CompSci 162
Spring 2023 Lecture :
More Pumping Lemma Practice

Supplemental #2

$L_2 = \{a^{n^2} | n \geq 0\}$

Assume FSOC L_2 is regular. Let p be the pumping length.

Let $w = a^{p^2} \in L_2$. So $w = xyz$

$|xy| \leq p$ $|y| > 0$

// What if pump?

$w' = xyyz$ $|y| \leq p$ so $|xyyz| \leq p^2 + p < (p+1)^2$

$|xyz| + |y|$

but $> p^2$ $(|y| > 0)$

$w' \notin L_2$ $\rightarrow\leftarrow$

Supplemental #3

$L_3 = \{a^i b^k | i > k\}$

Assume ... let p be pumping length.

Let $w = a^p b^{p-1} \in L_3$ ... because ...

$|xy| \leq p$ and $|y| > 0$

xz is $p-1$ (or fewer) as then b^{p-1}

$xz \notin L_3$

Supplemental #4

$$\{a^{10^n} | n \geq 0\}$$

Supplemental #5

$$\{a^n b^n c^n | n \geq 0\}$$

Supplemental #6

Let L_6 be the the set of odd-length strings in which the first, middle, and last symbols are the same.

Assume FSOC L_6 is regular. Let p be the pumping length. Let $w = b a^p b a^p b$

$|xy| \leq p$ and $|y| > 0$

If $|x| \neq 0$, $xyyz$ "shifts the middle" $\notin L_6$ →←

If $|x| = 0$, $y = ba^*$ (at most $p-1$ as), set $i=0$ and xz starts a ends b $\notin L_6$ →←

Challenge

The set of odd-length strings where the middle symbol also appears elsewhere in the string.