LAB – 2: TO LEARN TRANSACTIONS IN SQL

This Document contains Screenshots of the output by executing queries & Explanation (if required). Queries are attached in another file.
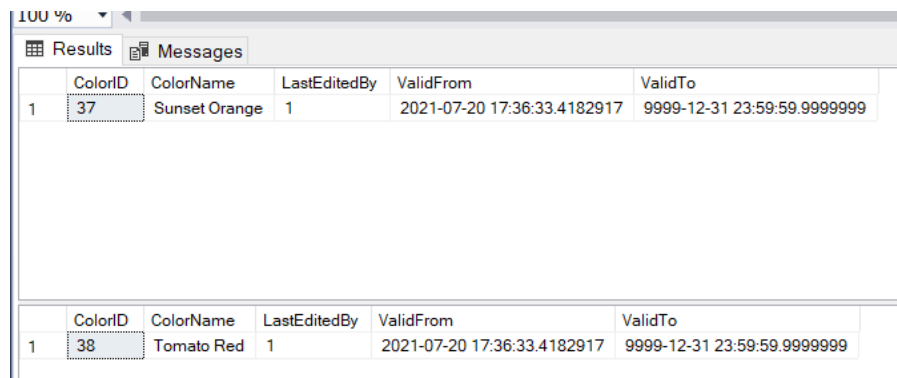
1. Create a transaction

i) Running Stored Procedure 'Warehouse.uspInsertColor' from previous section.

```
Commands completed successfully.

Completion time: 2021-07-20T23:02:35.1573388+05:30
```

ii) a. Executing 'BEGIN TRANSACTION FirstTransaction'

```
Commands completed successfully.

Completion time: 2021-07-20T23:06:33.4197360+05:30
```
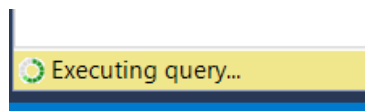
b. Use Stored Procedure & add 2 new colors to table

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	37	Sunset Orange	1	2021-07-20 17:36:33.4182917	9999-12-31 23:59:59.9999999

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	38	Tomato Red	1	2021-07-20 17:36:33.4182917	9999-12-31 23:59:59.9999999

c. Use Stored Procedure & add 2 new colors to table

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	38	Tomato Red	1	2021-07-20 18:16:45.7479635	9999-12-31 23:59:59.9999999
2	37	Sunset Orange	1	2021-07-20 18:16:45.7479635	9999-12-31 23:59:59.9999999
3	36	Yellow	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
4	35	White	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
5	34	Wheat	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
6	33	Teal	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
7	32	Tan	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
8	31	Silver	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
9	30	Salmon	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
10	29	Royal Blue	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
11	28	Red	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
12	27	Purple	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
13	26	Puce	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
14	25	Plum	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
15	24	Orange	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
16	23	Olive	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
17	22	Navy Blue	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999

d. Running same query in another query window.

The query was not able to execute because the transaction has not yet been committed or roll-back. Bottom screen message is in infinite loop waiting for deadlock to get released.

e. Rolling back transaction.

```
Commands completed successfully.

Completion time: 2021-07-20T23:52:48.6680084+05:30
```

In the other query window:

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	36	Yellow	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
2	35	White	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
3	34	Wheat	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
4	33	Teal	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
5	32	Tan	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
6	31	Silver	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
7	30	Salmon	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
8	29	Royal Blue	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
9	28	Red	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
10	27	Purple	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
11	26	Puce	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
12	25	Plum	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
13	24	Orange	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
14	23	Olive	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
15	22	Navy Blue	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
16	21	Mauve	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
17	20	Maroon	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999

Message at the bottom of the screen reads 'Query executed successfully'. Deadlock was released because we rolled back our transaction of adding 2 colors and table does not have 2 new rows(colors) added in transaction.

f. Repeating Steps (a) to (d) and Committing Transaction instead of Rollback.

```
Commands completed successfully.

Completion time: 2021-07-21T00:02:27.7650817+05:30
```

In the other query window

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	38	Tomato Red	1	2021-07-20 18:32:11.0011475	9999-12-31 23:59:59.9999999
2	37	Sunset Orange	1	2021-07-20 18:32:11.0011475	9999-12-31 23:59:59.9999999
3	36	Yellow	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
4	35	White	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
5	34	Wheat	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
6	33	Teal	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
7	32	Tan	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
8	31	Silver	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
9	30	Salmon	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
10	29	Royal Blue	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
11	28	Red	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
12	27	Purple	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
13	26	Puce	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
14	25	Plum	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
15	24	Orange	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
16	23	Olive	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
17	22	Navy Blue	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999

2. Transaction save point

i) Tracking if any transaction is already running.

Open Transactions
	Open Transactions
1	0

As there is no transaction running, it is showing 0.

ii) Initiating Transaction.

Commands completed successfully.

Completion time: 2021-07-21T00:10:57.9959955+05:30

iii) Repeating step 1 to display total transactions running.

	Open Transactions
1	1

It changed to 1 from 0 as we started transaction.

iv) Nested Transactions

As shown in below screenshot, after initiating another transaction within already running transaction total count is 2.

	Open Transactions
1	2

If we perform rollback operation, all transactions are rolled back and as shown in screenshot, @@TRANCOUNT is set to 0

	Open Transactions
1	0

v) Creating Savepoint after each transaction to solve this problem

a. Initiating Transaction and Executing Stored Procedure for new color

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	39	Lemongrass Green	1	2021-07-20 21:15:17.8785894	9999-12-31 23:59:59.9999999

b. Create Transaction Savepoint

```
Commands completed successfully.

Completion time: 2021-07-21T02:51:57.4814741+05:30
```

c. Checking TRANCOUNT value

	Open Transactions
1	1

d. Adding another color 'Galaxy Purple'

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	40	Galaxy Purple	1	2021-07-20 21:15:17.8785894	9999-12-31 23:59:59.9999999

e. Checking Warehouse.Colors table

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	40	Galaxy Purple	1	2021-07-20 21:15:17.8785894	9999-12-31 23:59:59.9999999
2	39	Lemongrass Green	1	2021-07-20 21:15:17.8785894	9999-12-31 23:59:59.9999999
3	38	Tomato Red	1	2021-07-20 18:32:11.0011475	9999-12-31 23:59:59.9999999
4	37	Sunset Orange	1	2021-07-20 18:32:11.0011475	9999-12-31 23:59:59.9999999
5	36	Yellow	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
6	35	White	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
7	34	Wheat	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
8	33	Teal	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
9	32	Tan	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
10	31	Silver	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
11	30	Salmon	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
12	29	Royal Blue	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
13	28	Red	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
14	27	Purple	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
15	26	Puce	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
16	25	Plum	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
17	24	Orange	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999

2 colors 'Galaxy Purple' & 'Lemongrass Green' have been added to the table. Galaxy Purple was added after savepoint whereas 'Lemongrass Green' was added after starting transaction.

f. Executing query to revert to savepoint.

```
Commands completed successfully.

Completion time: 2021-07-21T02:59:22.1811741+05:30
```

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	39	Lemongrass Green	1	2021-07-20 21:15:17.8785894	9999-12-31 23:59:59.9999999
2	38	Tomato Red	1	2021-07-20 18:32:11.0011475	9999-12-31 23:59:59.9999999
3	37	Sunset Orange	1	2021-07-20 18:32:11.0011475	9999-12-31 23:59:59.9999999
4	36	Yellow	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
5	35	White	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
6	34	Wheat	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
7	33	Teal	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
8	32	Tan	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
9	31	Silver	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
10	30	Salmon	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
11	29	Royal Blue	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
12	28	Red	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
13	27	Purple	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
14	26	Puce	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
15	25	Plum	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
16	24	Orange	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
17	23	Olive	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999

As we can see from above table, latest color 'Galaxy Purple' inserted after savepoint has been reverted. If we omit the save point name then, the whole transaction (both colors including 'Lemongrass Green') would be roll backed instead of savepoint.

g. Checking TRANCOUNT value

	Open Transactions
1	1

As we roll back transaction to the savepoint, we are still inside transaction started before savepoint and hence, value of TRANCOUNT is 1.

h. Committing above Transaction & Displaying the table

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	39	Lemongrass Green	1	2021-07-20 21:15:17.8785894	9999-12-31 23:59:59.9999999
2	38	Tomato Red	1	2021-07-20 18:32:11.0011475	9999-12-31 23:59:59.9999999
3	37	Sunset Orange	1	2021-07-20 18:32:11.0011475	9999-12-31 23:59:59.9999999
4	36	Yellow	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
5	35	White	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
6	34	Wheat	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
7	33	Teal	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
8	32	Tan	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
9	31	Silver	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
10	30	Salmon	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
11	29	Royal Blue	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
12	28	Red	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
13	27	Purple	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
14	26	Puce	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
15	25	Plum	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
16	24	Orange	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999
17	23	Olive	1	2013-01-01 00:00:00.0000000	9999-12-31 23:59:59.9999999

As we committed the transaction after reverting back to savepoint, color 'Lemongrass Green' has been added to the table.

3. Automatically roll back transactions

i. If transaction includes command that generates error, then that command would not be executed other commands in the transaction would be executed.

ii. Checking most recent color. (It is 'Lemongrass Green')

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	39	Lemongrass Green	1	2021-07-20 21:15:17.8785894	9999-12-31 23:59:59.9999999

iii. Initiating new transaction

```
Commands completed successfully.

Completion time: 2021-07-21T03:24:19.6541133+05:30
```

iv. Insert new color 'burnished bronze' using Stored Procedure

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	40	burnished bronze	1	2021-07-20 21:54:19.6521298	9999-12-31 23:59:59.9999999

v. Repeat above step

```
Msg 2627, Level 14, State 1, Procedure Warehouse.uspInsertColor, Line 5 [Batch Start Line 106]
Violation of UNIQUE KEY constraint 'UQ_Warehouse_Colors_ColorName'. Cannot insert duplicate key in object 'Warehouse.Colors'. The duplicate key value is (burnished bronze).
The statement has been terminated.

(0 rows affected)

Completion time: 2021-07-21T03:25:56.1015801+05:30
```

We encountered error because Color with ColorName = 'burnished bronze' has been already present and UNIQUE key constraint is applied on it.

vi. Committing the transaction

```
Commands completed successfully.

Completion time: 2021-07-21T03:27:39.2139971+05:30
```

vii. Checking again the most recent color.

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	40	burnished bronze	1	2021-07-20 21:54:19.6521298	9999-12-31 23:59:59.9999999

viii. Going back to the explanation from (i)

As we can see, even if there was an error in one of the command in transaction, other insert stored procedure worked and added the entry.

ix. Use XACT_ABORT to automatically roll back if error occurs in transaction.

	XACT_ABORT
1	OFF

As we can see XACT_ABORT is turned OFF.

x. Turning XACT_ABORT ON.

Commands completed successfully.

Completion time: 2021-07-21T03:42:50.6863580+05:30

xi. Again Initiating Transaction.

Commands completed successfully.

Completion time: 2021-07-21T03:54:03.9481190+05:30

xii. Insert new color 'Glittering Gold'

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	41	Glittering Gold	1	2021-07-20 22:30:28.8521639	9999-12-31 23:59:59.9999999

xiii. Again executing above statement.

Msg 2627, Level 14, State 1, Procedure Warehouse.uspInsertColor, Line 5 [Batch Start Line 135]
Violation of UNIQUE KEY constraint 'UQ_Warehouse_Colors_ColorName'. Cannot insert duplicate key in object 'Warehouse.Colors'. The duplicate key value is (Glittering Gold).

Completion time: 2021-07-21T04:02:16.1317632+05:30

We got error due to the inserting the same color again that creates duplicate values in table.

xiv. Commit above Transaction.

Messages

Msg 3902, Level 16, State 1, Line 140
The COMMIT TRANSACTION request has no corresponding BEGIN TRANSACTION.

Completion time: 2021-07-21T04:03:34.0053076+05:30

As we had turned ON XACT_ABORT, the transaction rolled back when error occurred in 2nd Insert. Hence, we got an error for no BEGIN TRANSACTION statement for COMMIT TRANSACTION statement.

xv. Checking most recent color.

	ColorID	ColorName	LastEditedBy	ValidFrom	ValidTo
1	40	burnished bronze	1	2021-07-20 21:54:19.6521298	9999-12-31 23:59:59.9999999

As we can see in screenshot, color 'Glittering Gold' was not added to the table.

xvi. XACT_ABORT applies to the current session only. Upon restarting, it resets automatically to OFF.

4. QUIZ

i. Creating Bank Accounts table and adding some rows of data.

```
(3 rows affected)

Completion time: 2021-07-21T04:10:54.7702826+05:30
```

ii. Create Stored Procedure that takes input parameter (Payor Account number, Payee Account number and Amount) and outputs string which indicates if payment was successful or not.

```
Commands completed successfully.

Completion time: 2021-07-21T04:11:25.4260062+05:30
```

It also checks if Payor is paying more money than his balance which is not possible. In that case, transaction is rolled back, and no changes are made to the data. Moreover, it returns 'Transaction Unsuccessful' as output string.

iii. Testing Solution by transferring 50$ from account 1 to account 3.

```
(1 row affected)

(1 row affected)
Transaction Successful

Completion time: 2021-07-21T04:17:51.8137936+05:30
```

The output message was 'Transaction successful' and as we can see in table, 50$ is deducted from account1 and added to account 3.

	AccountID	Balance
1	1	50.00
2	2	200.00
3	3	350.00

If we perform an invalid operation such as transferring 100 dollars from account 1 to account 3. We get following message and data remains consistent (does not change):

```
Transaction Unsuccessful

Completion time: 2021-07-21T04:21:11.7353847+05:30
```

	AccountID	Balance
1	1	50.00
2	2	200.00
3	3	350.00