

Parallel Programming WS 2014/2015 - Assignment 1

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Exercise 1 (Hoare Logic)

Consider the following process p1:

```
{ P1: moneyBag = x }  
  
  b1 = 10;  
  t1 = moneyBag;  
  t1 = t1 + b1;  
  moneyBag = t1;  
  
{ Q1: moneyBag = x + 10 }
```

Show that the postcondition Q1 holds for the sequential execution of the process if the execution starts in a state characterized by P1.

Exercise 2 (Interleaved Execution)

Consider the following two statements

```
S1: x = x + y;  
S2: y = x - y;
```

Assume that x is initially 2 and that y is 5. What are the possible final values of x and y for each of the following programs?

a)

```
S1; S2;
```

b)

```
co <S1> //  
  <S2>  
oc
```

c)

```
co S1 //  
  S2  
oc
```

Exercise 3 (Interleaved Execution)

- a) Consider 2 scenarios:
- 2 processes executing 3 atomic actions
 - 3 processes executing 2 atomic actions

Which scenario results in more interleaved execution orders?

- b) Find a formula for the number of interleaved execution orders for n processes executing m atomic actions each.

Exercise 4 (At-most-Once Property)

Two processes p_1 and p_2 operate on a common variable x and local variables t and v :

```
x = 0;
```

```
p1: t = x; t = t + 2; x = t;
```

```
p2: v = x + 1; x = v + 1;
```

Find a decomposition of the two processes into constructs that are atomic by AMO. Choose this decomposition as coarse as possible.

Exercise 5 (LAB or HOME: Java Simulation)

The Java program `Atomic.java` is a simulation of the process structure in Assignment 2c. Compile and execute it to compare the results.