Today’s Plan

Upcoming:
- Quiz #2 today!
- Assignment 1

Last time:
- The critical section problem
- Conditions for a solution

Today’s topics:
- From last time:
  - Software Solutions to the Critical Section Problem
  - A Hardware Solution to the Critical Section Problem
- Semaphores
Semaphores are used to synchronize the actions of processes.

Both P and V are atomic.

P(S) blocks the calling process if S <= 0, once unblocked it decrements S.

V(S) increments S. If S > 0 then one process blocked on P(S) becomes unblocked.
Semaphores

\[ P(S) : \]

\[ V(S) : \]
Semaphores

- The value of a semaphore is the "memory" of the difference between the number of V's and P's called.
- e.g. 1 - critical sections:
  - (Initially, S = 1)
Semaphores

- e.g. 2 - process synchronization (want S1 to complete before S2 begins)
  - (Initially, $S = 0$)