Chomsky Normal Form



A context free grammar (CFG) is in Chomsky Normal Form (CNF) if all production rules satisfy one of the following conditions:

- A non-terminal generating a terminal (e.g.; X→x)
- A non-terminal generating two non-terminals (e.g.; X→YZ)
- Start symbol generating ϵ . (e.g.; $S \rightarrow \epsilon$)

Steps:

Step 1. Eliminate start symbol from RHS.

If start symbol S is at the RHS of any production in the grammar, create a new production as:

S0→S where S0 is the new start symbol.

Step 2. Eliminate null, unit and useless productions.

Step 3. Eliminate terminals from RHS if they exist with other terminals or non-terminals. e.g,; production rule $X \rightarrow xY$ can be decomposed as:

 $X \rightarrow ZY$

 $Z \rightarrow x$

Step 4. Eliminate RHS with more than two non-terminals.

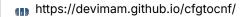
e.g,; production rule $X \rightarrow XYZ$ can be decomposed as:

X→PZ

 $P \rightarrow XY$

CFG to CNF

A website to convert Context Free Grammar(CFG) to equivalent Chomsky Normal Form(CNF)





▼ Past Paper Qs

Convert to CNF and you must show all the intermediary four steps in the order studied to score full marks:

$$S \rightarrow SS \mid AB \mid B$$

$$A \rightarrow aAAa$$

$$B \rightarrow bBb \mid bb \mid \Delta$$

$$C \rightarrow CC \mid a$$

$$D \rightarrow aC \mid bb$$

Convert the following grammar to Chomsky Normal Form Grammar. Show all the

intermediary steps in the correct order clearly to score full marks.

$$A \rightarrow aA \mid a \mid CD$$

$$B \rightarrow CbC \mid b$$

$$C \rightarrow S \mid \Delta$$

$$D \rightarrow CC \mid Db$$

$$E \rightarrow S \mid \Delta$$

Convert the following grammar to Chomsky Normal Form Grammar. Show all the intermediary steps in the correct order clearly to score full marks.

$$A \rightarrow aA | a | CD$$

$$B \rightarrow CbC \mid b$$

$$C \rightarrow CC \mid \Delta$$

$$D \rightarrow CC \mid Db$$

$$E \rightarrow EE \mid \Delta$$

CNF: Convert the following CFG to CNF

$$B\rightarrow b|bD|\Delta$$

$$D \rightarrow DD$$