# Lecture #9: Nonregular Languages, Part Two
# What Will Happen During the Lecture

## Review

The lecture presentation will begin with a ***brief*** review of the material in the preparatory video and documents for this lecture — and students will have the chance to ask questions about this.

## Problems To Be Solved

1. Let $\Sigma = \{\mathtt{a}, \mathtt{b}\}$. Using one or more the ***closure properties*** for regular languages, that have now been discussed in class, we will show that the language

   $$L = \{\omega \in \Sigma^\star \mid \text{the number of } \mathtt{a}\text{'s in } \omega \text{ is equal to the number of } \mathtt{b}\text{'s in } \omega\} \subseteq \Sigma^\star$$

   is not a regular language.

2. In order to have *another* closure property that can be used to prove that languages are not regular, we will prove the following: For every alphabet $\Sigma$ and for languages $L_1, L_2 \subseteq \Sigma^\star$, if $L_1$ is a regular language and $L_2$ is a regular language then their ***intersection***, $L_1 \cap L_2$, is also a regular language.

3. It there is time then the above closure property will be used to provide a *different* proof that the language $L$, introduced in Problem #1, is not a regular language.