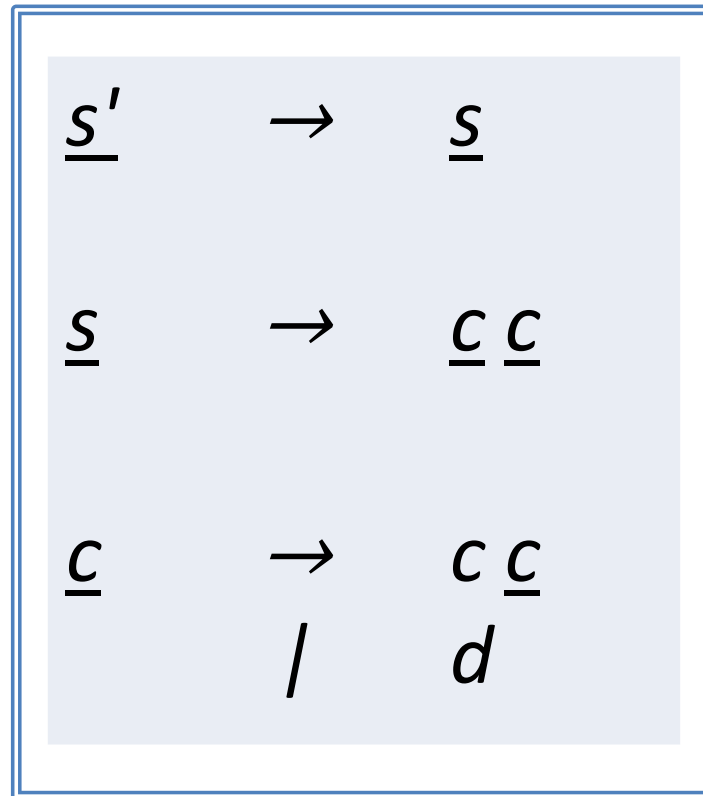


Example of computing the
CLOSURE of a set of LR(1) items

Question



What is $CLOSURE(\{ \underline{s'} \rightarrow \cdot \underline{s} \{ \$ \} \})$?

Compute *first* sets

s' \rightarrow s

s \rightarrow c c

c \rightarrow c c
 $\quad \quad \quad |$ d

first(c) = { c, d }

first(s) = { c, d }

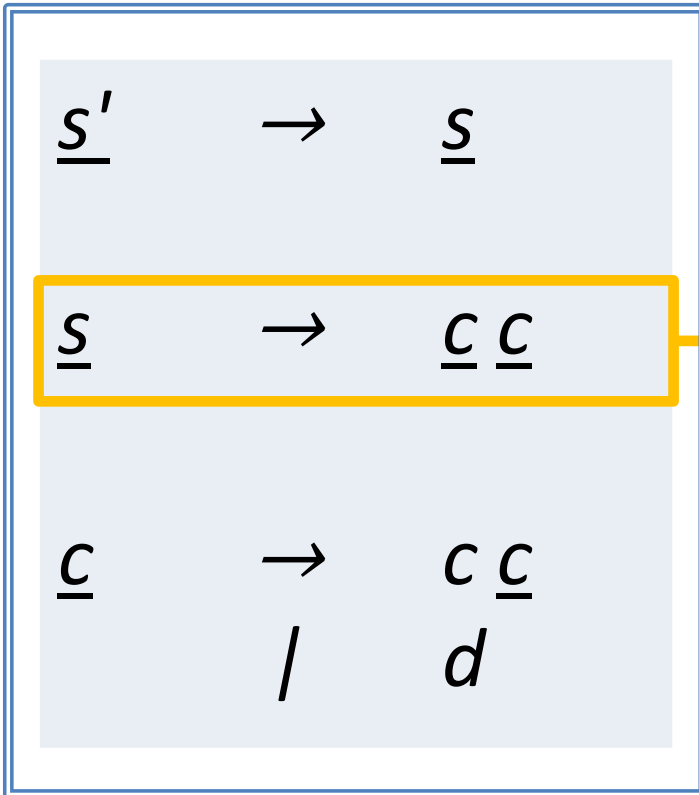
first(s') = { c, d }

First iteration

<u>s'</u>	→	<u>s</u>
<u>s</u>	→	<u>c</u> <u>c</u>
<u>c</u>	→	c <u>c</u>
		d

$$\begin{aligned} & \text{CLOSURE}(\{ \underline{s}' \rightarrow \cdot \underline{s} \{\$ \} \}) \\ &= \{ \underline{s}' \rightarrow \cdot \underline{s} \{\$ \} \} \end{aligned}$$

Second iteration



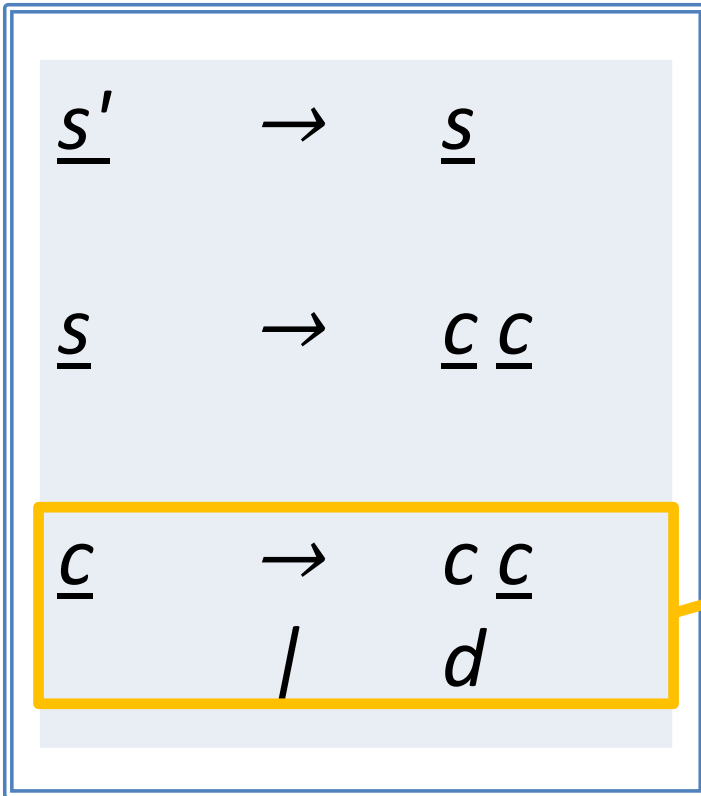
$$\begin{aligned} & \text{CLOSURE}(\{ \underline{s}' \rightarrow \cdot \underline{s} \{ \$ \} \}) \\ &= \{ \underline{s}' \rightarrow \cdot \underline{s} \{ \$ \} \} \\ & \quad , \underline{s} \rightarrow \cdot \underline{c} \underline{c} \\ & \quad \} \end{aligned}$$

Second iteration

<u>s'</u>	→	<u>s</u>
<u>s</u>	→	<u>c</u> <u>c</u>
<u>c</u>	→	<u>c</u> <u>c</u>
		<u>d</u>

$$\begin{aligned} & \text{CLOSURE}(\{ \underline{s}' \rightarrow \cdot \underline{s} \{ \$ \} \}) \\ = & \{ \underline{s}' \rightarrow \cdot \underline{s} \{ \$ \} \\ & , \underline{s} \rightarrow \cdot \underline{c} \underline{c} \{ \$ \} \\ & \} \end{aligned}$$

Third iteration



$$\begin{aligned} & \text{CLOSURE}(\{ \underline{s}' \rightarrow \cdot \underline{s} \{ \$ \} \}) \\ = & \{ \underline{s}' \rightarrow \cdot \underline{s} \{ \$ \} \\ & , \underline{s} \rightarrow \cdot \underline{c} \underline{c} \{ \$ \} \\ & , \underline{c} \rightarrow \cdot \underline{c} \underline{c} \\ & , \underline{c} \rightarrow \cdot \underline{d} \\ & \} \end{aligned}$$

Third iteration

<u>s'</u>	→	<u>s</u>
<u>s</u>	→	<u>c</u> <u>c</u>
<u>c</u>	→	c <u>c</u>
		d

$$\begin{aligned} & \text{CLOSURE}(\{ \underline{s}' \rightarrow \cdot \underline{s} \{ \$ \} \}) \\ = & \{ \underline{s}' \rightarrow \cdot \underline{s} \{ \$ \} \\ & , \underline{s} \rightarrow \cdot \underline{c} \underline{c} \{ \$ \} \\ & , \underline{c} \rightarrow \cdot c \underline{c} \{ c, d \} \\ & , \underline{c} \rightarrow \cdot d \\ & \} \end{aligned}$$

first

Third iteration

<u>s'</u>	→	<u>s</u>
<u>s</u>	→	<u>c</u> <u>c</u>
<u>c</u>	→	c <u>c</u>
		d

$$\begin{aligned} & \text{CLOSURE}(\{ \underline{s}' \rightarrow \cdot \underline{s} \{ \$ \} \}) \\ = & \{ \underline{s}' \rightarrow \cdot \underline{s} \{ \$ \} \\ & , \underline{s} \rightarrow \cdot \underline{c} \underline{c} \{ \$ \} \\ & , \underline{c} \rightarrow \cdot c \underline{c} \{ c, d \} \\ & , \underline{c} \rightarrow \cdot d \{ c, d \} \\ & \} \end{aligned}$$

first

Final result

<u>s'</u>	→	<u>s</u>
<u>s</u>	→	<u>c</u> <u>c</u>
<u>c</u>	→	c <u>c</u> d

$$\begin{aligned} & \text{CLOSURE}(\{ \underline{s}' \rightarrow \cdot \underline{s} \{ \$ \} \}) \\ = & \{ \underline{s}' \rightarrow \cdot \underline{s} \{ \$ \} \\ & , \underline{s} \rightarrow \cdot \underline{c} \underline{c} \{ \$ \} \\ & , \underline{c} \rightarrow \cdot c \underline{c} \{ c, d \} \\ & , \underline{c} \rightarrow \cdot d \{ c, d \} \\ & \} \end{aligned}$$