

Peer feedback:

fill out feedback form

when finished, discuss w/ partner

give Lucy form + printed solution - they
will be scanned ^{right} after class and
put on canvas

Written HW logistics:

I will ask for resubmissions if :

- no citations
- no chat transcripts
- starting HW 2, probs not on
separate pages

Formal Languages and Regular Expressions

language = set of strings

ex $L = \{\text{String, array}\}$

$\{0, 1\}^*$

The set of all Python programs
that print "Hello, world!"

	language ?	length / size ?
\emptyset	yes	0
ϵ	no	$ \epsilon = 0$
$\{\epsilon\}$	yes	1

$L = \{ w \in \{0, 1\}^* : w \text{ has an even number of 1s} \}$

0101 $\in L$

00 $\in L$

$\epsilon \in L$ 1 $\notin L$

Familiar set operations

A, B languages

$$L = A \cup B$$

$$L = A \cap B$$

$$L = A \setminus B$$

New operations:

concatenation

$$L = A \bullet B = \{x \bullet y : x \in A \text{ and } y \in B\}$$

$$A = \{\text{black, blue}\}$$

$$B = \{\text{berry, fish}\}$$

$$A \bullet B = \{\text{blackberry, blueberry, black fish, blue fish}\}$$

$$|A \bullet B| = |A| \cdot |B|$$

$$|A|, |B|$$

$$\emptyset \bullet A = \{ \} \bullet \{\text{black, blue}\} = \emptyset$$

what language has property

$$B \bullet L = L \quad \text{for all } L?$$

$$B = \{ \epsilon \}$$

Ekleene Star

A^* = concatenation of any string in A

$w \in A^*$ if and only if $\left\{ \begin{array}{l} w = \epsilon \text{ or} \\ w = xy \text{ where} \\ x \in A \text{ and} \\ y \in A^* \end{array} \right.$

ex $A = \{ ba, bar \}$

ϵ

$w = \epsilon$

$\epsilon \in A^*$

$ba \in A^*$

$ba \cdot \epsilon$
↑ ↓
 ϵA ϵA^*

$baba \in A^*$

$ba \cdot ba$
↑ ↑
 ϵA ϵA^*

Regular expressions

$\{w\}$	w]	notation
$A \cup B$	$A + B$		
$A \cdot B$	AB		operations allowed
A^*	A^*		

$$L = \{0\} \cup (\{1\} \cdot \{0\}^*) = 0 + 10^*$$

10 ∉ L

$0 \in L$

10

|

$|E| = 1$

↑
precedence
rule