N bits

UNSIGNED INTEGERS

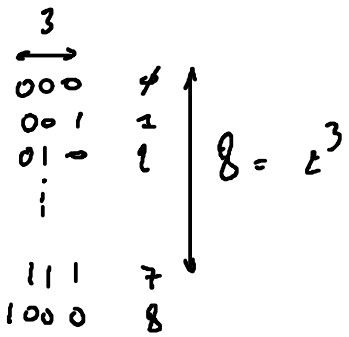
$$x_{MIN} = [\![\overbrace{"00\cdots0"}^{N}]\!] = 0 \in \mathbb{N}_0$$

$$x_{MAX} = [\![\overbrace{"11\ldots1"}^{N}]\!]$$

$$= 1\times 2^{N-1} + 1\times 2^{N-2} + \cdots + 1\times 2^1 + 1\times 2^0$$

$$= 2^{N-1} + \ldots 8 + 4 + 2 + 1$$

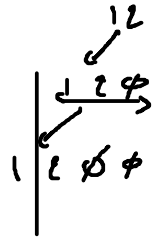
$$= 2^N - 1$$



b=10 $12 \times 10^2 = 1200$

$12 \times 10^4 = 120000$

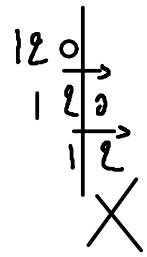
xb SHIFT LEFT



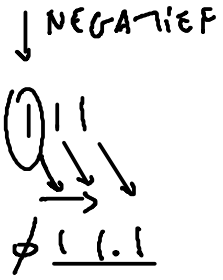
OVERFLOW

/b SHIFT RIGHT

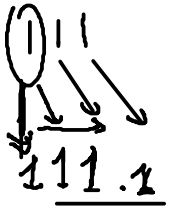
$120 / 100 = 1.2$



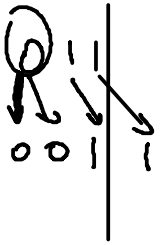
UNDERFLOW

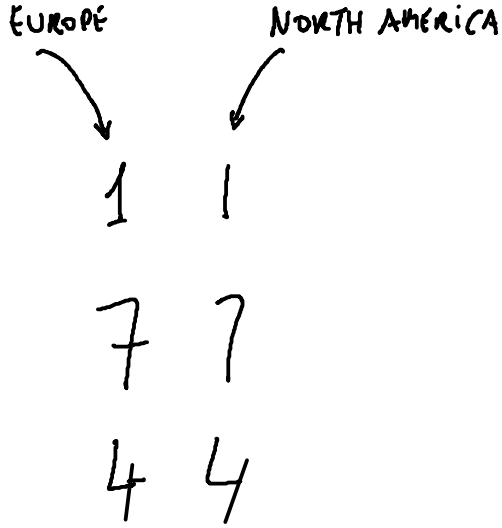


SHIFT RIGHT LOGICAL SRL



SHIFT RIGHT ARITHMETIC SRA





$1/3 = 0.333333\ldots_{10}$

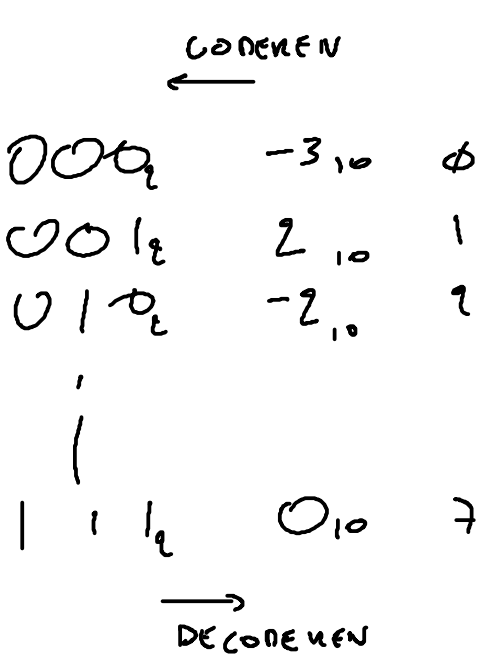
$= 0.1_3 = 0 \times 3^{0} + 1 \times 3^{-1}$

$9 = 100_3$ ($\times 3^2$, $\times 3^1$, $\times 3^0$)

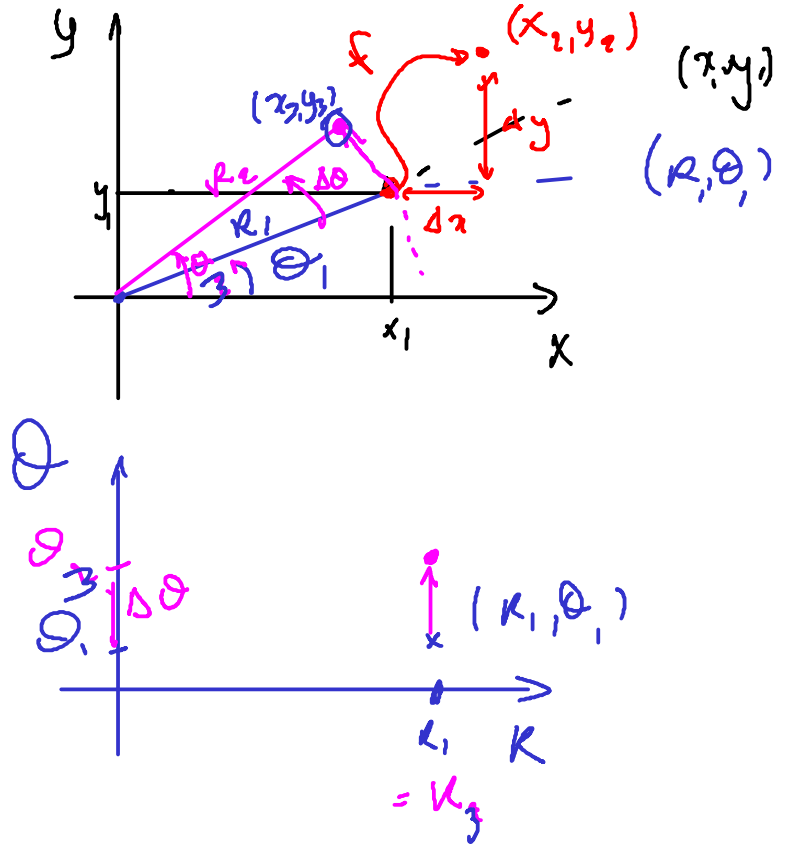
$b \rightarrow [0 .. b-1]$

0	0
1	1
2	2
10	3
11	4
12	5
20	6
21	7
22	8
100	9

$$x = \sum_{i=0}^{N} x_i b^i \qquad (b=2)$$



REGULARITY



CARTESIAN

POLAR

$$\begin{cases} x_2 = x_1 \oplus \Delta x \\ y_2 = y_1 \oplus \Delta y \end{cases}$$

TRANSLATION

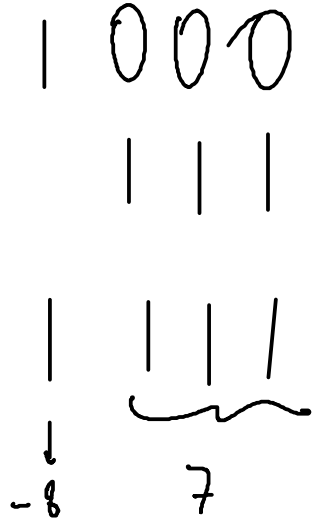
$$\begin{cases} R_3 = R_1 \\ \theta_3 = \theta_1 \oplus \Delta\theta \end{cases}$$

ROTATION

$(R_3,\theta_3) \rightarrow (x_3,y_3)$ PERF

$x_3 = R_3 \cos\theta_3$

$y_3 = R_3 \sin\theta_3$



$$2^{n-1} \geq \sum_{i=0}^{n-2} 1 \cdot 2^i$$

$$= -1_{10}$$