

Applied Logic 2ITX0, 2021/2022

Assignment 3

This Assignment 3 counts for 10 % of the final grade, it should be done individually.

The following should be submitted electronically in ANS, no later than January 14, 2022, 23:59:

- A report in pdf containing the motivated answers to the problem,
- a text file `inp.txt` containing the input for Z3 giving the result for one of the cases, and
- a text file `outp.txt` containing the Z3 output for a case where 'crash' is reached.

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

Problem

The number N is defined as follows.

If your student number ends in 0 or 5 then $N = 450$.

If your student number ends in 1 or 6 then $N = 460$.

If your student number ends in 2 or 7 then $N = 520$.

If your student number ends in 3 or 8 then $N = 470$.

If your student number ends in 4 or 9 then $N = 490$.

Consider the following program:

```
a := 1; b := 1;
for i := 1 to 10 do
    if f(i) then ⟨a := a + 2b; b := b + i⟩ else ⟨b := a + b; a := a + i⟩;
if b = N + n then crash
```

Here f is an unknown function mapping any number from 1 to 10 to false or true. Note that the statement 'if $b = N + n$ then crash' is outside the for loop.

Establish by Z3 for which values of $n = 1, 2, 3, 4, 5$ it is safe, that is, for no function f it will reach 'crash'. Show for one of the non-safe values of n how $b = N + n$ can be reached. Separately, 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 requirements.