

CPSC 351 — Tutorial Exercise #12

Many-One Reductions I

These questions are intended to give you practice in establishing **many-one reductions** between languages. They are of the difficulty, and length, that would be appropriate for a question on a **test** in CPSC 351.

Problems To Be Solved

1. Let $A, B \subseteq \Sigma^*$ for $\Sigma = \{a, b, c\}$, and let $x_{\text{Yes}}, x_{\text{No}} \in \Sigma^*$, such that the following properties are satisfied.
 - (i) $B = \{\mu \in \Sigma^* \mid \mu \in A \text{ and } \mu \text{ ends with "c"}\}$.
 - (ii) B is **unrecognizable**.
 - (iii) $x_{\text{Yes}} \in A$ and $x_{\text{No}} \notin A$.

Give a **many-one reduction** to show that A is **unrecognizable** as well.

2. Let $L_1, L_2 \subseteq \Sigma^*$ for an alphabet Σ and let $x_{\text{yes}}, x_{\text{no}} \in \Sigma^*$ such that the following properties are satisfied.
 - (i) The language $L_1 \cup L_2$ is **undecidable**.
 - (ii) The language L_2 is **decidable**.
 - (iii) $x_{\text{yes}} \in L_1$ and $x_{\text{no}} \notin L_1$.

Give a **many-one reduction** to show that L_1 is undecidable as well.