

# Introduction to Language Theory and Compilation Exercises

## Session 5: Pushdown automata and parsing

(1)	$\langle \text{program} \rangle$	$\rightarrow$	begin $\langle \text{statement list} \rangle$ end
(2)	$\langle \text{statement list} \rangle$	$\rightarrow$	$\langle \text{statement} \rangle \langle \text{statement tail} \rangle$
(3)	$\langle \text{statement tail} \rangle$	$\rightarrow$	$\langle \text{statement} \rangle \langle \text{statement tail} \rangle$
(4)	$\langle \text{statement tail} \rangle$	$\rightarrow$	$\epsilon$
(5)	$\langle \text{statement} \rangle$	$\rightarrow$	ID := $\langle \text{expression} \rangle$ ;
(6)	$\langle \text{statement} \rangle$	$\rightarrow$	read ( $\langle \text{id list} \rangle$ ) ;
(7)	$\langle \text{statement} \rangle$	$\rightarrow$	write ( $\langle \text{expr list} \rangle$ ) ;
(8)	$\langle \text{id list} \rangle$	$\rightarrow$	ID $\langle \text{id tail} \rangle$
(9)	$\langle \text{id tail} \rangle$	$\rightarrow$	, ID $\langle \text{id tail} \rangle$
(10)	$\langle \text{id tail} \rangle$	$\rightarrow$	$\epsilon$
(11)	$\langle \text{expr list} \rangle$	$\rightarrow$	$\langle \text{expression} \rangle \langle \text{expr tail} \rangle$
(12)	$\langle \text{expr tail} \rangle$	$\rightarrow$	, $\langle \text{expression} \rangle \langle \text{expr tail} \rangle$
(13)	$\langle \text{expr tail} \rangle$	$\rightarrow$	$\epsilon$
(14)	$\langle \text{expression} \rangle$	$\rightarrow$	$\langle \text{primary} \rangle \langle \text{primary tail} \rangle$
(15)	$\langle \text{primary tail} \rangle$	$\rightarrow$	$\langle \text{add op} \rangle \langle \text{primary} \rangle \langle \text{primary tail} \rangle$
(16)	$\langle \text{primary tail} \rangle$	$\rightarrow$	$\epsilon$
(17)	$\langle \text{primary} \rangle$	$\rightarrow$	( $\langle \text{expression} \rangle$ )
(18)	$\langle \text{primary} \rangle$	$\rightarrow$	ID
(19)	$\langle \text{primary} \rangle$	$\rightarrow$	INTLIT
(20)	$\langle \text{add op} \rangle$	$\rightarrow$	+
(21)	$\langle \text{add op} \rangle$	$\rightarrow$	-
(22)	$\langle S \rangle$	$\rightarrow$	$\langle \text{program} \rangle \$$