

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:

```
mysql> SELECT @@GLOBAL.transaction_isolation, @@transaction_isolation;
+-----+-----+
| @@GLOBAL.transaction_isolation | @@transaction_isolation |
+-----+-----+
| REPEATABLE-READ                | REPEATABLE-READ         |
+-----+-----+
1 row in set (0.00 sec)

mysql> |
```

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 |    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 |
|    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)

mysql> SET TRANSACTION
-> ISOLATION LEVEL READ COMMITTED;
Query OK, 0 rows affected (0.00 sec)

mysql> -- Amount to be transferred by A
mysql> SET @amountA = 200;
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 @balanceA = @balanceA - @amountA;
Query OK, 0 rows affected (0.00 sec)

mysql> SELECT @balanceA;
+-----+
| @balanceA |
+-----+
|      800 |
+-----+
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;
+-----+-----+
| acctID | balance |
+-----+-----+
|    101 |      800 |
+-----+-----+
1 row 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> SET TRANSACTION
-> ISOLATION LEVEL READ COMMITTED;
Query OK, 0 rows affected (0.00 sec)

mysql> -- Amount to be transferred by B
mysql> SET @amountB = 500;
Query OK, 0 rows 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 @balanceB = @balanceB - @amountB;
Query OK, 0 rows affected (0.00 sec)

mysql> UPDATE Accounts
-> SET balance = @balanceB
-> WHERE acctID = 101;
Query OK, 1 row affected (14.29 sec)
Rows matched: 1 Changed: 1 Warnings: 0

mysql> SELECT acctID, balance
-> FROM Accounts
-> WHERE acctID = 101;
+-----+-----+
| acctID | balance |
+-----+-----+
|    101 |      500 |
+-----+-----+
1 row in set (0.00 sec)

mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)

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 |    1000 |
|    202 |    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)

mysql> SET TRANSACTION
-> ISOLATION LEVEL SERIALIZABLE;
Query OK, 0 rows affected (0.00 sec)

mysql> -- Amount to be transferred by A
mysql> SET @amountA = 200;
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 @balanceA = @balanceA - @amountA;
Query OK, 0 rows affected (0.00 sec)

mysql> SELECT @balanceA;
+-----+
| @balanceA |
+-----+
|      800 |
+-----+
1 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 |
+-----+-----+
|    101 |      800 |
+-----+-----+
1 row 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)

mysql> SET TRANSACTION
-> ISOLATION LEVEL SERIALIZABLE;
Query OK, 0 rows affected (0.00 sec)

mysql> -- Amount to be transferred by B
mysql> SET @amountB = 500;
Query OK, 0 rows 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 @balanceB = @balanceB - @amountB;
Query OK, 0 rows affected (0.00 sec)

mysql> UPDATE Accounts
-> SET balance = @balanceB
-> WHERE acctID = 101;
ERROR 1213 (40001): Deadlock found when trying to get lock; try restarting transaction
mysql> SELECT acctID, balance
-> FROM Accounts WHERE acctID = 101;
+-----+-----+
| acctID | balance |
+-----+-----+
|    101 |      800 |
+-----+-----+
1 row in set (0.00 sec)

mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)

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    | 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)
```

```
mysql> SET TRANSACTION
-> ISOLATION LEVEL SERIALIZABLE;
Query OK, 0 rows affected (0.00 sec)
```

```
mysql> SELECT balance FROM Accounts
-> WHERE acctID = 101;
```

```
+-----+
| balance |
+-----+
| 1000    |
+-----+
1 row in set (0.00 sec)
```

```
mysql> UPDATE Accounts SET balance = balance - 200 WHERE acctID = 101;
Query OK, 1 row affected (39.69 sec)
Rows matched: 1 Changed: 1 Warnings: 0
```

```
mysql> SELECT acctID, balance
-> FROM Accounts
-> WHERE acctID = 101;
```

```
+-----+-----+
| acctID | balance |
+-----+-----+
| 101    | 800     |
+-----+-----+
1 row 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 statement.
```

```
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> SELECT balance FROM Accounts
-> WHERE acctID = 101;
```

```
+-----+
| balance |
+-----+
| 1000    |
+-----+
1 row in set (0.00 sec)
```

```
mysql> UPDATE Accounts SET balance = balance - 500 WHERE acctID = 101;
ERROR 1213 (40001): Deadlock found when trying to get lock; try restarting transaction
```

```
mysql> SELECT acctID, balance
-> FROM Accounts
-> WHERE acctID = 101;
```

```
+-----+-----+
| acctID | balance |
+-----+-----+
| 101    | 800     |
+-----+-----+
1 row in set (0.00 sec)
```

```
mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)
```

```
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 |
+-----+-----+
|      101 |      1000 |
|      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 the current input statement.

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> 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> UPDATE Accounts SET balance = balance + 100
WHERE acctID = 202;
Query OK, 1 row affected (27.75 sec)
Rows matched: 1 Changed: 1 Warnings: 0

mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)

mysql> |

```

```

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

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> UPDATE Accounts
-> SET balance = balance - 200
-> WHERE acctID = 202;
Query OK, 1 row affected (0.01 sec)
Rows matched: 1 Changed: 1 Warnings: 0

mysql> UPDATE Accounts SET balance = balance + 200 WHERE acctID = 101;
ERROR 1213 (40001): Deadlock found when trying to get lock; try restarting transaction
mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)

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)

mysql> SET TRANSACTION
-> ISOLATION LEVEL REPEATABLE READ;
Query OK, 0 rows affected (0.00 sec)

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> UPDATE Accounts
-> SET balance = balance + 100
-> WHERE acctID = 202;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1 Changed: 1 Warnings: 0

mysql> ROLLBACK;
Query OK, 0 rows 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 (0.00 sec)

mysql> |
```

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

```
mysql> use testdb
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)

mysql> SET TRANSACTION
-> ISOLATION LEVEL READ UNCOMMITTED;
Query OK, 0 rows affected (0.00 sec)

mysql> SELECT * FROM Accounts;
+-----+-----+
| acctID | balance |
+-----+-----+
|    101 |    900 |
|    202 |    2100 |
+-----+-----+
2 rows in set (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 |    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)

mysql> SET TRANSACTION
-> ISOLATION LEVEL READ COMMITTED;
Query OK, 0 rows affected (0.00 sec)

mysql> SELECT * FROM Accounts
-> WHERE balance > 500;
+-----+-----+
| acctID | balance |
+-----+-----+
|    101 |    1000 |
|    202 |    2000 |
+-----+-----+
2 rows in set (0.00 sec)

mysql> SELECT * FROM Accounts
-> WHERE balance > 500;
+-----+-----+
| acctID | balance |
+-----+-----+
|    202 |    2500 |
+-----+-----+
1 row in set (0.00 sec)

mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)

mysql> |
```

```
mysql> use testdb
Database changed
mysql> SET AUTOCOMMIT = 0;
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> UPDATE Accounts
-> SET balance = balance + 500
-> WHERE acctID = 202;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> SELECT * FROM Accounts;
+-----+-----+
| acctID | balance |
+-----+-----+
|    101 |    500 |
|    202 |    2500 |
+-----+-----+
2 rows in set (0.00 sec)

mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)

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
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> START TRANSACTION READ ONLY;
Query OK, 0 rows affected (0.00 sec)

mysql> SELECT * FROM Accounts
-> WHERE balance > 1000;
+-----+-----+
| acctID | balance |
+-----+-----+
| 202 | 2000 |
| 301 | 3000 |
+-----+-----+
2 rows in set (0.00 sec)

mysql> SELECT * FROM Accounts
-> WHERE balance > 1000;
+-----+-----+
| acctID | balance |
+-----+-----+
| 202 | 2000 |
| 301 | 3000 |
+-----+-----+
2 rows in set (0.00 sec)

mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)

mysql>
```

```
mysql> use testdb
Database changed
mysql> SET AUTOCOMMIT = 0;
Query OK, 0 rows affected (0.00 sec)

mysql> INSERT INTO Accounts (acctID,
-> balance) VALUES (301,3000);
Query OK, 1 row affected (0.00 sec)

mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)

mysql> INSERT INTO Accounts (acctID,
-> balance) VALUES (302,3000);
Query OK, 1 row affected (0.00 sec)

mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)

mysql> select * from accounts;
+-----+-----+
| acctID | balance |
+-----+-----+
| 101 | 1000 |
| 202 | 2000 |
| 301 | 3000 |
| 302 | 3000 |
+-----+-----+
4 rows in set (0.00 sec)

mysql> |
```

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)

mysql> SET TRANSACTION
-> ISOLATION LEVEL REPEATABLE READ;
Query OK, 0 rows affected (0.00 sec)

mysql> SELECT * FROM T WHERE i = 1;
+----+-----+-----+
| id | s      | i |
+----+-----+-----+
| 1  | first  | 1 |
| 3  | third  | 1 |
| 5  | to be or not to be | 1 |
+----+-----+-----+
3 rows in set (0.00 sec)

mysql> SELECT * 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;
+----+-----+-----+
| id | s      | i |
+----+-----+-----+
| 1  | first  | 1 |
| 3  | third  | 1 |
| 5  | to be or not to be | 1 |
+----+-----+-----+
3 rows in set (0.00 sec)

Query OK, 1 row affected (0.00 sec)

Query OK, 1 row affected (0.00 sec)
Rows matched: 1 Changed: 1 Warnings: 0

Query OK, 1 row affected (0.00 sec)
Rows matched: 1 Changed: 1 Warnings: 0

Query OK, 1 row affected (28.33 sec)
Rows matched: 1 Changed: 1 Warnings: 0

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;

```

```

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> 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

mysql> INSERT INTO T (id, s, i)
-> VALUES (6, 'Insert Phantom', 1);
Query OK, 1 row affected (0.00 sec)

mysql> UPDATE T
-> SET s = 'Update Phantom', i = 1
-> WHERE id = 2;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1 Changed: 1 Warnings: 0

mysql> DELETE FROM T WHERE id = 5;
Query OK, 1 row affected (0.00 sec)

mysql> SELECT * FROM T;
+----+-----+-----+
| id | s      | i |
+----+-----+-----+
| 1  | Update by B | 1 |
| 2  | Update Phantom | 1 |
| 3  | third | 1 |
| 4  | fourth | 2 |
| 6  | Insert Phantom | 1 |
+----+-----+-----+
5 rows in set (0.00 sec)

mysql> SET TRANSACTION ISOLATION LEVEL READ
ERROR 1568 (25001): Transaction characteristics can't be changed while a transaction is in progress

```

```

Rows matched: 1 Changed: 1 Warnings: 0

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      | i |
+----+-----+-----+
| 1  | update by A after update by B | 1 |
| 3  | update by A inside the snapshot | 1 |
| 5  | to be or not to be | 1 |
| 7  | inserted by A | 1 |
+----+-----+-----+
4 rows in set (0.00 sec)

Query OK, 0 rows affected (0.00 sec)
Rows matched: 0 Changed: 0 Warnings: 0

+----+-----+-----+
| id | s      | i |
+----+-----+-----+
| 1  | update by A after update by B | 1 |
| 3  | update by A inside the snapshot | 1 |
| 5  | to be or not to be | 1 |
| 7  | inserted by A | 1 |
+----+-----+-----+
4 rows in set (0.00 sec)

Query OK, 0 rows affected (0.01 sec)

mysql> SELECT * FROM T;
+----+-----+-----+
| id | s      | i |
+----+-----+-----+
| 1  | update by A after update by B | 1 |
| 2  | Update Phantom | 1 |
| 3  | update by A inside the snapshot | 1 |
| 4  | update by A outside the snapshot | 2 |
| 6  | Insert Phantom | 1 |
| 7  | inserted by A | 1 |
+----+-----+-----+
6 rows in set (0.00 sec)

mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)

mysql>

```

```

ERROR 1568 (25001): Transaction characteristics can't be changed while a transaction is in progress
mysql> SELECT * FROM T;
+----+-----+-----+
| id | s      | i |
+----+-----+-----+
| 1  | Update by B | 1 |
| 2  | Update Phantom | 1 |
| 3  | third | 1 |
| 4  | fourth | 2 |
| 6  | Insert Phantom | 1 |
+----+-----+-----+
5 rows in set (0.00 sec)

mysql> COMMIT;
Query OK, 0 rows affected (0.01 sec)

mysql> SELECT * FROM T;
+----+-----+-----+
| id | s      | i |
+----+-----+-----+
| 1  | Update by B | 1 |
| 2  | Update Phantom | 1 |
| 3  | third | 1 |
| 4  | fourth | 2 |
| 6  | Insert Phantom | 1 |
+----+-----+-----+
5 rows in set (0.00 sec)

mysql> SELECT * FROM T;
+----+-----+-----+
| id | s      | i |
+----+-----+-----+
| 1  | Update by B | 1 |
| 2  | Update Phantom | 1 |
| 3  | third | 1 |
| 4  | fourth | 2 |
| 6  | Insert Phantom | 1 |
+----+-----+-----+
5 rows in set (0.00 sec)

mysql> COMMIT;
Query OK, 0 rows affected (0.00 sec)

mysql>

```