Exercises on the topics of class 4

Exercises with solutions

Ex 1. Turn in base 2, by using the base complement format, the decimal numbers 104 e 57, by using 8 bit for the representation. Then, calculate 104 – 57 in base 2.

SOLUTION:

104 : 2 = 52 rem. 0 52 : 2 = 26 rem. 0 26 : 2 = 13 rem. 0
13 : 2 = 6 rem. 1 6 : 2 = 3 rem. 0 3 : 2 = 1 rem. 1 1 : 2 = 0 rem. 1

Hence, 104_{10} is represented (by using 8 bits 2-compl) 01101000.

57 : 2 = 28 rem. 1 28 : 2 = 14 rem. 0 14 : 2 = 7 rem. 0
7 : 2 = 3 rem. 1 3 : 2 = 1 rem. 1 1 : 2 = 0 rem. 1

Hence, 57_{10} is represented as 00111001.

In 8 bits 2-compl, –57 becomes 11000111, by first complementing bit-by-bit (11000110) and then adding 1. By now summing such a number to 01101000, we obtain 00101111.

Ex. 2. Turn -4720_8 by using the 16 bits 2-complement format.

SOLUTION:

The absolute value of the given number represented with 16 bits is

0000 100 111 010 000

Its bitwise complement is 1111 011 000 101 111 and hence the 2-compl is

1111 011 000 110 000

Ex. 3. Consider 4521_6. Turn it in base 2 and then subtract to the obtained number the binary representation of the hexadecimal number 5AE. Work with 12 bits.

SOLUTION:

Let's turn 4521_6 in base 10:

$$4521_6 = 4 \times 6^3 + 5 \times 6^2 + 2 \times 6 + 1 \times 1 = 1057$$

This number in base 2 is 010000100001. The hexadecimal number 5AE turned in base 2 is 010110101110, whose 2-compl is 101001010010. Hence, the required difference (obtained by summing the first one to the 2-complof the secondo ne) is:

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  010000100001  +
  101001010010  =
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  111001110011
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Exercises without solutions

Ex. 1.

a) Write in 2-compl the decimal number - 177, by using 8 bits.
b) Will the result change by having 7 bits?
c) By having 9 bits, how will the result change?

Ex. 2. Given A = -24_{10} and B = 37_{10}, turn them in the 2-compl format and calculate both A+B and A–B in such a format, by checking the results (turn them back in base 10).
Remark. Work in a format with the minimum number of bits that make A, B, A+B and A–B all representable.