INTRODUCTION TO COMPUTATIONAL LOGIC
HOMEWORK 2
DUE DATE: OCTOBER 21, 2020

Consider the following *pigeonhole problem*:

- There are n pigeons and m holes.
- Each pigeon has to live in a hole.
- Each hole can have at most one pigeon.

We would like to find a hole for every pigeon. Clearly, the problem is not solvable if $n > m$.

Let p_{ij} be an atom for $1 \le i \le n$ and $1 \le j \le m$. The atom p_{ij} is T iff the pigeon i live in the hole j. Consider the following clause:

$$p_{i1} \vee p_{i2} \vee \cdots \vee p_{im}.$$

This clause says that pigeon i lives in a hole. Moreover, consider

$$\bigwedge_{1 \le i < j \le n} \neg p_{ik} \vee \neg p_{jk}.$$

This formula says that at most one pigeon lives in hole k.

Please write a program such that:

- it accepts two positive numbers n and m as inputs.
- it outputs a CNF formula in DIMACS SAT format.
- the generated CNF formula specifies the pigeonhole problem with n pigeons and m holes.

You can use any programming language of your choice.

Please send me the following files:

(1) your program source code with instructions on how to use it;
(2) the output files (in DIMACS SAT format) for
   - $n = 3$ and $m = 3$;
   - $n = 4$ and $m = 3$.
(3) the outputs of MiniSat on the above two input files.