1990 first web browser - CERN Geneva

Resources - Hypertext Transfer Protocol (HTTP)

Web Pages - Hypertext Markup Language (HTML)

- languages suited to web development

**High-level programming languages

- ALGOL
- FORTRAN (1957) - John Backus (1924 - 2007)
- LISP (1959) - John McCarthy (1927 - 2011)
- BASIC (1959) - John Kemeny (1926 - 1992) & Thomas Kurtz (1928 -)
- COBOL (1960) - Grace Murray-Hopper (1906 - 1992)
- Time-sharing - Multiprogramming - Multiprocessing
- Pascal (1971) - Niklaus Wirth (1934 -)
- C (1972) - Dennis Ritchie (1941 - 2011)
- C++ (1985) - Bjarne Stroustrup (1950 -)
- Java (1995) - James Gosling (1955 -)

- C# (2000) - Anders Hejlsberg (1960 -)
- Python (1991) - Guido van Rossum (1956-)
- PHP (1994) - Hypertext Preprocessor - Rasmus Lerdorf (1968 -)
- JavaScript (1995) - Brendan Eich (1961 -)
- Ruby on Rails (2005) - David Heinemeier Hansson (1979 -)
- ⋮

* Operating Systems
  - Mainframes Era
    - IBM - OS/360, DOS/360, ...
    - DEC (Digital Equipment Corporation) - TOPS-10
  - Minicomputers Era
    - Unix (1973) - Ken Thompson (1943 -) & Dennis Ritchie (1941-2011)
    - ⋮
    - Linux (1991) - Linus Torvalds (1969 -)
  - Microcomputers Era
    - CP/M (1974) - Control Program/Monitor) David Kildall (1942-1994)

Windows NT (1993) - Microsoft - versions
Macintosh operating system

* Industry
  - Microsoft (1975) - Bill Gates (1955-) & Paul Allen (1953 - 2018)
  - Apple (1976) - Steve Jobs (1955 - 2011) & Steve Wozniak (1950 -) & Ronald Wayne (1934 -)
  - Google (1998) - Larry Page (1973-) & Sergey Brin (1973-)
  - Amazon (1994) - Jeff Bezos (1964 -) Blue Origin (2000)
  - Pay Pal (1998) - Elon Musk (1971 -) Space X (2002) Bitcoin - Blockchain
  - Facebook (2004) - Mark Zuckerberg (1984-)
  - ⋮

Listă bibliografică pentru pregătirea examenului la disciplina “Fundamentele calculatoarelor”-an 1 INF-2021/2022

1. Mircea Vlăduțiu: “Computer Arithmetic. Algorithms and Hardware Implementations” Springer-Verlag, Heidelgerg, New York, Dordecht, London, 2012, ISBN 978-3-642-18314-0, ISBN 978-3-642-18315-7 (http://www.springer.com/computer/hardware/book/978-3-642-18314-0).

2. Mircea Vlăduţiu: „Arhitectura şi organizarea calculatoarelor” Vol.1: Aritmetica sistemelor de calcul (monografie), Editura Politehnica Timişoara, 2008 (274pagini), ISBN 978-973-625-706-3 (general), ISBN 978-973-625-709-4 (vol. 1).

3. John L. Hennessy, David A. Patterson: „Computer Architecture. A Quantitative Approach” Morgan Kaufmann Publishers, Inc., Fifth Edition, 2012.

4. William Stallings: „Computer Organization and Architecture. Designing for Performance” Prentice Hall, 11th Edition, 2018.

5. **David M**. **Harris. Sarah L. Harris**: „Digital Design and Computer Architecture” Morgan Kaufmann Publishers, Inc., Second Edition, 2012.

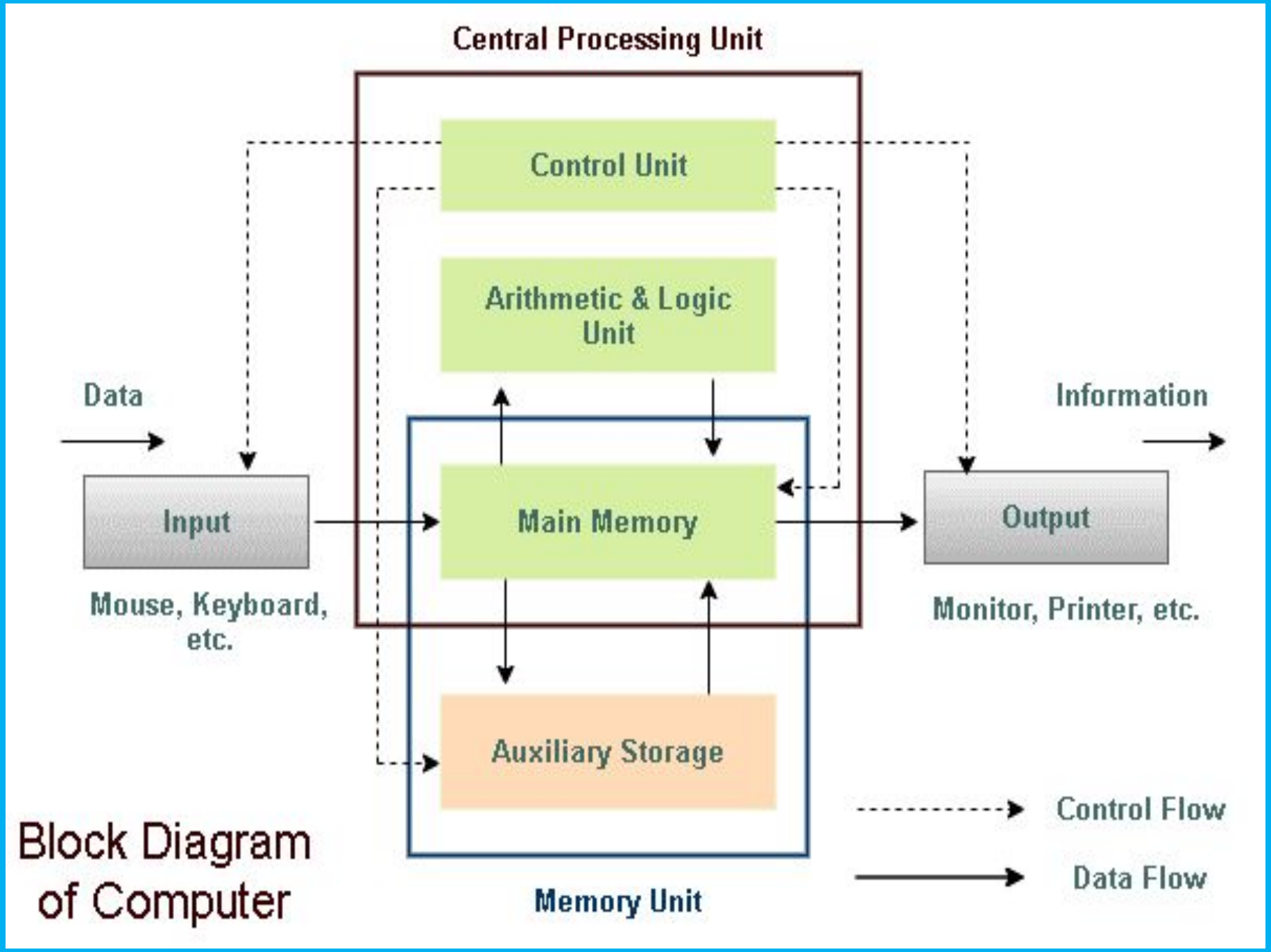
Listă bibliografică pentru pregătirea examenului la disciplina "Fundamentele calculatoarelor"-an 1 INF-2021/2022

6. Alan B. Marcovits: „Introduction to Logic Desgn" Third Edition, Paperback, 2015.

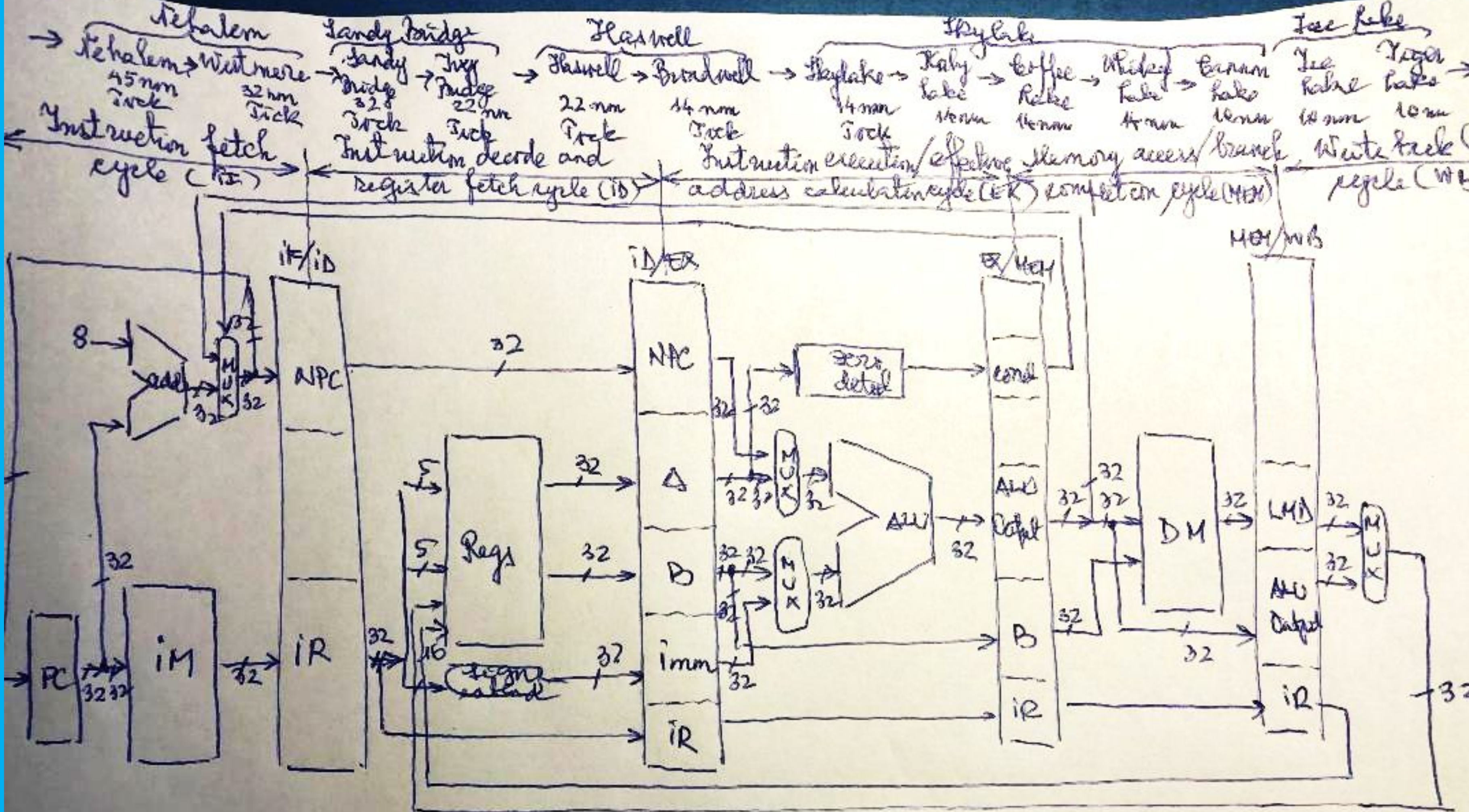
7. **John F. Wakerly**: „Digital Design: Principles and Practices" Fifth Edition, 2018.

8. **Tutorialspoint**: „Digital Circuits Design"

https://www.tutorialspoint.com/digital_circuits/digital_circuits_logic_gates.htm



Block Diagram of Computer



PC - Program counter
iM - Instruction memory
iR - Instruction register
NPC - Next program counter

MUX - Multiplexer
Regs - Register file
A, B, imm - Buffer register
↑ Immediate

ALU - Arithmetic/logic unit
DM - Data memory
LMD - Load memory data register

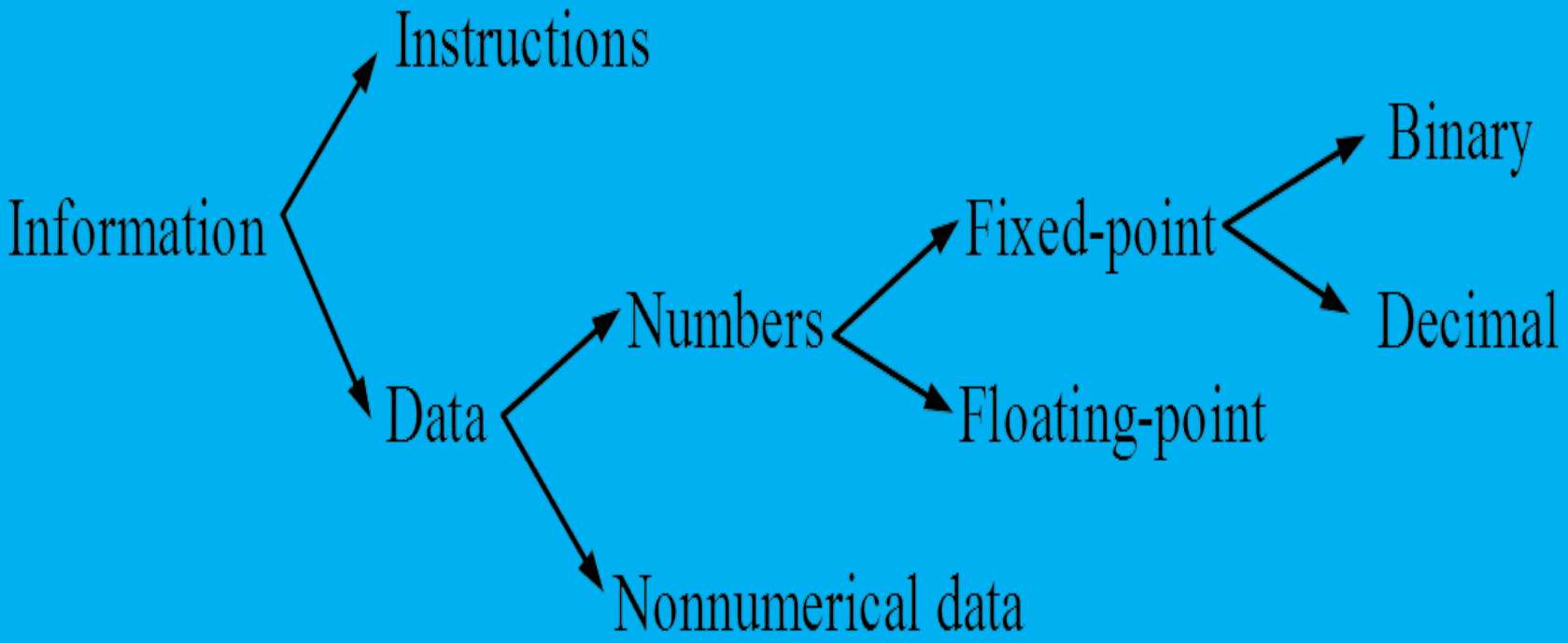

Information
Instructions
Data
Numbers
Fixed-point
Binary
Decimal
Floating-point
Nonnumerical data

Fig.1.1

integer

707_{10} digital to binary conversion

remainder method

$10^2\ 10^1\ 10^0$

$707_{10} = 7 \times 10^2 + 0 \times 10^1 + 7 \times 10^0$

1011000011_2

Computer

1011000011_2

Binary to digital conversion

707_{10}

$707_{10} \rightarrow 1011000011_2$

707	2	
1	353	2
1	176	2
0	88	2
0	44	2
0	22	2
0	11	2
1	5	2
1	2	2
	0	

$2^9\ 2^1\ 2^0$

$1011000011_2 = 1 \times 2^9 + 0 \times 2^8 + 1 \times 2^7 + 1 \times 2^6 + 0 \times 2^1 + 1 \times 2^0 =$

$= 512 + 128 + 64 + 2 + 1 = 707_{10}$

$$N = \sum_{i=0}^{n-1} x_i \cdot r^i$$

r ... radix

$x_i \in [0, r-1]$, $i = 0, 1, \ldots, n-1$

Fractions

$0,046875_{10} = 4\times10^{-2} + 6\times10^{-3} + 8\times10^{-4} + 7\times10^{-5} + 5\times1$

$0,046875_{10}$ multiplication method digital to binary conversion

$0,0000011_2$

Computer

$0,046875_{10} = 0,0000011_2$

$0,0000011_2$ binary to decimal conversion

$0,046875_{10}$

$0,046875 \times 2$
$0,093750 \times 2$
$0,187500 \times 2$
$0,375000 \times 2$
$0,750000 \times 2$
$1,500000 \times 2$
$1,000000$

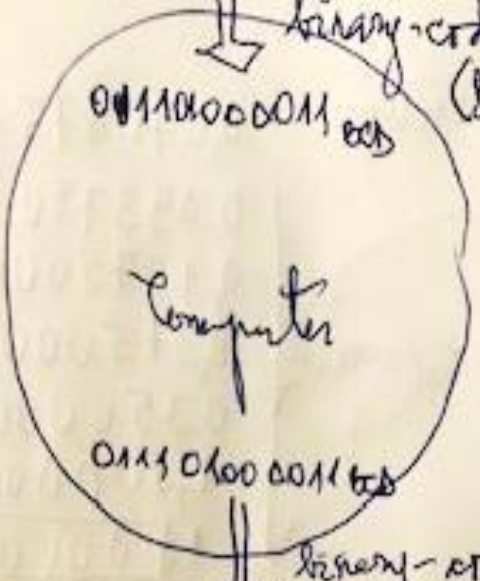
$2^{-1} \dots 2^{-5} 2^{-6}$

$0,0000011_2 = 0\times2^{-1} + 0\times2^{-2} + 0\times2^{-3} + 0\times2^{-4} + 1\times2^{-5} + 1\times2^{-6}$

$= \frac{1}{32} + \frac{1}{64} = \frac{3}{64} = 0,046875_{10}$

$N = 707,046875_{10} = 1011000011,0000011_2$

Decimal digit	Fixed-point decimal codes		
	BCD	E3	2-out-of-5
0	0000	0011	11000
1	0001	0100	00011
2	0010	0101	00101
3	0011	0110	00110
4	0100	0111	01001
5	0101	1000	01010
6	0110	1001	01100
7	0111	1010	10001
8	1000	1011	10010
9	1001	1100	10100



$743_{10} = 0111\ 0100\ 0011_{BCD}$

$743_{10} = 1010\ 0111\ 0110_{E3}$

$743_{10} = 10001\ 01001\ 00110$
2-out-of-5

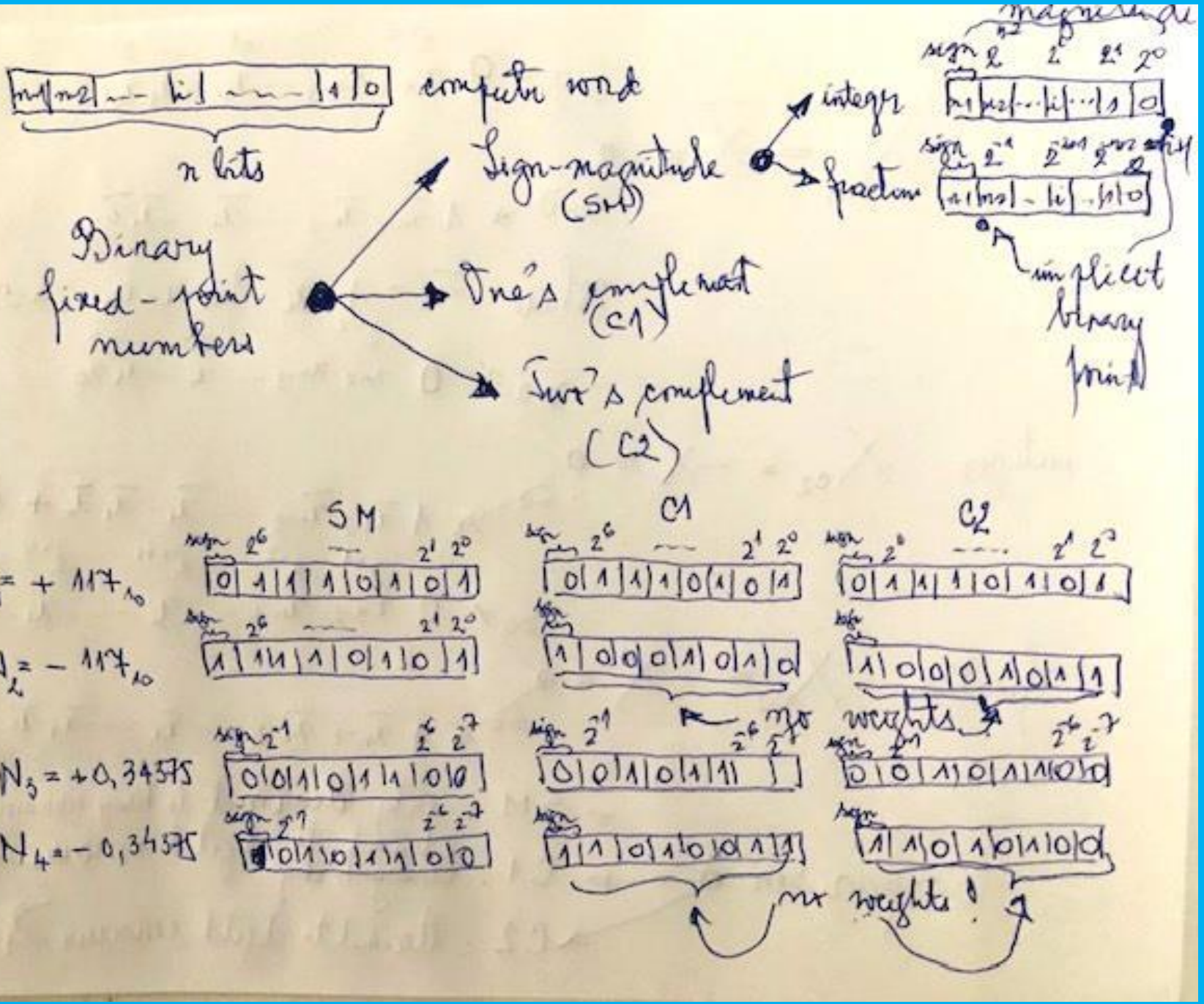
$\underbrace{0111}_{7}\ \underbrace{0100}_{4}\ \underbrace{0011}_{3}{}_{BCD} = 743_{10}$

$\underbrace{1010}_{7}\ \underbrace{0111}_{4}\ \underbrace{0110}_{3}{}_{E3} = 743_{10}$

$\underbrace{10001}_{7}\ \underbrace{01001}_{4}\ \underbrace{00110}_{3} = 743_{10}$
2-out-of-5

Decimal fixed-point numbers

- Binary-coded-decimal (BCD)
- Excess three (E3)
- Two-out-of-five (2-out-of-5)


n bits
computer word
Binary fixed-point numbers
Sign-magnitude (SM)
integer
fractional
implicit binary point
One's complement (C1)
Two's complement (C2)
SM
C1
C2
$N_1 = +117_{10}$
$N_2 = -117_{10}$
$N_3 = +0,34375$
$N_4 = -0,34375$
weights
no weights !