

## Tutorial 14

### Exercise 1

Use Iben to check whether the two circuits on page 30 (Figure 19) in the note "An Introduction to Binary Decision Diagrams" are equivalent or not.

### Exercise 2

Use Iben to find (the number of) solutions to Sudoku with the following initial configurations (find boolean encoding of Sudoku on the home-page under Lecture 15):

1. The diagonal holds the numbers 1, 2, 3 and 4;
2. The first row holds the numbers 1, 2, 3 and 4;
3. The corners hold the numbers 1, 2, 3 and 4;
4. The diagonal holds the numbers 1, 1, 1 and 1.

Using Iben find an initial configuration with exactly one solution and being as small as possible.

### Exercise 3

Per, Kristian, Ole and Jens are to hold an Xmas-party. Unfortunately, they are almost out of money which severely limits the amount of beer at the party. In fact, they have to make do with 1 Tuborg, 1 Carlsberg, 1 Xmas (a Danish Xmas beer), and one Carls Special. However, the four guys have individual requirements which must be fulfilled at all costs. In particular, Per only drinks Tuborg and Carlsberg; Kristian only drinks Carlsberg and Xmas; Ole essentially drinks everything except Xmas, and Jens can only drink Carlsberg and Carls Special. Is it possible to plan the party drinking so that they all get something to drink? Of course you should use Iben to help them.

### Exercise 4

Consider a transition system with states  $A$ ,  $B$ ,  $C$  and  $D$  with no labels on the edges such that  $A \rightarrow B$ ,  $B \rightarrow C$ ,  $C \rightarrow B$ ,  $C \rightarrow C$ ,  $D \rightarrow B$  and  $D \rightarrow C$ . Represent the transition system as a boolean function and use Iben to compute the set of all reachable states from the initial state  $A$ .