Abstraction & Formality

- Often make simple things hard
- But also make complex things approachable
- We’re spend a fair bit of the quarter learning to do this with simple things, so the complex things you see later aren’t totally intimidating

Example:
Push Button Light Switch

State: summary of the past sufficient to define future behavior
Symbols: 0, 1, a, b, $ \ldots$

Alphabet set of symbols: \( \Sigma \) = \{0, 1\}

Strings: (1, 1, 0)

\[ 110 \]

\[ \Sigma^* = \text{Set of all finite length strings over } \Sigma \]

Length: \( |110| = 3 \)

Empty string: \( \epsilon \)

\( |\epsilon| = 0 \)

\[ \Sigma^* = \{ \epsilon, 0, 1, 00, 01, 10, \ldots \} \]

Operations:

- \( x = 10 \)
- \( y = 01 \)
- \( xy = 1001 \)
- \( yx = 0110 \)

A language \( L \) is a subset of \( \Sigma^* \)

- \( L_1 = \{ w \in \Sigma^* \mid \text{length}(w) \text{ is even} \} \)
  
  \( L_1 = \{ \epsilon, 00, 01, 10, 11, 0000, 0001, \ldots \} \)

- \( L_2 = \{ w \mid \text{value of } w, \text{interpreted as a binary number}, \text{is a multiple of 5} \} \)

  \( L_2 = \{ \epsilon, 0, 00, \ldots, 101, 0101, 010100, \ldots \} \)