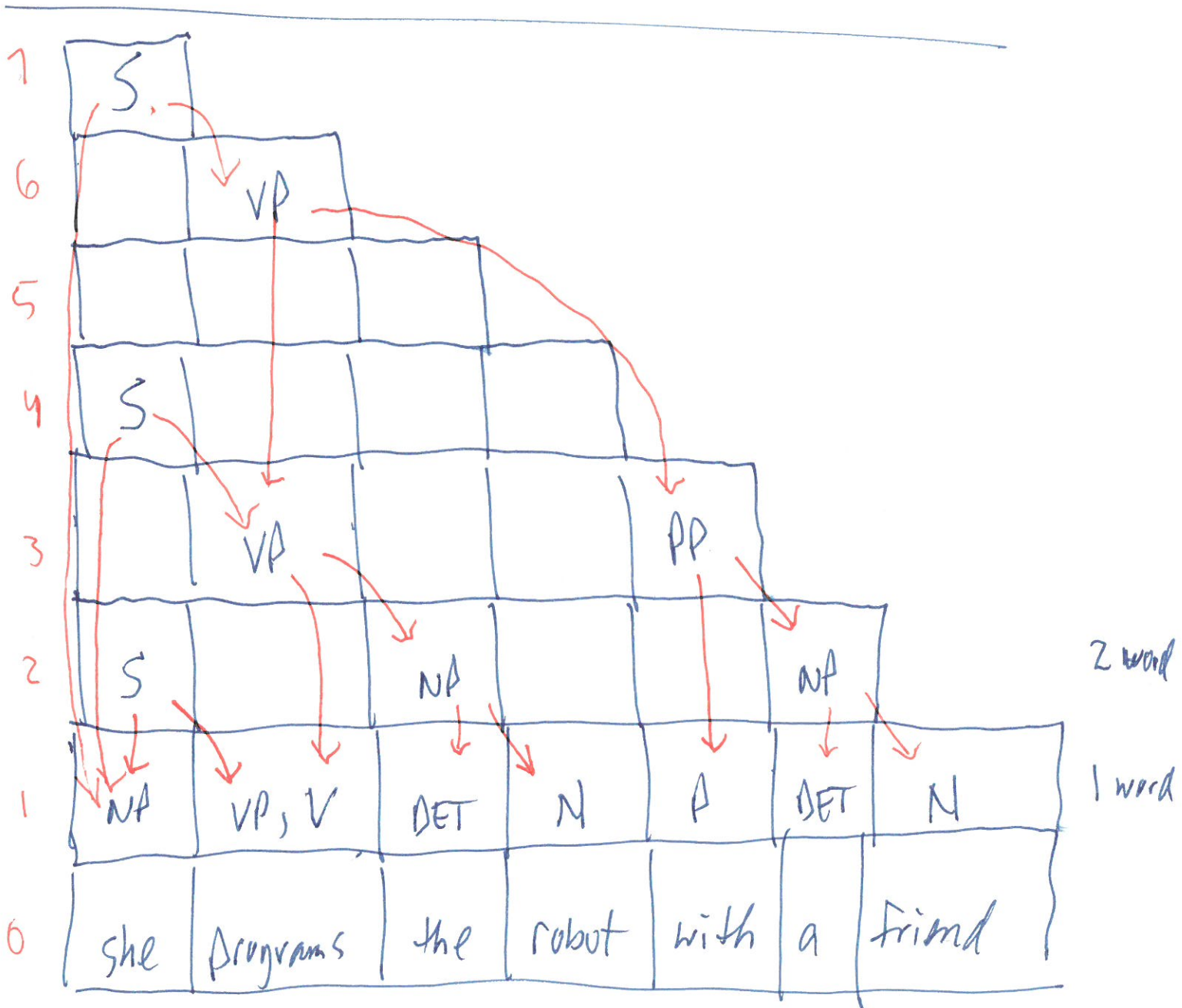


Partial
recursive
Fibonacci
tree



$S \rightarrow NP \quad VD$
 $\rightarrow she \quad VD$
 $\rightarrow she \quad VD \quad PP$
 $\rightarrow she \quad V \quad NP \quad PP$
 $\rightarrow she \quad programs \quad NP \quad PP$
 $\rightarrow \dots \quad DET \quad N \quad PP$
 $\rightarrow \dots \quad the \quad N \quad PP$
 $\rightarrow \dots \quad the \quad robot \quad PP$
 $\rightarrow \dots \quad A \quad NP$
 $\rightarrow \dots \quad with \quad NP$
 $\rightarrow \dots \quad with \quad DET \quad N$
 $\rightarrow \dots \quad with \quad the \quad N$
 $\rightarrow \dots \quad with \quad a \quad friend$

If k is the number of words in a sentence
 and the sentence can be produced using a grammar
 that is in Chomsky-Normal Form, the # of steps in the derivation
 is $2k - 1$