

WEEK#7
 COCKE-KASAMI-YOUNGER

①

CKY

$S \rightarrow AB \mid AC \mid AD \mid AE$
 $\mid BA \mid BF \mid BG \mid BH$

$A \rightarrow a$ $C \rightarrow DS$ $F \rightarrow GS$
 $B \rightarrow b$ $D \rightarrow SB$ $G \rightarrow SA$
 $E \rightarrow BS$ $H \rightarrow AS$

	b	a	b	b	a	a	b	a
1	B	A	B	B	A	A	B	A
2	S	S		S		S	S	
3	E, D	D	F	G	H	H, G		
4		S	S	S				
5	E, C	H, G	E, D	F, G				
6	S	S	S					
7	E, C, D	H, F, G						
8	S							

ACCEPT

WEEK #7
PUMPING LEMMA
FOR CFLS

②

IF L IS A CFL, THEN $\exists N > 0$,
SUCH THAT IF $Z \in L$ AND $|Z| \geq N$
THEN $Z = UN^iWXY$,
WHERE $|NW| \leq N$, $|X| > 0$
AND $\forall i \geq 0 \quad UN^iWXY \in L$

NOTE THAT IF $|\Sigma| = 1$ THEN
PUMPING LEMMA FOR CFL
DEGENERATES TO PUMPING LEMMA FOR REGULAR
THUS, IF $L \subseteq \Sigma^*$, $|\Sigma| = 1$, AND L
IS NOT REGULAR THEN L IS NOT A CFL

$L = \{ww \mid w \in \{a,b\}^*\}$ IS NOT A CFL

1. ASSUME L IS A CFL

2. PL GIVES YOU N

3. YOU CHOOSE $a^N b^N a^N b^N$

4. PL SPLITS $a^N b^N a^N b^N$ INTO $u^i v^j w^k x^l y^m$
WHERE $|u^i v^j w^k| \leq N$, $|x^l| > 0$

AND STATES $\forall l > 0 \ u^i v^j w^k x^l y^m \in L$

5. a) IF $u^i v^j w^k$ IS OVER a 'S ONLY
THEN SINCE $|u^i v^j w^k| \leq N$:
 $u^i v^j w^k$ CANNOT SPAN FROM ONE OF
THE a^N SUBSTRINGS TO OTHER,
AND SO FOR $i=0$, WE GET EITHER
 $a^{N-|x^l|} b^N a^N b^N \in L$ OR $a^N b^{N-|x^l|} a^N b^N \in L$
AND BOTH ARE NOT SO.

b) IF $u^i v^j w^k$ IS OVER b 'S ONLY, THE
SAME ARGUMENTS APPLY

c) IF $u^i v^j w^k$ SPANS a 'S AND b 'S THEN
THIS MUST BE WITHIN ONE OF
THE $a^N b^N$ OR $b^N a^N$ SUBSTRINGS
AS $|u^i v^j w^k| \leq N$. IF $i=0$ THEN WE
REDUCE SOME a 'S AND SOME b 'S, BUT NOT ALL,
WITHIN JUST ONE OF THE CONSECUTIVE
 a 'S AND b 'S, BUT NOT THE OTHER
AND, SO THE RESULTING STRING IS NOT
IN L