

COM3028 Systems Verification

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1. $\llbracket AF AG(p \vee q) \rrbracket_{M1}$

$SAT_{AF}(AG(p \vee q))$

$SAT_{AF}(SAT_{AG}(p \vee q))$

$SAT_{AF}(SAT_{AG}(SAT(p) \cup SAT(q)))$

$SAT_{AF}(SAT_{AG}(\{S_0, S_2\} \cup \{S_3\}))$

$SAT_{AF}(SAT_{AG}(\{S_0, S_2, S_3\}))$

$SAT_{AF}(\neg SAT_{EF}(\neg\{S_0, S_2, S_3\}))$

$SAT_{AF}(\neg SAT_{EF}(\{S_1\}))$

$SAT_{AF}(\neg SAT_E(\top \cup \{S_1\}))$

$SAT_{AF}(\neg\{S_0, S_1, S_2, S_3\})$

$SAT_{AF}(\emptyset)$

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This model does not satisfy $AF AG(p \vee q)$

2. TODO

3. (a) This Dafny code iterates through a list and ensures that each item is not equal to the item in position 0

The loop invariant ensures that all items in a position greater than 0 and less than the current index do not equal the item in position 0.

- (b) This Dafny code iterates through a list and ensures that the current item does not appear in the subsequent indexes in the list.

The outer loop invariant ensures that all items less than the current index do not have a duplicate anywhere in the list.

The inner loop invariant ensures that there are no duplicates of the current item in a position greater than the outer loop index and less than the inner loop index.

- (c) This method is very similar to the answer to (b) it iterates through the column in position 0 of the array in the same way, ensuring that each item does not have a duplicate in a position greater than its own in the list.

The outer loop invariant ensures that all items less than the current index do not have a duplicate anywhere else in the list.

The inner loop invariant ensures there are no duplicates of the current item in a position greater than the current item and less than the inner loop index.

- (d) This method contains 3 loops nested within each other, the first iterates through either the row or column, for each column or row it checks that each item is not repeated in a higher position in the row or column.