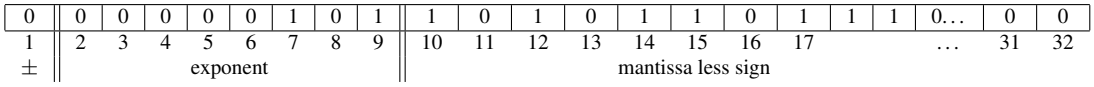
1S2 (Timoney) Tutorial sheet 13
[February 18 – 22, 2008]

Name: Solutions

1. Find the mantissa and exponent (both in binary) for the binary floating point number $(101011.0111)_2$ when it is converted to (binary) scientific notation.

   Solution:
   $$(101011.0111)_2 = (1.010110111)_2 \times 2^5$$
   The mantissa is 1.010110111 and the exponent is 5, which is 101 in binary.

   Also indicate on the diagram how the above number might be stored as a (single precision 32 bit) floating point number on a computer. (Show the bit pattern.)



2. With the aid of the following table, show how the integers 13 and -14 would be converted to a bit pattern (zeros and ones) in a computer with 32 bit integers.

13	0	0	...	0	0	1	1	0	1
-14	1	1	...	1	1	0	0	1	0
Bit position:	1	2	...	27	28	29	30	31	32

   Solution: Uses $13 = 8 + 5 = 8 + 4 + 1 = 2^3 + 2^2 + 1 = (1101)_2$. To store -14 we take the ones complement of $14 - 1 = 13$.

3. Convert $(1010011001)_2$ to octal and $(3146)_8$ to binary using the "3 binary for 1 octal digit" rule.

   Solution:
   $$(1010011001)_2 = (001\ 010\ 011\ 001)_2 = (1231)_8$$
   $$(3146)_8 = (011\ \ 001\ \ 100\ \ 110)_2 = (11001100110)_2$$

4. Convert $(2ab4)_{16}$ to binary using the "4 binary for one hex" rule.

   Solution:
   $$(2ab4)_{16} = (0010\ 1010\ 1011\ 0100)_2 = (10101010110100)_2$$

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