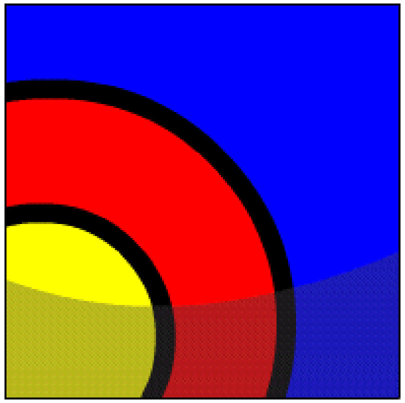
Manipulating Data in PL/SQL

What Will I Learn?

In this lesson, you will learn to:

- Construct and execute PL/SQL statements that manipulate data with DML statements
- Describe when to use implicit or explicit cursors in PL/SQL
- Create PL/SQL code to use SQL implicit cursor attributes to evaluate cursor activity



Why Learn It?

In the previous lesson, you learned that you can include SELECT statements that return a single row in a PL/SQL block. The data retrieved by the SELECT statement must be held in variables using the `INTO` clause.

In this lesson, you learn how to include data manipulation language (DML) statements, such as `INSERT`, `UPDATE`, `DELETE`, and `MERGE` in PL/SQL blocks.

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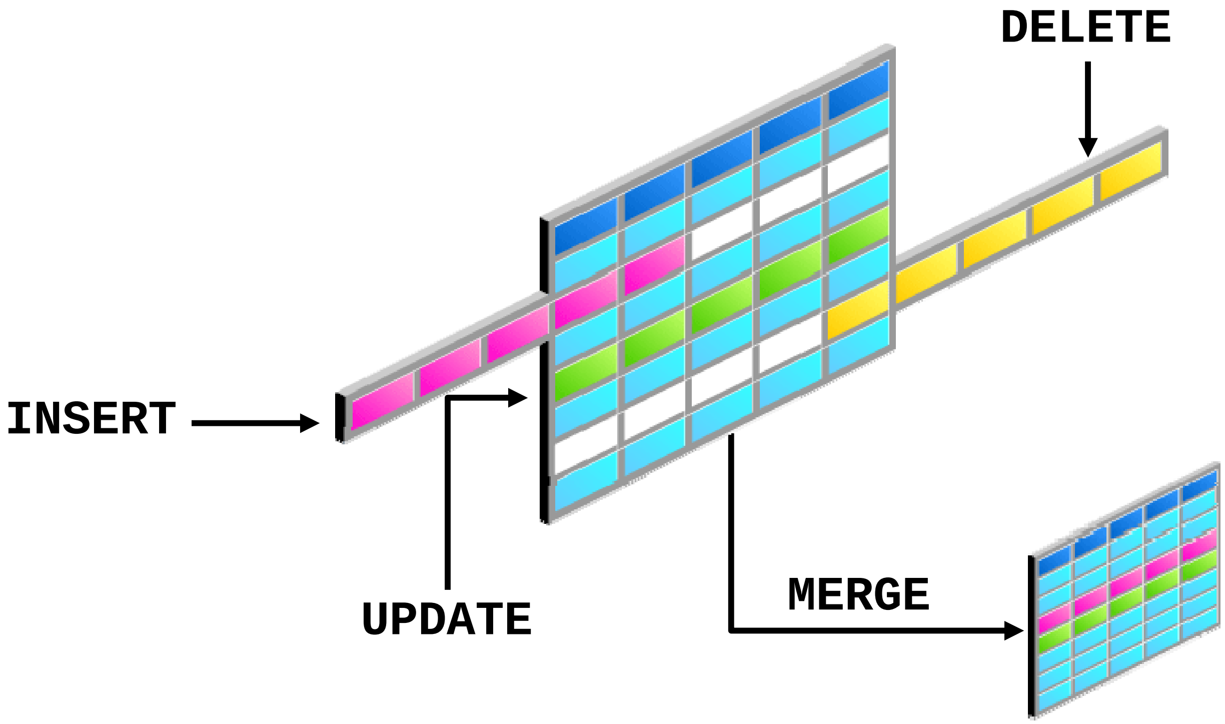
Manipulating Data Using PL/SQL

Make changes to data by using DML commands within your PLSQL block:

- `INSERT`
- `UPDATE`
- `DELETE`
- `MERGE`



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Manipulating Data Using PL/SQL (continued)

- You manipulate data in the database by using the DML commands.
- You can issue the DML commands—`INSERT`, `UPDATE`, `DELETE`, and `MERGE`—without restriction in PL/SQL. Row locks (and table locks) are released by including `COMMIT` or `ROLLBACK` statements in the PL/SQL code.
  - The `INSERT` statement adds new rows to the table.
  - The `UPDATE` statement modifies existing rows in the table.
  - The `DELETE` statement removes rows from the table.
  - The `MERGE` statement selects rows from one table to update and/or insert into another table. The decision whether to update or insert into the target table is based on a condition in the `ON` clause.
- **Note:** `MERGE` is a deterministic statement—that is, you cannot update the same row of the target table multiple times in the same `MERGE` statement. You must have `INSERT` and `UPDATE` object privileges in the target table and the `SELECT` privilege in the source table.

Tell Me/Show Me

Inserting Data

The INSERT statement adds new row(s) to a table.

Example: Add new employee information to the COPY_EMP table.

```
BEGIN
  INSERT INTO copy_emp
     (employee_id, first_name, last_name, email,
      hire_date, job_id, salary)
   VALUES (99, 'Ruth', 'Cores',
          'RCORES', SYSDATE, 'AD_ASST', 4000);
END;
```

One new row is added to the COPY_EMP table.

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Updating Data

The UPDATE statement modifies existing row(s) in a table.

Example: Increase the salary of all employees who are stock clerks.

```
DECLARE
  v_sal_increase   employees.salary%TYPE := 800;
BEGIN
  UPDATE      copy_emp
    SET       salary = salary + v_sal_increase
    WHERE     job_id = 'ST_CLERK';
END;
```

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Deleting Data

The `DELETE` statement removes row(s) from a table.

Example: Delete rows that belong to department 10 from the `COPY_EMP` table.

```
DECLARE
  v_deptno   employees.department_id%TYPE := 10;
BEGIN
  DELETE FROM   copy_emp
    WHERE  department_id = v_deptno;
END;
```

Tell Me/Show Me

Merging Rows

The MERGE statement selects rows from one table to update and/or insert into another table. Insert or update rows in the copy_emp table to match the employees table.

```
BEGIN
  MERGE INTO copy_emp c
     USING employees e
     ON (e.employee_id = c.employee_id)
   WHEN MATCHED THEN
     UPDATE SET
       c.first_name     = e.first_name,
       c.last_name      = e.last_name,
       c.email          = e.email,
       . . .
   WHEN NOT MATCHED THEN
     INSERT VALUES(e.employee_id, e.first_name, …e.department_id);
END;
```

Tell Me/Show Me

Getting Information From a Cursor

Look again at the DELETE statement in this PL/SQL block.

```
DECLARE
  v_deptno   employees.department_id%TYPE := 10;
BEGIN
  DELETE FROM   copy_emp
    WHERE  department_id = v_deptno;
END;
```

It would be useful to know how many COPY_EMP rows were deleted by this statement.

To obtain this information, we need to understand cursors.

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What is a Cursor?

Every time an SQL statement is about to be executed, the Oracle server allocates a private memory area to store the SQL statement and the data that it uses. This memory area is called an implicit cursor.

Because this memory area is automatically managed by the Oracle server, you have no direct control over it. However, you can use predefined PL/SQL variables, called implicit cursor attributes, to find out how many rows were processed by the SQL statement.

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Implicit and Explicit Cursors

There are two types of cursors:

- Implicit cursors: Defined automatically by Oracle for all SQL data manipulation statements, and for queries that return only one row. An implicit cursor is always automatically named “SQL.”

- Explicit cursors: Defined by the PL/SQL programmer for queries that return more than one row. (Covered in a later lesson.)

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Cursor Attributes for Implicit Cursors

Cursor attributes are automatically declared variables that allow you to evaluate what happened when a cursor was last used. Attributes for implicit cursors are prefaced with “SQL.” Use these attributes in PL/SQL statements, but not in SQL statements. Using cursor attributes, you can test the outcome of your SQL statements.

`SQL%FOUND`	Boolean attribute that evaluates to TRUE if the most recent SQL statement returned at least one row
`SQL%NOTFOUND`	Boolean attribute that evaluates to TRUE if the most recent SQL statement did not return even one row
`SQL%ROWCOUNT`	An integer value that represents the number of rows affected by the most recent SQL statement

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Using Implicit Cursor Attributes: Example 1

Delete rows that have the specified employee ID from the copy_emp table. Print the number of rows deleted.

```
DECLARE
  v_deptno copy_emp.department_id%TYPE := 50;
BEGIN
  DELETE FROM copy_emp
    WHERE department_id = v_deptno;
  DBMS_OUTPUT.PUT_LINE(SQL%ROWCOUNT ||
                       ' rows deleted.');
END;
```

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Using Implicit Cursor Attributes: Example 2

Update several rows in the COPY_EMP table. Print the number of rows updated.

```
DECLARE
  v_sal_increase   employees.salary%TYPE := 800;
BEGIN
  UPDATE      copy_emp
    SET       salary = salary + v_sal_increase
    WHERE     job_id = 'ST_CLERK';
  DBMS_OUTPUT.PUT_LINE(SQL%ROWCOUNT ||
                       ' rows updated.');
END;
```

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Using Implicit Cursor Attributes: Good Practice Guideline

Look at this code, which creates a table and then executes a PL/SQL block. What value is inserted into RESULTS?

```
CREATE TABLE results (num_rows NUMBER(4));

BEGIN
  UPDATE      copy_emp
    SET       salary = salary + 100
    WHERE     job_id = 'ST_CLERK';
  INSERT INTO results (num_rows)
    VALUES (SQL%ROWCOUNT);
END;
```

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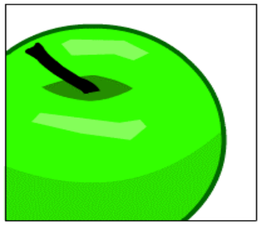

Terminology

Key terms used in this lesson include:

INSERT

UPDATE

DELETE

MERGE

Implicit cursors

Explicit cursors

Summary

In this lesson, you learned to:

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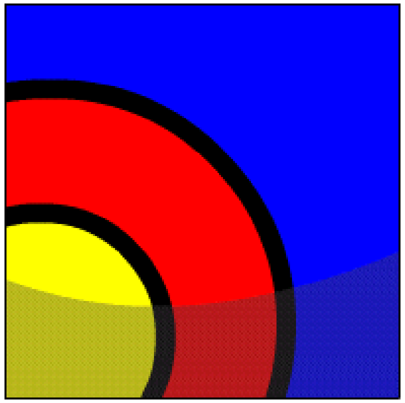

Try It/Solve It

The exercises in this lesson cover the following topics:

- Executing PL/SQL statements that manipulate data with DML statements
- Describing when to use implicit or explicit cursors in PL/SQL
- Using SQL implicit cursor attributes in PL/SQL