Turing Machines

\( (Q, \Sigma, \Gamma, \delta, q_0, q_{\text{accept}}, q_{\text{reject}}) \)

- \( Q \): set of states
- \( \Sigma \): input alphabet
- \( \Gamma \): tape alphabet \( \Sigma \subseteq \Gamma \), \( \epsilon \in \Gamma \)
- \( q_0 \): start state
- \( q_{\text{accept}} \in Q \)
- \( q_{\text{reject}} \in Q \)

\( \delta : Q \times \Gamma \rightarrow Q \times \Gamma \times \{L, R\} \)

Input: \( w = w_1 w_2 w_3 \ldots w_n \in \Sigma^* \)

Configurations

\[ \begin{array}{c}
q_0 \\
01010 \ldots \ldots \ldots \\
01q_0010 \\
\delta(q_0, 0) = (q_0, 0, L) \\
0q_01010
\end{array} \]
collection of strings that T.M. M accepts \( L(M) \).

- \( L(M) \) is the language recognized by M.

- a language is Turing recognizable if some T.M recognizes it.
TM's that accept or reject all inputs are called deciders.

- A decider that recognizes a language is said to decide the language.

- A language is decidable if some TM decides it.
PDA

| 0 | 1 | 0 | 1 | # | 1 |

- input
- stack
- top of stack
\[ L = \{ \sigma \in \Sigma^* \mid \sigma \in \{0, 1\}^* \} \]