

$\{x \in \{a,b\}^+ \mid x \text{ has same \# of } a \text{ \& } b \text{ 's}\}$

$S \rightarrow aSb \mid bSa \mid \epsilon \mid SS$

derive abbbabaaaba



$S \Rightarrow SS \Rightarrow SSS \Rightarrow aSb SS \Rightarrow \underline{ab} SS$

$\Rightarrow ab bSa S \Rightarrow abbbSaa S \Rightarrow abbbabaa S$

$\Rightarrow \underline{abbbabaa} S \Rightarrow abbbabaa bSa$
 $\Rightarrow abbbabaaaba$

A real-world grammar

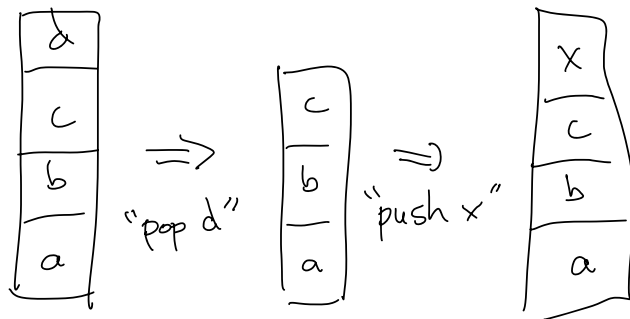
Python: `def square(x):`
 `y = x * x`
 `return y`

Stack Machines

A machine for accepting/rejecting strings.

It has rules for how it acts, and
memory stored in a stack

A stack is a data structure where we only
access the "top" element.



write:

dcba $\xrightarrow{\text{pop d}}$ cba $\xrightarrow{\text{push x}}$ xcba

A stack machine:

	<u>read</u>	<u>pop</u>	<u>push</u>	
1.	a	S	SX	← If we read a from the input string, we should pop S, then push SX.
2.	b	X	ε	
3.	ε	S	ε	

The stack always starts as just S.

A string is accepted if you can read the whole string, leaving the stack empty at the end.

aabb is accepted in this one.

	<u>read</u>	<u>pop</u>	<u>push</u>	<u>input</u>	<u>stack</u>	
				aabb	S	(start)
1.	a	S	SX	a abb	SX	#1
2.	b	X	ε	a a bb	SXX	#1
				a a b b	XX	#3
3.	ε	S	ε	a a b b	X	#2
				a a b b	ε	#2

We read the whole input, stack is empty, so aabb is accepted