

## Exercise 5

1. Isolation property in ACID properties states that each transaction should run without interfering or being aware of other transactions in the system. In that case, we can run each transaction sequentially by locking the whole database for itself. Review why this may not be an ideal solution.
2. Given two transactions, per operation of each transaction, we can use locks to make sure concurrent access is done properly to individual objects that are used in both transactions i.e., they are not accessed at the same time. This is after all what the operating systems do, e.g., lock a file while one program is accessing it so others cannot change it at the same time. Give two transactions showing that this is not enough to achieve the isolation property of transactions for RDBMSs.
3. What is the probability that a deadlock situation occurs?
4. Given the following two tasks where initial values of B is 50, and operations are labeled as Op1, Op2, etc, per task and we know that Task 1 has done its first operation already, please show all possible concurrent execution orders of the following tasks. Then state which orders make sense and which ones do not. If these were two transactions running concurrently this way, what property of transactions we would be violating with the invalid concurrent execution orders? The tasks are:
  - Task 1:
    - Op1)  $B = B \times 2$
    - Op2)  $B = B \times 2$
  - Task 2:
    - Op1)  $B = B + 10$