

Context Free Grammar (CFG)

Samhengisfrjáls mállýsing

$$E \rightarrow (E) \mid EOE \mid N$$

$$O \rightarrow + \mid - \mid * \mid /$$

$$N \rightarrow D \mid DN$$

$$D \rightarrow 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$$

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Non-terminal symbols:

E, O, N, D

(sometimes called
intermediate symbols)

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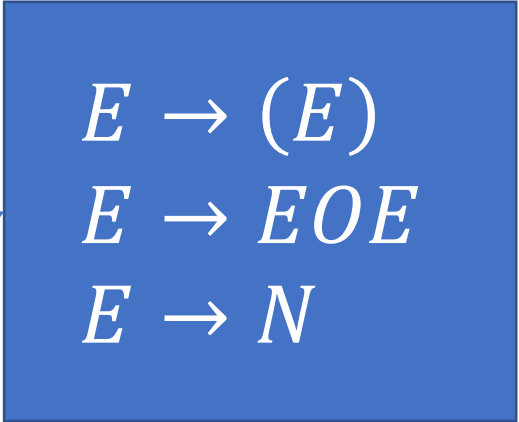
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$$D \rightarrow 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$$

Starting
symbol:
 E

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Terminal symbols:

(,), +, -, *, /
, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

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Derivations of 1-2-3 -- Útleiðslur á 1-2-3

1. E

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

1. E

$$E \rightarrow EOE$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

1. $E \Rightarrow EOE$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

1. $E \Rightarrow EOE$

 $0 \rightarrow -$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

1. $E \Rightarrow EOE \Rightarrow E - E$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$1. \ E \Rightarrow EOE \Rightarrow E - E$$



$$E \rightarrow N$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

1. $E \Rightarrow EOE \Rightarrow E - E \Rightarrow N - E$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$1. \ E \Rightarrow EOE \Rightarrow E - E \Rightarrow N - E$$

$$N \rightarrow D$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$1. \ E \Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$1. \ E \Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E$$

$$D \rightarrow 1$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$1. \ E \Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$1. \ E \Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E$$

$$E \rightarrow EOE$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$1. \ E \Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$1. \ E \Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE$$

$$E \rightarrow N$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$1. \ E \Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ 1 - NOE$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$1. \ E \Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ 1 - NOE$$

$$N \rightarrow D$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$\begin{aligned} 1. \quad E &\Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ &1 - NOE \Rightarrow 1 - DOE \end{aligned}$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$1. \ E \Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ 1 - NOE \Rightarrow 1 - DOE$$

$$D \rightarrow 2$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$\begin{aligned} 1. \quad E &\Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ &1 - NOE \Rightarrow 1 - DOE \Rightarrow 1 - 2OE \end{aligned}$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$1. \ E \Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ 1 - NOE \Rightarrow 1 - DOE \Rightarrow 1 - 2OE$$

$$O \rightarrow -$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$\begin{aligned} 1. \quad E &\Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ &1 - NOE \Rightarrow 1 - DOE \Rightarrow 1 - 2OE \Rightarrow 1 - 2 - E \end{aligned}$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$\begin{aligned} 1. \quad E &\Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ &1 - NOE \Rightarrow 1 - DOE \Rightarrow 1 - 2OE \Rightarrow 1 - 2 - E \end{aligned}$$

$$E \rightarrow N$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$\begin{aligned} 1. \quad E &\Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ &1 - NOE \Rightarrow 1 - DOE \Rightarrow 1 - 2OE \Rightarrow 1 - 2 - E \Rightarrow \\ &1 - 2 - N \end{aligned}$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$\begin{aligned} 1. \quad E &\Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ &1 - NOE \Rightarrow 1 - DOE \Rightarrow 1 - 2OE \Rightarrow 1 - 2 - E \Rightarrow \\ &1 - 2 - N \end{aligned}$$

$$N \rightarrow D$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$\begin{aligned} 1. \quad E &\Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ &1 - NOE \Rightarrow 1 - DOE \Rightarrow 1 - 2OE \Rightarrow 1 - 2 - E \Rightarrow \\ &1 - 2 - N \Rightarrow 1 - 2 - D \end{aligned}$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$\begin{aligned} 1. \quad E &\Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ &1 - NOE \Rightarrow 1 - DOE \Rightarrow 1 - 2OE \Rightarrow 1 - 2 - E \Rightarrow \\ &1 - 2 - N \Rightarrow 1 - 2 - D \end{aligned}$$

$$D \rightarrow 3$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$\begin{aligned} 1. \quad E &\Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ &1 - NOE \Rightarrow 1 - DOE \Rightarrow 1 - 2OE \Rightarrow 1 - 2 - E \Rightarrow \\ &1 - 2 - N \Rightarrow 1 - 2 - D \Rightarrow 1 - 2 - 3 \end{aligned}$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$\begin{aligned} 1. \quad E &\Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ &1 - NOE \Rightarrow 1 - DOE \Rightarrow 1 - 2OE \Rightarrow 1 - 2 - E \Rightarrow \\ &1 - 2 - N \Rightarrow 1 - 2 - D \Rightarrow 1 - 2 - 3 \end{aligned}$$

$$2. \quad E \Rightarrow EOE \Rightarrow \underset{\uparrow}{E} - E$$

$$E \rightarrow EOE$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$1. \ E \Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow$$

$$1 - NOE \Rightarrow 1 - DOE \Rightarrow 1 - 2OE \Rightarrow 1 - 2 - E \Rightarrow$$

$$1 - 2 - N \Rightarrow 1 - 2 - D \Rightarrow 1 - 2 - 3$$

$$2. \ E \Rightarrow EOE \Rightarrow E - E \Rightarrow EOE - E$$

Derivations of 1-2-3 -- Útleiðslur á 1-2-3

$$\begin{aligned} 1. \quad E &\Rightarrow EOE \Rightarrow E - E \Rightarrow N - E \Rightarrow D - E \Rightarrow 1 - E \Rightarrow 1 - EOE \Rightarrow \\ &1 - NOE \Rightarrow 1 - DOE \Rightarrow 1 - 2OE \Rightarrow 1 - 2 - E \Rightarrow \\ &1 - 2 - N \Rightarrow 1 - 2 - D \Rightarrow 1 - 2 - 3 \end{aligned}$$

$$\begin{aligned} 2. \quad E &\Rightarrow EOE \Rightarrow E - E \Rightarrow EOE - E \Rightarrow NOE - E \Rightarrow DOE - E \Rightarrow \\ &1OE - E \Rightarrow 1 - E - E \Rightarrow 1 - N - E \Rightarrow 1 - D - E \Rightarrow \\ &1 - 2 - E \Rightarrow 1 - 2 - N \Rightarrow 1 - 2 - D \Rightarrow 1 - 2 - 3 \end{aligned}$$

Leftmost Derivations -- Vinstri útleiðslur

$$1. \quad E \xRightarrow{lm} EOE \xRightarrow{lm} NOE \xRightarrow{lm} DOE \xRightarrow{lm} 1OE \xRightarrow{lm} 1 - E \xRightarrow{lm} 1 - EOE \xRightarrow{lm}$$

$$1 - NOE \xRightarrow{lm} 1 - DOE \xRightarrow{lm} 1 - 2OE \xRightarrow{lm} 1 - 2 - E \xRightarrow{lm}$$

$$1 - 2 - N \xRightarrow{lm} 1 - 2 - D \xRightarrow{lm} 1 - 2 - 3$$

$$2. \quad E \xRightarrow{lm} EOE \xRightarrow{lm} EOEEOE \xRightarrow{lm} NOEOE \xRightarrow{lm} DOEOE \xRightarrow{lm} 1OEEOE \xRightarrow{lm}$$

$$1 - EOE \xRightarrow{lm} 1 - NOE \xRightarrow{lm} 1 - DOE \xRightarrow{lm} 1 - 2OE \xRightarrow{lm} 1 - 2 - E \xRightarrow{lm}$$

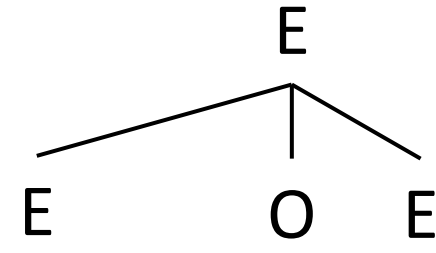
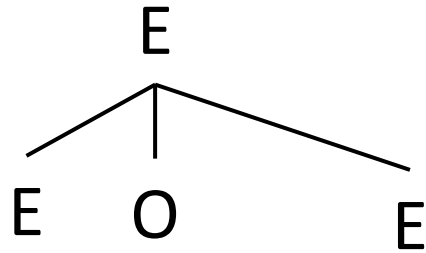
$$1 - 2 - N \xRightarrow{lm} 1 - 2 - D \xRightarrow{lm} 1 - 2 - 3$$

Derivation trees -- Útleiðslutré

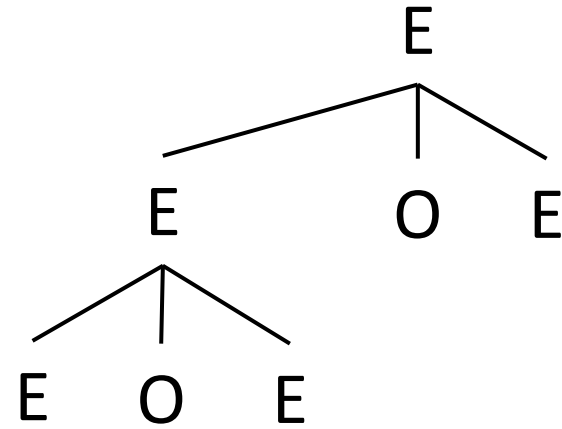
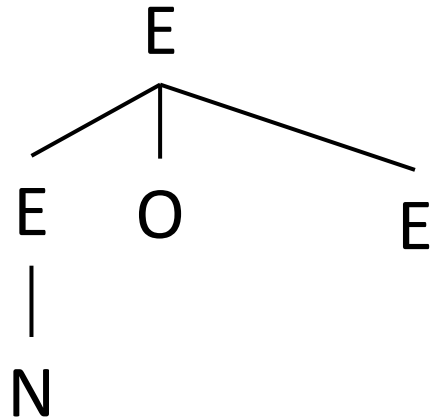
E

E

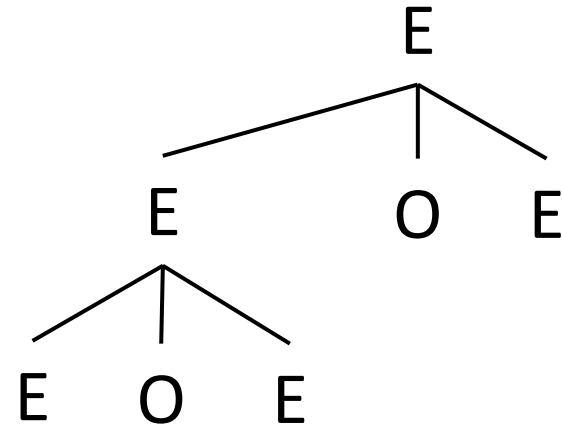
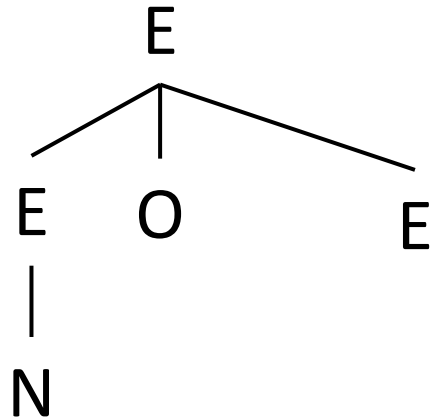
Derivation trees -- Útleiðslutré



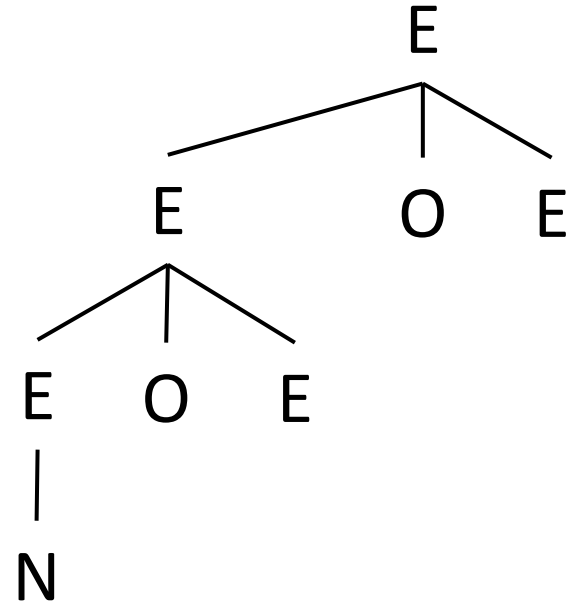
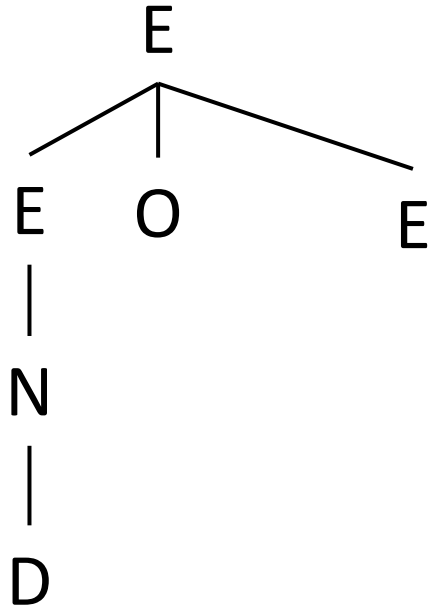
Derivation trees -- Útleiðslutré



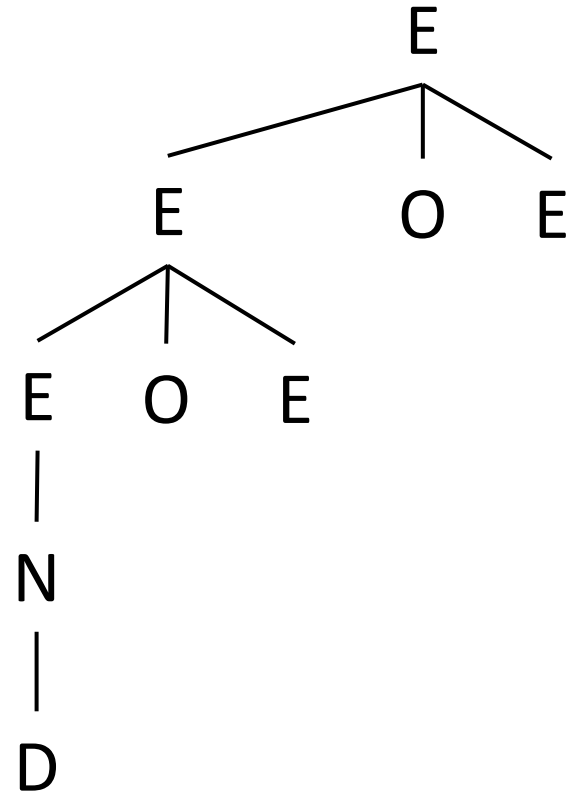
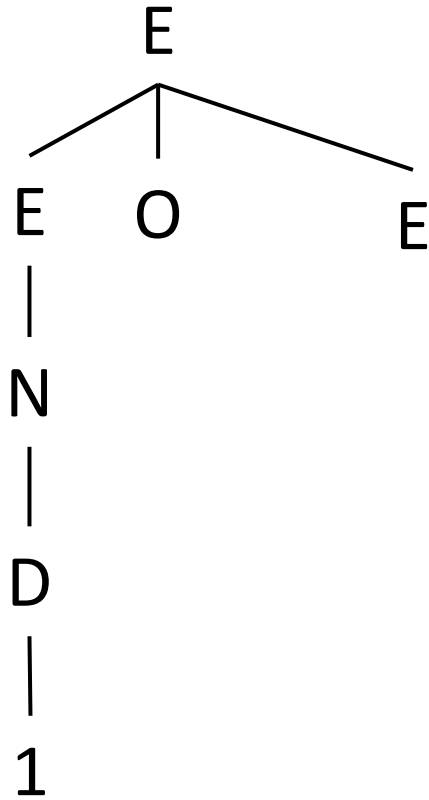
Derivation trees -- Útleiðslutré



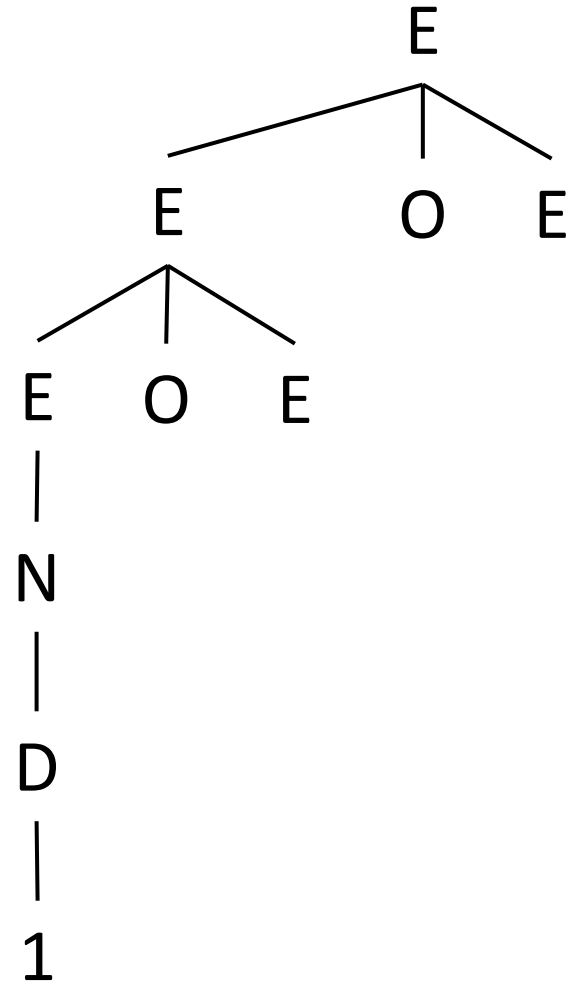
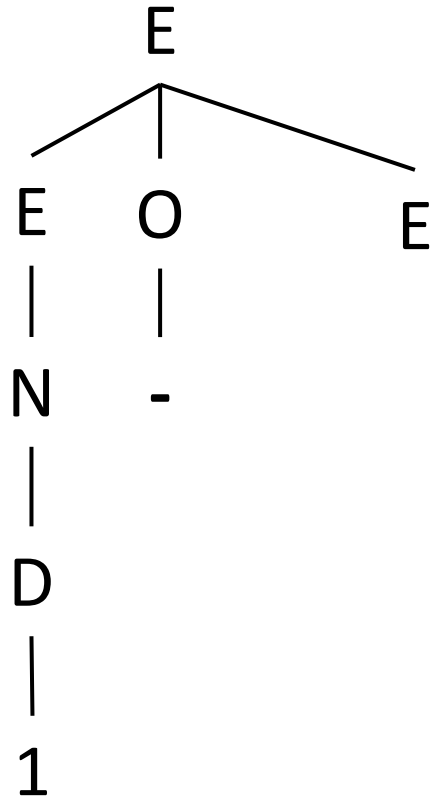
Derivation trees -- Útleiðslutré



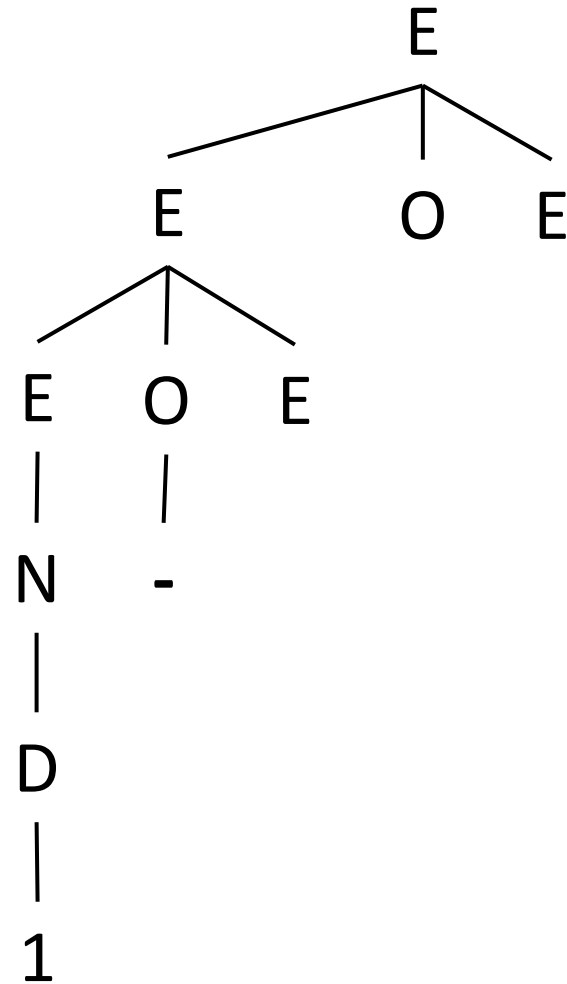
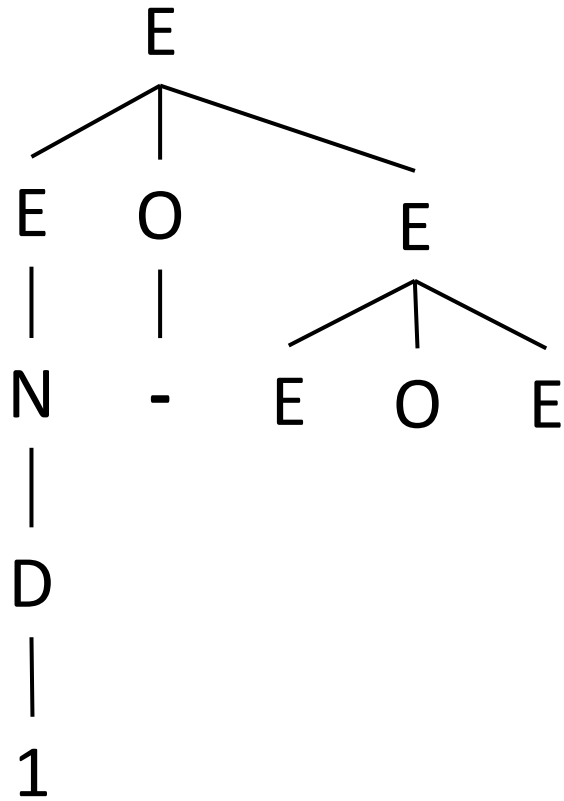
Derivation trees -- Útleiðslutré



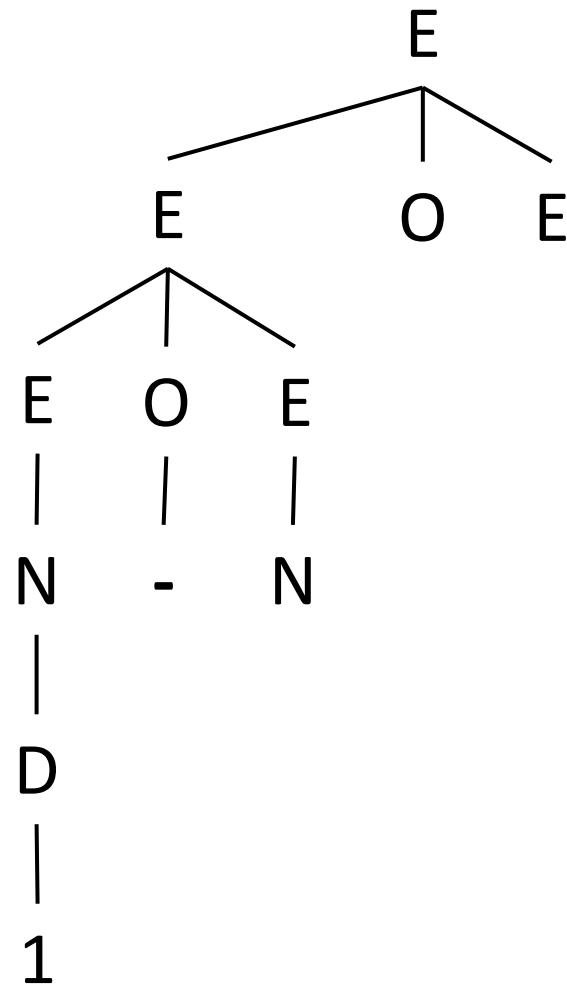
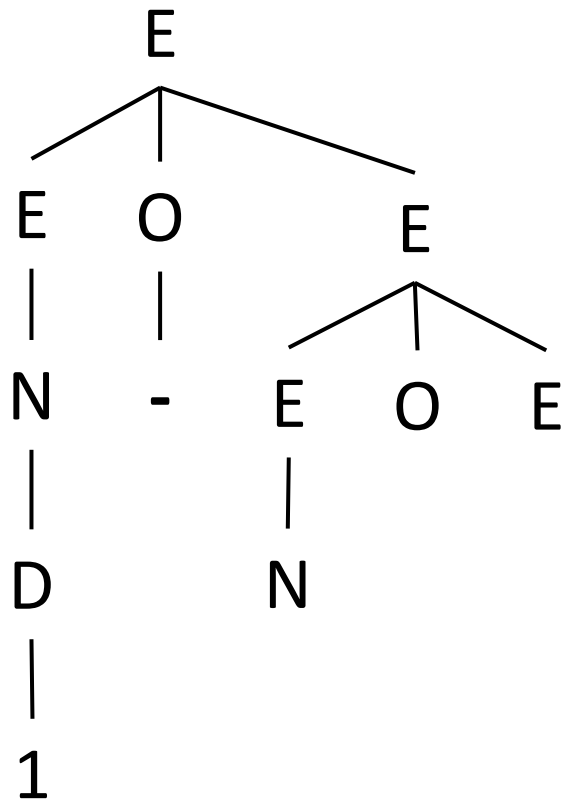
Derivation trees -- Útleiðslutré



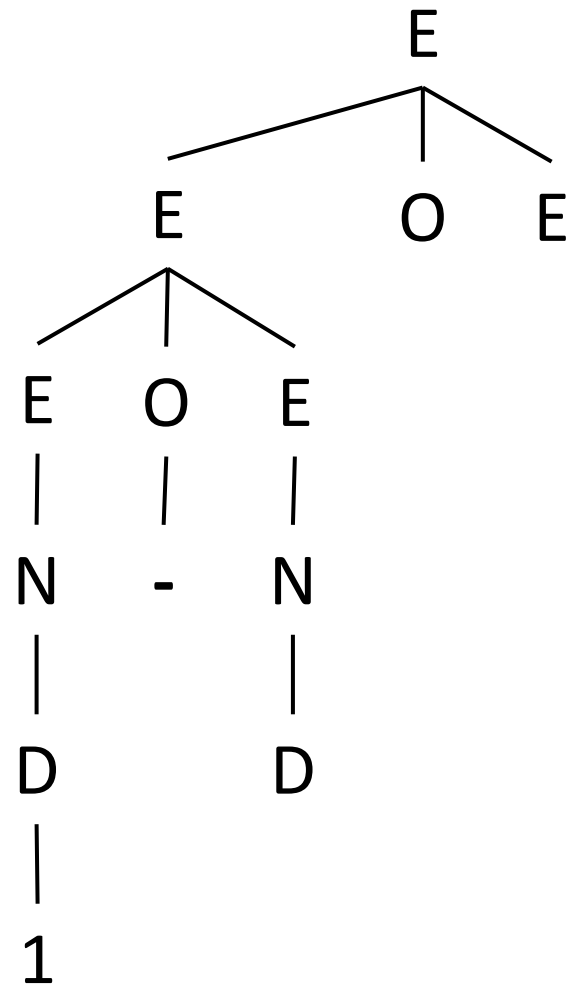
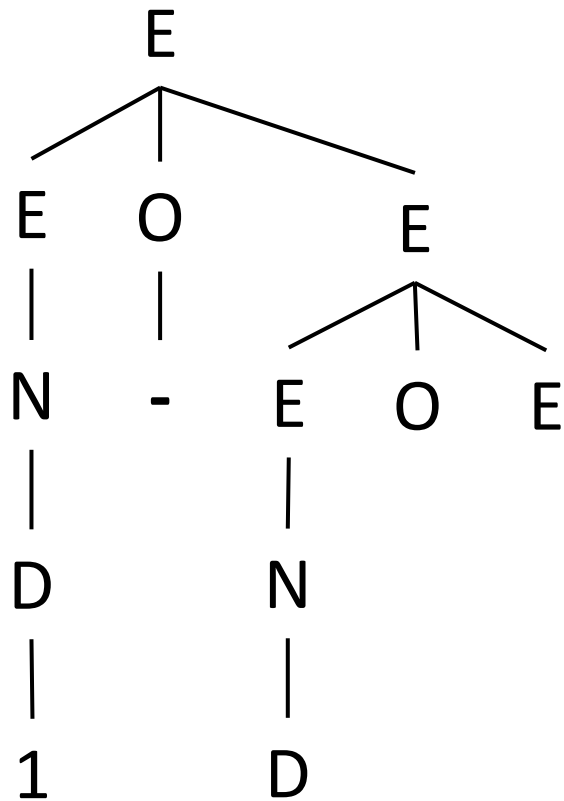
Derivation trees -- Útleiðslutré



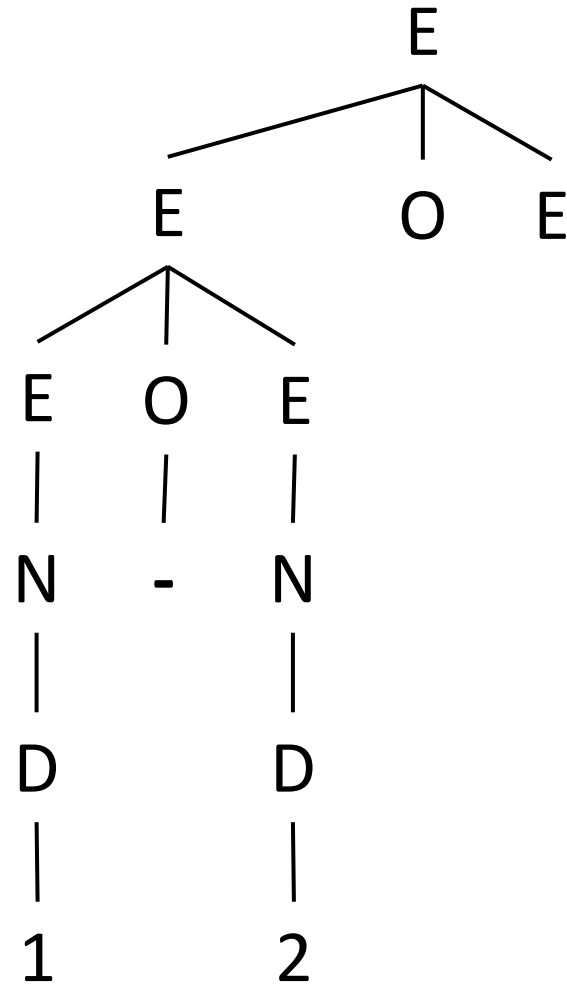
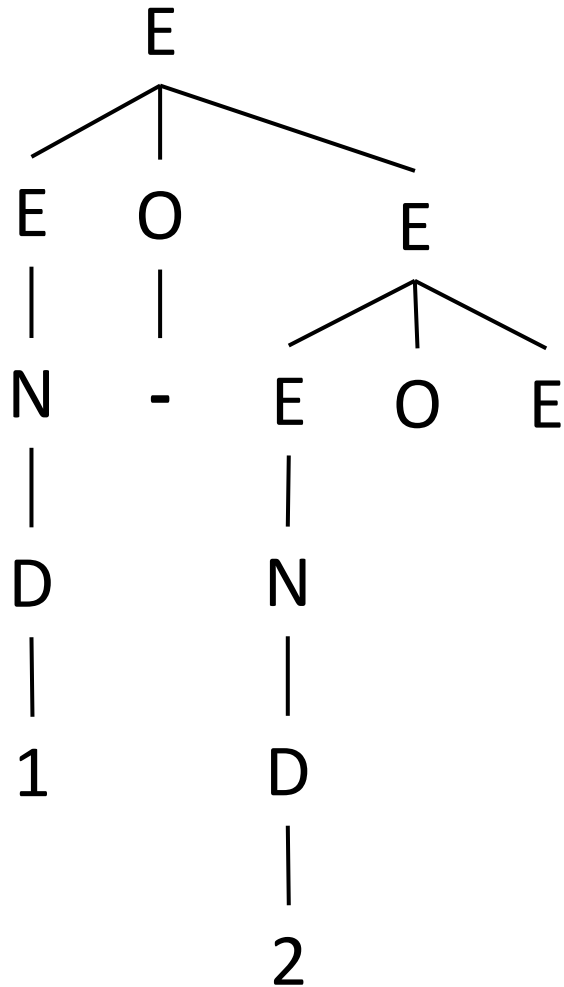
Derivation trees -- Útleiðslutré



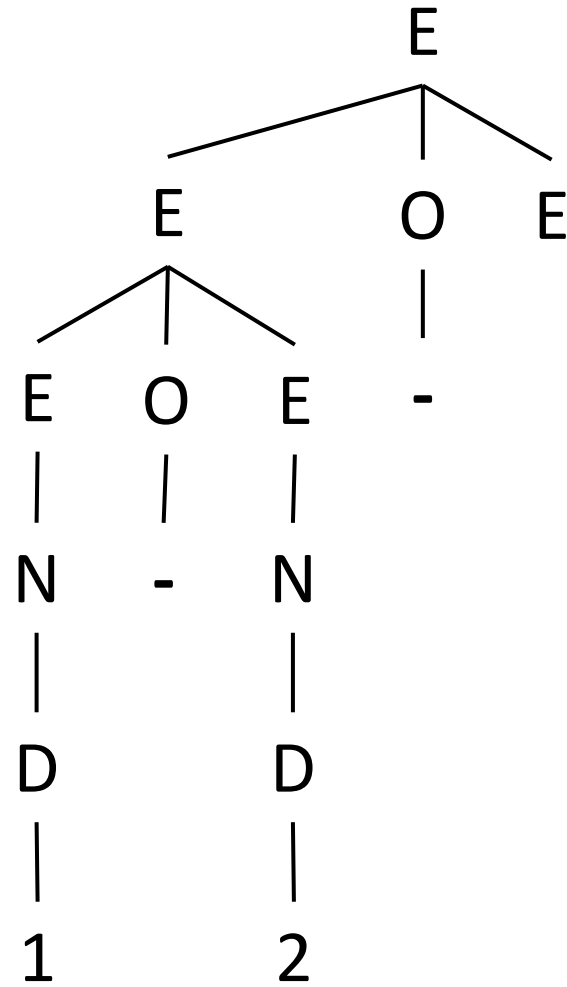
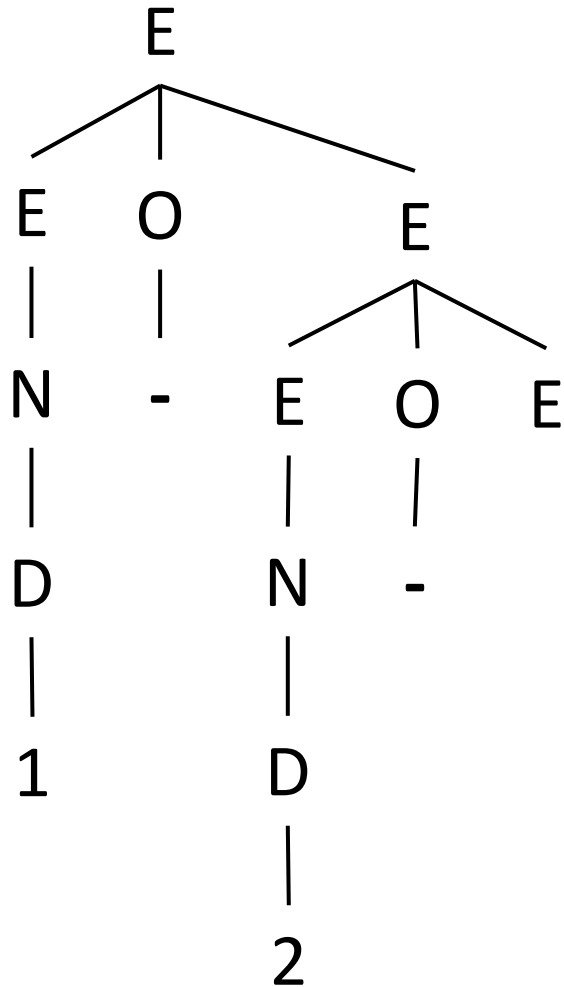
Derivation trees -- Útleiðslutré



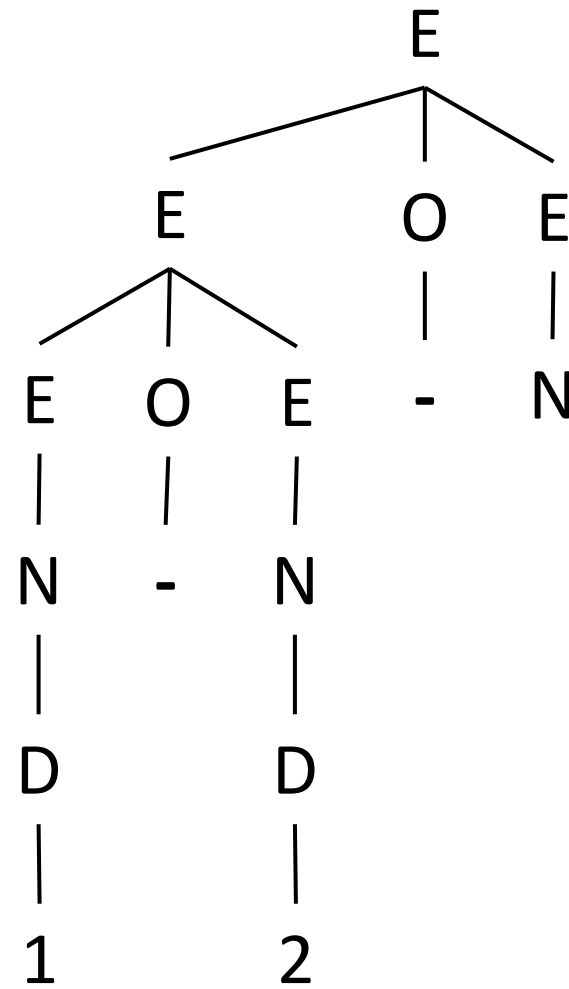
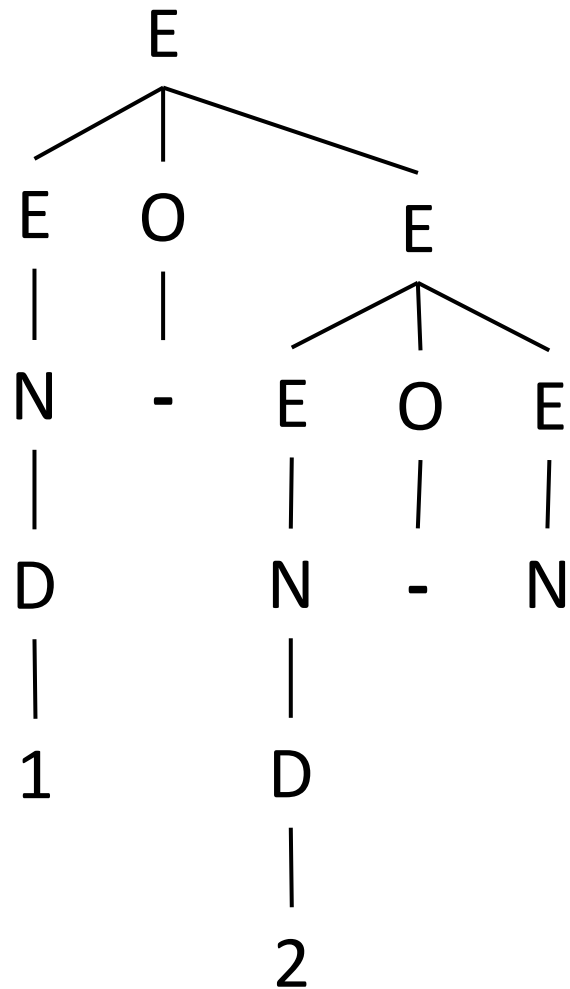
Derivation trees -- Útleiðslutré



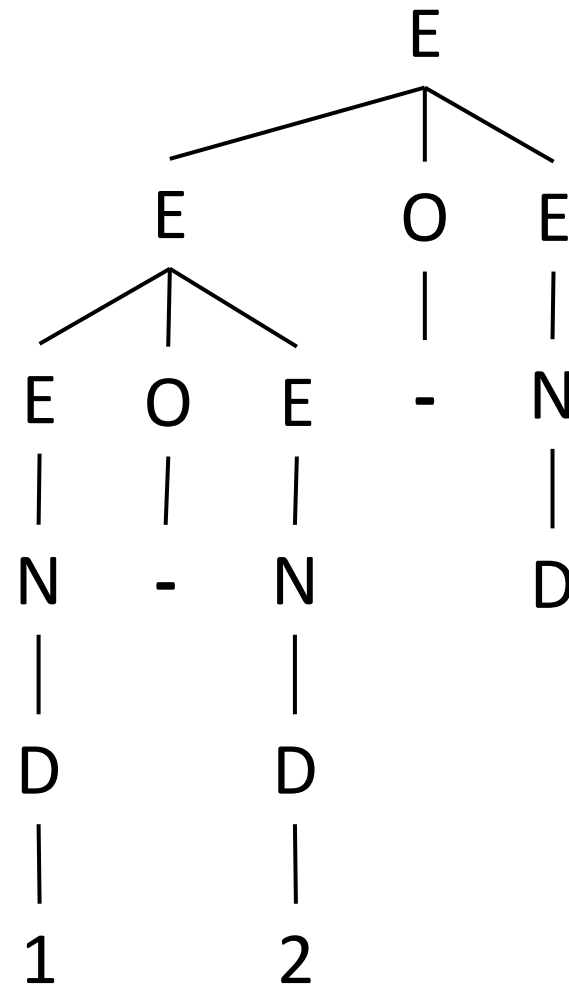
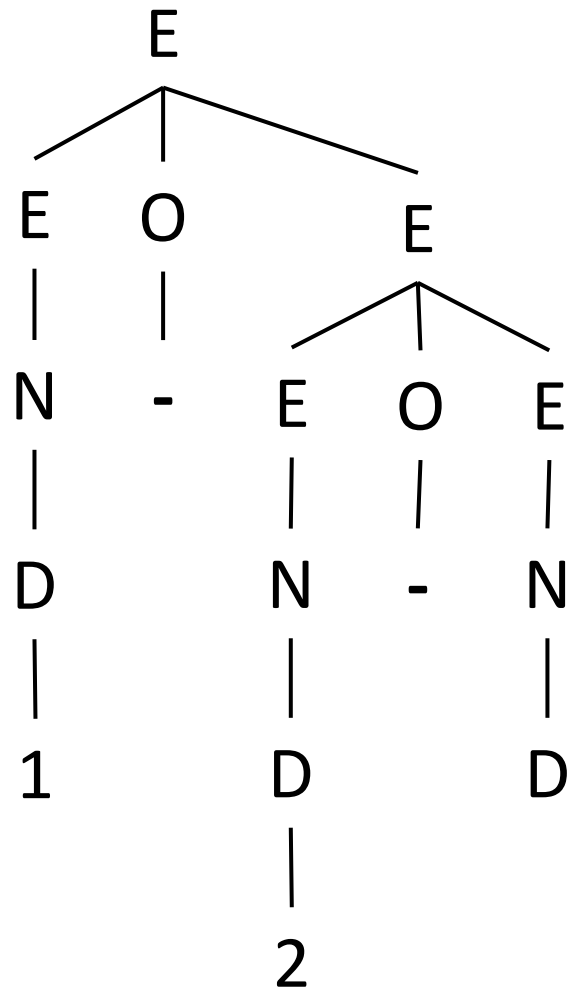
Derivation trees -- Útleiðslutré



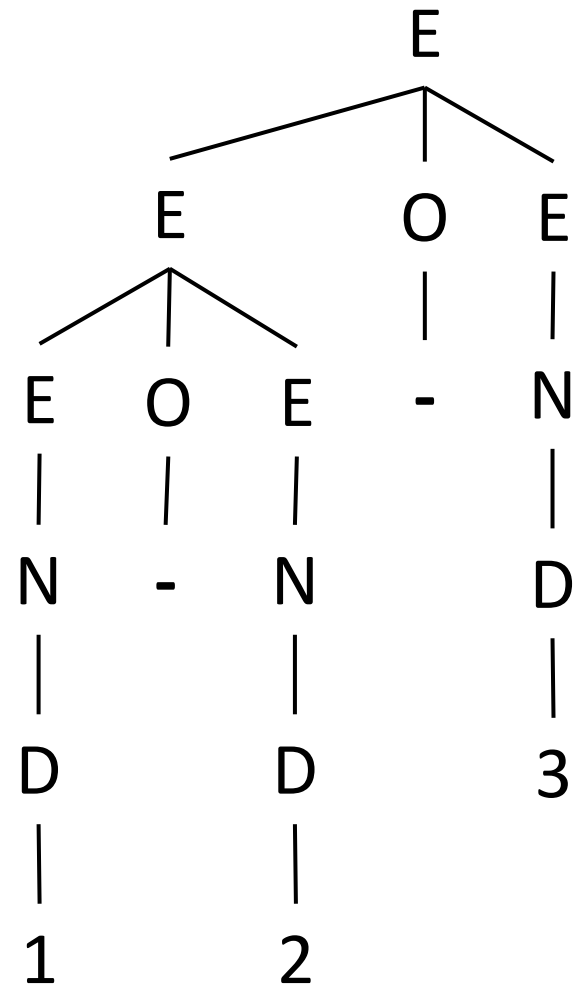
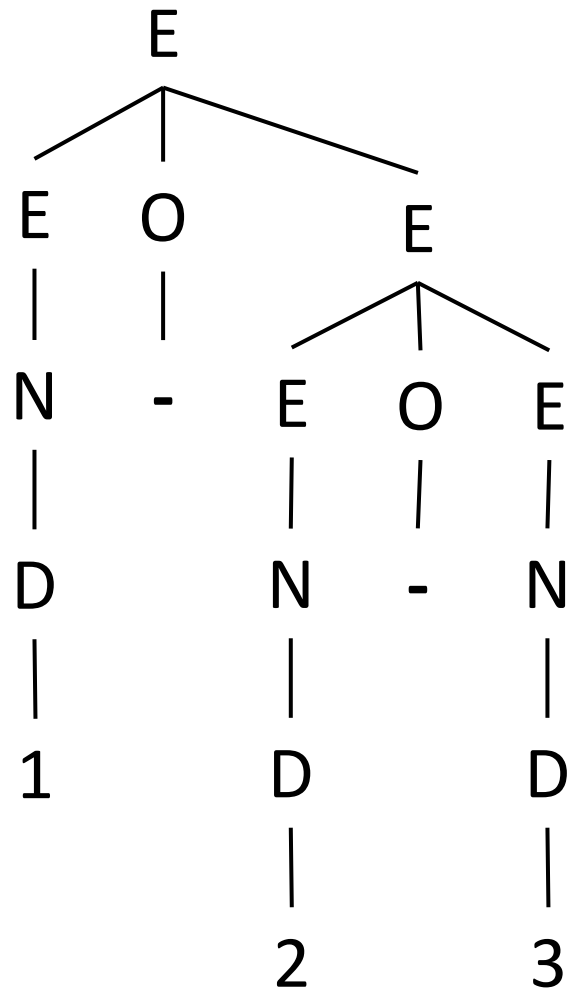
Derivation trees -- Útleiðslutré



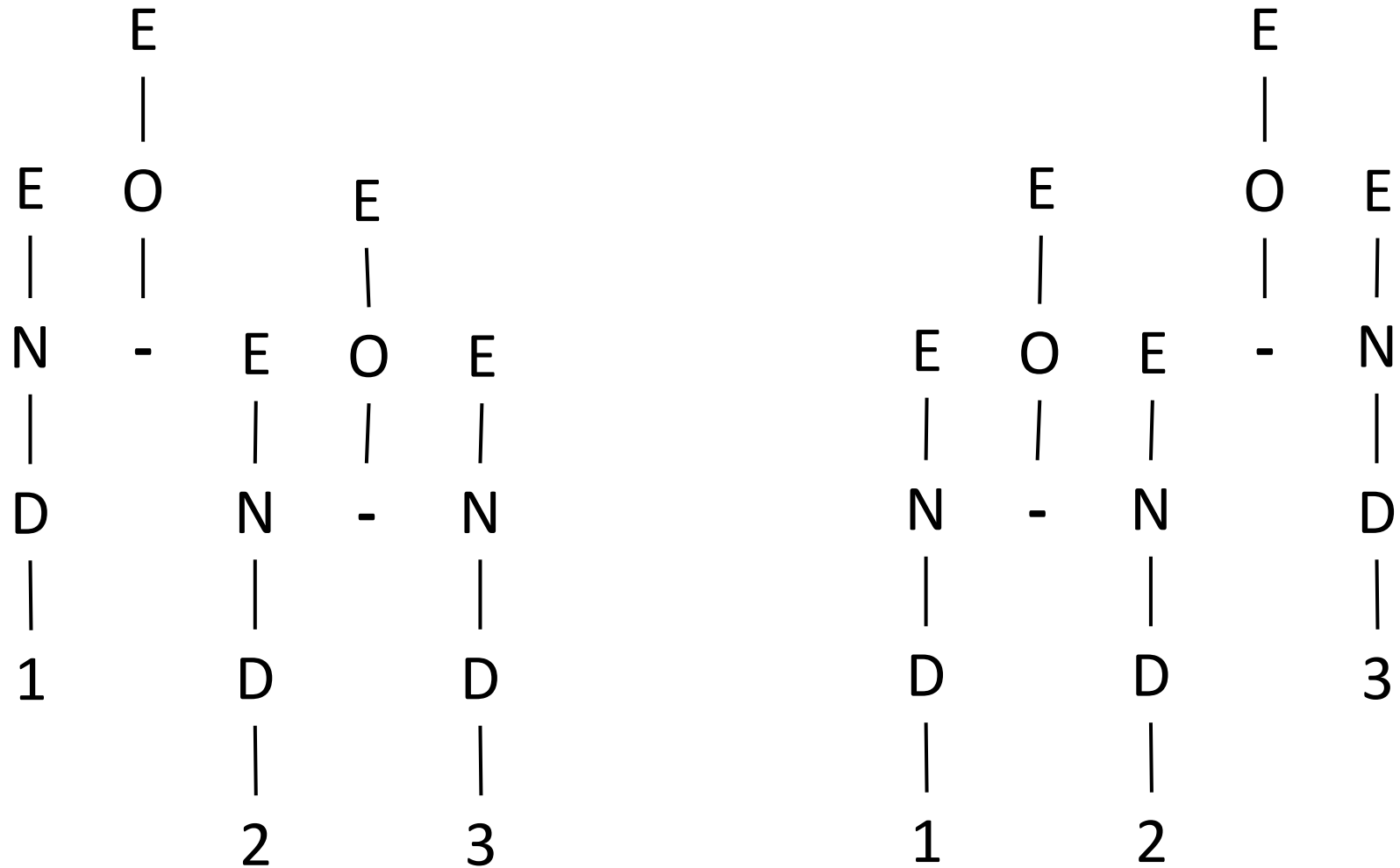
Derivation trees -- Útleiðslutré



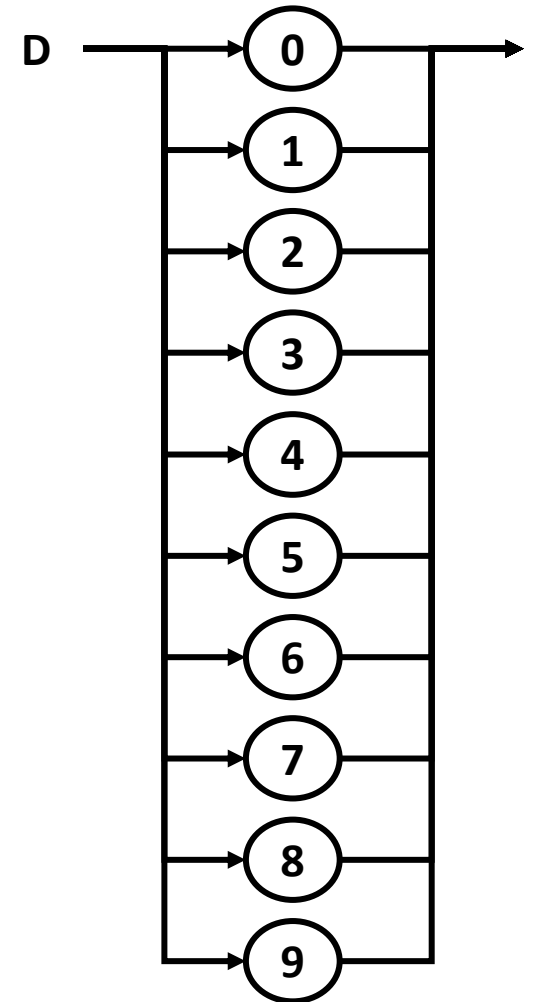
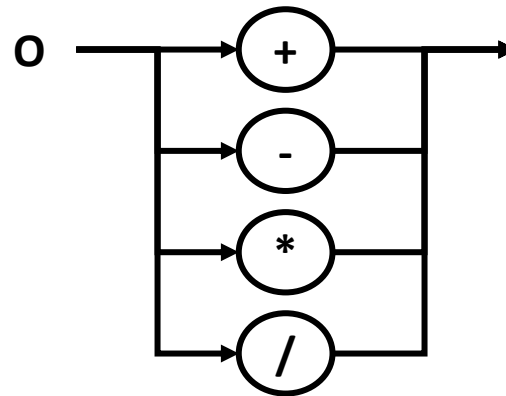
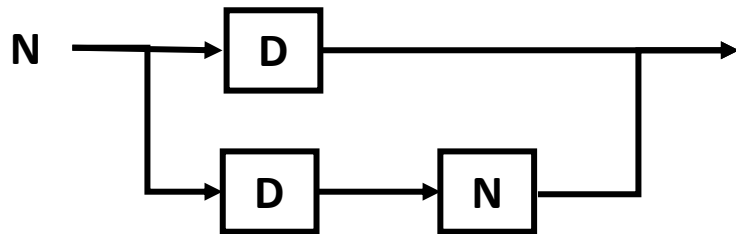
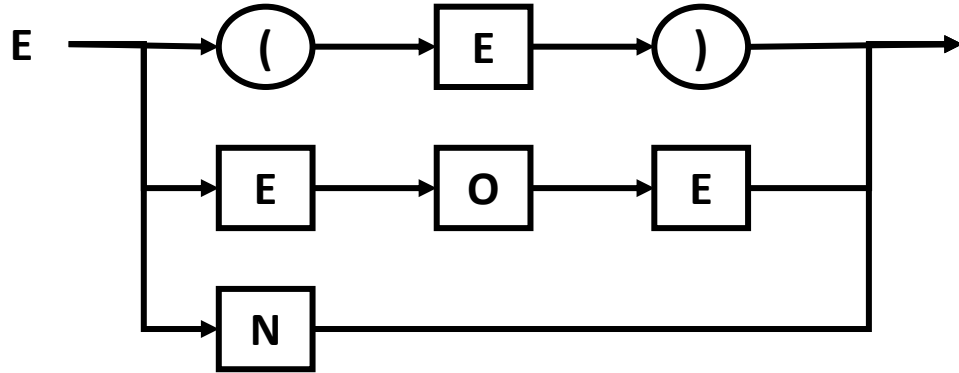
Derivation trees -- Útleiðslutré



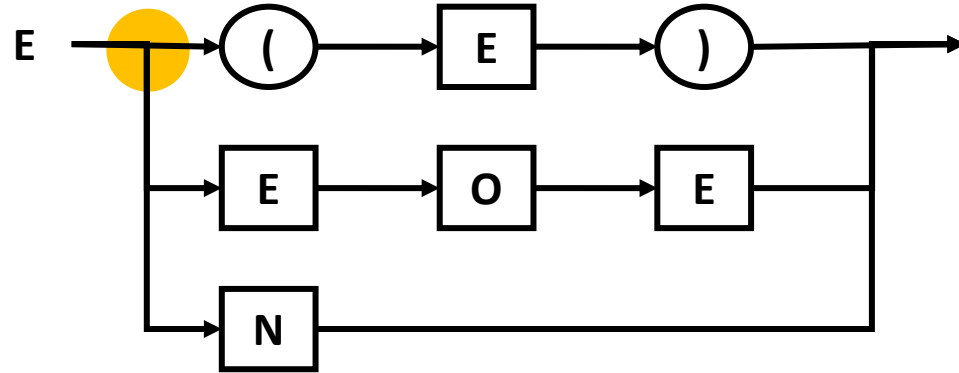
Not Derivation trees – Ekki útleiðslutré



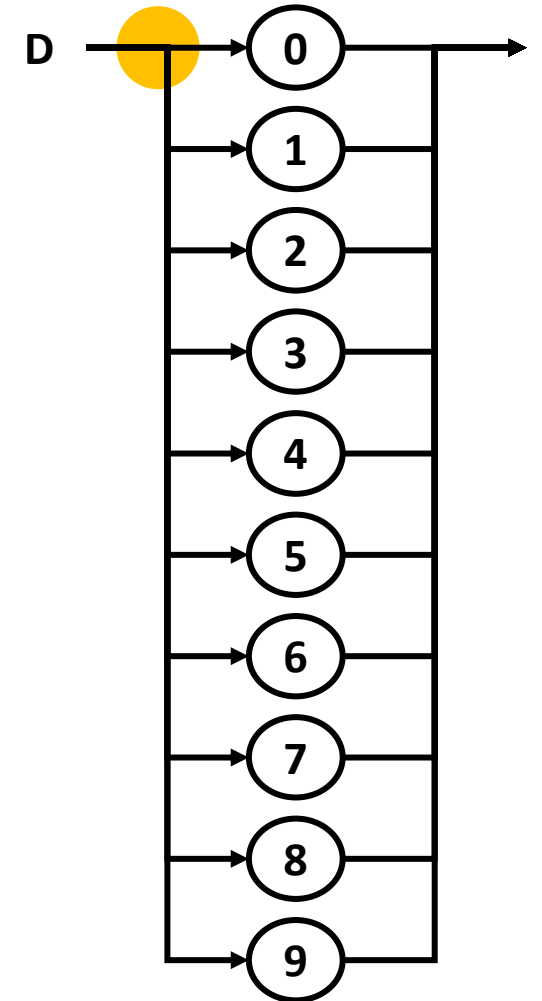
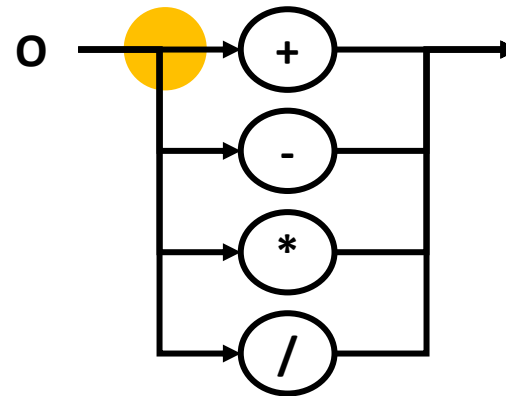
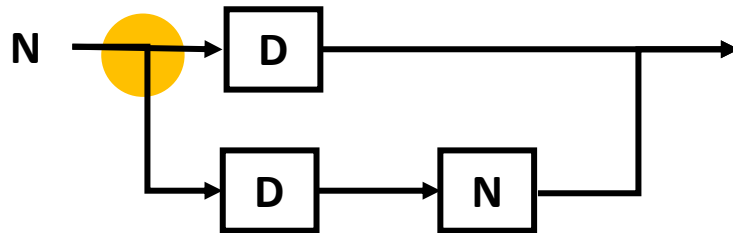
Syntax Diagram -- Málrít



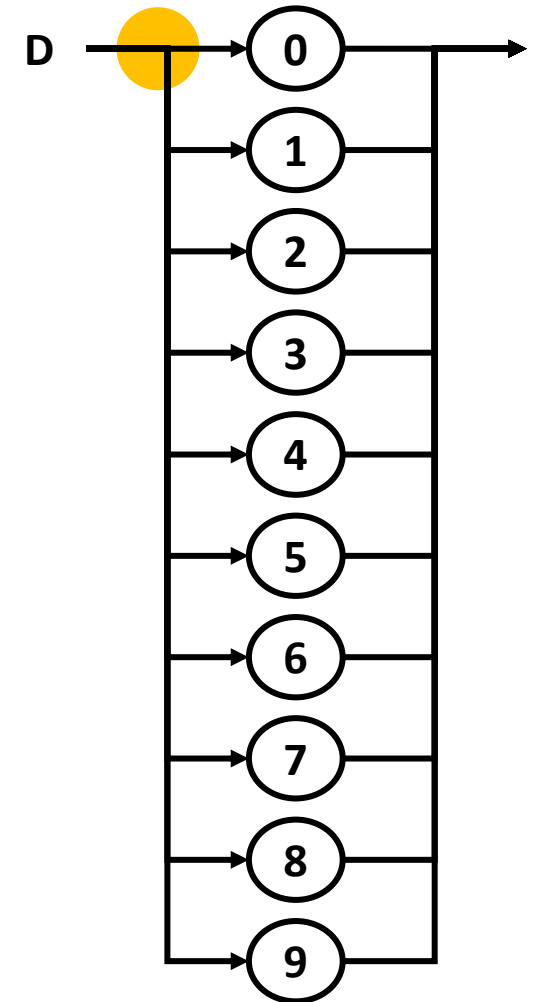
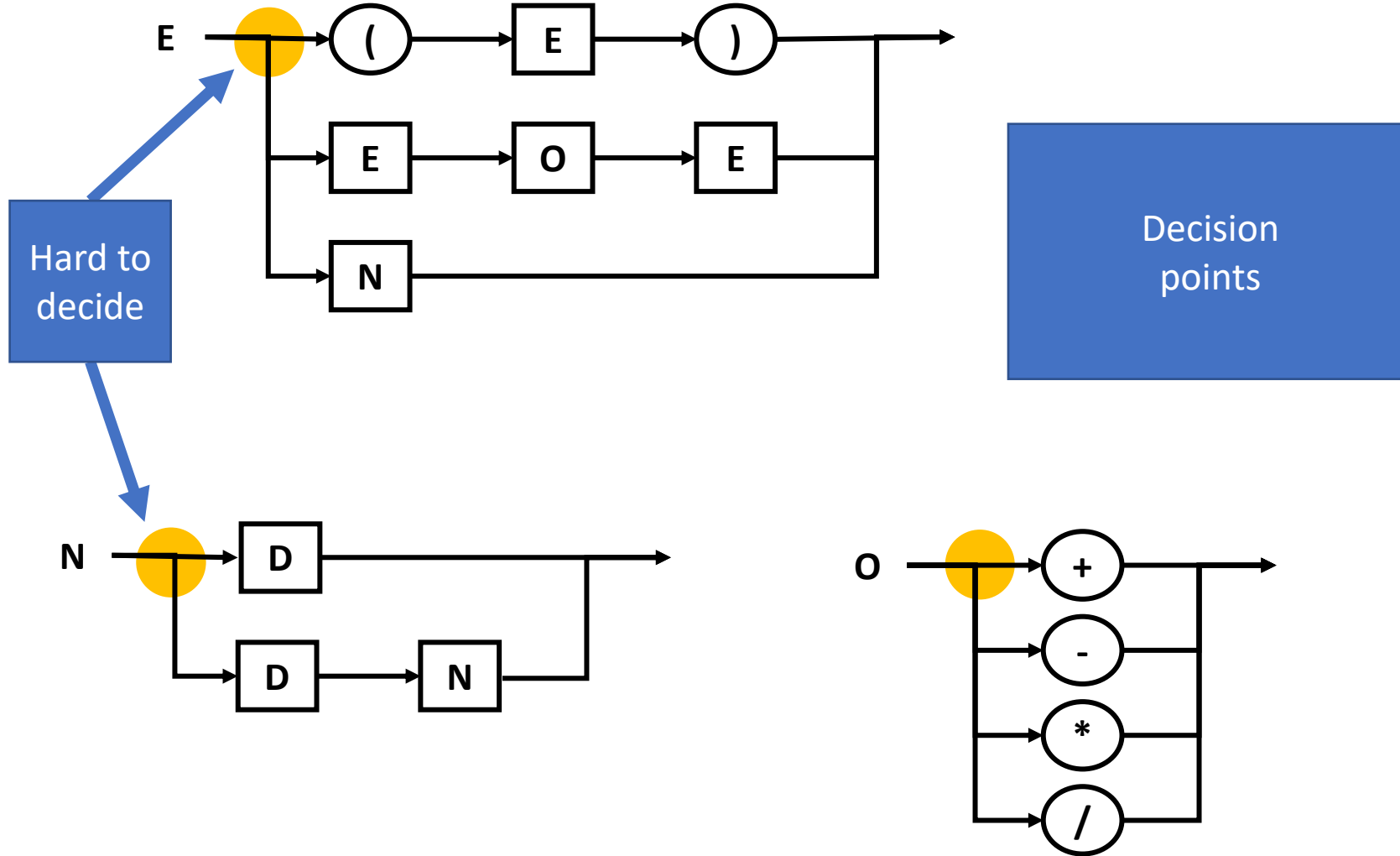
Syntax Diagram -- Málrít



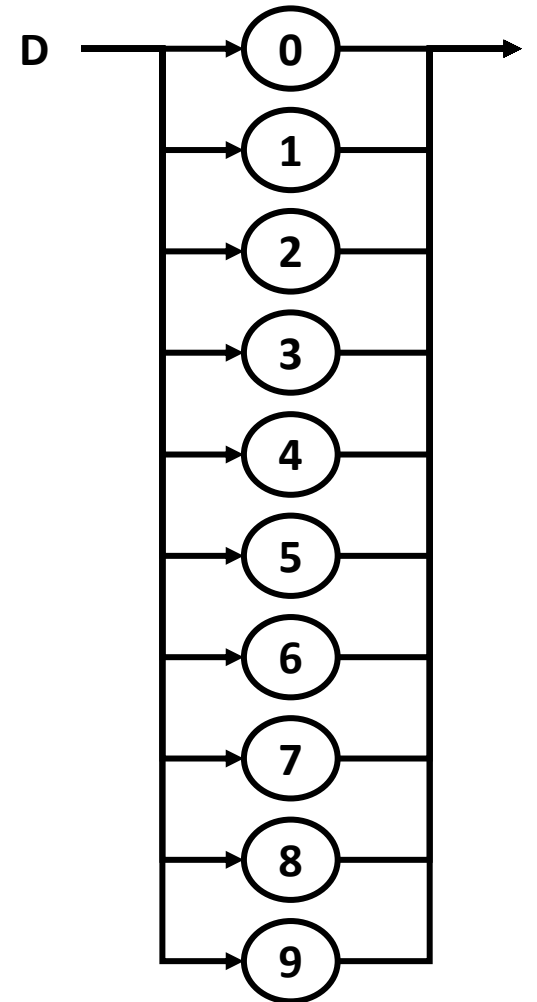
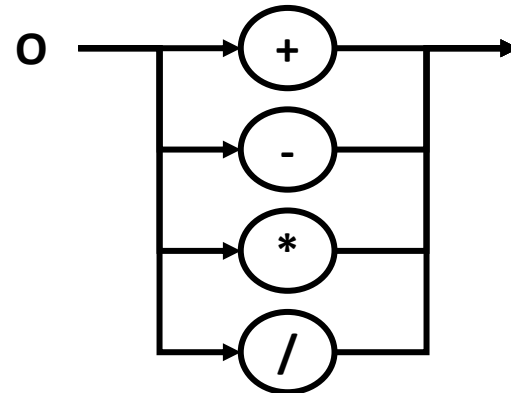
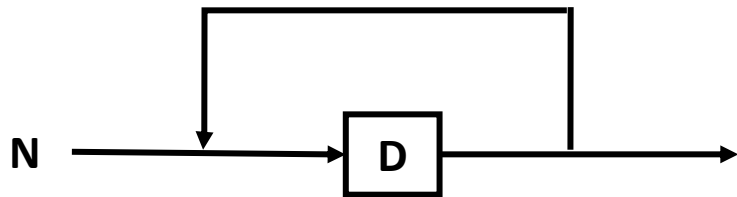
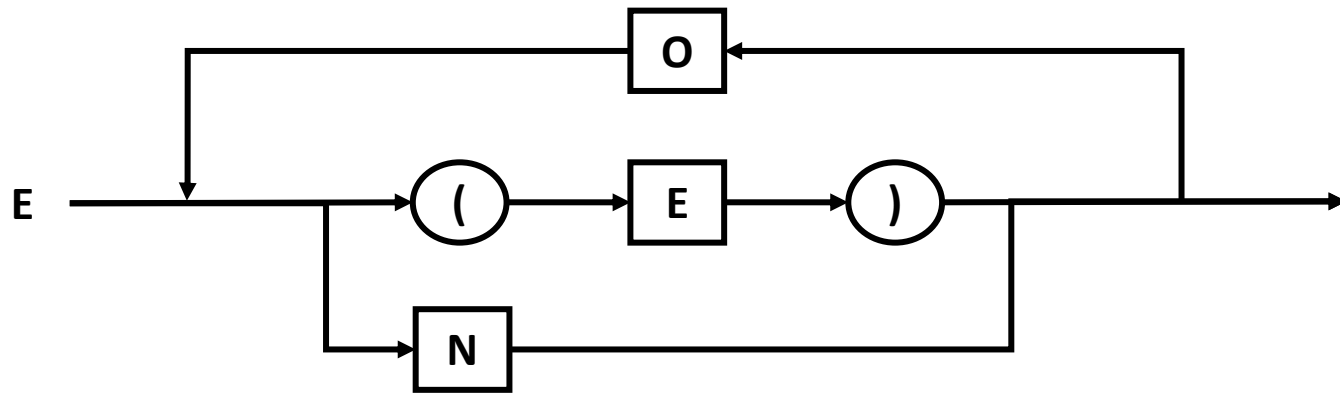
Decision points



Syntax Diagram -- Málrít



Same Language, different diagram,
unambiguous (different grammar)



Same Language, different diagram, unambiguous (different grammar)

