

Example

Convert to CNF

$$A \rightarrow BAB \mid B \mid \varepsilon$$

$$B \rightarrow 00 \mid \varepsilon$$

START:

$$S \rightarrow A$$

$$A \rightarrow BAB \mid B \mid \varepsilon$$

$$B \rightarrow 00 \mid \varepsilon$$

BIN: Replace $A \rightarrow BAB$:

$$S \rightarrow A$$

$$A \rightarrow BA_1 \mid B \mid \varepsilon$$

$$B \rightarrow 00 \mid \varepsilon$$

$$A_1 \rightarrow AB$$

DEL- ε : Remove $A \rightarrow \varepsilon$:

$$S \rightarrow A \mid \varepsilon$$

$$A \rightarrow BA_1 \mid B$$

$$B \rightarrow 00 \mid \varepsilon$$

$$A_1 \rightarrow AB \mid B$$

Remove $B \rightarrow \varepsilon$:

$$S \rightarrow A \mid \varepsilon$$

$$A \rightarrow BA_1 \mid B \mid A_1$$

$$B \rightarrow 00$$

$$A_1 \rightarrow AB \mid B \mid A \mid \varepsilon$$

Don't add $A \rightarrow \varepsilon$ because we already removed it

Remove $A_1 \rightarrow \varepsilon$:

$$S \rightarrow A \mid \varepsilon$$

$$A \rightarrow BA_1 \mid B \mid A_1$$

$$B \rightarrow 00$$

$$A_1 \rightarrow AB \mid B \mid A$$

Don't add $A \rightarrow \varepsilon$ because we already removed it

UNIT: Remove $S \rightarrow A$

$$S \rightarrow BA_1 \mid B \mid A_1 \mid \varepsilon$$

$$A \rightarrow BA_1 \mid B \mid A_1$$

$$B \rightarrow 00$$

$$A_1 \rightarrow AB \mid B \mid A$$

Example continued

From previous slide

$$S \rightarrow BA_1 \mid B \mid A_1 \mid \varepsilon$$

$$A \rightarrow BA_1 \mid B \mid A_1$$

$$B \rightarrow 00$$

$$A_1 \rightarrow AB \mid B \mid A$$

Remove $S \rightarrow A_1$

$$S \rightarrow BA_1 \mid \varepsilon \mid 00 \mid AB$$

$$A \rightarrow BA_1 \mid B \mid A_1$$

$$B \rightarrow 00$$

$$A_1 \rightarrow AB \mid B \mid A$$

Remove $A \rightarrow A_1$

$$S \rightarrow BA_1 \mid \varepsilon \mid 00 \mid AB$$

$$A \rightarrow BA_1 \mid 00 \mid AB$$

$$B \rightarrow 00$$

$$A_1 \rightarrow AB \mid B \mid A$$

Remove $S \rightarrow B$

$$S \rightarrow BA_1 \mid A_1 \mid \varepsilon \mid 00$$

$$A \rightarrow BA_1 \mid B \mid A_1$$

$$B \rightarrow 00$$

$$A_1 \rightarrow AB \mid B \mid A$$

Don't add $S \rightarrow B$ or $S \rightarrow A$ because we removed them

Remove $A \rightarrow B$

$$S \rightarrow BA_1 \mid \varepsilon \mid 00 \mid AB$$

$$A \rightarrow BA_1 \mid A_1 \mid 00$$

$$B \rightarrow 00$$

$$A_1 \rightarrow AB \mid B \mid A$$

Don't add $A \rightarrow B$ because we removed it
Don't add $A \rightarrow A$ because it's useless

Remove $A_1 \rightarrow B$

$$S \rightarrow BA_1 \mid \varepsilon \mid 00 \mid AB$$

$$A \rightarrow BA_1 \mid 00 \mid AB$$

$$B \rightarrow 00$$

$$A_1 \rightarrow AB \mid A \mid 00$$

Example continued

Copied from the previous slide

$$S \rightarrow BA_1 \mid \varepsilon \mid 00 \mid AB$$

$$A \rightarrow BA_1 \mid 00 \mid AB$$

$$B \rightarrow 00$$

$$A_1 \rightarrow AB \mid A \mid 00$$

Remove $A_1 \rightarrow A$

$$S \rightarrow BA_1 \mid \varepsilon \mid 00 \mid AB$$

$$A \rightarrow BA_1 \mid 00 \mid AB$$

$$B \rightarrow 00$$

$$A_1 \rightarrow AB \mid 00 \mid BA_1$$

TERM: Add $Z \rightarrow 0$

$$S \rightarrow BA_1 \mid \varepsilon \mid ZZ \mid AB$$

$$A \rightarrow BA_1 \mid ZZ \mid AB$$

$$B \rightarrow ZZ$$

$$A_1 \rightarrow AB \mid ZZ \mid BA_1$$

$$Z \rightarrow 0$$