T-106.420 Concurrent programming
Example solution for homework assignment 2

1. (a) The average of the array $x[0...N-1]$, $N \geq 1$, is m:
   $m = (\Sigma i : 0 \leq i < N : x[i])/N$

   (b) The segment of the array x that is between indices p and $q-1$ inclusive contains only zeroes:
   $(\forall i : p \leq i < q : x[i] = 0)$

   (c) The index of the minimum value of the array $x[0...N]$, $N \geq 0$, is i:
   $0 \leq i \leq N \wedge (\forall j : 0 \leq j \leq N : x[i] \leq x[j])$

   (d) The value of each element in array $x[0...N]$, $N \geq 1$, is unique (within the array):
   $(\forall i, j : 0 \leq i, j \leq N : x[i] = x[j] \Rightarrow i = j)$
   Or, equivalently:
   $(\forall i, j : 0 \leq i, j \leq N : i \neq j \Rightarrow x[i] \neq x[j])$

2. (a) The solution does not work. For example one process flips the lock to 1 and enters the critical section. The other process flips the lock to 0 and enters the inner loop. Lock is 0, so go back and flip again to 1, and enter critical section.

   (b) This solution works. One process flips the lock to 1 and enters the critical section. The other process flips the lock to 2 and spins in the inner loop until lock $==$ 0, which happens when the first process exits the critical section.
   The solution works, but is not fair.