Q 19 Jan 2026

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

$L_n = \{ w \in \Sigma^* \mid \#a(w) \equiv \#b(w) \pmod{n}$

To show its regular we construct a DFA:

$M = (Q, \Sigma, \delta, q_0, F)$

$Q = \{0, \ldots, n-1\}$

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

$q_0$ = start state

F = {0}

δ = transition function

When you read 'a', difference increases by 1.

$$\delta(q,a) = (q+1) \bmod n$$

When reading 'b' difference decreases by 1:

$$\delta(q,b) = (q-1) \bmod n$$