

Problem Sheet 7

1. Simplify the following (check your answers using Maude):

- (a) `initial ; 'x := 2 ; if 'y < 'x then 'y := 'y + 1 else skip endif`
- (b) `initial ; 'x := 2 ; while 'y < 'x do 'y := 'y + 1 ; 'z := 'z + 'y od`
- (c) `initial ; while 'y < 2 do 'y := 'y + 1 ; 'z := 'z + 'y od [['z]]`

2. Prove that the following program swaps the values of 'x and 'y.

```
'x := 'x + 'y ; 'y := 'x - 'y ; 'x := 'x - 'y
```

3. Write a program that sets 'a to the maximum of the values of 'x and 'y. Prove that your program is correct.

4. Extend the Maude syntax and semantics of SIMPLE with case-conditionals.

5. (Tricky!) Extend the Maude syntax and semantics of SIMPLE with post-increments: expressions of the form $V++$, which as expressions give the value of the variable V , but also have the side-effect of incrementing that value. Comparing this with the Class Test, you will want to make use of pairs $\langle I, S \rangle$, where I is an integer, and S is a Store. Such pairs can be specified in Maude as follows.

```
sort IntStorePair .
op <_,_> : Int Store -> IntStorePair .
op getInt : IntStorePair -> Int .
op getStore : IntStorePair -> Store .
var I : Int .
var S : Store .
eq getInt(< I , S >) = I .
eq getStore(< I , S >) = S .
```