

1.  $\setminus d\{3\} - \setminus d\{2\} - \setminus d\{4\}$

d) A social security number in the format xxx-xx-xxxx.

2.  $[a-z]\setminus d^*$

d) Any word containing only lowercase letters followed by optional digits.

3.  $\setminus d\{3\} - \setminus d\{3\} - \setminus d\{4\} | \setminus d\{10\}$

a) A SSN in the format xxx-xxx-xxxx or a 10-digit phone number.

4.  $[a-z]^+ ? [a-zA-Z]^+ ? [a-zA-Z]^+ \{2,3\}$

as few times as possible as few times as possible of followed by 2 or 3  
 $f$  (one or more  $[a-z]$ ) (one or more  $[a-zA-Z]$ )  $[a-zA-Z]$

ex.: wooyoung.jung@storybrake.edu

b) An email address.

5. grep cmd to search all .md files w/ negative integers,  $\{n | n \in \mathbb{Z}^-\}$

Step 1. construct regex to search neg. ints.

$[^-][0-9][0-9]^*$

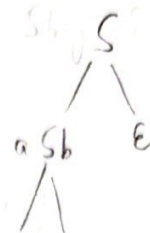
Step 2. research grep command

grep "str" \* ext  
 regex extension

$\therefore \Rightarrow$  grep " $[^-][0-9][0-9]^*$ " \* .md

6.  $G: S \rightarrow aSb | \epsilon$

~~X~~ The set of all strings that begin with a and end with b.



$ab \leftarrow \epsilon \xrightarrow{aSb} abab$   
 $\xrightarrow{aSb} ab$

$L(S) = \{ \epsilon, ab, aabb, aaabbb, \dots \}$

But, does not include strings such as  $a^n b^n | n \in \mathbb{Z}^+$   
 $\{ aab, abb, aabb, abbb, \dots \}$

B. Equal number of a's and b's:

$L(S) = \{ \epsilon, ab, aabb, \dots, a^n b^n | n \in \mathbb{Z}^+ \}$

it can be argued that  $\epsilon$  has zero a's and b's, equal number of a's and b's

~~X~~ Even number of a's and b's:  $\nearrow$  not an even number.

$L(S) = \{ \epsilon, ab, aabb, \dots, a^n b^n | 2 \cdot n \in \mathbb{Z}^+ \}$

it can be argued that zero is an even number.

D. The set of all strings that contain n 'a's followed by m 'b's s.t.  $n=m \geq 0$

$L(S) = \{ \epsilon, ab, aabb, \dots, a^n b^n | n=m \geq 0 \}$

D is true

$L(S) = \{ \epsilon, ab, aabb, aaabbb, \dots, a^n b^n | n \geq 0 \}$

7. G that generates all strings on

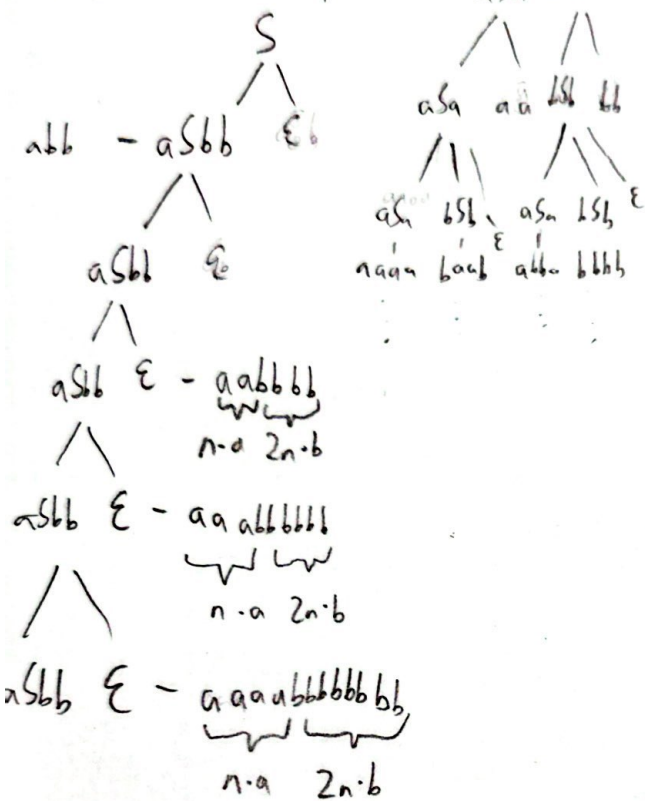
$\{a, b\}$  that start & end w/ the same symbol.

$L(S) = \{\epsilon, a, b, ab, ba, aab, aba, bba, bab, aaba, abba, bbaa, abab, baab, aabab, ababa, bbaab, bbaab, \dots\}$

$S ::= aAa | bAb | a | b$

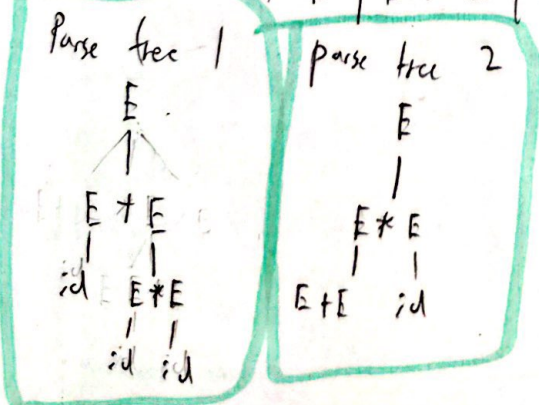
$A ::= aA | bA | \epsilon$

8.  $S ::= aSbb | \epsilon$



$L(S) = \{\epsilon, abb, aabbbb, a^2 a b^{10}, a^3 a b^{18}, \dots, a^n a b^{2n}\}$

9.  $E ::= E + E | E * E | id$



In this grammar, there are

two possible combinations of leaf nodes that a parse tree can have.

For the string  $id + id * id$ ,

both  $E + E$  and  $E * E$  can come first, which is then completed with either an  $E * E \rightarrow id * id$  or  $E + E \rightarrow id + id$ .

10.  $S ::= aAb$

$A ::= c | d$

String	Can be parsed (T/F)
acb	T
adb	T
adab	F
aab	F
ab	F

