Assignment 1

This assignment consists of 2 problems, and should be handed in at the latest by Friday, Jan. 30.

Problem 1  In the below figures you find three suggestions for action systems that are intended to implement mutual exclusion between two processes. In all action systems, locations $l_1$ and $m_1$ are intended to represent the section of a process which is not interested in the critical section, locations $l_2$ and $m_2$ are intended to represent the section where the process is interested in entering the critical section, and locations $l_3$ and $m_3$ represent the critical sections themselves. The purpose of a mutual exclusion algorithm is to ensure that

1. At most one process is in its critical section at any time
2. A process that intends to enter its critical section should be allowed to do so eventually, or after some reasonable waiting time

For each of the action systems you should determine how well it satisfies these two criteria. You are also welcome to criticize some of the solutions on other grounds, and possibly improve them (this last part is not required).

Action System *mutex1*

```plaintext
declare s : integer
initially s = 1

l_1
|--|--
|  |  |
s := s + 1

l_3

s ≥ 1 → s := s - 1

l_2

m_1

|--|--
|  |  |
s := s + 1

m_3

s ≥ 1 → s := s - 1

m_2
```

end
**Action System** mutex2

declare $y_1, y_2 : \text{integer}$

initially $y_1 = y_2 = 0$

end

**Action System** mutex3

declare $t : \text{integer}$

initially $t = 1$

end

**Problem 2.** Construct the transition system corresponding to the action system mutex2 in the previous problem.