Applied Logic 2ITX0, 2021/2022

Assignment 1

General information

This assignment should be done individually and counts for 10 %.

You should upload in ANS, `https://secure.ans-delft.nl/`, no later than 23:59 on Friday, December 3, 2021, the following files:

- A report in pdf containing the motivated answers to the problem,
- a text file `inp.txt` containing the input for Z3 giving the result, and
- a text file `outp.txt` containing the corresponding Z3 output.

Important: The documents should contain your name and student number on top.

The problem

Six trucks have to deliver pallets of obscure building blocks to a magic factory. Every truck has a capacity of 8000 kg and can carry at most eight pallets. In total, the following has to be delivered:

- Four pallets of nuzzles, each of weight 800 kg.
- A number of pallets of prittles, each of weight 1300 kg.
- Eight pallets of skipples, each of weight 1000 kg.
- Eight pallets of crottles, each of weight 1500 kg.
- Twelve pallets of dupples, each of weight 400 kg.

Skipples need to be cooled; only two of the six trucks have the facility for cooling skipples.

Nuzzles are very valuable; to distribute the risk of loss no two pallets of nuzzles may be in the same truck.

There is one more extra requirement that is not the same for every one and is based on your student number (to be included on top of your document).

(a) If your student number ends in 0 or 1 then it is given that prittles and nuzzles are an explosive combination: they are not allowed to be put in the same truck.

(b) If your student number ends in 2 or 3 then it is given that prittles and crottles are an explosive combination: they are not allowed to be put in the same truck.

(c) If your student number ends in 4 or 5 then it is given that dupples and crottles are an explosive combination: they are not allowed to be put in the same truck.

(d) If your student number ends in 6 or 7 then it is given that skipples and crottles are an explosive combination: they are not allowed to be put in the same truck.

(e) If your student number ends in 8 or 9 then at most 3 dupples are allowed to be put in the same truck.

Investigate by using Z3 what is the maximum number of pallets of prittles that can be delivered, and show how for that number all pallets may be divided over the six trucks. Give these results in a table.

Also, give a short description of your encoding: what are the variables you used, and how did you express the requirements.

Separately, as indicated above also submit a text file `inp.txt` containing the input for Z3 giving this result, and a text file `outp.txt` containing the corresponding Z3 output. The input should be given in SMT-LIB 2 format, just like the examples on the slides. In this format a line starting by ';' is comment; please put comments in this way in your input file to explain the separate requirements.