Tutorial 1
Binary Integers

Exercise 1

Without using the successive division method, convert the decimal integers below into their natural binary equivalents. From these binary representations, deduce their hexadecimal values.
28_{10}, 129_{10}, 147_{10}, 255_{10}.

Exercise 2

1. Are the following binary numbers even or odd?
   11000010_2, 10010100_2, 11101111_2, 10000011_2, 10101000_2
2. Which ones are divisible by 4, 8 or 16?
3. Divide each number by 2, 4 and 8. Write down their quotients and remainders.
4. What operations could be performed instead of division in order to obtain the quotient and remainder of a binary number divided by 2^n?
5. What operation could be performed instead of multiplication in order to multiply any binary number by a power of 2?
6. What operations could be performed instead of multiplication in order to multiply any binary number by 3 or 10?

Exercise 3

Work out the decimal range of signed and unsigned binary numbers for each of the following word lengths: 4, 8, 16, 32 and *n* bits.

Exercise 4

Given the following numbers: 11111111_2 et 10110110_2.

1. Write down their decimal equivalents, assuming that they are 8-bit signed numbers.
2. Write down their decimal equivalents, assuming that they are 16-bit signed numbers.

Given the following negative number: -80_{10}.

3. Write down its binary and hexadecimal equivalents, assuming that it is an 8-bit signed number.
4. Write down its binary and hexadecimal equivalents, assuming that it is a 16-bit signed number.

Exercise 5

1. How many bits do the following values contain? Use a power-of-two notation.
   128 Kib, 16 Mib, 2 KiB, 512 GiB.
2. How many bytes do the following values contain? Use binary prefixes (Ki, Mi or Gi). Choose the most appropriate prefix so that the numerical value will be as small as possible.
   2 Mib, 2^{14} bits, 2^{26} bytes, 2^{32} bytes.