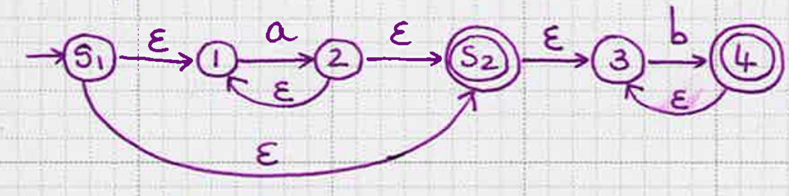
NFA to DFA algorithm:
zoom on the transition table.

example:



- <u>start state of the DFA</u> = ε-closure (start state of the NFA)

ε-closure$(S_1) = \{S_1, 1, S_2, 3\}$

- we <u>start the transition table</u> with the new start state and we generate new states as we go (= the reachable states).

δ	a	b
$\{S_1, 1, S_2, 3\}$		

how do we fill the transition table?

↳ we do it in 2 steps for each cell.

let's look at: $\delta(\{S_1, 1, S_2, 3\}, a)$ and $\delta(\{S_1, 1, S_2, 3\}, b)$.

- $\delta(\{S_1, 1, S_2, 3\}, a)$:

(1) for each state in $\{S_1, 1, S_2, 3\}$, we look at δ(given state, a):

$\delta(S_1, a) = \emptyset$ *S_1 only has ε transitions
$\delta(1, a) = 2$
$\delta(S_2, a) = \emptyset$ *S_2 only has ε transitions
$\delta(3, a) = \emptyset$ *3 only has b transition.

as a result, the <u>true</u> transitions via a from $\{S_1, 1, S_2, 3\}$ lead to $\{2\}$.

(2) take the ε-closure of the set of states obtained at step (1):
ε-closure$(\{2\}) = \{2, 1, S_2, 3\}$.

we conclude that:
$\delta(\{S_1, 1, S_2, 3\}, a) = \{2, 1, S_2, 3\}$.

- $\delta(\{S_1, 1, S_2, 3\}, b)$:

(1) for each state in $\{S_1, 1, S_2, 3\}$, we look at its transition through b:

$\delta(S_1, b) = \emptyset$
$\delta(1, b) = \emptyset$
$\delta(S_2, b) = \emptyset$
$\delta(3, b) = 4$

(2) we take the ε-closure of $\{4\}$:
ε-closure$(\{4\}) = \{4, 3\}$.

we conclude that: $\delta(\{S_1, 1, S_2, 3\}, b) = \{4, 3\}$.

- Now, we have two more states, $\{2, 1, S_2, 3\}$ and $\{4, 3\}$, to add to the transition table, and we keep going by following the above 2 steps!