FSD Assessment 1

1a) Denote an Ace in the hand by A, and a King in the hand by K. Then we have:

$((K \Rightarrow A) \land \neg(\neg K \Rightarrow A)) \lor (\neg(K \Rightarrow A) \land (\neg K \Rightarrow A))$

$\equiv ((\neg K \lor A) \land \neg(K \lor A)) \lor (\neg(\neg K \lor A) \land (K \lor A))$ By "$\Rightarrow$" equivalence

$\equiv ((\neg K \lor A) \land (\neg K \land \neg A)) \lor ((K \land \neg A) \land (K \lor A))$ By De Morgan's Law

$\equiv ((\neg K \land \neg A)) \lor ((K \land \neg A))$ By Identity

$\equiv \neg A \land (K \lor \neg K)$ By Distributivity

$\equiv \neg A$ By Identity

So statement 4 must follow

1b) $[nn, ii := nn + ss(ii), ii+1](nn = \Sigma xx \cdot (xx \in [ii-1] \mid ss(xx)))$

$= (nn + ss(ii) = \Sigma xx . (xx \in [ii] \mid ss(xx))$

$= (nn := \Sigma xx . (xx \in [ii-1] \mid ss(xx)))$

After the substitution the state hasn't changed. This arises for any condition in the invariant.