Infinite, or $w$-words over alphabet $\Sigma$ is a sequence $a_0a_1a_2\ldots$ such that each $a_i \in \Sigma$.

Can view as a map $w: \mathbb{N} \rightarrow \Sigma$

$w(i)$ is the $i$th position in the $w$-word.

Set of all $w$-words is denoted by $\Sigma^\omega$. 
Automate for $w$ - words $A = (Q, Q_0, \delta, A_{cc})$

- States
- Initial state $Q_0$
- Transition function $\delta$
- Acceptance

$(Q, Q_0, \delta)$ - just as for NFAs

$\delta: \Sigma \times Q \rightarrow 2^Q$

Run of $A$ on $w = a_0a_1$

1. $p(0) \in Q_0$
2. $p(1) \in \delta(p(1), a_1)$

$\delta(N) \rightarrow Q$

$\{q_0, q_1, q_2, q_3\}$

$\{q_0, q_1, q_2, q_3\}$
Buchi Automata

\[ \text{Acc} \subseteq Q \]

set of final
(accepting) states

For a run \( p \),

\( \text{Inf}(p) \) is the set of states that occur infinitely often in \( p \)

A run \( p \) is accepting if \( \text{Inf}(p) \cap F \neq \emptyset \)
Liveness if (E) then eventually (S)
W-regular languages = accepted by nondeterministic Buchi automata

\[(Q, Q_0, F, \delta)\]

- closure proof
- decision proc
- determinization
- reg expr