Coursework 2
Part 1

range N = 1..4
set Students = {a,b,c,d}

STUDENT = (arrive --> handOut --> fillIn --> handIn -->
leave --> STUDENT).

JJ = (handOut --> handIn --> JJ).

||OFFICE = (Students:STUDENT || Students::JJ).
Part 2(a)

range N = 1..4
set Students = {a,b,c,d}
STUDENT = (arrive -> handOut -> fillIn -> handIn ->
leave -> STUDENT).
JJ = (handOut -> handIn -> JJ).
||OFFICE = (Students:STUDENT || Students::JJ).
progress A = {a.handIn}
progress B = {b.handIn}
progress C = {c.handIn}
progress D = {d.handIn}
Part 2 (b)

range N = 1..4
set Students = \{a,b,c,d\}

DOOR = NEXT[1],
NEXT[n:N] = (arrive[n] -> NEXT[n%4+1]).


JJ = JJ[1],
JJ[n:N] = (handOut[n] -> handIn[n] -> JJ[n%4+1]).

||OFFICE = (Students:STUDENT || Students::DOOR || Students::JJ).
Part 2(b): Safety Properties

property ARRIVE_ORDER = ARRIVE_ORDER[1],
ARRIVE_ORDER[n:N] = (arrive[n] -> ARRIVE_ORDER[n%S+1]).

property HANDIN_ORDER = HANDIN_ORDER[1],
HANDIN_ORDER[n:N] = (handIn[n] -> HANDIN_ORDER[n%S+1]).

property SAME_ORDER = (arrive[n:N] -> handIn[n] ->
                        SAME_ORDER).

||ALL_ORDER = (Students::ARRIVE_ORDER ||
               Students::HANDIN_ORDER || Students::SAME_ORDER).

||CHECKED_OFFICE = (OFFICE || ALL_ORDER).
Part 2b (alternative)

// students get to hand in in the order that they queued.
property SAFE = SAFE[0][0][0][0]
SAFE[w:Q][x:Q][y:Q][z:Q] = ( when(z==0) student[s:ID].queue ->
  if(w==0) then SAFE[s][0][0][0] else
  if(x==0) then SAFE[w][s][0][0] else
  if(y==0) then SAFE[w][x][s][0] else
    SAFE[w][x][y][s] |
  when(w!=0) student[w].handin -> SAFE[x][y][z][0] ).
Part 4, JJ and Patricia

const S = 4
range N = 1..S
set Staff = {jj, pat}

DOOR = NEXT[1],
NEXT[n:N] = ([n].arrive -> NEXT[n%S+1]).

STUDENT = (arrive -> choose -> [s:Staff].handOut -> chosen -> fillIn ->
[s].handIn -> leave -> STUDENT).

STAFF = (handOut -> handIn -> STAFF).

LEAVE_QUEUE = CHOICE[1],
CHOICE[n:N] = ([n].choose -> [n].chosen -> CHOICE[n%S+1]).

||OFFICE = ([N]:STUDENT || DOOR || LEAVE_QUEUE || [N]::Staff:STAFF).