Template: The Pumping Lemma for Regular Languages

Sigrid Ewert

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Consider the language
$$\mathcal{L} = \{\ldots\} \ .$$
We want to prove that $\mathcal{L}$ is not regular.

Suppose $\mathcal{L}$ is regular. According to the pumping lemma for regular languages, there exists an n such that for every $x \in \mathcal{L}$ with $|x| \geq n$, x can be written uvw for some u, v and w with $|uv| \leq n$, $|v| > 0$, and for any $m \geq 0$, $uv^m w \in \mathcal{L}$.

Let n be the integer in the statement of the pumping lemma.

Choose x so that $|x| \geq n$.

Complete the proof.

$x =$＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿ .

Then $uv =$＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿ .

This implies that $w =$＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿ .

Moreover, $v =$＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿ .

According to the lemma, $uv^m w \in \mathcal{L}$ for every $m \geq 0$.
Consider

$$
\begin{aligned}
uv^m w \ &= \ \ldots \\
&= \ \ldots \\
&= \ \ldots
\end{aligned}
$$

For $m =$ _____ , $uv^m w \notin \mathcal{L}$,

since _____

_____

This contradicts the lemma, therefore our assumption that $\mathcal{L}$ is regular is wrong.

8 mark(s)