Lecture #1: Welcome to CPSC 351!
Lecture Presentation

Review of Preparatory Material

Suggestion: Use this page to note things that you would like to ask the instructor or a teaching assistant about, during or after the lecture presentation.

Course Learning Goals, Topics, and Organization

Review of Material from Discrete Mathematics

Alphabets, Strings and Languages

A Problem To Be Solved

Let $\Sigma = \{\mathtt{a}, \mathtt{b}\}$. Suppose that $L_0, L_1, L_2 \subseteq \Sigma^\star$, and that these languages satisfy the following properties.

(a) $\lambda \in L_0$, $\lambda \notin L_1$, and $\lambda \notin L_2$.

(b) For every string $\omega \in \Sigma^\star$ such that $\omega \in L_0$, $\omega \cdot \mathtt{a} \in L_1$, $\omega \cdot \mathtt{a} \notin L_0$, and $\omega \cdot \mathtt{a} \notin L_2$.

(c) For every string $\omega \in \Sigma^\star$ such that $\omega \in L_0$, $\omega \cdot \mathtt{b} \in L_0$, $\omega \cdot \mathtt{b} \notin L_1$, and $\omega \cdot \mathtt{b} \notin L_2$.

(d) For every string $\omega \in \Sigma^\star$ such that $\omega \in L_1$, $\omega \cdot \mathtt{a} \in L_2$, $\omega \cdot \mathtt{a} \notin L_0$, and $\omega \cdot \mathtt{a} \notin L_1$.

(e) For every string $\omega \in \Sigma^\star$ such that $\omega \in L_1$, $\omega \cdot \mathtt{b} \in L_1$, $\omega \cdot \mathtt{b} \notin L_0$, and $\omega \cdot \mathtt{b} \notin L_2$.

(f) For every string $\omega \in \Sigma^\star$ such that $\omega \in L_2$, $\omega \cdot \mathtt{a} \in L_0$, $\omega \cdot \mathtt{a} \notin L_1$, and $\omega \cdot \mathtt{a} \notin L_2$.

(g) For every string $\omega \in \Sigma^\star$ such that $\omega \in L_2$, $\omega \cdot \mathtt{b} \in L_2$, $\omega \cdot \mathtt{b} \notin L_0$, and $\omega \cdot \mathtt{b} \notin L_1$.

One Claim To Try To Prove

Claim 1. *Let Σ and L_0 be as given above. Then, for every string $\omega \in \Sigma^\star$, $\omega \in L_0$ if and only if the number of copies of "$\mathtt{a}$" in ω is divisible by 3.*

Choosing a Proof Technique:

How a Proof Would Start:

What Happens After This?

Another Proof To Try To Prove

Claim 2. *Let Σ, L_0, L_1 and L_2 be as given above. Then the following properties are satisfied.*

(a) For every string $\omega \in \Sigma^\star$, $\omega \in L_0$ if and only if the number of copies of "$\mathtt{a}$" in ω is divisible by 3. In other words, *$\omega \in L_0$ if and only if the number of copies of "$\mathtt{a}$" in ω is congruent to 0 modulo 3.*

(b) For every string $\omega \in \Sigma^\star$, $\omega \in L_1$ if and only if the number of copies of "$\mathtt{a}$" in ω is congruent to 1 modulo 3.

(c) For every string $\omega \in \Sigma^\star$, $\omega \in L_2$ if and only if the number of copies of "$\mathtt{a}$" in ω is congruent to 2 modulo 3.

Choosing a Proof Technique:

How a Proof Would Start:

What Happens After This?

OK. The Proof Can Be Completed. What Do We Do Next?

How Do I Assess My Work?

How Can I Keep This Organized?