Prework 5.2a: The Post Correspondence Problem

Write your preliminary solutions to each problem on this sheet of paper (front and back). Use additional sheets if necessary. The names in brackets indicate the subset responsible for presenting the problem.

1. [Ryley, Sam, Tristan] Find a match in the following instance of the Post Correspondence Problem.

$$\left\{\left[\frac{\texttt{ab}}{\texttt{abab}}\right],\left[\frac{\texttt{b}}{\texttt{a}}\right],\left[\frac{\texttt{aba}}{\texttt{b}}\right],\left[\frac{\texttt{aa}}{\texttt{a}}\right]\right\}$$

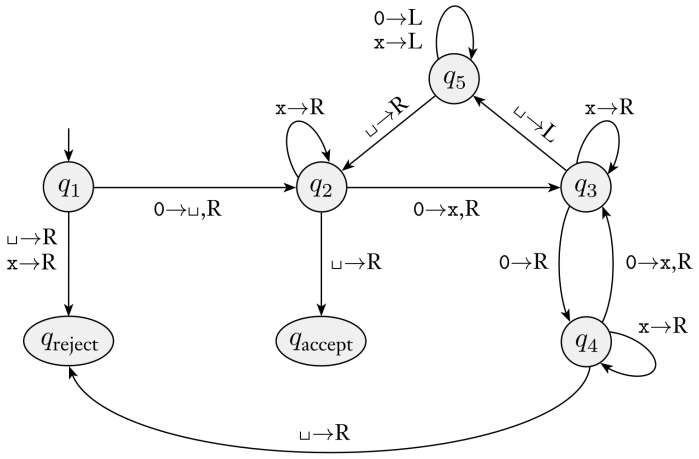
2. How could you decide the Post Correspondence Problem if you knew that every domino had the same number of symbols on the top as on the bottom?

3. [James, Trevor, Drake] On pages 230–232, an instance of the Post Correspondence Problem is shown to verify a computation history using the following sequence of tiles, interspersed with tiles of the form $\left[\frac{a}{a}\right]$:

$$\left[\frac{\#}{\#q_0\texttt{01000}\#}\right],\left[\frac{q_0\texttt{0}}{\texttt{2}q_7}\right],\left[\frac{q_7\texttt{1}}{\texttt{0}q_5}\right],\left[\frac{\texttt{0}q_5\texttt{0}}{q_9\texttt{02}}\right]$$

   Let's assume that $q_9 = q_{\text{accept}}$. Give the sequence of tiles that finishes off the PCP (i.e., the sequence refered to on page 232 where it says, "The tiles we have just added …"). Then draw a state diagram for the path that the TM follows on the whole computation history.

4. [Wesley, Sophia, Carolyn] Consider the following Turing Machine. On input 00, this TM accepts. Determine the dominos needed for the PCP for this accepting computation history. List the dominos (excluding those of the form $\left[\frac{a}{a}\right]$), and draw a diagram with diagonal lines (like the diagrams on pp. 230–232) showing the correspondence.



BEGIN YOUR SOLUTIONS BELOW THIS LINE