EXERCISE 2:

1. Synchronous System

You are running a collection of processes \( p_1, p_2, ..., p_N \). Each process \( p_i \) contains a variable \( v_i \). You wish to determine whether all the variables \( v_1, v_2, ..., v_N \) were ever equal in the course of the execution.

- Your processes run in a synchronous system. You use a monitor process to determine whether the variables were ever equal. When should the application processes communicate with the monitor process, and what should their messages contain?
- Explain the statement \( \text{possibly}(v_1 = v_2 = ... = v_N) \). How can you determine whether this statement is true of your execution?

2. Global States for the Execution

The figure above shows events occurring for each of two processes, \( p_1 \) and \( p_2 \). Arrows between processes denote message transmission. Draw and label the lattice of consistent states \( (p_1 - \text{state}, p_2 - \text{state}) \), beginning with the initial state \((0, 0)\).