Sept 27

COMPSCI 3331

Fall 2022

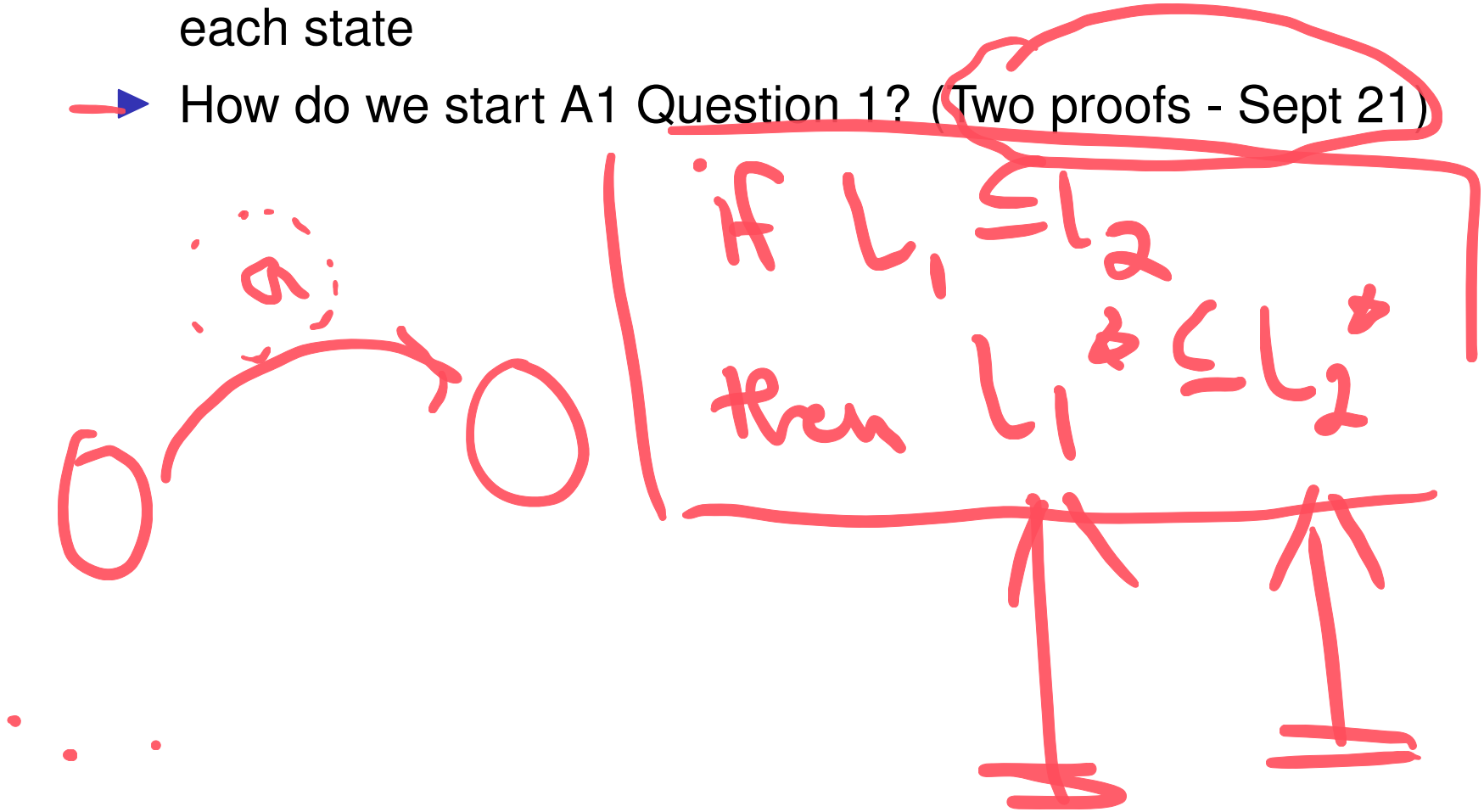
What's next?

- Assignment 1: out now, due Oct 11.
- Quiz 1 tomorrow **IN CLASS**.
- Remaining material tomorrow - asynchronous.

- office hours thursday - zoom
  - same link as Monday.

Some questions ..

- Can a DFA match a prefix or suffix (ie: str*, obj*, db*, etc) or does each line have to match a single character to for each state
- How do we start A1 Question 1? (Two proofs - Sept 21)



$$L^* = \bigcup_{i=0}^{\infty} L^i = \{\varepsilon\} \cup L \cup L^2 \cup \dots$$

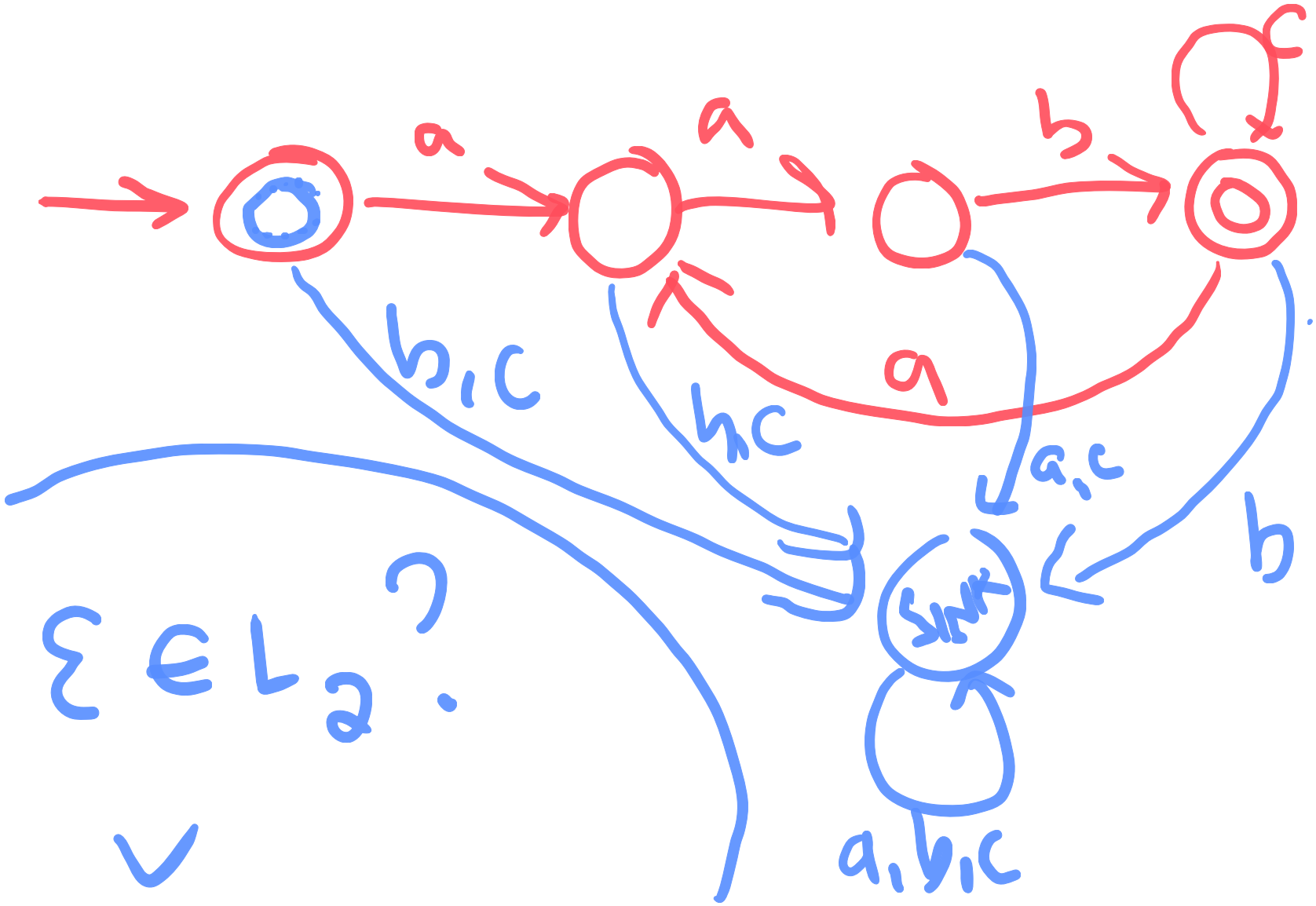
$x \in L^* \Rightarrow \exists\, n \geq 0$ such that there are $y_1, y_2 \dots, y_n \in L$ with $x = y_1 y_2 \cdots y_n$.

DFAs

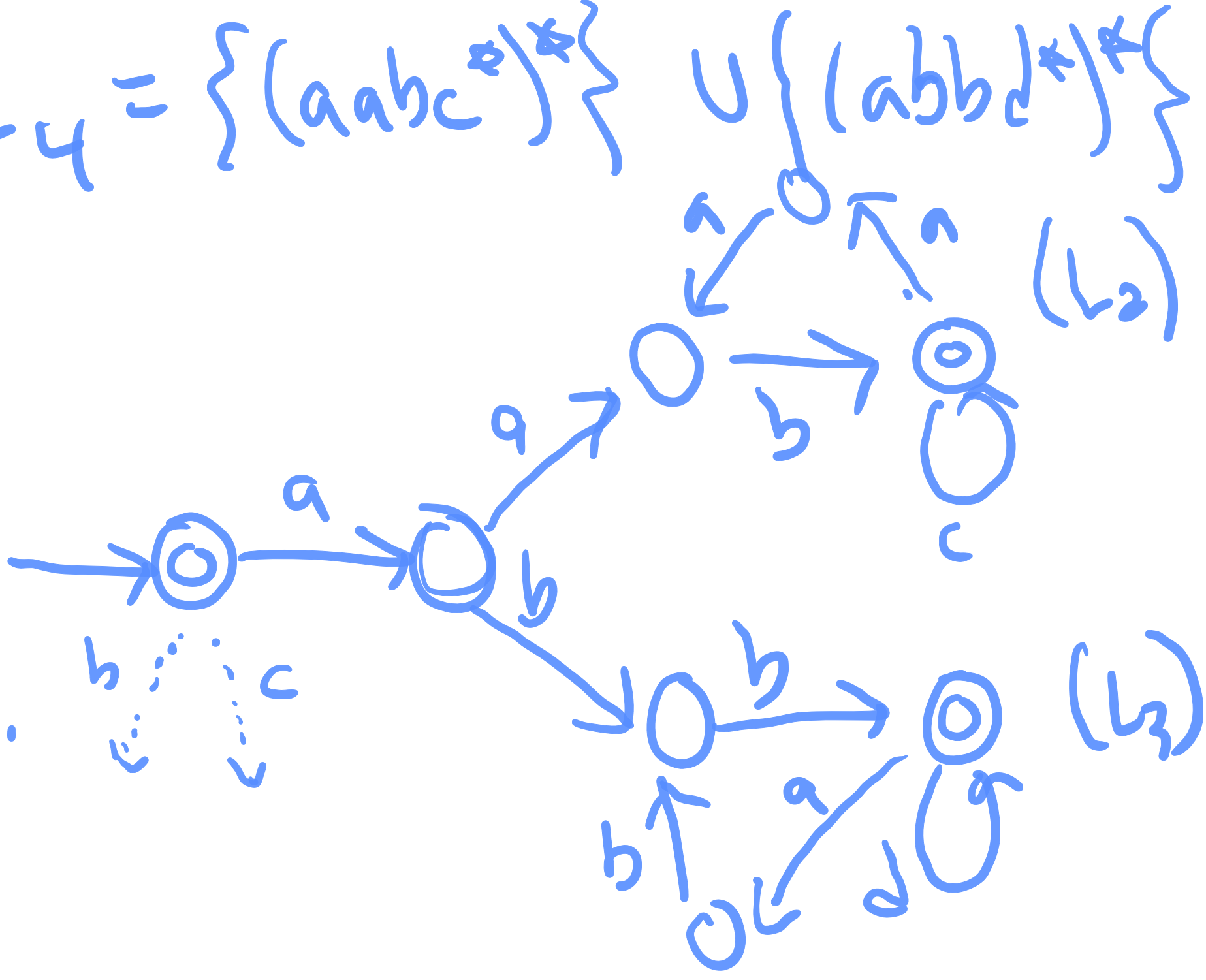
Build DFAs for the following languages.

- $L_2 = \{(aabc^*)^*\}$ → aabcaabccaabc ∈ L2.
- $L_3 = \{(abbd^*)^*\}$ → abbdabbdabbddd ∈ L3
- $L_4 = L_2 \cup L_3$

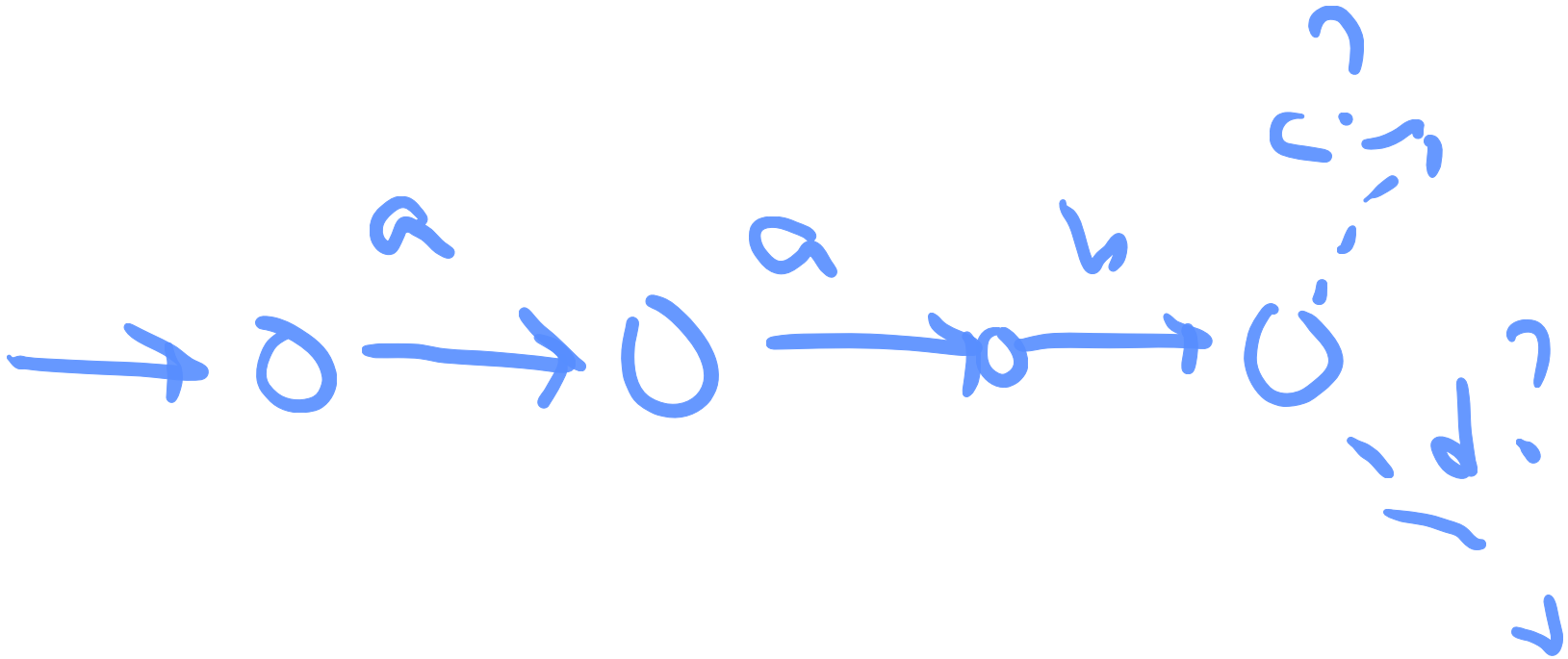
→ what do we need to keep track of?


a
a
b
f
b,c
a
b,c
a,c
b
SINK
a,b,c
ε ∈ L2 ?
✓
baabc

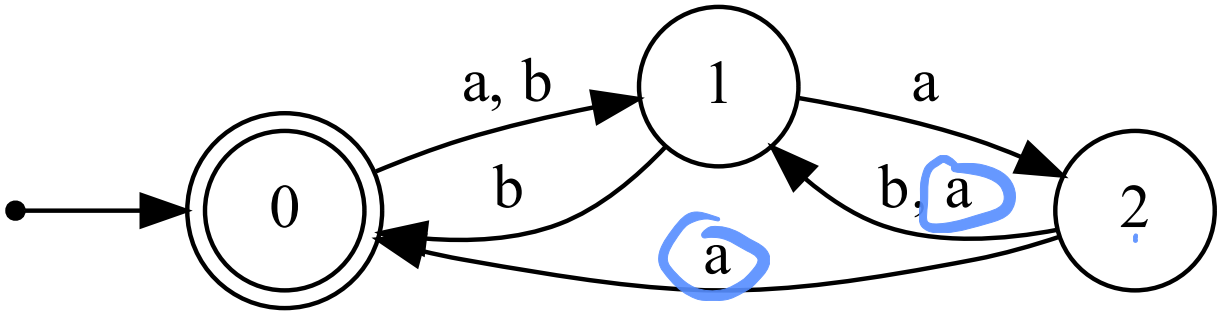
$L_4 = \{(aabc^*)^*\} \cup \{(abbd^*)^*\}$



$L_5 = \{ (aabc^*)^* \} \cup \{ aabd^*)^* \}$



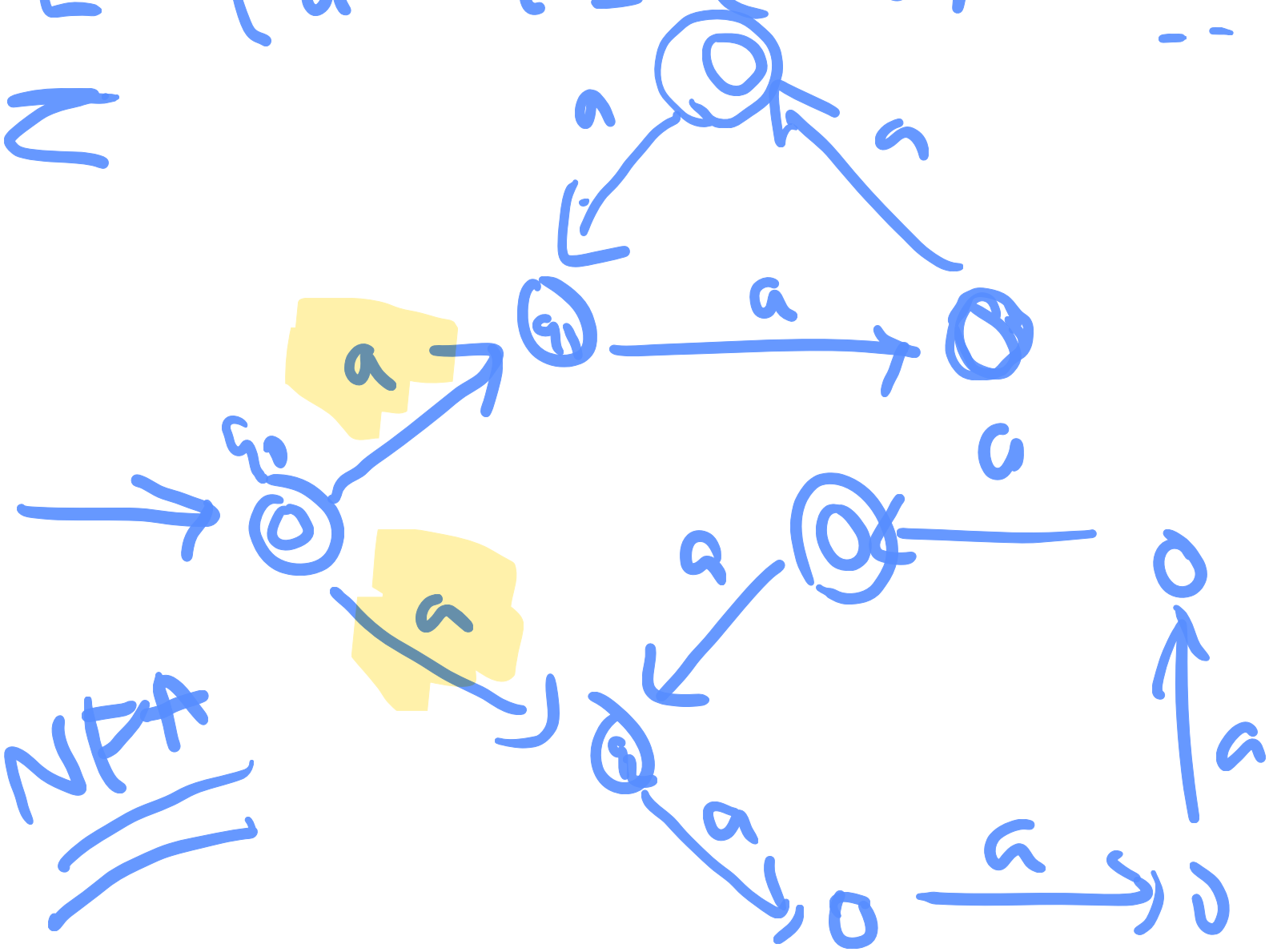
NFAs



baa
- 0 → 1 → 2 → 0
- 0 → 1 → 2 → 1

aa
ab
ba
bb

$L = \{a^i : i \equiv 0 \pmod 5 \text{ or } i \equiv 0 \pmod 3\}$



NFA

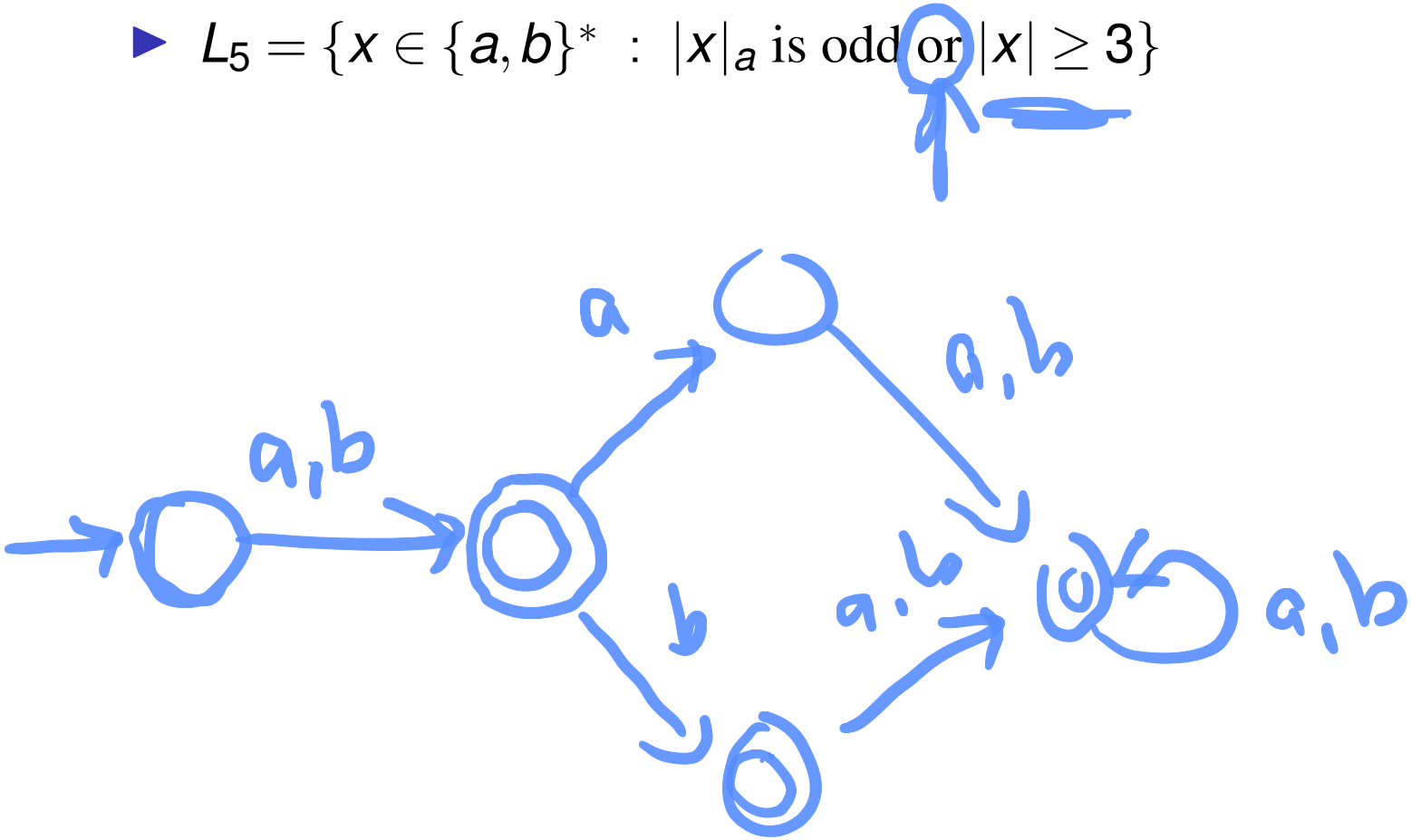
NFAs

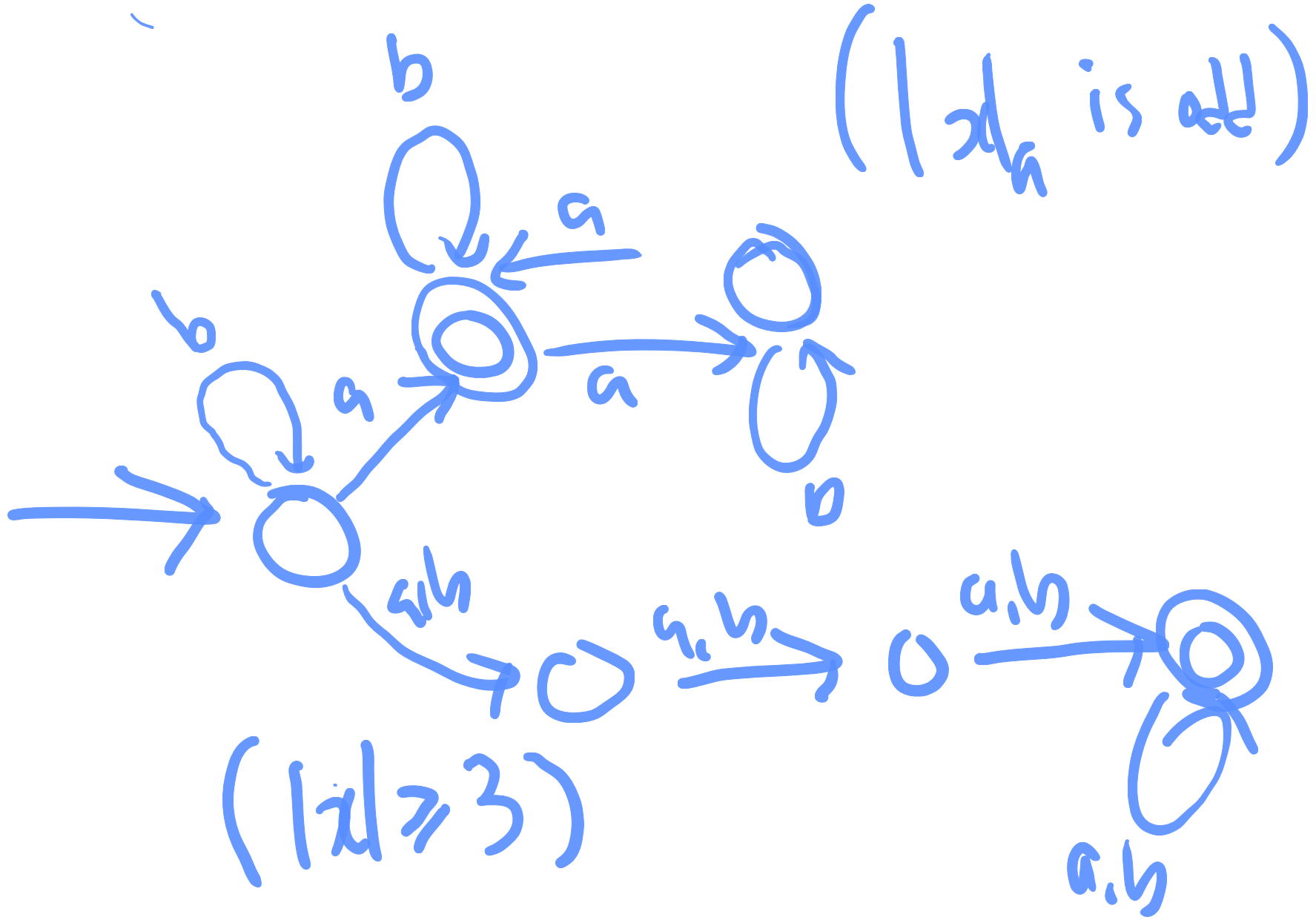
Which statements about NFAs are true?

- **A** In an NFA, there can be multiple transitions with the same label leaving one state.
- **B** In an NFA, there must be more than one path through the NFA for **some** word.
- **C** To accept a word, every path from the initial state must end in a final state.
- **D** To accept a word, one path from the initial state must end in a final state.
- **E** To **reject** a word, no paths from the initial state can end in a final state.

NFAs

- $L_5 = \{x \in \{a,b\}^* \ : \ |x|_a \text{ is odd or } |x| \geq 3\}$




(|x|h is odd)
b
a
b
a
a
a
a,b
a,b
a,b
a,b
(|x| ≥ 3)

Subset Construction

- $M = (Q, \Sigma, \delta, q_0, F)$ be an NFA. $\delta : Q \times \Sigma \to 2^Q$.
- Define a DFA $M_D = (2^Q, \Sigma, \delta_D, q_D, F_D)$.
- $\delta_D(P, a) =$
- $q_D =$
- $F_D =$

$2^Q = \{P : P \subseteq Q\}$ Q has n states

2^Q has 2^n subsets.

Subset Construction Example