Regular Grammars

G = {V, T, S, P}

V - is a finite non empty set of variable symbols

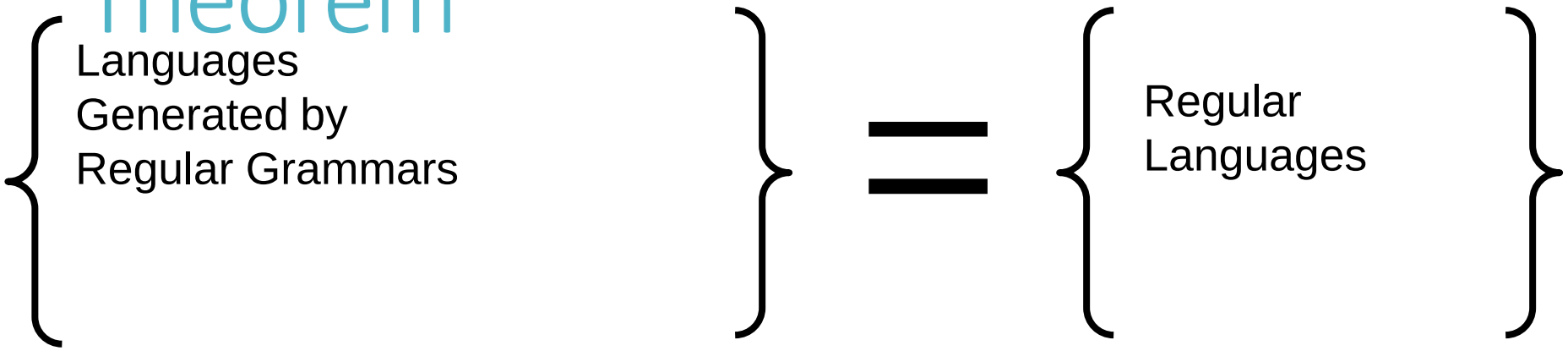
T - is a finite set of terminal (input) symbols

S – is a starting symbol (special variable)

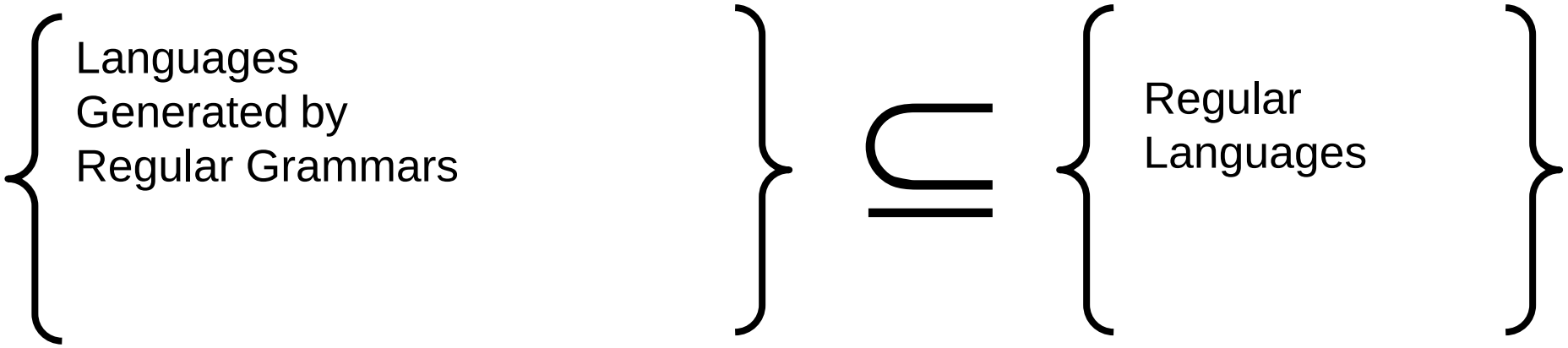
P – production rules

Regular Grammars Generate Regular Languages

Theorem

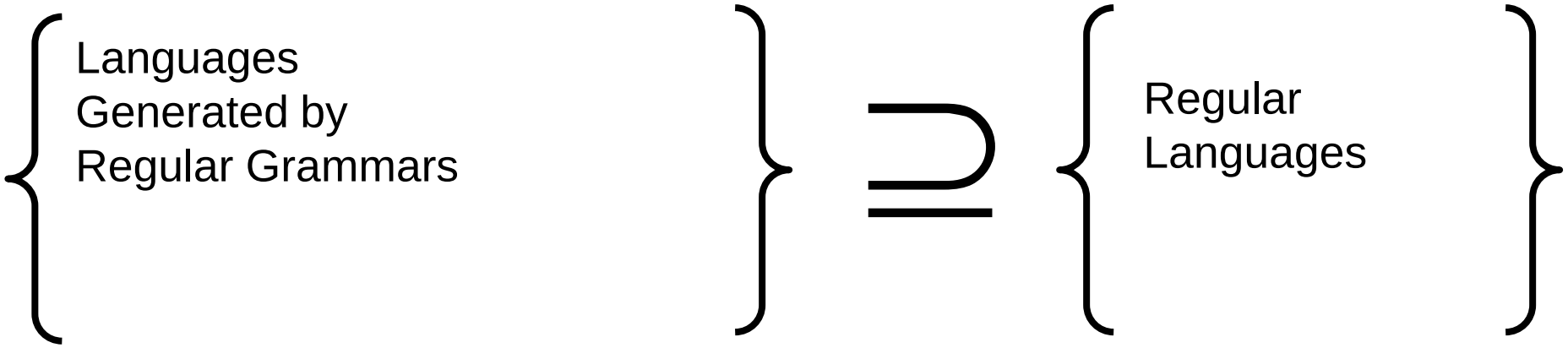

Languages
Generated by
Regular Grammars
=
Regular
Languages

Theorem - Part 1



Any regular grammar generates
a regular language

Theorem - Part 2



Any regular language is generated
by a regular grammar

Left-Linear Grammars

All productions have form:

$$A \rightarrow Bx$$

$$A \rightarrow x$$

string of terminals

Example:

$$S \rightarrow Aab$$

$$A \rightarrow Aab \mid B$$

$$B \rightarrow a$$

Right-Linear Grammars

All productions have form:

$$A \rightarrow xB$$
$$A \rightarrow x$$

string of terminals

Example:

$$S \rightarrow abS$$
$$S \rightarrow a$$

Regular Grammars

A regular grammar is any

right-linear or left-linear grammar

Examples: G_1

$$S \to abS$$

$$S \to a$$

G_2

$$S \to Aab$$

$$A \to Aab \mid B$$

$$B \to a$$

Write regular grammar for all strings with any number of a’s ended by one b over ∑ (a, b).

$L = \{ a^n b \mid n>0 \}$

All strings over {a, b} that begin and end with the b over ∑ (a, b).

$L = \{ b\,W\,b \mid W \in \{a, b\}^* \}$ OR

$L = \{ b\,W\,b \mid W \in \sum^* \}$

Write Regular grammars for given Regular languages

$$L(G_1) = (ab)^* a$$

G_1

$$S \to abS$$

$$S \to a$$

$$L(G_2) = aab(ab)^*$$

G_2

$$S \to Aab$$

$$A \to Aab \mid B$$

$$B \to a$$

Example:

Following grammars are regular grammar?

G

$$S \to aA \mid B$$

$$A \to aa\ B$$

$$B \to b\ B \mid a$$

$G2$

$$S \to SA \mid ab$$

$$A \to aa\ B$$

$$B \to b\ B \mid a$$

G_1

$$S \to aSb \mid ab$$

Write RE for all strings with even number of a’s followed by odd number of b’s over ∑ (a b).

Write a regular grammar for $L = \{a^{2n} b^{2m+1} \mid n >= 0, m>=0\}$