Automata Theory, Languages, and Computation

Name: _____ Date: _____

Note: The purpose of the following questions is:

• *Enhance learning*	• *Summarized points*	• *Analyze abstract ideas*

Class 14: Pumping Lemma Examples

This pumping lemma is useful in showing that a language does not belong to the family of context-free languages. Its application is typical of pumping lemmas in general; they are used negatively to show that a given language doesn't belong to some family.

The Pumping Lemma:

For infinite context-free language L

there exists an integer m such that

for any string $w \in L, \quad |w| \geq m$

we can write $w = uvxyz$

with lengths $|vxy| \leq m$ and $|vy| \geq 1$

and it must be:

$$uv^i xy^i z \in L, \quad \text{for all } i \geq 0$$

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More Applications of the Pumping Lemma

1. Show that the language

$$L = \{vv: v \in \{a,b\}^*\}$$

is not context-free

2. Show that the language

$$L = \{a^{n!} : n \geq 0\}$$

is not context-free

3. Show that the language

$$L = \{a^{n^2} b^n : n \geq 0\}$$

is not context-free