A Turing Machine is a 7-tuple, \((Q, \Sigma, \Gamma, S, q_0, q_{\text{accept}}, q_{\text{reject}})\)

1. \(Q\) is the set of states.
2. \(\Sigma\) — input alphabet not containing \(\_
\)
3. \(\Gamma\) — tape alphabet, \(\_
\in \Gamma\) and \(\Sigma \subseteq \Gamma\)
4. \(S: Q \times \Gamma \rightarrow Q \times \Gamma \times \{L,R\}\) is the transition function
5. \(q_0 \in Q\) is the start state
6. \(q_{\text{accept}} \in Q\) is the accept state
7. \(q_{\text{reject}} \in Q\) is the reject state, where \(q_{\text{accept}} \neq q_{\text{reject}}\).
- A language is Turing-recognizable if some Turing machine recognizes it.

- 3 outcomes for a TM: accept, reject, loop.

- Looping is difficult to be distinguished from taking a long time to compute.

- A TM decides over a language A if it either accepts or rejects A.

- A language is Turing-decidable or decidable if some TM decides it.