# System Security Lab 6

## Praneesh R V

## CB.SC.U4CYS23036

## Exercise 2.0:

Create database and use it:

```
mysql> create database TestDB;
Query OK, 1 row affected (0.02 sec)

mysql> use TestDB
Database changed
```

Auto commit = 0:

```
mysql> set autocommit=0;
Query OK, 0 rows affected (0.00 sec)
mysql>
```

#### Read isolation level:

Creating table:

```
mysql> CREATE TABLE Accounts (
    -> acctID INTEGER NOT NULL PRIMARY KEY,
    -> balance INTEGER NOT NULL,
    -> CONSTRAINT remains_nonnegative CHECK (balance >= 0)
    -> );
Query OK, 0 rows affected (0.07 sec)
mysql>
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (101,1000);
Query OK, 1 row affected (0.02 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (202,2000);
Query OK, 1 row affected (0.00 sec)
mysql> SELECT * FROM Accounts;
| acctID | balance |
    101 I
             1000
    202 |
             2000
2 rows in set (0.00 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
mysql>
```

## Exercise 2.1:

```
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
mysql> DELETE FROM Accounts;
Query OK, 2 rows affected (0.01 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (101, 1000);
Query OK, 1 row affected (0.00 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (202, 2000);
Query OK, 1 row affected (0.00 sec)
mysql> SELECT * FROM Accounts;
| acctID | balance |
    101
              1000 I
     202 |
              2000 I
2 rows in set (0.00 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
mysql>
```

```
mysql> use testdb
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
                                                                                                                                                                      mysql> use testdb
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
                                                                                                                                                                      mysql> SET TRANSACTION
-> ISOLATION LEVEL READ COMMITTED;
Query OK, 0 rows affected (0.00 sec)
mysql> -- Amount to be transfered by A
mysql> SET @amountA = 200;
Query OK, 0 rows affected (0.00 sec)
                                                                                                                                                                      mysql> -- Amount to be transfered by B
mysql> SET @amountB = 500;
Query OK, 0 rows affected (0.00 sec)
mysql> SET @balanceA = 0; -- Init value
Query OK, 0 rows affected (0.00 sec)
mysql> SELECT balance INTO @balanceA
-> FROM Accounts WHERE acctID = 101;
Query OK, 1 row affected (0.00 sec)
                                                                                                                                                                      mysql> SET @balanceB = 0; -- Init value
Query OK, 0 rows affected (0.00 sec)
                                                                                                                                                                      mysql> SELECT balance INTO @balanceB
mysql> SET @balanceA = @balanceA - @amountA;
Query OK, 0 rows affected (0.00 sec)
                                                                                                                                                                      -> FROM Accounts WHERE acctID = 101;
Query OK, 1 row affected (0.00 sec)
 mysql> SELECT @balanceA;
                                                                                                                                                                      mysql> SET @balanceB = @balanceB - @amountB;
Query OK, 0 rows affected (0.00 sec)
 | @balanceA |
            800 |
                                                                                                                                                                      mysql> UPDATE Accounts
-> SET balance = @balanceB
-> WHERE acctID = 101;
Query OK, 1 row affected (14.29 sec)
Rows matched: 1 Changed: 1 Warnings: 0
1 row in set (0.00 sec)
mysql> UPDATE Accounts
-> SET balance = @balanceA
-> WHERE acctID = 101;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1 Changed: 1 Warnings: 0
                                                                                                                                                                      mysql> SELECT acctID, balance
                                                                                                                                                                           -> FROM Accounts
-> WHERE acctID = 101;
mysql> SELECT acctID, balance
-> FROM Accounts
-> WHERE acctID = 101;
                                                                                                                                                                       acctID | balance |
| acctID | balance |
                                                                                                                                                                       101 | 500 |
   101 | 800 |
                                                                                                                                                                      1 row in set (0.00 sec)
 1 row in set (0.00 sec)
                                                                                                                                                                      mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
                                                                                                                                                                      mysql>|
mysql>|
```

#### Exercise 2.2a:

```
mysql> use testdb
Database changed
mysql> SET AUTOCOMMIT=0;
Query OK, 0 rows affected (0.00 sec)
mysql> DELETE FROM Accounts;
Query OK, 2 rows affected (0.01 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (101,1000);
Query OK, 1 row affected (0.00 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (202,2000);
Query OK, 1 row affected (0.00 sec)
mysql> SELECT * FROM Accounts;
 acctID | balance |
     101 l
              1000
     202 I
              2000 |
2 rows in set (0.00 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
mysql>
```

```
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
                                                                                                                                                                          Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
 mysql> SET TRANSACTION
-> ISOLATION LEVEL SERIALIZABLE;
Query OK, 0 rows affected (0.00 sec)
                                                                                                                                                                          mysql> SET TRANSACTION
-> ISOLATION LEVEL SERIALIZABLE;
Query OK, 0 rows affected (0.00 sec)
 mysql> -- Amount to be transfered by A
mysql> SET @amountA = 200;
Query OK, 0 rows affected (0.00 sec)
                                                                                                                                                                          mysql> -- Amount to be transfered by B
mysql> SET @amountB = 500;
Query OK, 0 rows affected (0.00 sec)
 mysql> SET @balanceA = 0; -- Init value
Query OK, 0 rows affected (0.00 sec)
mysql> SELECT balance INTO @balanceA
-> FROM Accounts WHERE acctID = 101;
Query OK, 1 row affected (0.00 sec)
                                                                                                                                                                          mysql> SET @balanceB = 0; -- Init value
Query OK, 0 rows affected (0.00 sec)
                                                                                                                                                                          mysql> SELECT balance INTO @balanceB
  -> FROM Accounts WHERE acctID = 101;
Query OK, 1 row affected (0.00 sec)
mysql> SET @balanceA = @balanceA - @amountA;
Query OK, 0 rows affected (0.00 sec)
 mysql> SELECT @balanceA;
                                                                                                                                                                          mysql> SET @balanceB = @balanceB - @amountB;
Query OK, 0 rows affected (0.00 sec)
| @balanceA |
                                                                                                                                                                         mysql> UPDATE Accounts
-> SET balance = @balanceB
-> WHERE acctID = 101;
ERROR 1213 (40001): Deadlock found when trying to get lock; try restart ing transaction
mysql> SELECT acctID, balance
-> FROM Accounts WHERE acctID = 101;
 row in set (0.00 sec)
mysql> UPDATE Accounts
-> SET balance = @balanceA
-> WHERE acctID = 101;
Query OK, 1 row affected (13.25 sec)
Rows matched: 1 Changed: 1 Warnings: 0
mysql> SELECT acctID, balance
-> FROM Accounts WHERE acctID = 101;
                                                                                                                                                                           acctID | balance |
  acctID | balance |
                                                                                                                                                                           | 101 | 800 |
    101 | 800 |
                                                                                                                                                                           1 row in set (0.00 sec)
 1 row in set (0.00 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
                                                                                                                                                                          mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)
 mysql>|
                                                                                                                                                                           mysql>|
```

Exercise 2.2b:

```
mysql> use testdb
 Database changed
 mysql> SET AUTOCOMMIT=0;
 Query OK, 0 rows affected (0.00 sec)
 mysql> DELETE FROM Accounts;
 Query OK, 2 rows affected (0.01 sec)
 mysql> INSERT INTO Accounts (acctID, balance) VALUES (101,1000);
 Query OK, 1 row affected (0.00 sec)
 mysql> INSERT INTO Accounts (acctID, balance) VALUES (202,2000);
 Query OK, 1 row affected (0.00 sec)
 mysql> SELECT * FROM Accounts;
    acctID | balance |
           101
                            1000
           202 I
                            2000 |
 2 rows in set (0.00 sec)
 mysql> COMMIT;
 Query OK, 0 rows affected (0.01 sec)
 mysql>
                                                                             Type 'help;' or '\h' for help. Type '\c' to clear the current input sta tement.
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
                                                                             mysql> use testdb
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
mysql> SET TRANSACTION
-> ISOLATION LEVEL SERIALIZABLE;
Query OK, 0 rows affected (0.00 sec)
                                                                             mysql> SET TRANSACTION
-> ISOLATION LEVEL SERIALIZABLE;
Query OK, 0 rows affected (0.00 sec)
mysql> SELECT balance FROM Accounts
-> WHERE acctID = 101;
 balance |
                                                                             mysql> SELECT balance FROM Accounts
-> WHERE acctID = 101;
     1000
                                                                             | balance |
1 row in set (0.00 sec)
mysql> UPDATE Accounts SET balance = balance - 200 WHERE acctID = 101;
                                                                             1 row in set (0.00 sec)
Query OK, 1 row affected (39.69 sec)
Rows matched: 1 Changed: 1 Warnings: 0
                                                                            mysql> UPDATE Accounts SET balance = balance - 500 WHERE acctID = 101;
ERROR 1213 (40001): Deadlock found when trying to get lock; try restart
ing transaction
mysql> SELECT acctID, balance
-> FROM Accounts
-> WHERE acctID = 101;
mysql> SELECT acctID, balance
-> FROM Accounts
-> WHERE acctID = 101;
 acctID | balance |
                                                                             acctID | balance |
                                                                               101 800
                                                                             1 row in set (0.00 sec)
1 row in set (0.00 sec)
                                                                             mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
                                                                             mysql>|
mysql>|
```

## Exercise 2.3:

```
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
mysql> DELETE FROM Accounts;
Query OK, 2 rows affected (0.00 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (101,1000);
Query OK, 1 row affected (0.00 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (202,2000);
Query OK, 1 row affected (0.00 sec)
mysql> SELECT * FROM Accounts;
 acctID
          balance
              1000
     101 l
     202
              2000
2 rows in set (0.00 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
mysql>
```

```
Type 'help;' or '\h' for help. Type '\c' to clear t
he current input statement.
                                                               ear the current input statement.
                                                               mvsal> use testdb
mysql> use testdb
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
                                                               Database changed
                                                               mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
                                                               mysql> SET TRANSACTION
mysql> SET TRANSACTION
                                                                    -> ISOLATION LEVEL READ COMMITTED;
     -> ISOLATION LEVEL READ COMMITTED;
                                                               Query OK, 0 rows affected (0.00 sec)
Query OK, 0 rows affected (0.00 sec)
mysql> UPDATE Accounts
                                                               mysql> UPDATE Accounts
     -> SET balance = balance - 100
                                                                    -> SET balance = balance - 200
-> WHERE acctID = 101;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1 Changed: 1 Warnings: 0
                                                               -> WHERE acctID = 202;
Query OK, 1 row affected (0.01 sec)
                                                               Rows matched: 1 Changed: 1 Warnings: 0
mysql> UPDATE Accounts SET balance = balance + 100
                                                               mysql> UPDATE Accounts SET balance = balance +
WHERE acctID = 202;
                                                                200 WHERE acctID = 101;
Query OK, 1 row affected (27.75 sec)
Rows matched: 1 Changed: 1 Warnings: 0
                                                               ERROR 1213 (40001): Deadlock found when trying
                                                                to get lock; try restarting transaction
                                                               mysql> COMMIT;
mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
                                                               Query OK, 0 rows affected (0.00 sec)
mysql>|
                                                               mysql>
```

#### Exercise 2.4:

```
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
mysql> DELETE FROM Accounts;
Query OK, 2 rows affected (0.00 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (101,1000);
Query OK, 1 row affected (0.00 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (202,2000);
Query OK, 1 row affected (0.00 sec)
mysql> SELECT * FROM Accounts;
 acctID | balance
     101
              1000
     202
              2000
2 rows in set (0.00 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
mysql>
```

```
mysql> use testdb
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
                                                                                       Type 'help;' or '\h' for help. Type '\c' to cl
                                                                                       ear the current input statement.
mysql> SET TRANSACTION
-> ISOLATION LEVEL REPEATABLE READ;
Query OK, 0 rows affected (0.00 sec)
                                                                                       mysql> use testdb
                                                                                       Database changed
mysql> UPDATE Accounts

-> SET balance = balance - 100

-> WHERE acctID = 101;

Query OK, 1 row affected (0.00 sec)

Rows matched: 1 Changed: 1 Warnings: 0
                                                                                       mysql> SET AUTOCOMMIT = 0;
                                                                                       Query OK, 0 rows affected (0.00 sec)
                                                                                       mysql> SET TRANSACTION
mysql> UPDATE Accounts
-> SET balance = balance + 100
-> WHERE acctID = 202;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1 Changed: 1 Warnings: 0
                                                                                             -> ISOLATION LEVEL READ UNCOMMITTED;
                                                                                       Query OK, 0 rows affected (0.00 sec)
                                                                                       mysql> SELECT * FROM Accounts;
mysql> ROLLBACK;
Query OK, 0 rows affected (0.00 sec)
                                                                                       | acctID | balance |
mysql> SELECT * FROM Accounts;
 acctID | balance |
                                                                                                101
                                                                                                                  900
                                                                                                                2100
                                                                                                202
      101 | 202 |
                1000
2000
                                                                                       2 rows in set (0.00 sec)
2 rows in set (0.00 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)
                                                                                       mysql> COMMIT;
                                                                                       Query OK, 0 rows affected (0.00 sec)
 mysql>|
```

Exercise 2.5:

```
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
mysql> DELETE FROM Accounts;
Query OK, 2 rows affected (0.00 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (101,1000);
Query OK, 1 row affected (0.00 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (202,2000);
Query OK, 1 row affected (0.00 sec)
mysql> SELECT * FROM Accounts;
 acctID
          balance
     101 I
              1000
     202
              2000
2 rows in set (0.00 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
mysql>
```

```
mysql> use testdb
                                                                                                   mysql> use testdb
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
                                                                                                  Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
mysql> SET TRANSACTION
   -> ISOLATION LEVEL READ COMMITTED;
Query OK, 0 rows affected (0.00 sec)
                                                                                                  mysql> UPDATE Accounts
-> SET balance = balance - 500
-> WHERE acctID = 101;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1 Changed: 1 Warnings: 0
mysql> SELECT * FROM Accounts
-> WHERE balance > 500;
                                                                                                  mysql> UPDATE Accounts
-> SET balance = balance + 500
  acctID | balance |
                                                                                                  -> WHERE acctID = 202;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1 Changed: 1 Warnings: 0
        101
                       1000
                       2000
2 rows in set (0.00 sec)
                                                                                                  mysql> SELECT * FROM Accounts;
mysql> SELECT * FROM Accounts
-> WHERE balance > 500;
                                                                                                   | acctID | balance |
 acctID | balance |
                                                                                                           202
                                                                                                                          2500
        202
                      2500
                                                                                                  2 rows in set (0.00 sec)
1 row in set (0.00 sec)
                                                                                                  mysql> COMMIT;
mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)
                                                                                                  Query OK, 0 rows affected (0.00 sec)
                                                                                                  mysql>
mysql>|
```

### Exercise 2.6:

```
mysql> use testdb
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
mysql> DELETE FROM Accounts;
Query OK, 2 rows affected (0.02 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (101,1000);
Query OK, 1 row affected (0.00 sec)
mysql> INSERT INTO Accounts (acctID, balance) VALUES (202,2000);
Query OK, 1 row affected (0.00 sec)
mysql> SELECT * FROM Accounts;
acctID | balance |
    101
              1000 |
     202
              2000
2 rows in set (0.00 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
mysql>
```

```
mysql> use testdb
mysql> use testdb
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
                                                                                                Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
mysql> SET TRANSACTION
-> ISOLATION LEVEL REPEATABLE READ;
                                                                                                mysql> INSERT INTO Accounts (acctID,
-> balance) VALUES (301,3000);
Query OK, 1 row affected (0.00 sec)
Query OK, 0 rows affected (0.00 sec)
mysql> START TRANSACTION READ ONLY;
Query OK, 0 rows affected (0.00 sec)
                                                                                                mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
mysql> SELECT * FROM Accounts
    -> WHERE balance > 1000;
                                                                                                mysql> INSERT INTO Accounts (acctID,
                                                                                                -> balance) VALUES (302,3000);
Query OK, 1 row affected (0.00 sec)
| acctID | balance |
                                                                                                mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
                    3000
                                                                                                mysql> select * from accounts;
2 rows in set (0.00 sec)
mysql> SELECT * FROM Accounts
-> WHERE balance > 1000;
                                                                                                  acctID | balance |
                                                                                                                     1000
                                                                                                       101
                                                                                                                     2000
| acctID | balance
                                                                                                       202
                                                                                                       301
                                                                                                                     3000
                    2000
                                                                                                       302
                                                                                                                     3000
       202
                                                                                                4 rows in set (0.00 sec)
2 rows in set (0.00 sec)
                                                                                                mysql>
mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)
```

## Exercise 2.7:

```
mysql> use testdb
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
mysql> DROP TABLE T;
ERROR 1051 (42S02): Unknown table 'testdb.t'
mysql> CREATE TABLE T (id INT NOT NULL PRIMARY KEY, s VARCHAR(40), i SMALLINT);
Query OK, 0 rows affected (0.04 sec)
mysql> INSERT INTO T (id, s, i) VALUES (1, 'first', 1);
Query OK, 1 row affected (0.00 sec)
mysql> INSERT INTO T (id, s, i) VALUES (2, 'second', 2);
Query OK, 1 row affected (0.00 sec)
mysql> INSERT INTO T (id, s, i) VALUES (3, 'third', 1);
Query OK, 1 row affected (0.00 sec)
mysql> INSERT INTO T (id, s, i) VALUES (4, 'fourth', 2);
Query OK, 1 row affected (0.00 sec)
mysql> INSERT INTO T (id, s, i) VALUES (5, 'to be or not to be', 1);
Query OK, 1 row affected (0.00 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
mysql>
```

```
mysql> use testdb
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)
mysql> SET TRANSACTION
-> ISOLATION LEVEL REPEATABLE READ;
Query OK, 0 rows affected (0.00 sec)
                                                                                                                                     mysql> SET TRANSACTION
-> ISOLATION LEVEL READ COMMITTED;
Query OK, 0 rows affected (0.00 sec)
  ysql> SELECT * FROM T WHERE i = 1;
                                                                                                                                     mysql> UPDATE T SET s = 'Update by B'

-> WHERE id = 1;

Query OK, 1 row affected (0.00 sec)

Rows matched: 1 Changed: 1 Warnings: 0
  id | s
                                       | i
                                                                                                                                     mysql> INSERT INTO T (id, s, i)
-> VALUES (6, 'Insert Phantom', 1);
Query OK, 1 row affected (0.00 sec)
  rows in set (0.00 sec)
 mysql> SELECT \star FROM T WHERE i = 1; INSERT INTO T (id, s, i) VALUES (7, 'inserted by A', 1); UPDATE T SET s = 'update by A inside the snapshot' WHERE id = 3; UPDATE T SET s = 'update by A outside the snapshot' WHERE id = 4; UPDATE T SET s = 'update by A after update by B' WHERE id = 1;
                                                                                                                                     mysql> UPDATE T
-> SET s = 'Update Phantom', i = 1
-> WHERE id = 2;
Query ON, 1 row affected (0.00 sec)
Rows matched: 1 Changed: 1 Warnings: 0
   id | s
                                                                                                                                     mysql> DELETE FROM T WHERE id = 5;
Query OK, 1 row affected (0.00 sec)
                                                                                                                                      mysql> SELECT * FROM T;
                                                                                                                                      | id | s
   rows in set (0.00 sec)
                                                                                                                                         1 | Update by B
2 | Update Phantom
3 | third
4 | fourth
6 | Insert Phantom
 Query OK, 1 row affected (0.00 sec)
Query OK, 1 row affected (0.00 sec)
Rows matched: 1 Changed: 1 Warnings: 0
  uery OK, 1 row affected (0.00 sec)
lows matched: 1 Changed: 1 Warnings: 0
                                                                                                                                     5 rows in set (0.00 sec)
 Query OK, 1 row affected (28.33 sec)
Rows matched: 1 Changed: 1 Warnings: 0
                                                                                                                                     mysql> SET TRANSACTION ISOLATION LEVEL READ
-> UNCOMMITTED;
ERROR 1568 (25091): Transaction characteristics can't be changed while a transaction is in progress
mysql> SELECT * FROM T WHERE i = 1; UPDATE T SET s = 'updated after delete?' WHERE i d = 5; SELECT * FROM T WHERE i = 1; COMMIT;
Rows matched: 1 Changed: 1 Warnings: 0
                                                                                                                                                                                      ERROR 1568 (25001): Transaction charac-
                                                                                                                                                                                      is in progress
mysql> SELECT * FROM T;
mysql> SELECT * FROM T WHERE i=1; UPDATE T SET s= 'updated after delete?' WHERE i d = 5; SELECT * FROM T WHERE i=1; COMMIT;
                                                                                                                                                                                       | id | s
 | id | s
                                                                                  li
                                                                                                                                                                                                    Update by B
                                                                                                                                                                                                                                              1 |
1 |
      1 | update by A after update by B
3 | update by A inside the snapshot
5 | to be or not to be
7 | inserted by A
                                                                                                                                                                                                   Update Phantom
third
                                                                                                                                                                                           4 |
                                                                                                                                                                                                    fourth
                                                                                                                                                                                                                                              2 |
1 |
                                                                                                                                                                                                   Insert Phantom
4 rows in set (0.00 sec)
                                                                                                                                                                                      5 rows in set (0.00 sec)
Query OK, 0 rows affected (0.00 sec)
Rows matched: 0 Changed: 0 Warnings: 0
                                                                                                                                                                                      mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)
                                                                                                                                                                                       mysql> SELECT * FROM T;
   id | s
                                                                                                                                                                                       | id | s
                                                                                                                                                                                                                                    | i
      1 | update by A after update by B
3 | update by A inside the snapshot
5 | to be or not to be
7 | inserted by A
                                                                                                                                                                                                   Update by B
Update Phantom
third
                                                                                                                                                                                                                                               1
                                                                                                                                                                                           2 | Update Phantom
3 | third
4 | fourth
6 | Insert Phantom
                                                                                                                                                                                                                                              2 |
1 |
4 rows in set (0.00 sec)
Query OK, 0 rows affected (0.01 sec)
                                                                                                                                                                                      5 rows in set (0.00 sec)
mysql> SELECT * FROM T;
                                                                                                                                                                                      mysql> SELECT * FROM T;
    id | s
                                                                                    Ιi
                                                                                                                                                                                       | id | s
                                                                                                                                                                                                                                     Ιi
              update by A after update by B
Update Phantom
update by A inside the snapshot
update by A outside the snapshot
Insert Phantom
                                                                                                                                                                                           1 | Update by B
2 | Update Phantom
3 | third
4 | fourth
6 | Insert Phantom
      1
2
3
4
              inserted by A
                                                                                                                                                                                      5 rows in set (0.00 sec)
6 rows in set (0.00 sec)
                                                                                                                                                                                      mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)
mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)
                                                                                                                                                                                       mysql>|
 mysql>|
```

sal> use testab