# Homework 1

**Points:** 1 (1/8 per Question)

**Deadline**: 20.10.2020 23:59 (System time in Blackboard)

Create a table accounts with two columns, aid and balance, both of type integer. Insert two tuples: (1, 1000) and (2, 2000). Isolation level: read committed (default).

Execute the following transactions (imitating two concurrent money withdrawals from the same account). Before updating the balance with the new value, the transactions verify if there is enough money on the account (Step 3 and 4). After withdrawal, the new amount is also verified (Step 7 and 9). These tasks are imitated by the SELECT statements in steps 3, 4, 7, and 9.

| Step | T1 (withdraw 200) | T2 (withdraw 1000) |
|---|---|---|
| 1 | BEGIN; | |
| 2 | | BEGIN; |
| 3 | `SELECT balance into X FROM accounts` WHERE `aid = 1;` | |
| 4 | | `SELECT balance into Y FROM accounts WHERE aid = 1;` |
| 5 | `UPDATE accounts SET balance = X - 200 WHERE aid = 1;` | |
| 6 | | `UPDATE accounts SET balance = Y - 1000 WHERE aid = 1;` |
| 7 | `SELECT balance into X FROM accounts WHERE aid = 1;` | |
| 8 | COMMIT; | |
| 9 | | `SELECT balance into Y FROM accounts WHERE aid = 1;` |
| 10 | | COMMIT; |

## Questions

Answer the following 8 questions in the Test in Blackboard.

1) What are the values of variables X and Y in step 4?
2) After step 10, is the update made by T1 in step 5 reflected on the database or is it lost? Shortly explain.
3) What happens after step 6?
4) What are the values seen by `T1` in step 7 and `T2` in step 9? Is the balance of the account correct with respect to intended withdrawal tasks?

5) What happens to `T1` and `T2` if `T1` rolls back in step 7?
6) After swapping steps 4 and 5, does `T2` see the value updated by `T1`? Why is that so?
7) What happens if we partially modify the UPDATE statements with `SET balance = balance - 200` for `T1` and `SET balance = balance - 1000` for `T2`? Is the balance correct after the transactions commit?
8) How to fix the scenario to disallow a negative balance?