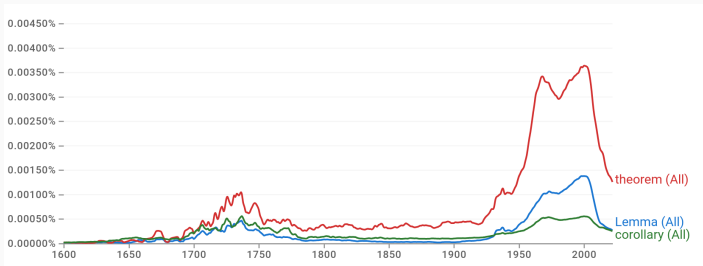


Games, graphs, and machines



September 30, 2025

Pumping lemma 1

Use the pumping lemma to show that $L = \{0^n 1^n \mid n \geq 0\}$ is not regular.

How to think about the pumping lemma?

Machine I can recognise L .

You How many states do you have?

Machine 212

You What would you do to $0^{300}1^{300}$?

Machine Accept, obviously.

You And as you are reading that, you loop in the first 212 bits?

Machine Of course.

You If you double that loop, do you still accept?

Machine Yes, I guess.

You Checkmate!

Pumping lemma 2

Use the pumping lemma to show that $L = \{\text{Palindrome}\}$ is not regular.

Pumping lemma 3

Use the pumping lemma to show that $L = \{0^n 1^m \mid n \geq m\}$ is not regular.

Pumping lemma 4

Use the pumping lemma to show that $L = \{ww \mid w \text{ any string}\}$ is not regular.