Logistics

MTE – 25

ETE – 50

CWS – 25

→ 5 Attendance — >95% – 5
90 – 94% → 4
85 – 89 → 3
80 – 84 – 2
75 – 79 – 1
<75 – 0

20 — Assignments
— Test

Books:

Hopcroft Ullman Introduction to Automata Theory, languages & Computation.

Theory of Computation:

Symbol a, b, c, d, 1, 2, 3 . . . . Basic Building Block (letters, numbers)

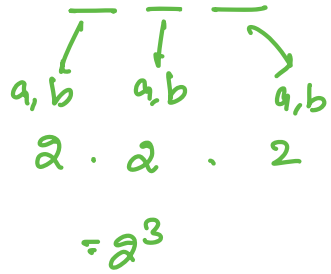
Alphabet $\Sigma = \{a, b\}$ Subset of Symbols
$\Sigma = \{a, b, c\}$ Σ

String → $\Sigma = \{a, b, c\}$
a, b, aa, bc, ca, cc . . . . Sequence of Alphabets

$\Sigma = \{a, b\}$ a, b, aaa, ab, ba . . . . .

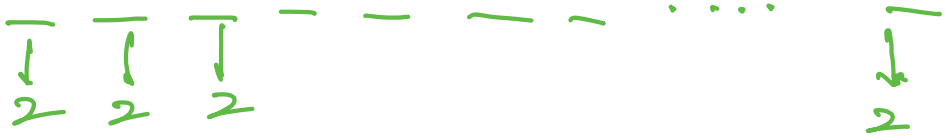
How many strings are possible of length n with {a,b} alphabets ?

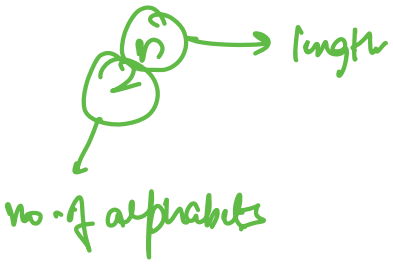
Length 3



aaa
aab
aba
abb
baa
bab
bba
bbb
} 8 strings

Length n





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

$|\Sigma|$: no of alphabets

no of strings of length $n = |\Sigma|^n$

Language Collection of Strings

L_1 Set of all strings of length 2

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

$L_1 = \{aa, ba, bb, ab\}$ → finite language

L_2 Set of all strings of length 3

$L_2 = \{aaa, aab, aba, abb, baa, bab, bba, bbb\}$

Language
- finite
- infinite

L_3 Set of all strings where each string starts with a

$L_3 = \{a, aa, ab, aaa, aba, aaaa, \ldots\ldots\}$

Infinite language

Powers of Σ

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

Σ^1 = Set of all strings over Σ of length 1

$= \{a, b\}$

Σ^2 = Set of all strings over Σ of length 2

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

$= \{aa, ab, ba, bb\}$

$\Sigma^3 = \Sigma \cdot \Sigma \cdot \Sigma = \{a, b\}\{a, b\}\{a, b\}$

$|\Sigma^3|$ = Cardinality of Σ^3

$= \{a, b\}\{a, b\}\{a, b\} = 8$

no of elements in Σ^3

Σ^n = n length strings

Σ^0 = Set of all strings over Σ of length 0

$= \{\varepsilon\}$

↳ epsilon is a spcl symbol of length 0

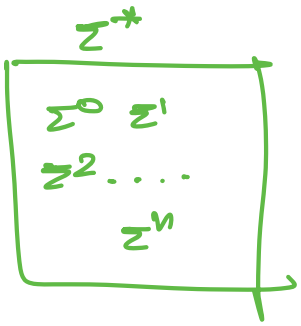
$|\varepsilon| = 0$ (length of epsilon is 0)

$\Sigma^* = \Sigma^0 \cup \Sigma^1 \cup \Sigma^2 \cup \Sigma^3 \ldots\ldots \Sigma^n$

$= \{\varepsilon\} \cup \{a,b\} \cup \{aa, ab, ba, bb\} \ldots\ldots$

$= \{\varepsilon, a, b, aa, ab, ba, bb \ldots\ldots\}$

↳ Set of all strings possible over $\{a,b\}$ of all length



Case 1: finite $\Sigma = \{a,b\}$

L_1 = Strings of length 2

$= \{aa, ab, ba, bb\}$

'bc' ∈ ? ✗

Case 2: Infinite

L_1 = Strings starting with a

$= \{a, ab, aa, aba \ldots\ldots\}$

'bc' ∈ ?

Given a language L, you need a finite representation (machine) which can be stored in a memory and by using it you should be able to tell if a string is present in language or not.

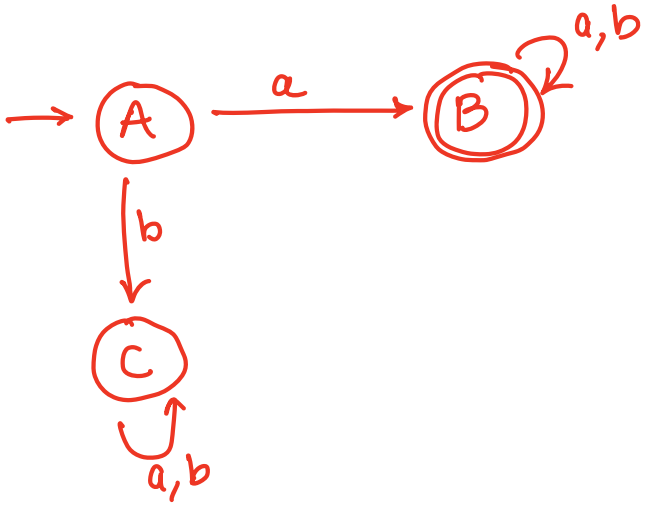
Finite Representation → Finite Automata (1) Machine

State: ○ Final State: ◎ Initial State: →○

L = Set of all strings which start with 'a'.

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

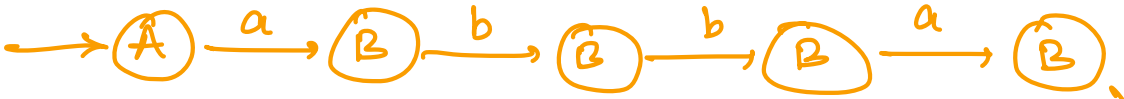
FA:



"abba"

"baa"

abba ✓✓✓✓



final State (String is in the language)

baa

(non final)

(String is not in the language)