Lesson Agenda

- Adding new rows in a table
  - INSERT statement
- Changing data in a table
  - UPDATE statement
- Removing rows from a table:
  - DELETE statement
  - TRUNCATE statement
- Database transactions control using COMMIT, ROLLBACK, and SAVEPOINT
- Read consistency
- FOR UPDATE clause in a SELECT statement

Removing a Row from a Table

DEPARTMENTS

	DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
1	10	Administration	200	1700
2	20	Marketing	201	1800
3	50	Shipping	124	1500
4	60	IT	103	1400
5	80	Sales	149	2500
6	90	Executive	100	1700
7	110	Accounting	205	1700
8	190	Contracting	(null)	1700

Delete a row from the DEPARTMENTS table:

	DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
1	10	Administration	200	1700
2	20	Marketing	201	1800
3	50	Shipping	124	1500
4	60	IT	103	1400
5	80	Sales	149	2500
6	90	Executive	100	1700
7	110	Accounting	205	1700

DELETE Statement

You can remove existing rows from a table by using the DELETE statement:

```
DELETE [FROM]   table
[WHERE          condition];
```

Deleting Rows from a Table

- Specific rows are deleted if you specify the WHERE clause:

```
DELETE FROM departments
WHERE  department_name = 'Finance';
```

```
1 rows deleted
```

- All rows in the table are deleted if you omit the WHERE clause:

```
DELETE FROM  copy_emp;
```

```
22 rows deleted
```

Deleting Rows Based on Another Table

Use the subqueries in the DELETE statements to remove rows from a table based on values from another table:

```
DELETE FROM employees
WHERE  department_id =
                (SELECT department_id
                 FROM   departments
                 WHERE  department_name
                        LIKE '%Public%');
```

```
1 rows deleted
```

TRUNCATE Statement

- Removes all rows from a table, leaving the table empty and the table structure intact
- Is a data definition language (DDL) statement rather than a DML statement; cannot easily be undone
- Syntax:

```
TRUNCATE TABLE table_name;
```

- Example:

```
TRUNCATE TABLE copy_emp;
```

Quiz

What does the word DML stands for in Oracle SQL?

A. Durability Management Language
B. Database Management Language
C. Database Manipulation Language
D. None of the above

Quiz

Which of the following are DML commands in Oracle Database?

A. SELECT
B. GROUP BY
C. INTERSECT
D. INSERT

Quiz

Which of following commands is a DDL (Data Definition Language) command but is often considered along with DML commands?

A. DELETE
B. INSERT
C. TRUNCATE
D. None of the above

Quiz

Which of the following commands is used to populate table rows with data?

A. DELETE
B. INSERT
C. SELECT
D. UPDATE

Quiz

Which of the following can be used to insert rows in tables?

A. SELECT
B. INSERT
C. Sub-queries
D. All of the above

Quiz

Which of the following commands is used to change the rows that already exist in a table?

A. INSERT
B. UNION
C. UPDATE
D. SELECT

Quiz

What is true about the UPDATE command?

A. It can update only one row at a time
B. It can update only 100 rows at a time
C. It can update unlimited rows at a time in bulk
D. None of the above

Quiz

Which of the following clauses decides how many rows are to be updated?

A. SELECT
B. WHERE
C. FROM
D. All of the above

Quiz

What among the following is true about the UPDATE statement? (Choose the most appropriate answer)

A. An UPDATE can update rows from only one table

B. An UPDATE can update rows from multiple tables

C. A single UPDATE command cannot affect rows in multiple tables

D. None of the above

Quiz

Which of the following commands can be used to remove existing records from a table?

A. UPDATE
B. INSERT
C. MINUS
D. DELETE

Quiz

What among the following is true about the DELETE statement?

A. The DELETE statement has to be accompanied by the WHERE clause
B. It is not mandatory to write a WHERE clause with the DELETE statement
C. DELETE can remove data from multiple tables at a time
D. None of the above

Quiz

What among the following is a TRUNCATE statement equivalent to? (Choose the most suitable answer)

A. To a DELETE statement
B. To an UPDATE statement
C. A DELETE statement without a WHERE clause
D. None of the above

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Database Transactions

A database transaction consists of one of the following:

- DML statements that constitute one consistent change to the data
- One DDL statement
- One data control language (DCL) statement

Database Transactions: Start and End

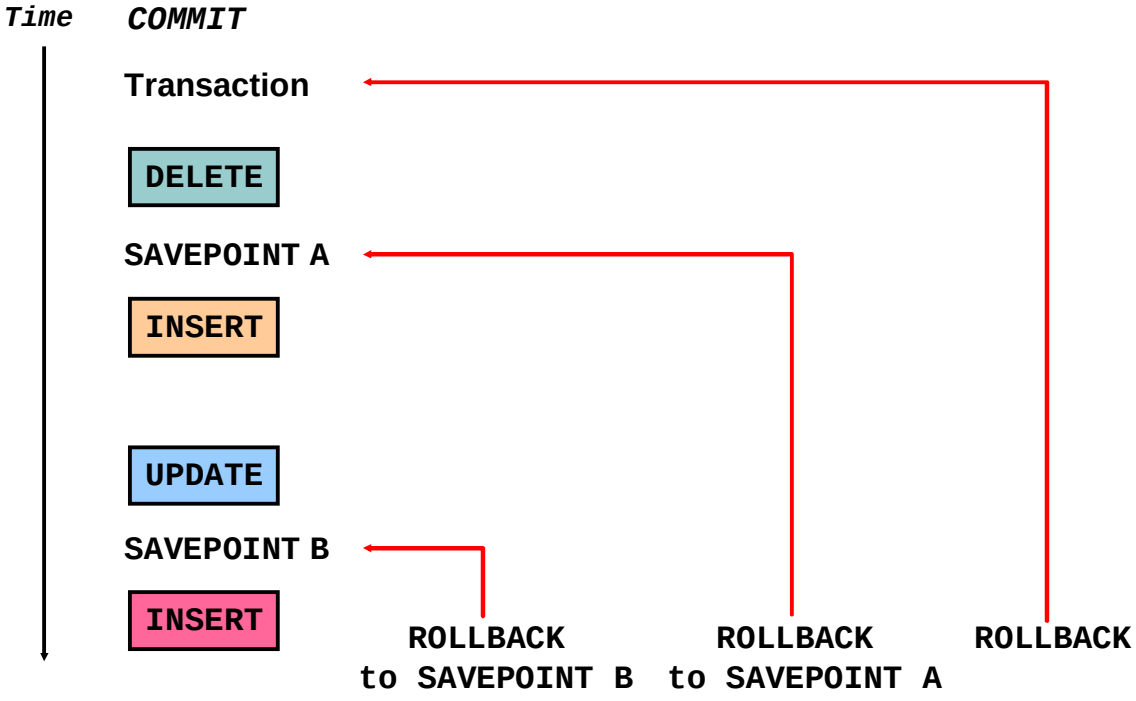
- Begin when the first DML SQL statement is executed.
- End with one of the following events:
  - A `COMMIT` or `ROLLBACK` statement is issued.
  - A DDL or DCL statement executes (automatic commit).
  - The user exits SQL Developer or SQL*Plus.
  - The system crashes.

Advantages of COMMIT and ROLLBACK Statements

With COMMIT and ROLLBACK statements, you can:

- Ensure data consistency
- Preview data changes before making changes permanent
- Group logically-related operations

Explicit Transaction Control Statements



Rolling Back Changes to a Marker

- Create a marker in the current transaction by using the SAVEPOINT statement.
- Roll back to that marker by using the ROLLBACK TO SAVEPOINT statement.

```
UPDATE...
SAVEPOINT update_done;
SAVEPOINT update_done succeeded.
INSERT...
ROLLBACK TO update_done;
ROLLBACK TO succeeded.
```

Implicit Transaction Processing

- An automatic commit occurs in the following circumstances:
  - A DDL statement issued
  - A DCL statement issued
  - Normal exit from SQL Developer or SQL*Plus, without explicitly issuing `COMMIT` or `ROLLBACK` statements
- An automatic rollback occurs when there is an abnormal termination of SQL Developer or SQL*Plus or a system failure.

State of the Data Before COMMIT or ROLLBACK

- The previous state of the data can be recovered.
- The current user can review the results of the DML operations by using the SELECT statement.
- Other users *cannot* view the results of the DML statements issued by the current user.
- The affected rows are *locked*; other users cannot change the data in the affected rows.

State of the Data After COMMIT

- Data changes are saved in the database.
- The previous state of the data is overwritten.
- All users can view the results.
- Locks on the affected rows are released; those rows are available for other users to manipulate.
- All savepoints are erased.

Committing Data

- Make the changes:

```
DELETE FROM employees
WHERE  employee_id = 99999;
1 rows deleted

INSERT INTO departments
VALUES (290, 'Corporate Tax', NULL, 1700);
1 rows inserted
```

- Commit the changes:

```
COMMIT;
COMMIT succeeded.
```

State of the Data After ROLLBACK

Discard all pending changes by using the ROLLBACK statement:

- Data changes are undone.
- Previous state of the data is restored.
- Locks on the affected rows are released.

```
DELETE FROM copy_emp;
ROLLBACK ;
```

State of the Data After ROLLBACK: Example

```
DELETE FROM test;
25,000 rows deleted.

ROLLBACK;
Rollback complete.

DELETE FROM test WHERE  id = 100;
1 row deleted.

SELECT * FROM   test WHERE  id = 100;
No rows selected.

COMMIT;
Commit complete.
```

Statement-Level Rollback

- If a single DML statement fails during execution, only that statement is rolled back.
- The Oracle server implements an implicit savepoint.
- All other changes are retained.
- The user should terminate transactions explicitly by executing a `COMMIT` or `ROLLBACK` statement.

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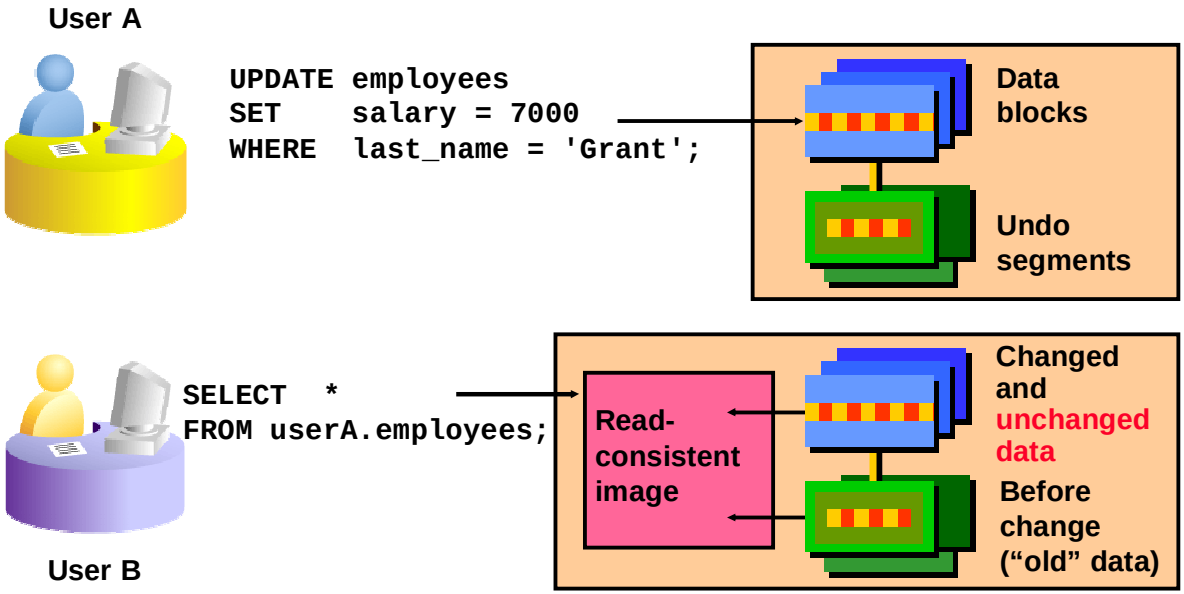
Read Consistency

- Read consistency guarantees a consistent view of the data at all times.
- Changes made by one user do not conflict with the changes made by another user.
- Read consistency ensures that, on the same data:
  - Readers do not wait for writers
  - Writers do not wait for readers
  - Writers wait for writers

Implementing Read Consistency



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FOR UPDATE Clause in a SELECT Statement

- Locks the rows in the EMPLOYEES table where job_id is SA_REP.

```
SELECT employee_id, salary, commission_pct, job_id
FROM employees
WHERE job_id = 'SA_REP'
FOR UPDATE
ORDER BY employee_id;
```

- Lock is released only when you issue a ROLLBACK or a COMMIT.
- If the SELECT statement attempts to lock a row that is locked by another user, the database waits until the row is available, and then returns the results of the SELECT statement.

FOR UPDATE Clause: Examples

- You can use the FOR UPDATE clause in a SELECT statement against multiple tables.

```
SELECT e.employee_id, e.salary, e.commission_pct
FROM employees e JOIN departments d
USING (department_id)
WHERE job_id = 'ST_CLERK‘
AND location_id = 1500
FOR UPDATE
ORDER BY e.employee_id;
```

- Rows from both the EMPLOYEES and DEPARTMENTS tables are locked.
- Use FOR UPDATE OF *column_name* to qualify the column you intend to change, then only the rows from that specific table are locked.

Quiz

The following statements produce the same results:

```
DELETE FROM copy_emp;
```

```
TRUNCATE TABLE copy_emp;
```

1. True
2. False

Quiz

Which of the following best defines a transaction?

A. A transaction consists of DDL statements on the database schema
B. A transaction consists of COMMIT or ROLLBACK in a database session
C. A transaction consists of either a collection of DML statements or a DDL or DCL or TCL statement to form a logical unit of work in a database session
D. A transaction consists of collection of DML and DDL statements in different sessions of the database

Quiz

What does a collection of DML statements that form a logical unit work known as?

A. ACID property
B. UNION
C. UNION ALL
D. Transaction

Quiz

What is true about the keyword VALUES in INSERT statements?

A. VALUES can add multiple rows at a time during the INSERT
B. VALUES can add only 100 rows at a time during the INSERT
C. VALUES is mandatory to be used if we use the keyword INSERT
D. VALUES add only one row at a time

Quiz

Which of the following commands is used to save the changed data in a table permanently?

A. ROLLBACK
B. COMMIT
C. INSERT
D. UPDATE

Quiz

Which of the following commands allows enabling markers in an active transaction?

A. ROLLBACK
B. COMMIT
C. SAVEPOINT
D. None of the above

Quiz

Which of the following commands allows undoing the changed data?

A. ROLLBACK
B. COMMIT
C. INSERT
D. UPDATE

Quiz

Which of the following is the syntax for inserting rows through a sub-query?

A. INSERT INTO tablename [{column_name,..}]
   subquery;

B. INSERT INTO tablename VALUES [{column_name,..}]
   subquery;

C. Both A and B
D. None of the above

Quiz

Which of the following commands / statements would end a transaction?

A. COMMIT
B. SELECT
C. SAVEPOINT
D. CREATE

Quiz

When does a transaction complete?

A. When a ROLLBACK is executed
B. When a COMMIT is executed
C. When TRUNCATE is executed
D. All of the above

Quiz

What happens when a transaction is committed?

A. The changes made during the transaction are saved for a particular user session
B. The changes made during the transaction are discarded
C. If the transaction is a DDL, the commit doesn't work
D. None of the above

Quiz

You need to copy the data from one table to another table. Which of the following methods can be used?

A. You can use the COPY command
B. You can use the INSERT command
C. You can use the UPDATE command
D. None of the above

Quiz

Which of the following reasons will terminate a transaction?

A. A DDL statement
B. Exiting a client
C. System crashes
D. All of the above

Summary

In this lesson, you should have learned how to use the following statements:

Function	Description
INSERT	Adds a new row to the table
UPDATE	Modifies existing rows in the table
DELETE	Removes existing rows from the table
TRUNCATE	Removes all rows from a table
COMMIT	Makes all pending changes permanent
SAVEPOINT	Is used to roll back to the savepoint marker
ROLLBACK	Discards all pending data changes
FOR UPDATE clause in SELECT	Locks rows identified by the SELECT query

Practice 9: Overview

This practice covers the following topics:

- Inserting rows into the tables
- Updating and deleting rows in the table
- Controlling transactions