More RDBMS(Relational Database Management System)

Summary

Till now we have studied about various SQL statements manipulating data stored in a MySQL database. We executed SQL statements without concern about inconsistencies arising due to group of statements not being executed in entirety. In this lesson, we will study the basic concepts of Transaction processing and how MySQL ensures consistency of data when a group of statements is executed.

Key Pionts

- Work done during a transaction is a series of operations.

- If one of the operations of a transaction is not executed successfully, then the
- entire transaction should be cancelled. If all the operations are executed
- successfully, the transaction should be saved to a database.
- START TRANSACTION statement is used to start a transaction.
- The process of cancelling a transaction is called Rolling back.
- ROLLBACK statement is used to terminate a transaction and roll back the
- database to its original state before the transaction.
- COMMIT statement is used to save changes to the database.
- When AutoCommit is ON, each SQL statement is a transaction.The changes resulting from each statement are automatically committed.

Q. What do you mean by DBMS and Transaction Management ?

Suppose Raunak's account number is 3246 and his aunt's account number is 5135. In order to process the cheque presented by Raunak, the following two SQL commands need to be executed on the database maintained by the bank:

UPDATE Savings SET balance = balance – 2000 WHERE account_no = 5135; For Aunt's account

UPDATE Savings SET balance = balance + 2000 WHERE account_no = 3246; For Raunak's account

The above two Updates should both take place. If the first Update takes place and there is a system failure, the first updation should be undone. Either both the updations should be done and if it is not possible for both the updations to be done, then no updation should be done.

Q. What is a Transaction?

A Transaction is a unit of work that must be done in logical order and successfully as a group or not done at all. Unit of work means that a Transaction consists of different tasks - but together they are considered as one unit. Each transaction has a beginning and an end. If anything goes wrong in between the execution of transaction, the entire transaction (No matter to what extent has been done) should be cancelled. If it is successful, then the entire transaction should be saved to the database.

A transaction is a unit of work that must be done in logical order and successfully as a group or not done at all.

In Raunak's case, both the updation statements constitute a transaction. Both are together treated as a single unit.

Q. how transactions are managed ?

Answer : let us study the following 3 statements of SQL:

- START TRANSACTION statement
- COMMIT statement
- ROLLBACK statement
-

START TRANSACTION Statement :

START TRANSACTION statement commits the current transaction and starts a new transaction. It tells MySQL that the transaction is beginning and the statements that follow should be treated as a unit, until the transaction ends. It is written like this:

START
TRANSACTION;

The START TRANSACTION statement has no clauses.

COMMIT Statement :

The COMMIT statement is used to save all changes made to the database during the transaction to the database.Commit statement is issued at a time when the transaction is complete- all the changes have been successful and the changes should be saved to the database. COMMIT ends the current transaction.

COMMIT statement is used like this:

COMMIT;
Or
COMMIT WORK;

Here WORK is a keyword and is optional.

In the following example, the table named savings has 2 rows. A transaction is started and balance in Siddharth's account (with account number 1004) is increased by Rs. 2000.00 and the balance in Akriti's account (with account number 1006) is decreased by Rs. 2000.00. COMMIT statement makes the changes made by the transaction permanent.

Example 1:

```
mysql> select * from savings;
+------------+-----------------+----------+
| account_no | name            | balance |
+------------+-----------------+----------+
|       1004 | Siddharth Sehgal | 87000.00 |
|       1006 | Akriti Malik     | 87000.00 |
+------------+-----------------+----------+
mysql> START TRANSACTION;
mysql> UPDATE Savings
    -> SET balance = balance + 2000
    -> WHERE account_no = 1004; mysql>
UPDATE Savings
    -> SET balance = balance - 2000
```

-> WHERE account_no = 1006; mysql>

SELECT * FROM Savings;

```
+------------+-----------------+----------+
| account_no | name            | balance  |
+------------+-----------------+----------+
|       1004 | Siddharth Sehgal| 89000.00 |
|       1006 | Akriti Malik    | 85000.00 |
+------------+-----------------+----------+
```

2 rows in set (0.00 sec)
mysql> COMMIT;

ROLLBACK Statement :

When a transaction is being executed, some type of error checking is usually performed to check whether it is executing successfully or not. If not, the entire transaction is undone using the ROLLBACK statement. The ROLLBACK statement cancels the entire transaction i.e. It rolls the transaction to the beginning. It aborts any changes made during the transaction and the state of database is returned to what it was before the transaction began to execute and does not save any of the changes made to the database during the transaction.

ROLLBACK statement is used like this:

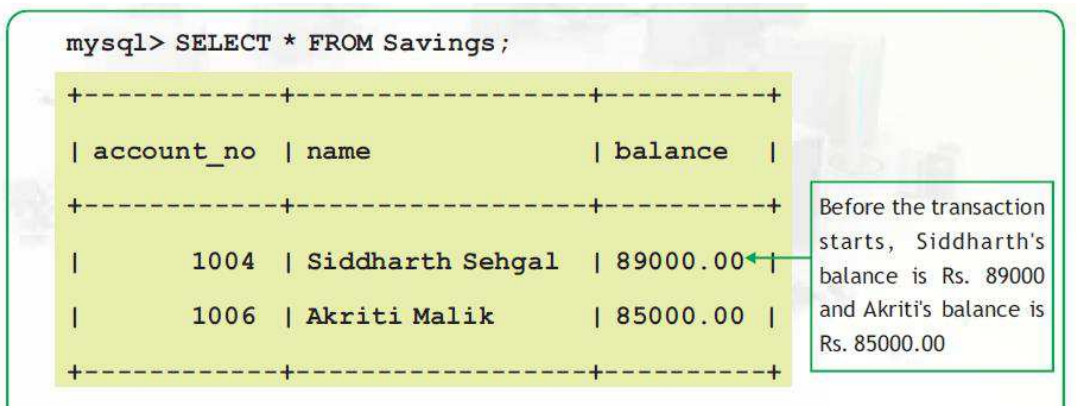
ROLLBACK;

Or

ROLLBACK WORK;

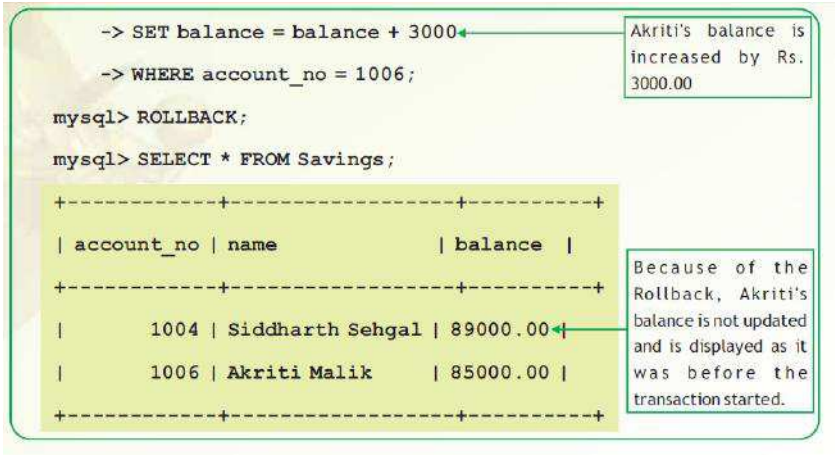
Here WORK is a keyword and is optional.

If in Example 1 shown above ROLLBACK was used instead of COMMIT, the updation of incrementing Siddharth's account by ` 2000.00 and decrementing Akriti's account by 2000 wouldn't have taken place. Let us now initiate a transaction, increase Akriti's account by ` 3000.00, then Rollback the transaction and see what happens to the updation done on Akriti's account.



mysql> START TRANSACTION;

mysql> UPDATE Savings

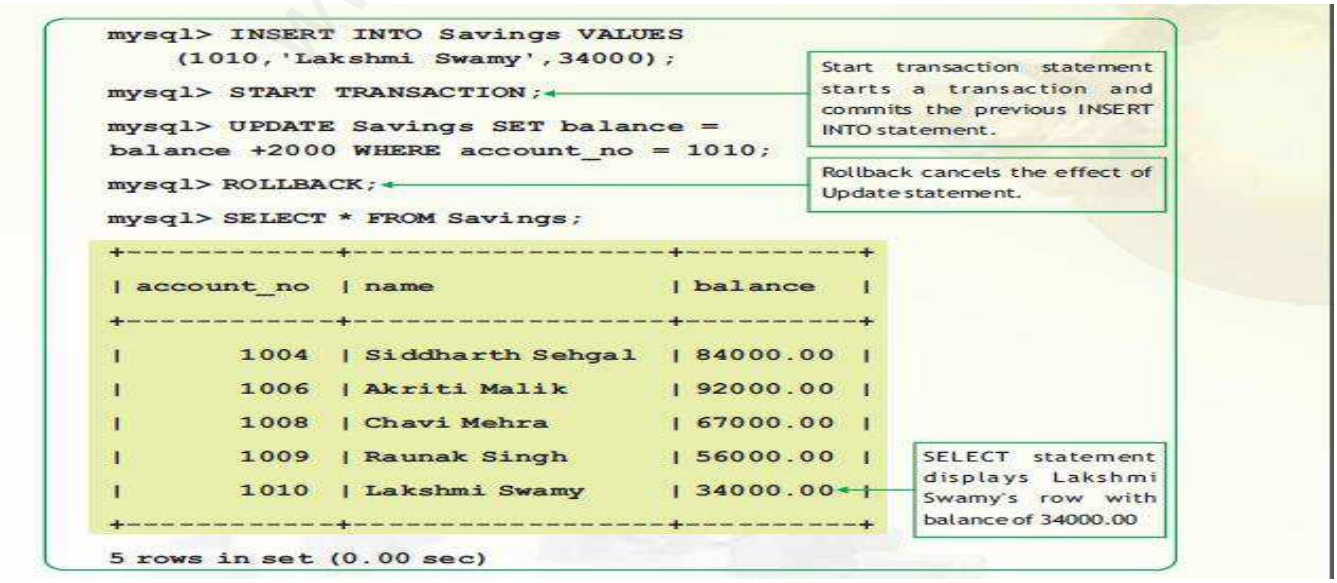


- After the ROLLBACK command is issued to the database, the database itself starts a new transaction; though no explicit command of starting a transaction like START TRANSACTION is issued.

Example 2:
Let us try out some more SQL statements on Savings table to understand transactions well.

mysql> SELECT * FROM savings;

account_no	name	balance
1004	Siddharth Sehgal	84000.00
1006	Akriti Malik	92000.00
1008	Chavi Mehra	67000.00
1009	Raunak Singh	56000.00



Q. What are SavePoints. What is benefit for inserting save points in a transaction ? Give Examples.

The SAVEPOINT statement defines a marker in a transaction. These markers are useful in rolling back a transaction till the marker.

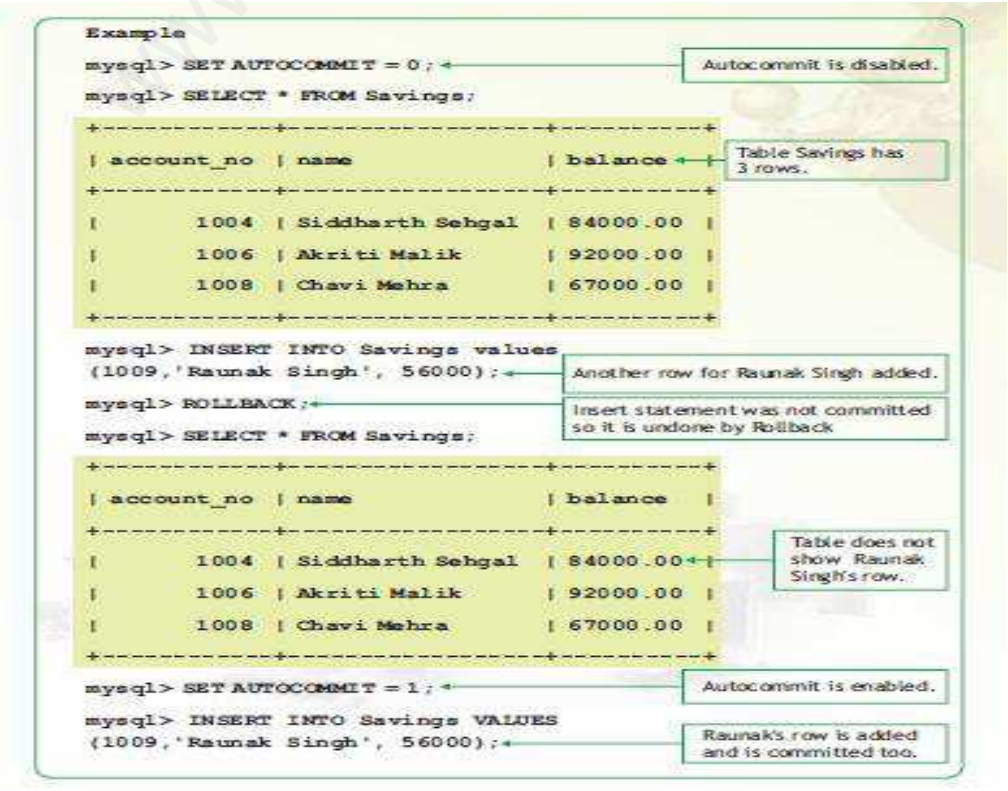
We can add a savepoint anywhere in a transaction. When you roll back to that savepoint, any changes made to the database after the savepoint are discarded, and any changes made prior to the savepoint are saved. It is like semicomitting a transaction.

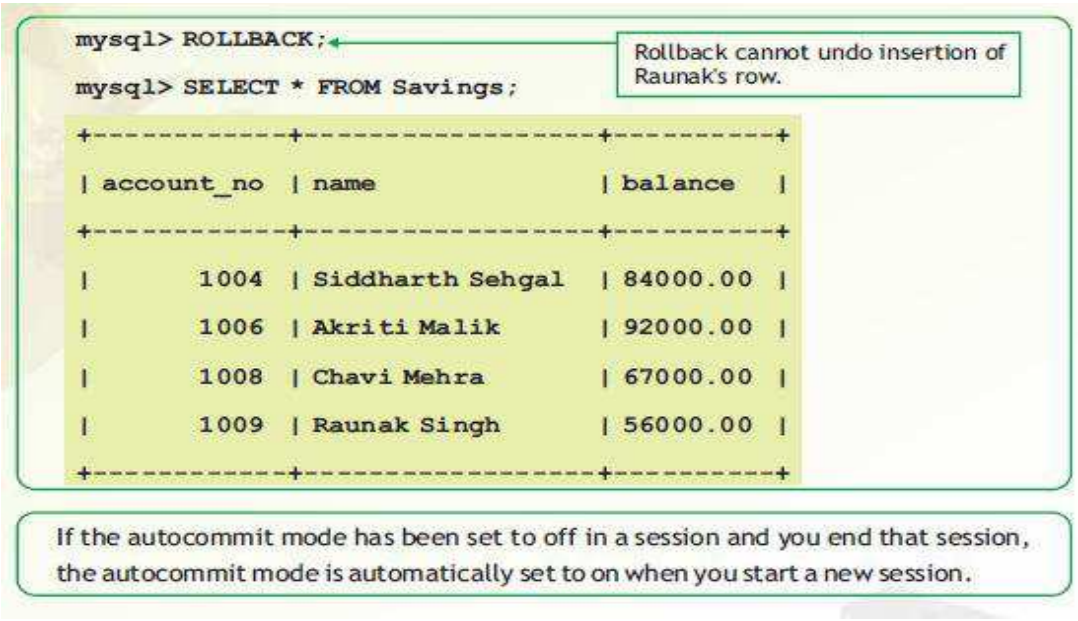
To define a savepoint, we enter the SAVEPOINT statement like this:
SAVEPOINT <savepoint-name>;
Example : SAVEPOINT Mark1;
In the above statement a marker (savepoint) with the name Mark1 is defined. It becomes a bookmark in the transaction. Now we can write the following statement:

Q. How we can rollback any transaction upto a save point ?
Ans : to rollback the transaction till the bookmark named Mark1.
ROLLBACK TO SAVEPOINT Mark1;

Q. What is Autocommit ?How can it be set ?

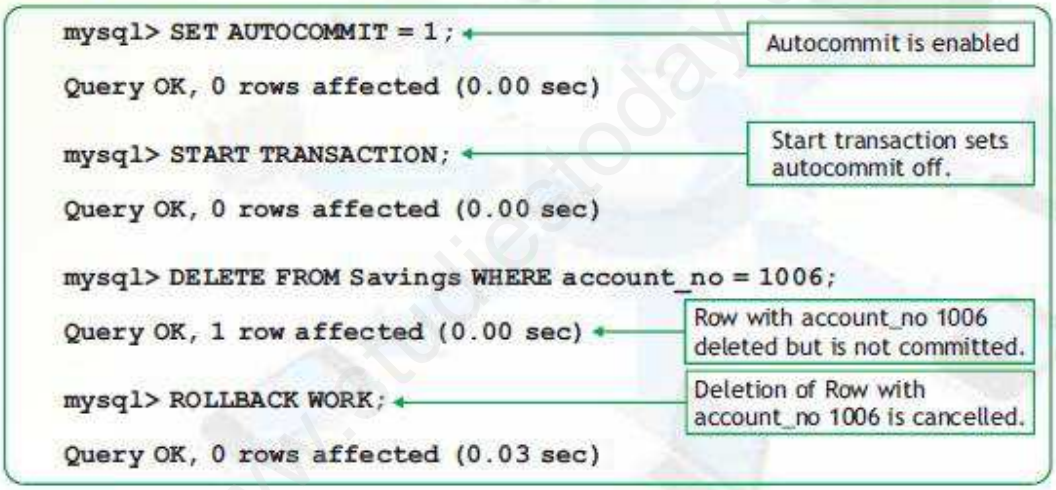
Answer : By default, Autocommit mode is on in MySQL. It means that MySQL does a COMMIT after every SQL statement that does not return an error. If it returns an error then either Rollback or Commit happens depending on the type of error. If we do not want individual statements of SQL to be automatically committed, we should set the autocommit mode to off.When Autocommit is off then we have to issue COMMIT statement explicitly to save changes made to the database. The following statement sets the autocommit mode to off. It also starts a new transaction
SET AUTOCOMMIT=0;
The following statement sets the autocommit mode to ON. It also commits and terminates the current transaction.
SET AUTOCOMMIT=1;
If autocommit is set to ON. we can still perform a multiple-statement transaction by starting it with an explicit START TRANSACTION statement and ending it with COMMIT or ROLLBACK.
Let us look at the following example to understand it:





Let us try out some more SQL statements :

Example



mysql> ROLLBACK WORK;
Query OK, 0 rows affected (0.03 sec)
Row with account_no 1006 deleted but is not committed. Deletion of Row with account_no 1006 is cancelled.An implicit COMMIT takes place, even if AUTOCOMMIT is set OFF, on the database when the user issues a Data Definition language command like CREATE TABLE, ALTER TABLE etc