

# CS 360 Assignment 3

**Due Date** Tuesday, March 16th, at the beginning of class.

All questions are worth the same amount. Please ensure that your name and student number appear, in ink, on each page of your assignment.

Work is to be done individually.

## Assignment Questions

1. Design a PDA that accepts the set of strings over  $\{a, b\}$  such that the number of  $b$ 's equals twice the number of  $a$ 's. Prove that the PDA accepts exactly that language.
2. Show that the following is a context free language:  $\{a^i b^j c^k \mid i = 2j \text{ or } j = 2k\}$ .
3. Construct a PDA that accepts the same language as the following grammar:  $S \rightarrow aAA, A \rightarrow aS \mid bS \mid a$ .
4. Show that  $\{a^i b^j c^k \mid 0 \leq i \leq j \leq k\}$  is not context free.
5. Let  $A, B \subseteq \Sigma^*$ . Define  $A \diamond B = \{xy \mid x \in A, y \in B \text{ and the length of } x = \text{the length of } y\}$ . Show that if  $A$  and  $B$  are regular then  $A \diamond B$  is context free.