

Numeral systems

Exercise 1:

Here are the given numbers: **1010, 1020, 108141, 2A0GF00, 01AFB, CEE, BAC.**

- Among these numbers, which ones can be the presentation of a number in **base 2, 8, 10 or 16**?
- Give the smallest base in which each number can be written?

Exercise 2:

Make the following conversions:

Base 10	Base 2	Base 8	Base 16	X	Base X
555				9	
120,25				4	
14,5				3	
35,05				7	
	101101			14	
	111.01011			6	
	101.101			3	
	1011011			4	
		37		5	
		1254,1		13	
		276,52		4	
			A2	11	
			A5F,6	12	
			B2CD,2A	7	
				5	32.4
				3	12
				12	24
				9	45

Exercise 3:

Determine the bases in which the following numbers are expressed:

Basex	Base 10	x
34	22	
75	117	
1110101	117	
24	14	
13	7	
70	56	
1111	40	
402	102	
135	75	
1023	75	

Exercise 4:

Find the solution to the following riddles:

- I am triple the value of 7 in decimal and I am an octal number. Who am I ?
- I am a binary number. If you convert me to decimal, I am double 11. Who am I ?
- I am a palindrome in base 3. If you convert me to decimal, I'm 130. What is my palindrome representation in base 3 ?

Exercise 5:

Determine the digits (x,y) such that the number N is written:

(x2y) in base 6 and (3x2) in base 5.

- Give the number N in the decimal system.

Exercise 6:

A clever hen mastered counting using a base 5 numeral system. She employed five symbols: **C**, **T**, **D**, **E**, and **O**. Each symbol corresponded to a specific numerical value.

- What numerical value did she give to each of these five letters, knowing that to name the decimal number **41346460**; She said “**COT COT CODET**”.

Exercise 7:

We have two numbers A and B represented in three positions as follows:

$$\mathbf{A = (a_3 a_2 a_1)_5; \quad B = (b_3 b_2 b_1)_7}$$

1. What are the possible values for the coefficients a_i, b_i ?
2. Knowing that $\mathbf{A + B = (138)_9}$, $\mathbf{A - B = (200)_6}$, Find the values of the coefficients a_i, b_i .
3. Transform A and B into binary then calculate $A+B, A-B, A * (B/100), A/B$.

Exercise 8:

Perform the following operations:

$$(1011.1101)_2 + (11.1)_2 = (?)_2$$

$$(1011.1101)_2 / (11.1)_2 = (?)_2$$

$$(1010.0101)_2 - (110.1001)_2 = (?)_2$$

$$(110)_2 * (1.01)_2 = (?)_2$$

$$(91B)_{16} + (6F2)_{16} = (?)_8$$

$$(3.6)_8 * (4.5)_8 = (?)_4$$

$$(340)_5 - (32)_7 = (?)_6$$

Exercise 9:

In a personal computer, the usable memory words have the following hexadecimal addresses: from 0000 to 01FF and from 4001 to 7E00. What is the total decimal number of usable memory words?

Exercise 10:

Use these different codings to code the following relative integers on 8 bits (if possible) then on 16 bits:

Decimal	Binary	SVA	C1	C2	Excess
1					
-1					
-99					
-24					
127					
-128					
405					

Exercise 11: Code the following real numbers according to the IEEE standard 754-32:

$$N1 = (-6.53125)_{10}$$

$$N2 = (-32.625)_{10}$$

$$N3 = (-11.8561)_{10}$$

$$N4 = N1 - N2$$

Exercise 12:

Convert to decimal the following binary number represented in floating point (IEEE754-32 bits)

Sign	Exponent	Mantissa
1	1000 0010	1010 1000 0000 0000 0000 000
1	1000 0100	1001 0100 0000 0000 0000 000
0	1000 1010	1111 1000 0000 0000 0000 000

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