

$$\begin{cases}
 S \rightarrow (L) \\
 L \rightarrow L, S / S \\
 A \rightarrow A \alpha / B \\
 L \rightarrow S L' \\
 L' \rightarrow , S L' | \epsilon
 \end{cases}$$

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$$\begin{aligned}
 A &\rightarrow A \alpha_1 / A \alpha_2 / A \alpha_3 / B_1 / B_2 / B_3 \\
 &\quad \alpha \quad \alpha \quad \alpha \quad B \quad B \quad B \\
 A &\rightarrow B_1 A' / B_2 A' / B_3 A' \\
 A' &\rightarrow \alpha_1 A' / \alpha_2 A' / \alpha_3 A' / \epsilon
 \end{aligned}$$

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$$\begin{cases}
 S \rightarrow i E T S / \\
 \quad i E T S e S \\
 \quad / a \\
 E \rightarrow b \\
 S \rightarrow i T T S S' / a \\
 S' \rightarrow e S / \epsilon \\
 \bar{E} \rightarrow b
 \end{cases}$$

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$$\begin{aligned}
 S &\rightarrow a S S b S / S \rightarrow a S' b \\
 & / a S a S b / S \rightarrow S S b S \\
 & / a b b / S \rightarrow S a S b \\
 & / b / S' \rightarrow S S' \\
 & / S' \rightarrow S b S \\
 & / a S b
 \end{aligned}$$

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<p>Top down production Rule</p> <p>↓</p> <p>if there is matching with the word</p>	<p>Bottom-up word</p> <p>if there is matching with the production rule</p>
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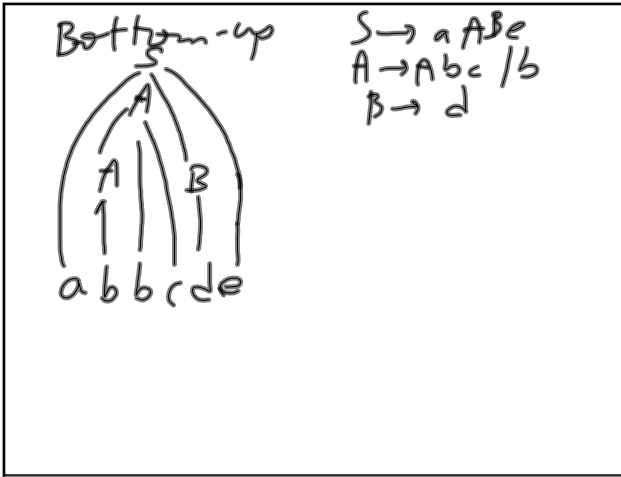
$$\begin{cases}
 S \rightarrow a A B e \\
 A \rightarrow A b c / b \\
 B \rightarrow d
 \end{cases}$$

Top-down

Left leftmost derivation

w = abbcd e

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$LL(1), LL(k)$
 $\text{IF}(x > 1) \text{ Then } y = 2;$
 $\text{IF}(\text{EXP}) \text{ Then Statement};$

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First $\left\{ \begin{array}{l} S \rightarrow a A B C D \\ A \rightarrow b \end{array} \right. \quad \{a, b, c, d, e\}$
 Follow $\left\{ \begin{array}{l} B \rightarrow c \\ C \rightarrow d \\ D \rightarrow e \end{array} \right.$
 First $S = \{a\}$
 $A = \{b\}$
 Follow: $S = \{\epsilon\}$
 $A = \{c\}$
 $B = \{d\}$

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	First	Follow
$S \rightarrow A B C D$		
S	{a}	{ε}
A	{b, ε}	{c, d}
B	{c, ε}	{d}
C	{d, ε}	{e}
D	{e}	{ε}

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