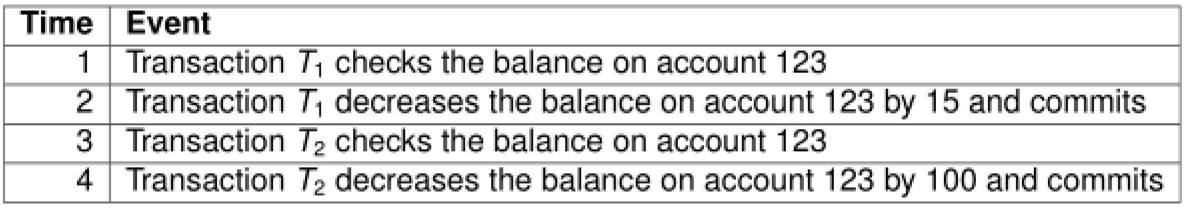
Tutorial 3 exercises

Question 1: Consider the following schedule S_1:



Time	Event
1	Transaction T_1 checks the balance on account 123
2	Transaction T_1 decreases the balance on account 123 by 15 and commits
3	Transaction T_2 checks the balance on account 123
4	Transaction T_2 decreases the balance on account 123 by 100 and commits

How would you write it in short-hand notation (say if the balance on account 123 was record X – just as a reminder: non-database operations should not be incl.)?

Hopefully easy: Is it a serial schedule? A conflict-serializable schedule? A serializable schedule? A concurrent schedule?

Consider which ACID properties are broken (hint: CID should be easy for this one…) if the server crashes and does nothing after restart:

1. Before starting the event at time 1?
2. After the event at time 1 is fully done, but before starting the event at time 2? <- people seems to struggle with this one
3. After the event at time 2 is fully done, but before starting the event at time 3?

Question 2: Consider the following schedule (given in short-hand notation):

$$S_2: r_1(X); w_1(X); r_2(X); w_2(X); c_2; \lightning; r_1(Y); r_1(Z); w_1(Y);$$

The server crashes at $\lightning$. If we do nothing, which ACID property or properties would be broken? What if we instead rolled transaction 1 back? What if we instead rolled both transactions back?

Question 3: Consider the following schedules (given in short-hand notation):

$$S_3: r_3(X);\ r_2(X);\ w_3(X);\ r_1(X);\ w_1(X);$$

$$S_4:\ r_3(X);\ r_2(X);\ r_1(X);\ w_3(X); w_1(X);$$

(They are identical, except for the third and fourth operation having been switched).

Draw a precedence graph for each and use it to decide if the schedules are conflict-serializable. If either or both are conflict-serializable also find an equivalent serial schedule…

Question 4 (tricky): Explain how, for any $n > 1$, one can find a schedule whose precedence graph has a cycle of length n, but no smaller cycle. (This is a simpler version of the exercise above the video in ”Recognizing a conflict-serializable schedule”, but the solution gives you a fairly strong hint to solving that)

Question 5: If time permits, you can work on Assignment 1 as well.