

Exercise 1 Consider the following logic program P :

$$\begin{aligned} \text{fly}(X) &\leftarrow \text{bird}(X), \sim \neg \text{fly}(X) \\ \neg \text{fly}(X) &\leftarrow \text{penguin}(X) \\ \text{bird}(X) &\leftarrow \text{penguin}(X) \\ \text{bird}(\text{skippy}) &\leftarrow \\ \text{penguin}(\text{tweety}) &\leftarrow \end{aligned}$$

Check if the following interpretations are stable models of P :

1. $\{\text{bird}(\text{skippy}), \text{penguin}(\text{tweety}), \text{bird}(\text{tweety}), \text{fly}(\text{skippy}), \neg \text{fly}(\text{tweety})\}$
2. $\{\text{bird}(\text{skippy}), \text{penguin}(\text{tweety}), \text{bird}(\text{tweety}), \neg \text{fly}(\text{skippy}), \text{fly}(\text{tweety})\}$

Exercise 2 Compute all stable models of the following logic program P :

$$\begin{aligned} a &\leftarrow \\ b &\leftarrow \sim c \\ c &\leftarrow \sim b, \sim d \\ d &\leftarrow c \end{aligned}$$

Exercise 3 A small new state has been founded in Europe. A passionate debate about its national flag results in the following consensus:

1. The flag consists of three horizontal stripes, and the only acceptable colours for these stripes are white, green, red and blue.
2. The combination of these colours is subject to strict conditions. Most importantly, no colour may be used for more than one stripe.
3. It is impossible to use both white and green in the flag.
4. If green appears in the flag, then the upper stripe must be blue.
5. The flag may have a red stripe, but only if it also has a white stripe.
6. If the colour white is used, then the lower stripe must not be blue.
7. If the colour blue is used, then the upper stripe must not be red.

The flag committee receives three different design proposals, all of which comply with the requirements. One of them is finally accepted. The other two have suggested the same colour for the lower stripe.

What will be the colours of the new national flag?

Exercise 4 Place eight chess towers on an 8×8 chessboard so that no two towers attack each other. Thus, a solution requires that no two towers share the same row or column.