

Date :- Aug 20, 2020

AFLL
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Homework

$$\Sigma = \{a, b, c\}$$

$$n_a(w) \bmod 3 = 2 \quad \& \quad n_b(w) \bmod 2 = 0 \quad \& \quad n_c(w) \bmod 2 = 1$$

states

$$\begin{array}{cccc} \downarrow & \downarrow & \downarrow \\ 3 & \times & 2 & \times \\ (0, 1, 2) & (0, 1) & (0, 1) \end{array}$$

$$\left[\begin{array}{c} a \\ \downarrow \\ \boxed{1} \\ \downarrow \\ b \\ \boxed{1} \\ \downarrow \\ c \\ \boxed{1} \end{array} \right] \quad \left\{ (\underline{00}), (\underline{01}), (10), (11), (20), (21) \right\} \times \left\{ \underline{0}, \underline{1} \right\}$$

12 states

$$\left\{ (000), (001), (010), (011), (100), (101), (110), (111), (200), (201) \right\}$$

| Number System | Σ | Base | |
|---------------|-------------------|------|---------------|
| Unary | (1) | 1 | 111 |
| Binary | (0, 1) | 2 | $2^2 2^1 2^0$ |
| Ternary | (0, 1, 2) | 3 | $4 + 0 + 1$ |
| : | | | |
| Octal | (0, 1, 2, ..., 7) | 8 | — |
| Decimal | (0, 1, 2, ..., 9) | 10 | — |

Reading y_p $L \xrightarrow{=} R$

Binary
system

Base

$$\begin{array}{r} 1 \quad 0 \quad 1 \\ 2 * 1 + 0 \\ \hline 2 * 2 + 1 \\ \hline 5 \end{array}$$

Decimal

Binary

Base

$$\begin{array}{r} | & | & | & 0 \\ 2 * 1 + 1 & & & \\ \hline 2 * 3 + 1 & & & \\ \hline 2 * 7 + 0 & & & \\ \hline 14 & & & \end{array}$$

Decimal

Octal



Base

8

3 1 2

$$8 \times 3 + 1$$

$$\overline{8 \times 25 + 2}$$



$$\underline{\underline{202}}$$

Decimal

Decimal



Base

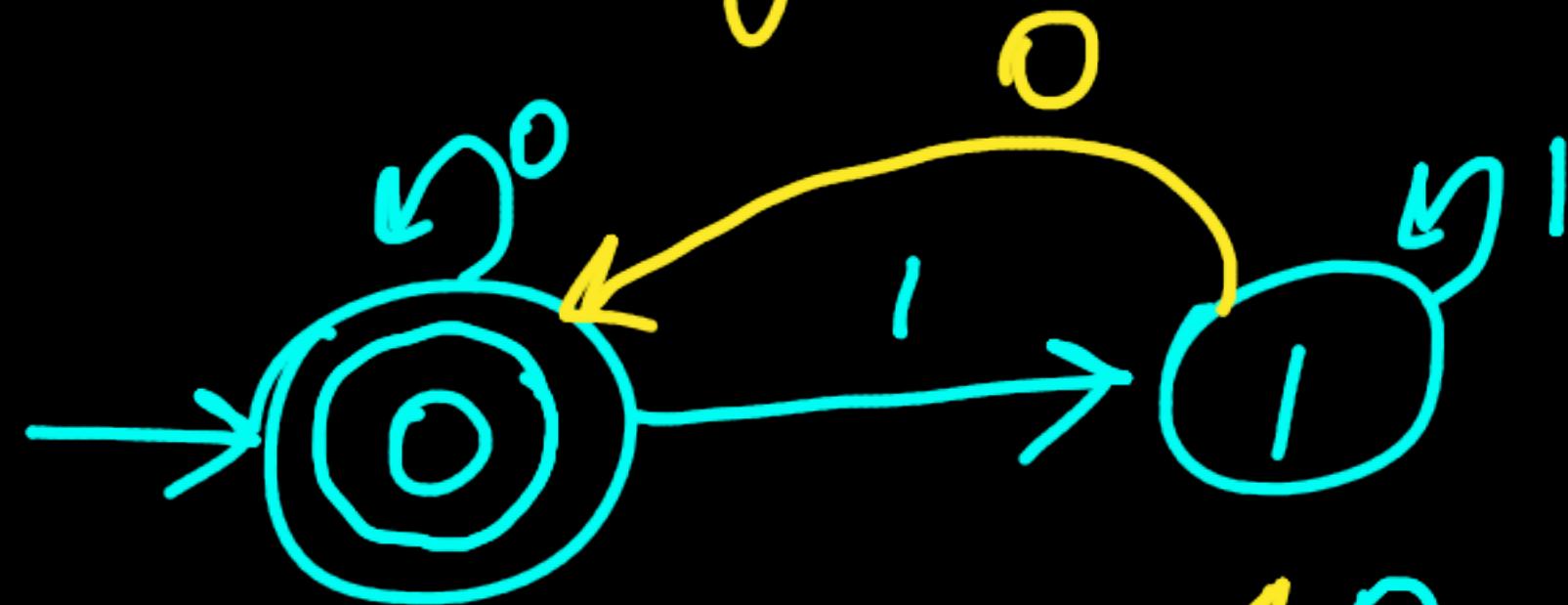
$$\begin{array}{r} 1 \ 2 \ 0 \\ 10 * 1 + 2 \\ \hline \end{array}$$

$$10 * 12 + 0$$

Decimal

$$\begin{array}{r} 120 \\ \hline \end{array}$$

Q:- Construct DFA for lang that accepts
 binary strings whose decimal equivalent
 is divisible by 2.
 $w \in \{0,1\}^*$ $w \bmod 2 = 0$



| Binary | State |
|--------|---------------|
| 0_p | $\bmod 2 = 0$ |
| 1_p | $\bmod 2 = 1$ |

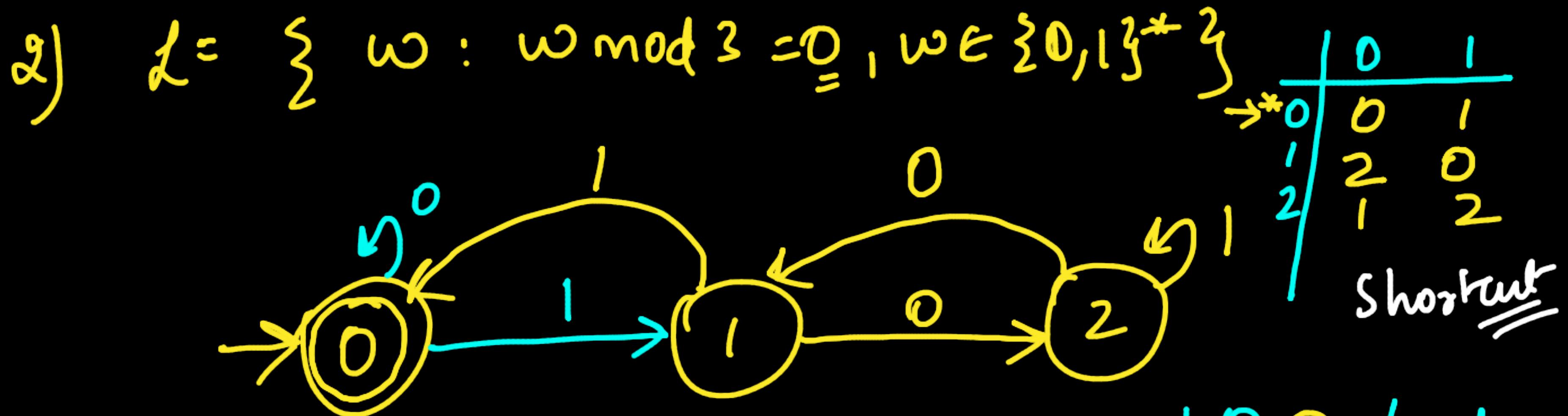
$$10_p = 2 \bmod 2 = 0$$

$$11_p = 3 \bmod 2 = 1$$

$$\begin{array}{r}
 10 \\
 2 \times 1 + 0 \\
 \hline
 2
 \end{array}$$

11

$$\frac{2 \times 1 + 1}{3}$$



$$0 \bmod 3 = 0$$

$$1 \bmod 3 = 1$$

$$2 * 1^+ 0 = 2 \bmod 3 = 2$$

$$2 * 1^+ 1 = 3 \bmod 3 = 0$$

$$1 0 0 = 4 \bmod 3 = 1$$

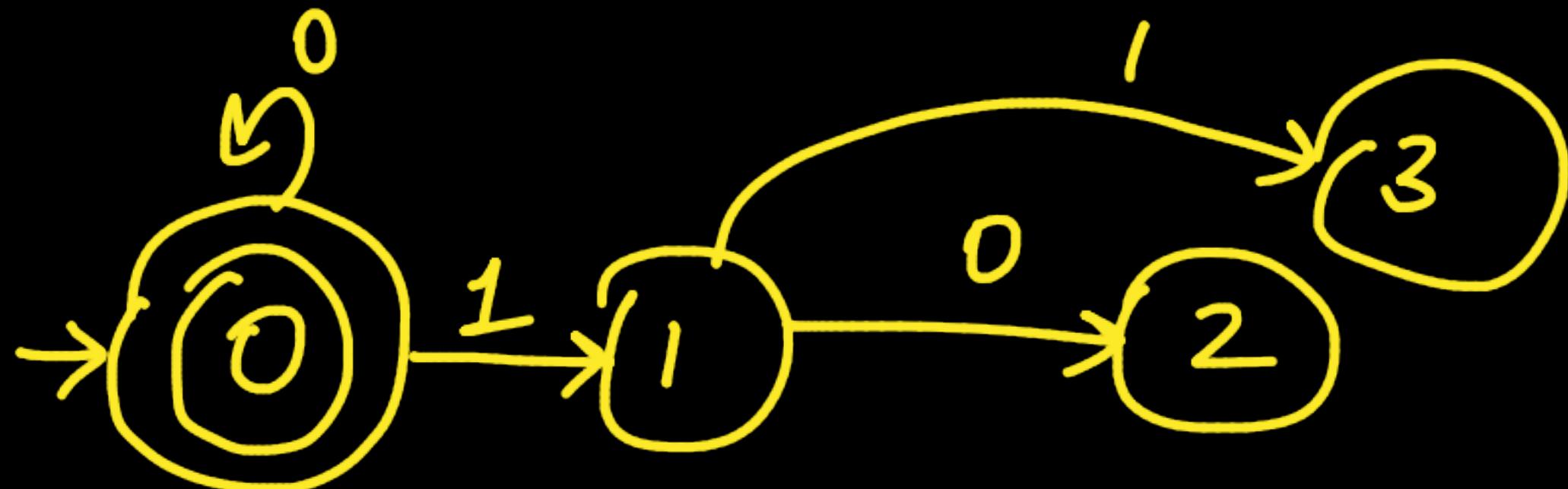
$$1 0 1 = 5 \bmod 3 = 2$$

$$\begin{array}{r} 1 0 \\ 2 * 1 + 0 \\ \hline 2 * 2 \end{array}$$

3) $L = \{ w : w \bmod 5 = 0, w \in \{0,1\}^* \}$

Transition table

| Q | Σ | |
|---|----------|---|
| | 0 | 1 |
| 0 | 0 | 1 |
| 1 | 2 | 3 |
| 2 | 4 | 0 |
| 3 | 1 | 2 |
| 4 | 3 | 4 |



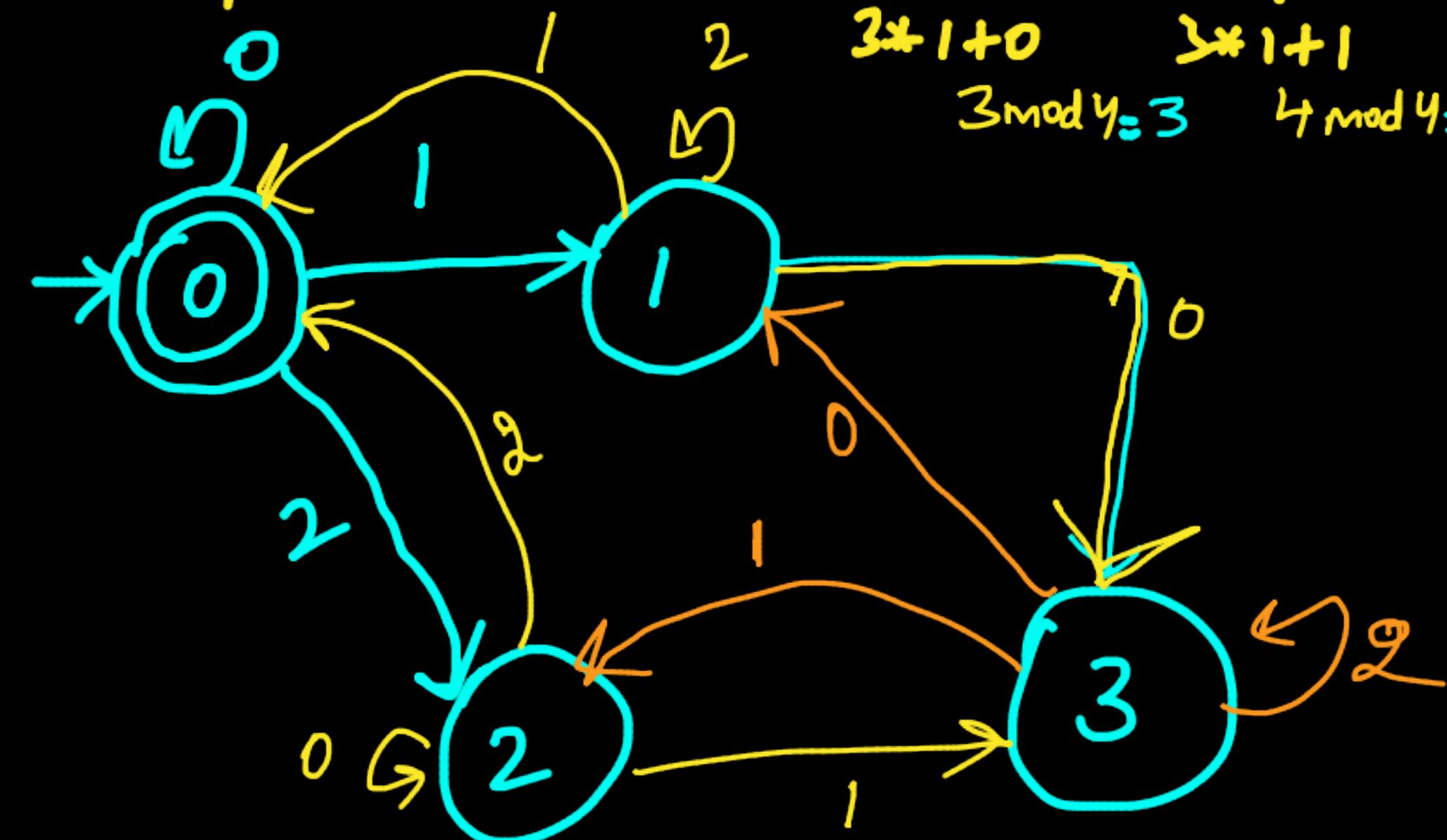
$$10 \equiv 2 \pmod{5} = 2$$

$$11 \equiv 3 \pmod{5} = 3$$

$$4) \quad L = \{ w : w \bmod 4 = 0, w \in \{0, 1, 2\}^* \}$$

Ternary No. system Base = 3

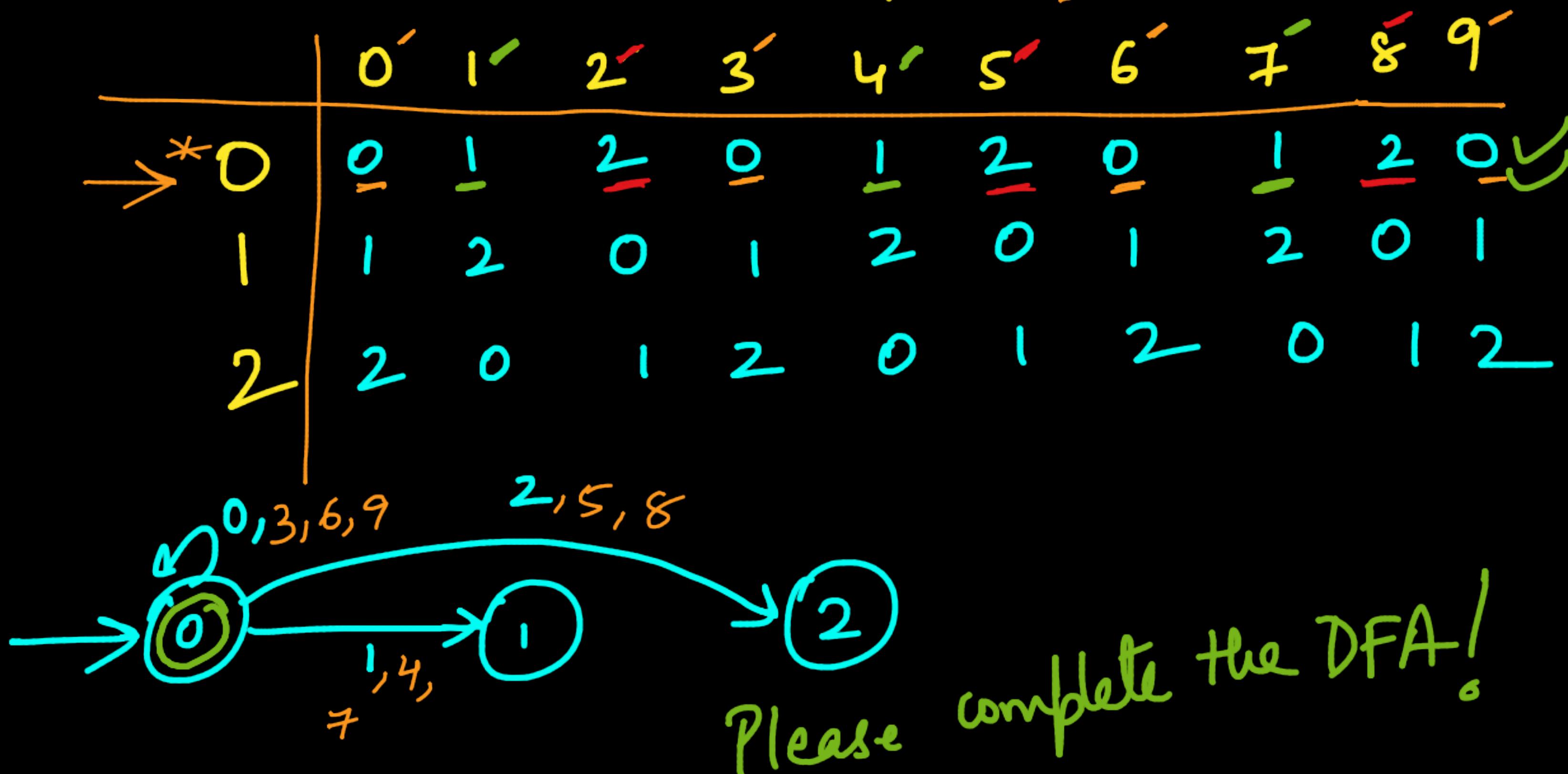
| | | | |
|---|---|---|---|
| | 0 | 1 | 2 |
| 0 | 0 | 1 | 2 |
| 1 | 3 | 0 | 1 |
| 2 | 2 | 3 | 0 |
| 3 | 1 | 2 | 3 |



$$\begin{array}{lll}
 \begin{array}{c} 10 \\ 3+1+0 \\ 3 \bmod 4 = 3 \end{array} &
 \begin{array}{c} 11 \\ 3+1+1 \\ 4 \bmod 4 = 0 \end{array} &
 \begin{array}{c} 12 \\ 3+1+2 \\ 5 \bmod 4 = 1 \end{array}
 \end{array}$$

$$\begin{array}{cccccc}
 20 & 21 & 22 & 100 & 101 & 102 \\
 3*2+0 & 3*2+1 & 3*2+2 & \frac{3*1+0}{3+3+0} & \frac{101}{10 \bmod 4} & 11 \bmod 4 \\
 6 \bmod 4 = 2 & 7 \bmod 4 = 3 & 8 \bmod 4 = 0 & 9 \bmod 4 = 1 & = 2 & = 3
 \end{array}$$

DFA
 \Rightarrow Decimal nos divisible by 3
 $w \in \{0, 1, \dots, 9\}^*$
 $w \bmod 3 = 0$



Extra

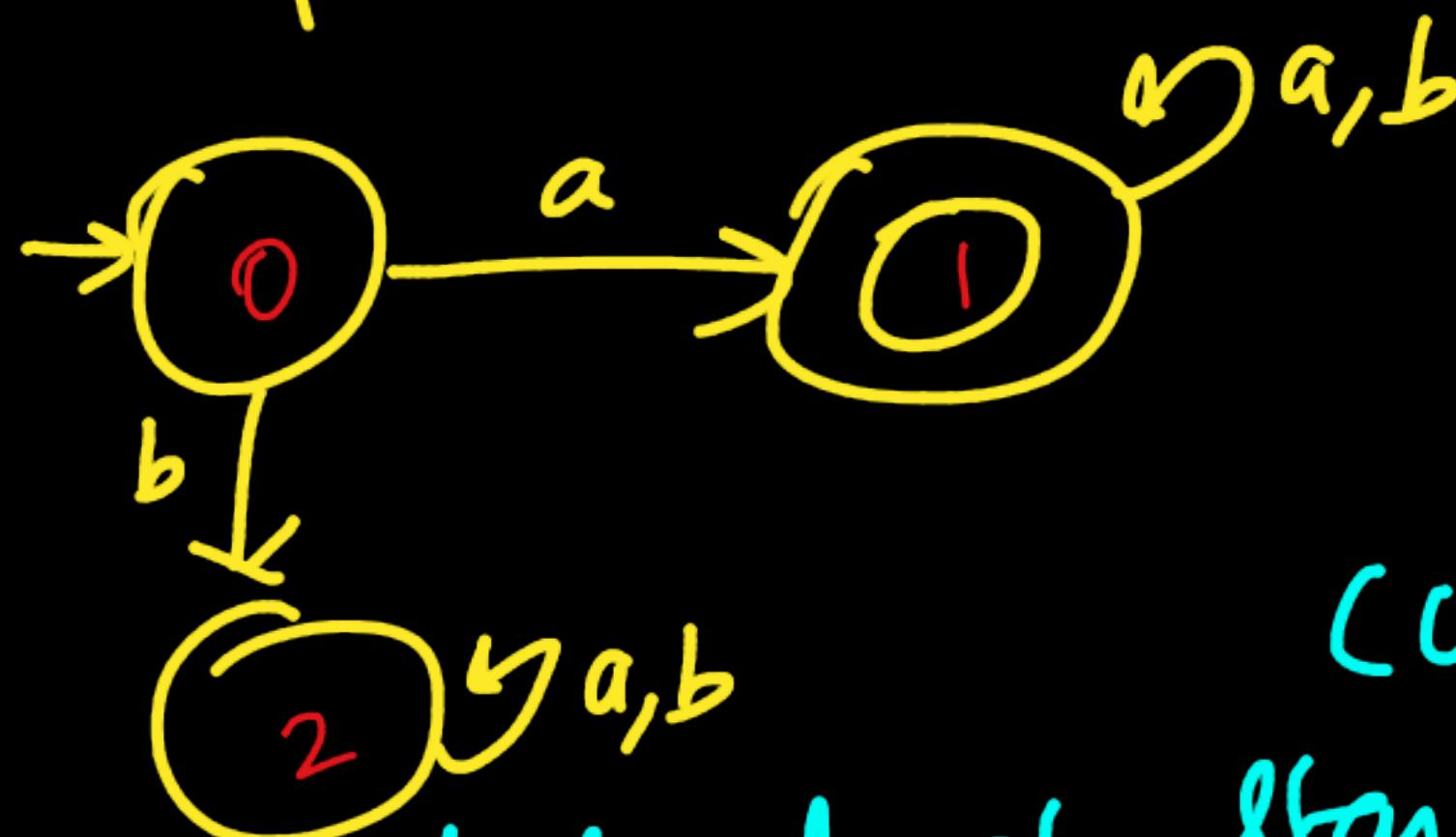
$$\Sigma = \{a, b\}$$

Accept strings that start with a

DFA :-

$$F = \{1\}$$

$$NF = \{0, 2\}$$



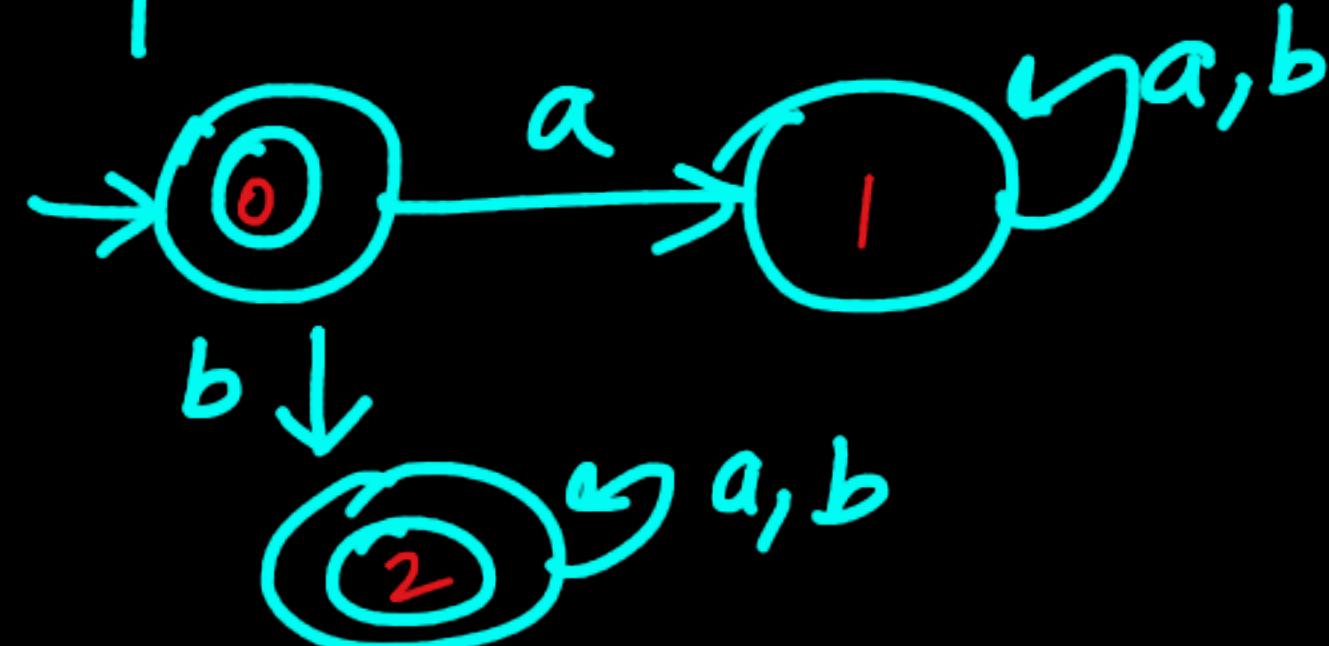
Toggle the
final f
the non-final
states

(compliment)

Accept strings that don't start with a

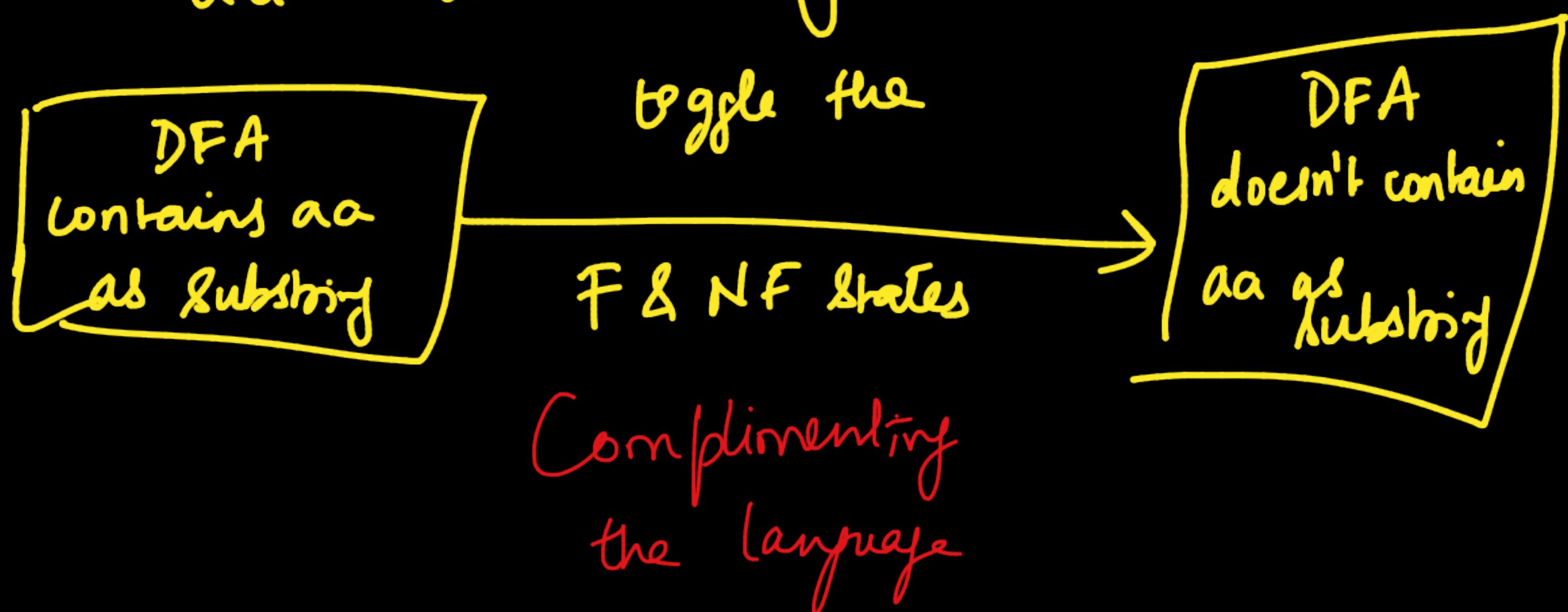
$$F = \{0, 2\}$$

$$NF = \{1\}$$



Homework

a) DFA that does not contain
"aa" as substring



Homework

b) DFA where every a is not followed
by "bb"

DFA topic is done !

Thank you !