Instructor Notes:

DBMS/SQL

Lesson 09 Transaction Control Language

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Instructor Notes:

Lesson Objectives

To understand the following topics:
- Introduction to Transactions
- Statement execution and Transaction control
- Commit Transactions
- Rollback transactions

Instructor Notes:

9.1: Introduction to Transactions
Defining Transaction

A "transaction" is a logical unit of work that contains one or more SQL statements.

- "Transaction" is an atomic unit.
- The effects of all the SQL statements in a transaction can be either:
  - all committed (applied to the database), or
  - all rolled back (undone from the database)
- A "transaction" begins with the first executable SQL statement.

Instructor Notes:

9.1: Introduction to Transactions
Defining Transaction

A "transaction" ends when any of the following occurs:

- A user issues a COMMIT or ROLLBACK statement without a SAVEPOINT clause.
- A user runs a DDL statement such as CREATE, DROP, RENAME, or ALTER.
- If the current transaction contains any DML statements, Oracle first commits the transaction, and then runs and commits the DDL statement as a new, single statement transaction.
- A user disconnects from Oracle. The current transaction is committed.
- A user process terminates abnormally. The current transaction is rolled back.

<u>**Note**</u>**:**
After one transaction ends, the next executable SQL statement automatically
starts the subsequent transaction.

Instructor Notes:

9.2 Statement Execution
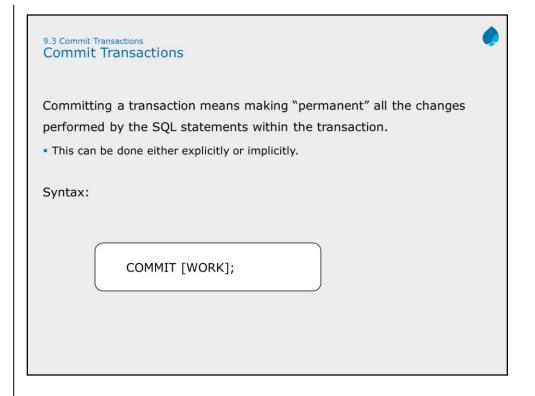## Statement Execution and Transaction Control

A "SQL statement" that runs successfully is different from a committed transaction.

However, until the "transaction" that contains the "statement" is committed, the "transaction" can be rolled back. As a result, all the changes in the statement can be undone.

Hence we can say, "a statement, rather than a transaction, runs successfully".

Statement Execution and Transaction Control:
- Executing successfully means that a single statement was:
  - ➢ Parsed
  - ➢ Found to be a valid SQL construction
  - ➢ Run without error as an atomic unit.
- For example: All rows of a multi-row update are changed.

Instructor Notes:

9.3 Commit Transactions
Commit Transactions

Committing a transaction means making "permanent" all the changes performed by the SQL statements within the transaction.

▪ This can be done either explicitly or implicitly.

Syntax:

```
COMMIT [WORK];
```

Note:
- An "explicit request" occurs when the user issues a COMMIT statement.
- An "implicit request" occurs after normal termination of an application or completion of a data definition language (DDL) operation.
- The changes made by the SQL statement(s) of a transaction become permanent and visible to other users only after that transaction is committed. Queries that are issued after the transaction is committed will see the committed changes.

Instructor Notes:

9.3 Commit Transactions
Commit Transactions

COMMIT types:

- Implicit: Database issues an implicit COMMIT before and after any data definition
  language (DDL) statement

- Explicit

Example of COMMIT command:

> DELETE FROM student_master
> WHERE student_name = 'Amit';
> COMMIT ;

Instructor Notes:

9.4 Rollback Transactions
Rollback Transactions

Rolling back a transaction means "undoing changes" to data that have been performed by SQL statements within an "uncommitted transaction".
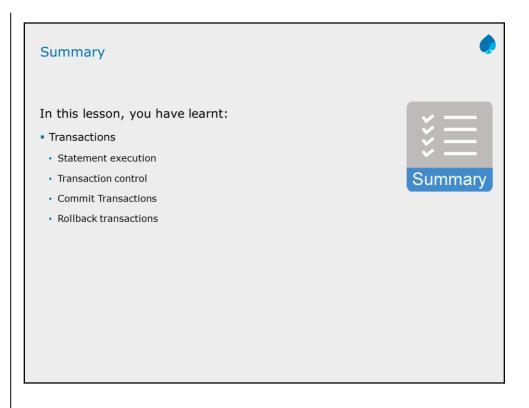
- Oracle uses "undo tablespaces" (or rollback segments) to store old values.

- Oracle also uses the "redo log" that contains a record of changes.

Oracle lets you roll back an entire "uncommitted transaction".

- Alternatively, you can roll back the trailing portion of an "uncommitted transaction" to a marker called a "savepoint".

Types of Roll back:
- All the following types of rollbacks use the same roll back procedure:
    - Statement-level rollback (due to statement or deadlock execution error)
    - Rollback to a savepoint
    - Rollback of a transaction due to user request
    - Rollback of a transaction due to abnormal process termination
    - Rollback of all outstanding transactions when an instance terminates abnormally
    - Rollback of incomplete transactions during recovery
- In rolling back an entire transaction, without referencing any savepoints, there is an occurrence of the following sequence:
    1. Oracle undoes all changes made by all the SQL statements in the transaction by using the corresponding undo tablespace.
    2. Oracle releases all the locks of data for the transaction.
    3. The transaction ends.

Instructor Notes:
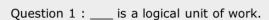
Summary

In this lesson, you have learnt:

- Transactions
  - Statement execution
  - Transaction control
  - Commit Transactions
  - Rollback transactions

Summary

Instructor Notes:

Answers to Review Questions

Question 1: Transaction

Question 2: True

Question 3: Option1, Option3

Question 4: True

Review – Questions

Question 1 : ____ is a logical unit of work.

Question 2: A transaction is committed when the user issues a DDL statement.
- True/False

Question 3: A transaction is rolled back when ____.
- Option 1: rollback statement is issued
- Option 2: the user session is abruptly terminated
- Option 3: an error occurs in DML statement
- Option 4: none of the above

Question 4:In a transaction, DDL statement after DML statement commits the changes done by DML.
- True/False

Instructor Notes:

Answers to Review Questions

Question 1: Transaction

Question 2: True

Question 3: Option1, Option3

Question 4: True

Review – Questions

➤ **Question 1 : ____ is a logical unit of work.**

➤ **Question 2: A transaction is committed when the user issues a DDL statement.**
  – True/False

➤ **Question 3: A transaction is rolled back when ____.**
  – Option 1: rollback statement is issued
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  – Option 3: an error occurs in DML statement
  – Option 4: none of the above

Question 4:In a transaction, DDL statement after DML statement commits the changes done by DML.
- True/False

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