Computationele logica

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Exercise 1

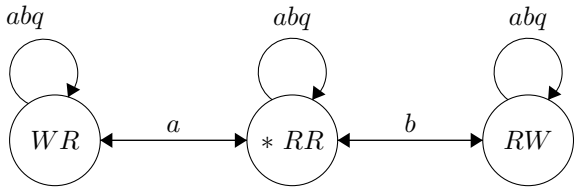
1. The sentence θ encoding all information:

   The Queen knows the following:
   Alice knows Bob has a red hat. Alice knows Bob doesn't know it, and she knows the Queen knows this. Alice doesn't know her own hat.
   Bob knows Alice has a red hat. Bob knows Alice doesn't know it, and he knows the Queen knows this. Bob doesn't know his own hat.

   $\theta = K_q(K_a(r_b \wedge \neg K_b(r_b \vee w_b) \wedge K_q((r_a \vee r_w) \wedge (r_b \vee r_w))) \wedge \neg K_a(r_a \vee w_a) \wedge K_b(r_a \wedge \neg K_a(r_a \vee w_a) \wedge K_q((r_a \vee r_w) \wedge (r_b \vee r_w))) \wedge \neg K_b(r_b \vee w_b))$

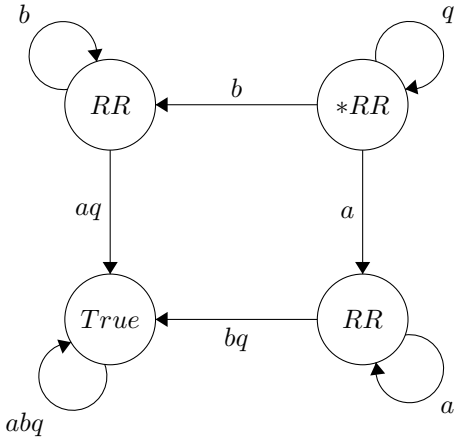
2. A representation of the situation model **M**:

   $\mathcal{A}$ = {a, b, q} the agents Alice, Bob, and the Queen
   $\Phi = \{r_a, w_a, r_b, w_b\}$ written as WR for: a is white and b is red



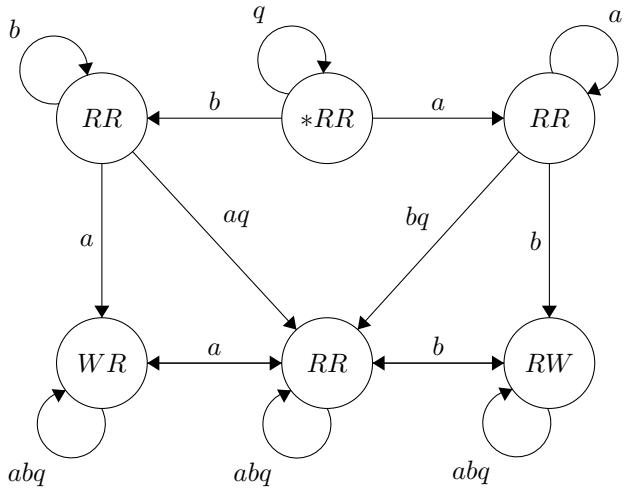
   This is an epistemic model: YES

3. Seperately a and b look in their mirrors and see their red hats, the queen sees everything, represented in the event model Σ with four actions:



This is an epistemic model: NO
This is a doxasic model: YES

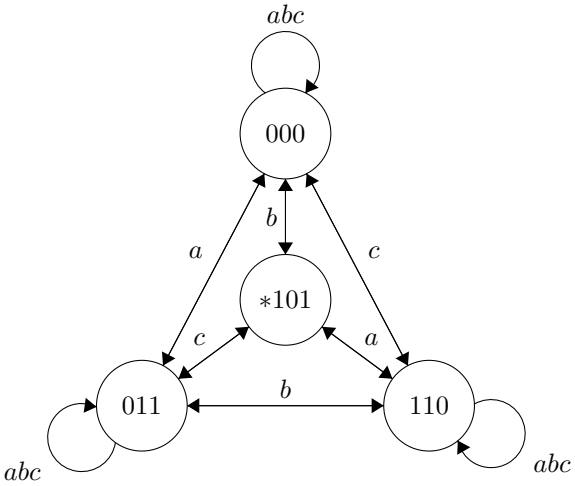
4. The update product of the two models $\mathbf{M} \bigotimes \Sigma$:



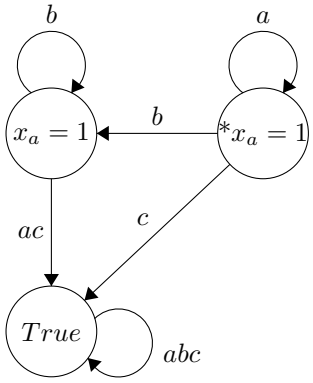
This is an epistemic model: NO
This is a doxasic model: YES

Exercise 2

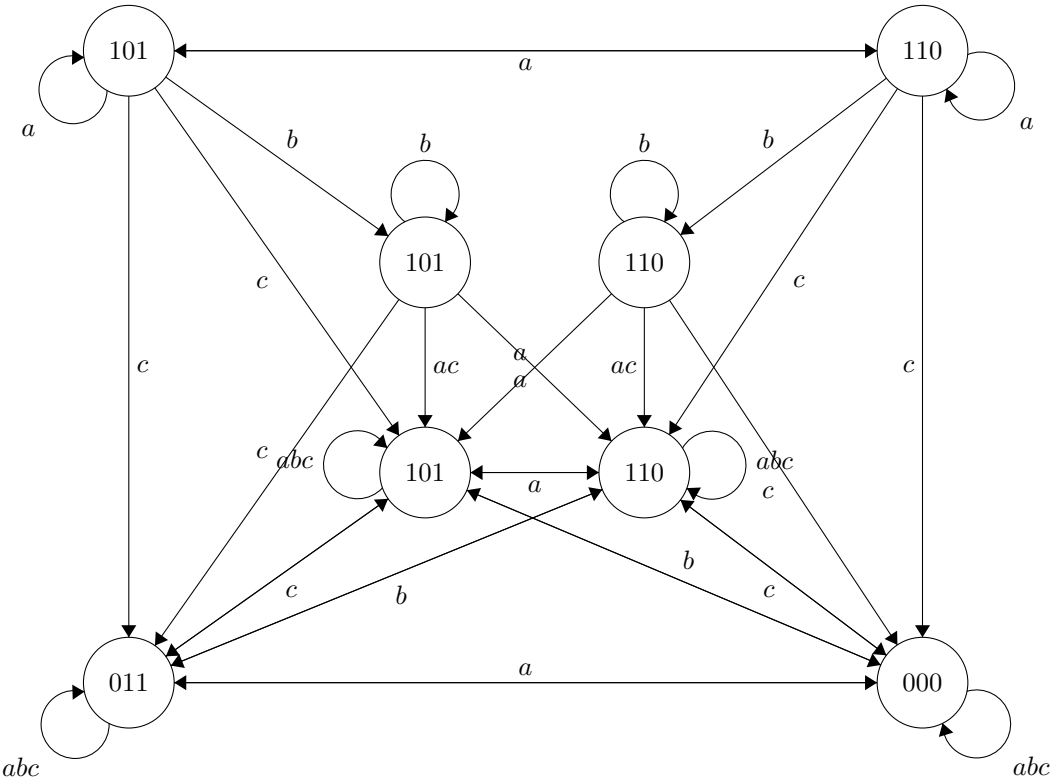
1. Representation of the bits world as an epistemic model **M**:



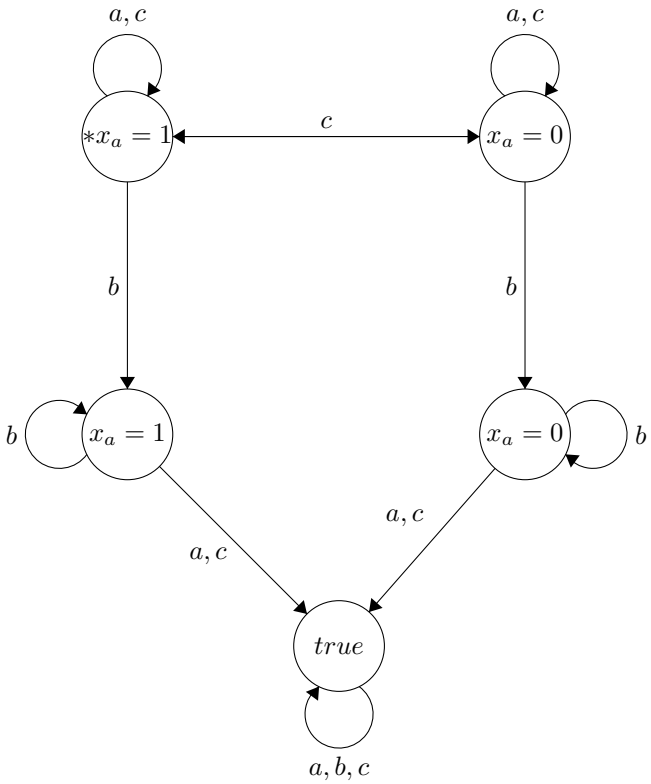
2. Representation of event model Σ:



3. Representation of model **M'**:



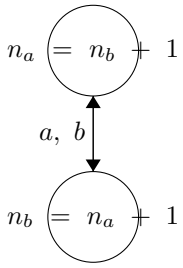
4. Representation of event model Σ**'**:



5. The update product of the two models **M"** = **M** $\bigotimes$ **Σ'** :

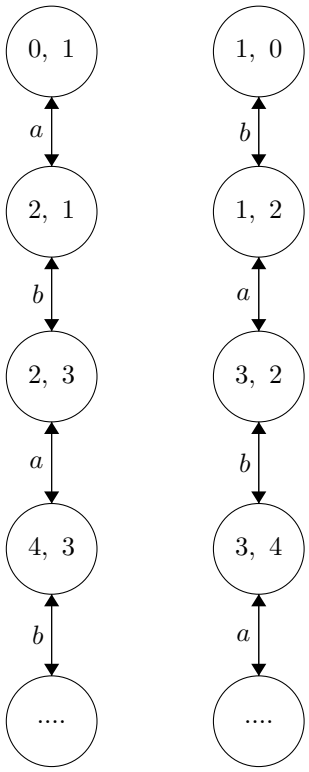
Exercise 3

1. *How many possible worlds* are there (that are consistent with the story above)?



2. Represent (draw) the above situation as an epistemic model M1, with two agents (a for Alice, b for Bob), using pairs of numbers (na,nb) as "names"

for the possible worlds. Draw the epistemic accessibility relations for each agent. but do not worry about the valuation (yet), since no atomic sentences are given yet.



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