Robin Karp Algorithm

a	b	c	d	e	f	g	h	i	j
1	2	3	4	5	6	7	8	9	10

10 Alphabet

Pattern → c a h

$3 \times 10^2 + 1 \times 10^1 + 8 \times 10^0$

$300 + 10 + 8 \Rightarrow 318$

M-character sequence $\Rightarrow$ m-digit number

b is base → no. of char used in Text

text ~~seq~~ Sequence $t[i \ldots i+M-1]$

↓ is mapped to

$$n(i) = t[i] \cdot b^{M-1} + t[i+1] \cdot b^{M-2} + \ldots + t[i+M-1]$$

with given $r(i)$ we can compute

$r(i+1)$ for the next subsequence

$t[i+1 \ldots i+1]$ in constant time

that is

$$r(i+1) = t[i+1] \cdot b^{M-1} + t[i+2] \cdot b^{M-2} + \ldots + t[i+M]$$

$$r(i+1) = r(i) \cdot b - t[i] \cdot b^M + t[i+M]$$

- $r(i) \cdot b$ → shift left one digit
- $t[i] \cdot b^M$ → substract leftmost digit
- $t[i+M]$ → add new rightmost digit

Ex →

Text ⇒ c c a c c a a e d b a

Pattern ⇒ d b a

$4 \times 10^2 + 2 \times 10^1 + 1 \times 10^0 = 421$

$3 \times 10^2 + 3 \times 10^1 + 1 \times 10^0 = 331$

$[3 \times 10^1 + 1 \times 10^0] \times 10$

$[[3 \times 10^2 + 3 \times 10^1 + 1 \times 10^0] - 3 \times 10^2] \times 10 + 3 \times 10^0$

↓

$[3 \times 10^1 + 1 \times 10^0] \times 10$

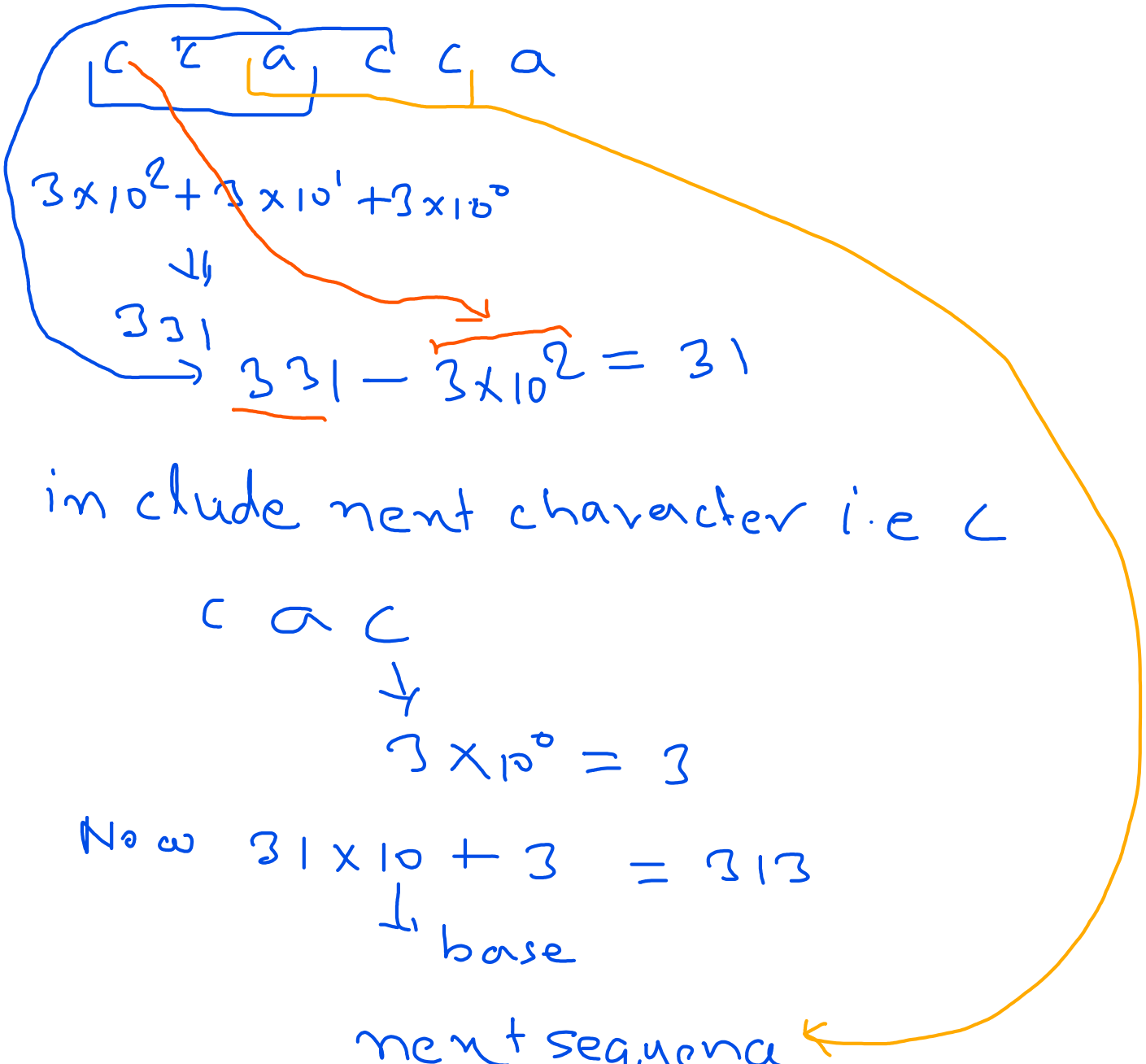
↓

This is after including next char

$[331 - 300] \times 10 + 3$

$310 + 3$

313 this is for c a c



include next character i.e c

c a c

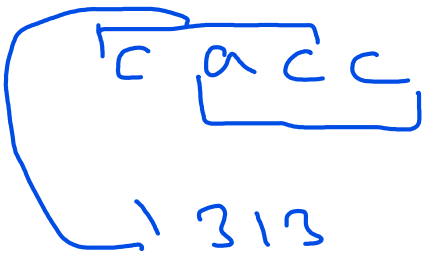
$3 \times 10^0 = 3$

Now $31 \times 10 + 3 = 313$

base

next sequence

is acc



$313 - 3 \times 10^2 = 13$

$13 \times 10 + 3 \times 10^0 = 133$