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-
$$\varepsilon$$
: Remove $A \to \varepsilon$:
 $S \to A \mid \varepsilon$
 $A \to BA_1 \mid B$
 $B \to 00 \mid \varepsilon$
 $A_1 \to AB \mid B$

Remove
$$B \to \varepsilon$$
:
$$S \to A \mid \varepsilon$$

$$A \to BA_1 \mid B \mid A_1$$

$$B \to 00$$

$$A_1 \to AB \mid B \mid A \mid \varepsilon$$
 Don't add $A \to \varepsilon$ because we already removed it

Don't add
$$A\to \varepsilon$$
 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
$$S \rightarrow A$$

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

$$A_1 \to AB \mid B \mid A$$



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
$$S \rightarrow B$$

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

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

$$B \rightarrow 00$$

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

Remove
$$S \to A_1$$
 Remove $A \to A_1$ $S \to BA_1 \mid \varepsilon \mid 00 \mid AB$ $S \to BA_1 \mid \varepsilon \mid 00 \mid AB$ $A \to BA_1 \mid B \mid A_1$ $A \to BA_1 \mid 00 \mid AB$ $B \to 00$ $A_1 \to AB \mid B \mid A$ $A \to AB \mid B \mid A$ Don't add $A \to B$ because because we removed them we removed it Don't add $A \to A$ because Remove $A \to B$ it's useless $A \to BA_1 \mid \varepsilon \mid 00 \mid AB$

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

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

 $B \rightarrow 00$

$$A_1
ightarrow AB \mid B \mid A$$
 $ightarrow A$ Don't add $A
ightarrow B$ because in we removed it

Don't add $A
ightarrow A$ because it's useless

 AB

Remove $A_1
ightarrow B$
 $S
ightarrow BA_1 \mid \varepsilon \mid 00 \mid AB$
 $A
ightarrow BA_1 \mid 00 \mid AB$
 $B
ightarrow 00$
 $A_1
ightarrow AB \mid A \mid 00$

Remove $A \rightarrow A_1$

 $B \rightarrow 00$

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

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

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
$$Z \rightarrow 0$$

 $S \rightarrow BA_1 \mid \varepsilon \mid ZZ \mid AB$
 $A \rightarrow BA_1 \mid ZZ \mid AB$
 $B \rightarrow ZZ$
 $A_1 \rightarrow AB \mid ZZ \mid BA_1$
 $Z \rightarrow 0$

