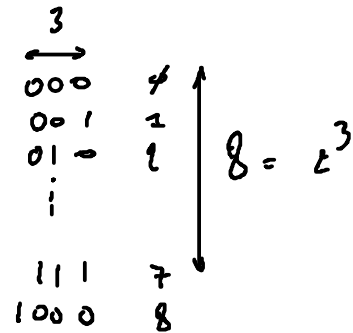


N bits

UNSIGNED INTEGERS

$$x_{\min} = \left[\begin{array}{c} \xleftrightarrow{N} \\ \text{"00...0"} \end{array} \right] = 0 \in \mathbb{N}_0$$

$$\begin{aligned} x_{\max} &= \left[\begin{array}{c} \xleftrightarrow{N} \\ \text{"11...1"} \end{array} \right] \\ &= 1 \times 2^{N-1} + 1 \times 2^{N-2} + \dots + 1 \times 2^1 + 1 \times 2^0 \\ &= 2^{N-1} + \dots + 2 + 1 \\ &= 2^N - 1 \end{aligned}$$



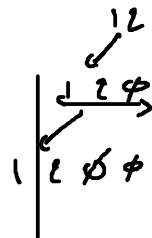
$$b=10$$

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

$$12 \times 10^4 = 120000$$

$\times b$

SHIFT LEFT

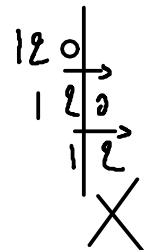


OVERFLOW

$/ b$

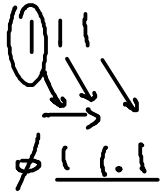
SHIFT RIGHT

$$120 / 100 = 1.2$$



UNDERFLOW

↓ NEGATIEF



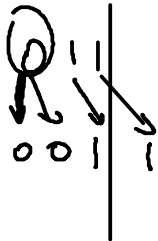
SHIFT RIGHT LOGICAL

SRL



SHIFT RIGHT ARITHMETIC

SRA



EUROPE

NORTH AMERICA

1

1

7

7

4

4

$$1/3 = \phi.333333 \dots \quad | \phi$$

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

$$9 = \begin{matrix} & \times 3^2 & & \times 3^1 & & \times 3^0 \\ & \downarrow & & \downarrow & & \downarrow \\ & 1 & 0 & 0 & & \\ & & & & & 3 \end{matrix}$$

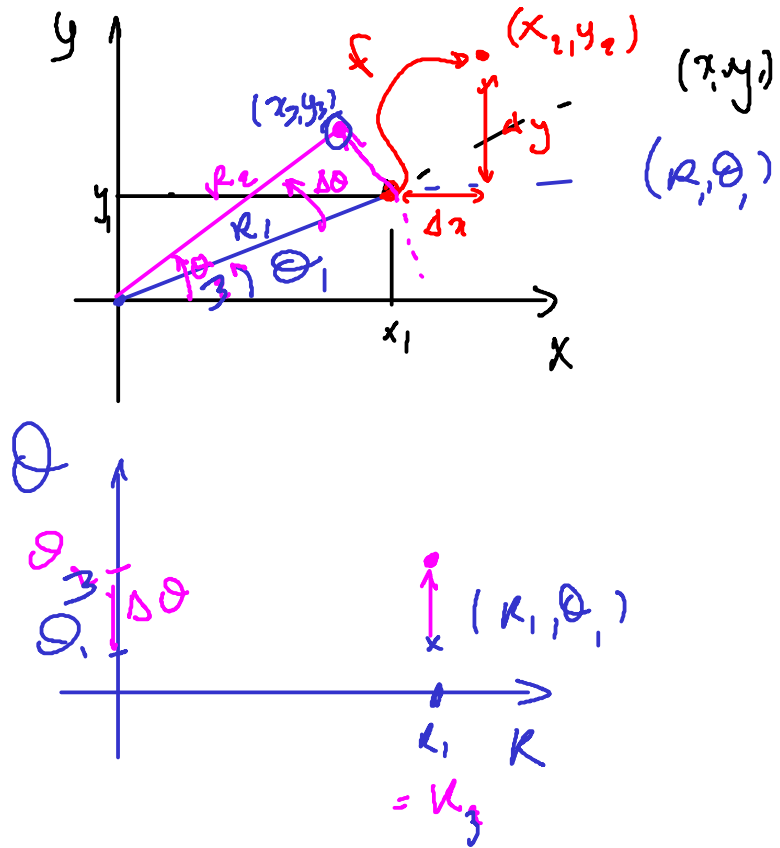
$$b \rightarrow [0 \dots b-1]$$

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

	←	CODINGEN		
000 ₂		-3 ₁₀	ϕ	
001 ₂		2 ₁₀	1	
010 ₂		-2 ₁₀	2	
111 ₂		0 ₁₀	7	
	→	DECODINGEN		

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

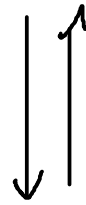
REGULARITY



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

TRANSLATION

CARTESIAN



POLAR

$$\begin{cases} r_3 = r_1 \\ \theta_3 = \theta_1 + \Delta \theta \end{cases}$$

ROTATION

$$(r_3, \theta_3) \rightarrow (x_3, y_3)$$

PERK F

$$x_3 = r_3 \cos \theta_3$$

$$y_3 = r_3 \sin \theta_3$$

| 000
| | |

| | | |
↓
-8
7

= -1₁₀

$$2^{n-1} > \sum_{i=0}^{n-2} 1 \times 2^i$$