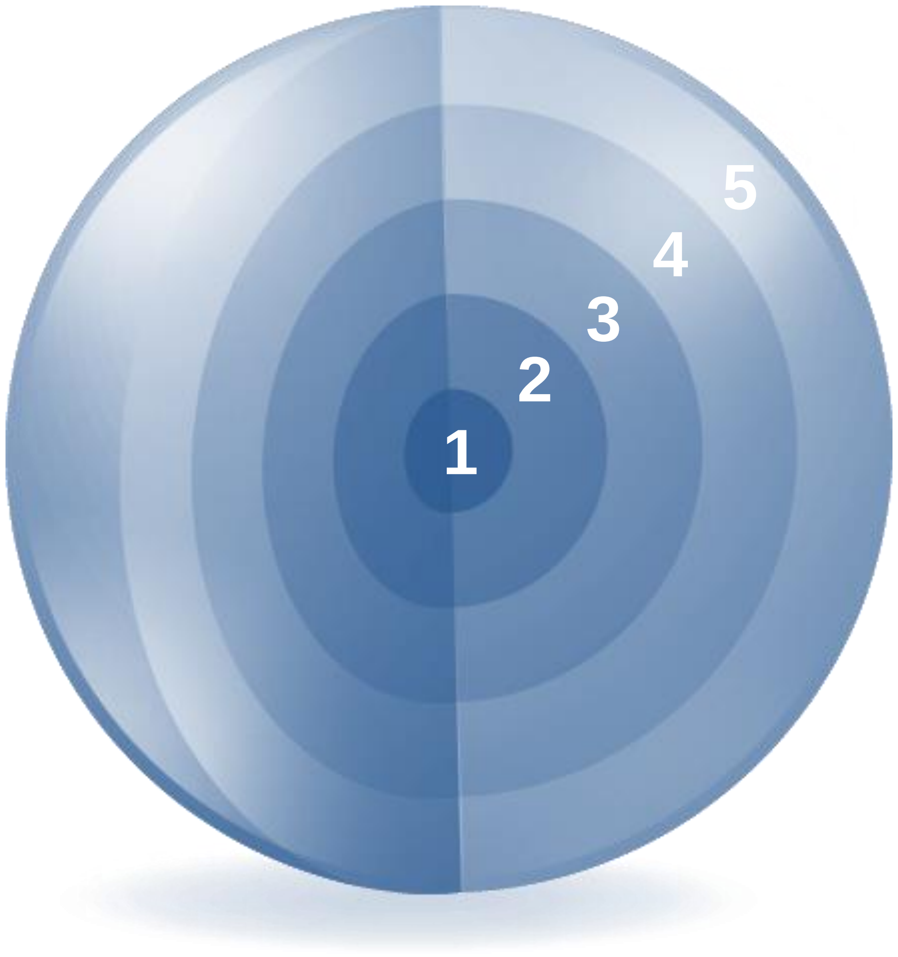
Lesson 9

Manipulating Data

What You will Learn at the end of this Session?



1. **Describe each data manipulation language (DML) statement**

   .

2. **Insert rows into a table**

3. **Update rows in a table**

4. **Delete rows from a table**

   .

5. **Control transactions**

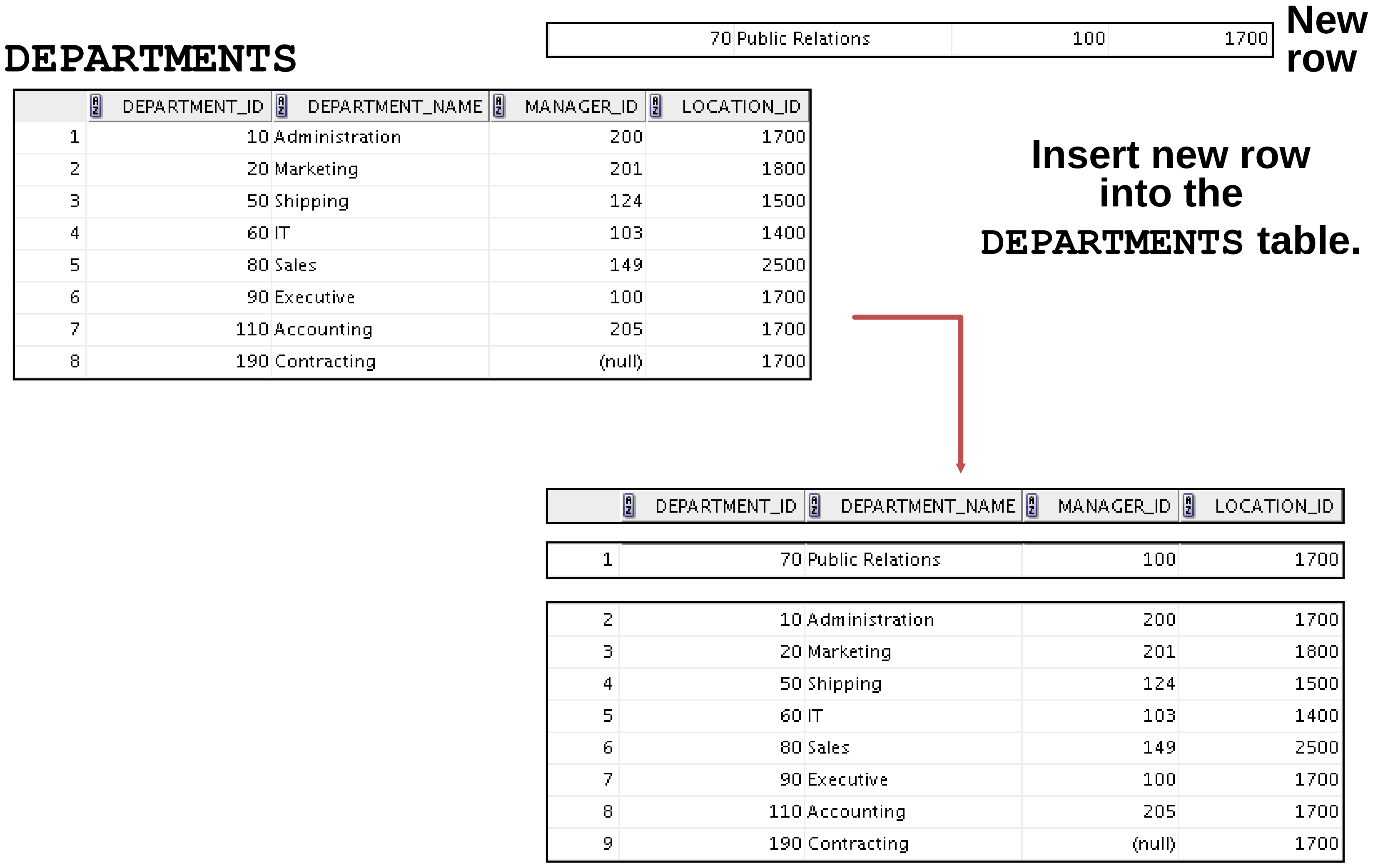
Data Manipulation Language

A DML statement is executed when you:

- Add new rows to a table
- Modify existing rows in a table
- Remove existing rows from a table

A *transaction* consists of a collection of DML statements that form a logical unit of work.

Adding a New Row to 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

70	Public Relations	100	1700

New row

Insert new row into the DEPARTMENTS table.

	DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
1	70	Public Relations	100	1700
2	10	Administration	200	1700
3	20	Marketing	201	1800
4	50	Shipping	124	1500
5	60	IT	103	1400
6	80	Sales	149	2500
7	90	Executive	100	1700
8	110	Accounting	205	1700
9	190	Contracting	(null)	1700

`INSERT` Statement Syntax

- Add new rows to a table by using the INSERT statement:

```
INSERT INTO   table [(column [, column...])]
VALUES        (value [, value...]);
```

- With this syntax, only one row is inserted at a time.

Inserting New Rows

Insert a new row containing values for each column.

List values in the default order of the columns in the table.

Optionally, list the columns in the INSERT clause.

```
INSERT   INTO   order_items (order_id,
line_item_id,  product_id,  unit_price,  quantity)
VALUES  (2355, 1, 3108, 46, 200) ;
```

```
1 rows inserted
```

Enclose character and date values within single quotation marks.

Inserting Rows with Null Values

- Implicit method: Omit the column from the column list.

```
INSERT INTO promotions (promo_id)
VALUES (3) ;
```

```
1 rows inserted
```

- Explicit method: Specify the NULL keyword in the VALUES clause.

```
INSERT INTO promotions
VALUES (3 , NULL) ;
```

```
1 rows inserted
```

Inserting Special Values

- The SYSDATE function records the current date and time.

```
INSERT INTO runreport
                      (date_run,
                       user_run,
                       comments)
VALUES
                      (SYSDATE,
                       'OE',
                       'Editing Report');
```

```
1 rows inserted
```

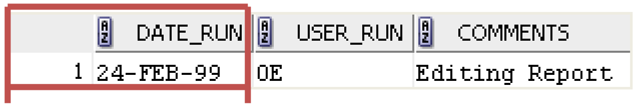
Inserting Specific Date and Time Values

– **Add a new report.**

```
INSERT INTO runreport
                   (date_run, user_run, comments)
VALUES
                   (to date('24 FEB,1999'),
                    'OE',
                    'Editing Report');
```

```
1 rows inserted
```

– **Verify your addition.**



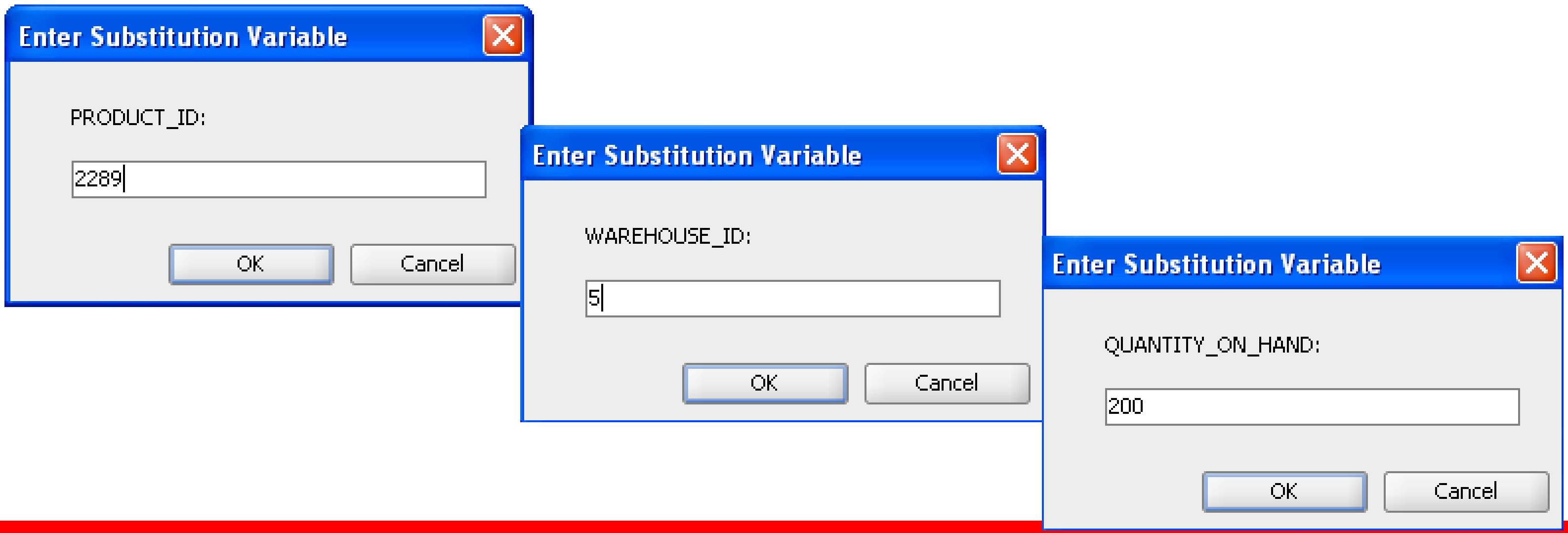
	DATE_RUN	USER_RUN	COMMENTS
1	24-FEB-99	OE	Editing Report

Creating a Script

– **Use the & substitution in a SQL statement to prompt for values.**

– **& is a placeholder for the variable value.**

```
INSERT   INTO   inventories
( product_id,  warehouse_id,  quantity_on_hand )
VALUES   ( &product_id,  &warehouse_id,  &quantity_on_hand ) ;
```



Enter Substitution Variable

PRODUCT_ID: 2289

Enter Substitution Variable

WAREHOUSE_ID: 5

Enter Substitution Variable

QUANTITY_ON_HAND: 200

Copying Rows from Another Table

Write your INSERT statement with a subquery:

```
INSERT INTO sales_reps(id, name, salary, commission_pct)
  SELECT employee_id, last_name, salary, commission_pct
  FROM   employees
  WHERE  job_id LIKE '%REP%';
```

```
4 rows inserted
```

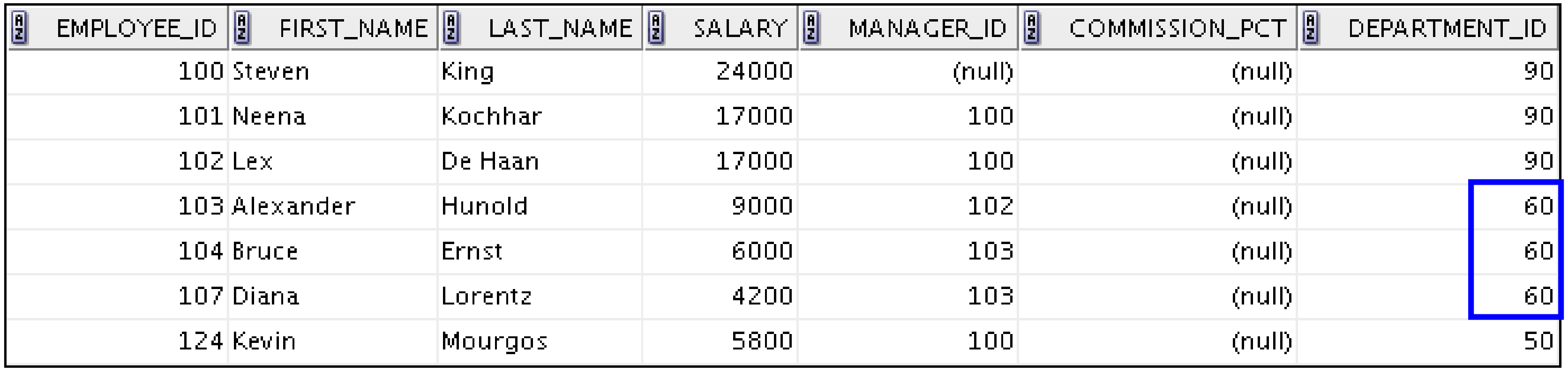
Do not use the VALUES clause.

Match the number of columns in the INSERT clause to those in the subquery.

Inserts all the rows returned by the subquery in the table, sales_reps.

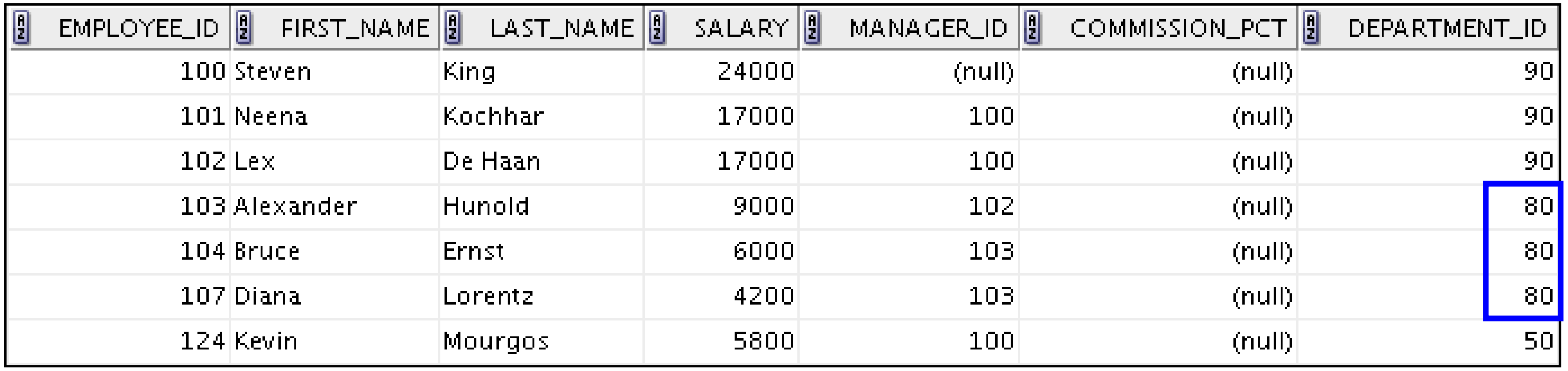
Changing Data in a Table

EMPLOYEES



EMPLOYEE_ID	FIRST_NAME	LAST_NAME	SALARY	MANAGER_ID	COMMISSION_PCT	DEPARTMENT_ID
100	Steven	King	24000	(null)	(null)	90
101	Neena	Kochhar	17000	100	(null)	90
102	Lex	De Haan	17000	100	(null)	90
103	Alexander	Hunold	9000	102	(null)	60
104	Bruce	Ernst	6000	103	(null)	60
107	Diana	Lorentz	4200	103	(null)	60
124	Kevin	Mourgos	5800	100	(null)	50

Update rows in the EMPLOYEES table:



EMPLOYEE_ID	FIRST_NAME	LAST_NAME	SALARY	MANAGER_ID	COMMISSION_PCT	DEPARTMENT_ID
100	Steven	King	24000	(null)	(null)	90
101	Neena	Kochhar	17000	100	(null)	90
102	Lex	De Haan	17000	100	(null)	90
103	Alexander	Hunold	9000	102	(null)	80
104	Bruce	Ernst	6000	103	(null)	80
107	Diana	Lorentz	4200	103	(null)	80
124	Kevin	Mourgos	5800	100	(null)	50

UPDATE Statement Syntax

– **Modify existing values in a table with the UPDATE statement:**

```
UPDATE        table
SET           column = value [, column = value, ...]
[WHERE        condition];
```

– **Update more than one row at a time (if required).**

Updating Rows in a Table

– **Values for a specific row or rows are modified if you specify the WHERE clause:**

```
UPDATE   inventories
SET   warehouse_id  =  7
WHERE   product_id  =  3108 ;
```

```
1 rows updated
```

– **Values for all the rows in the table are modified if you omit the WHERE clause:**

```
UPDATE   inventories
SET   warehouse_id  =  7 ;
```

– **Specify SET *column_name*= NULL to update a column value to NULL.**

Updating Two Columns with a Subquery

•**Update employee 113's job and salary to match those of employee 205.**

```
UPDATE   orders
SET    order_date  =  ( SELECT order_date
                         FROM  orders
                         WHERE   order_id  =  2397 ) ,
       customer_id  =  ( SELECT   customer_id
                          FROM   orders
                          WHERE   order_id  =  2397 )
WHERE   order_id  =  2458 ;
```

```
1 rows updated
```

Updating Rows Based on Another Table

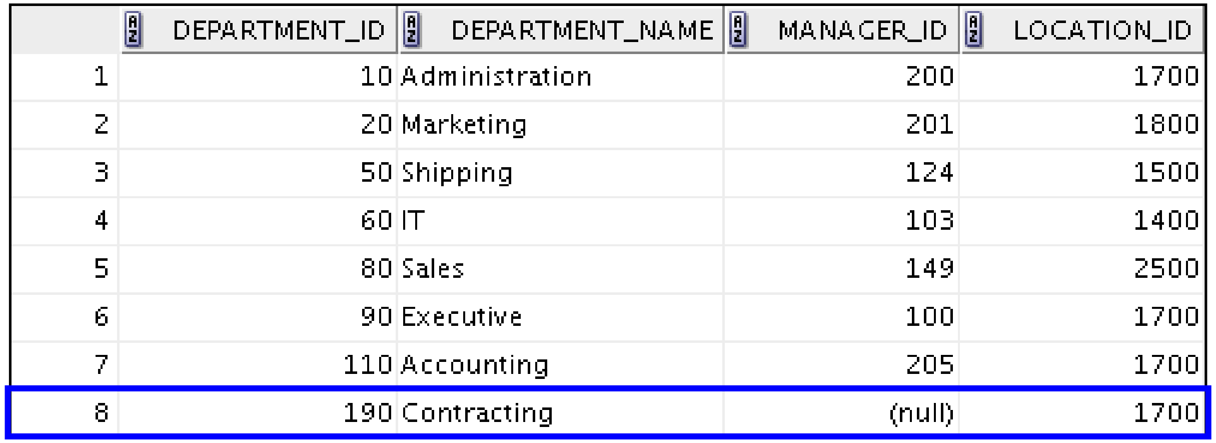
- Use the subqueries in the UPDATE statements to update row values in a table based on values from another table:

```
UPDATE   copy_emp
SET      department_id    =   (SELECT department_id
                               FROM employees
                               WHERE employee_id = 100)
WHERE    job_id           =   (SELECT job_id
                               FROM employees
                               WHERE employee_id = 200);
```

```
1 rows updated
```

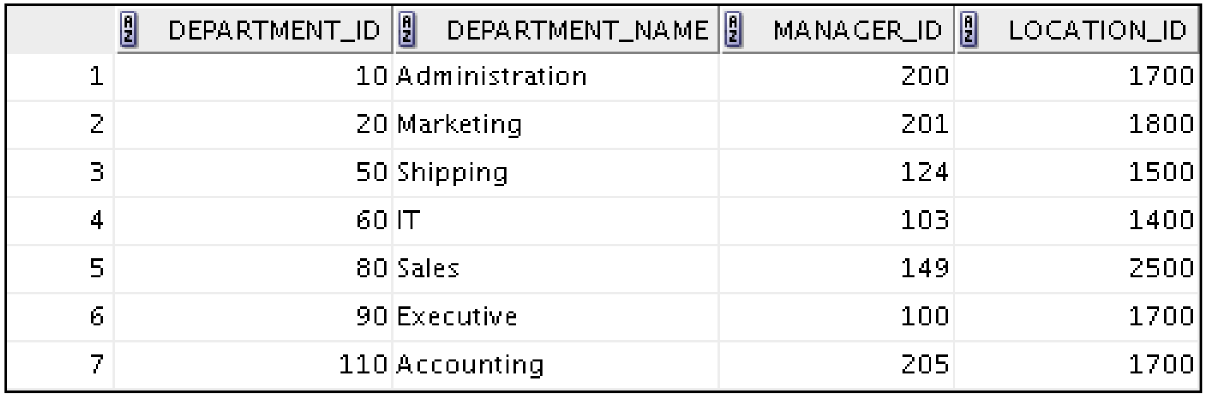
Removing a Row from a Table

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
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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   runreport
WHERE   comments  =  ' Editing Report ' ;
```

```
1 rows deleted
```

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

```
DELETE  FROM  copy_emp;
```

```
22 rows deleted
```

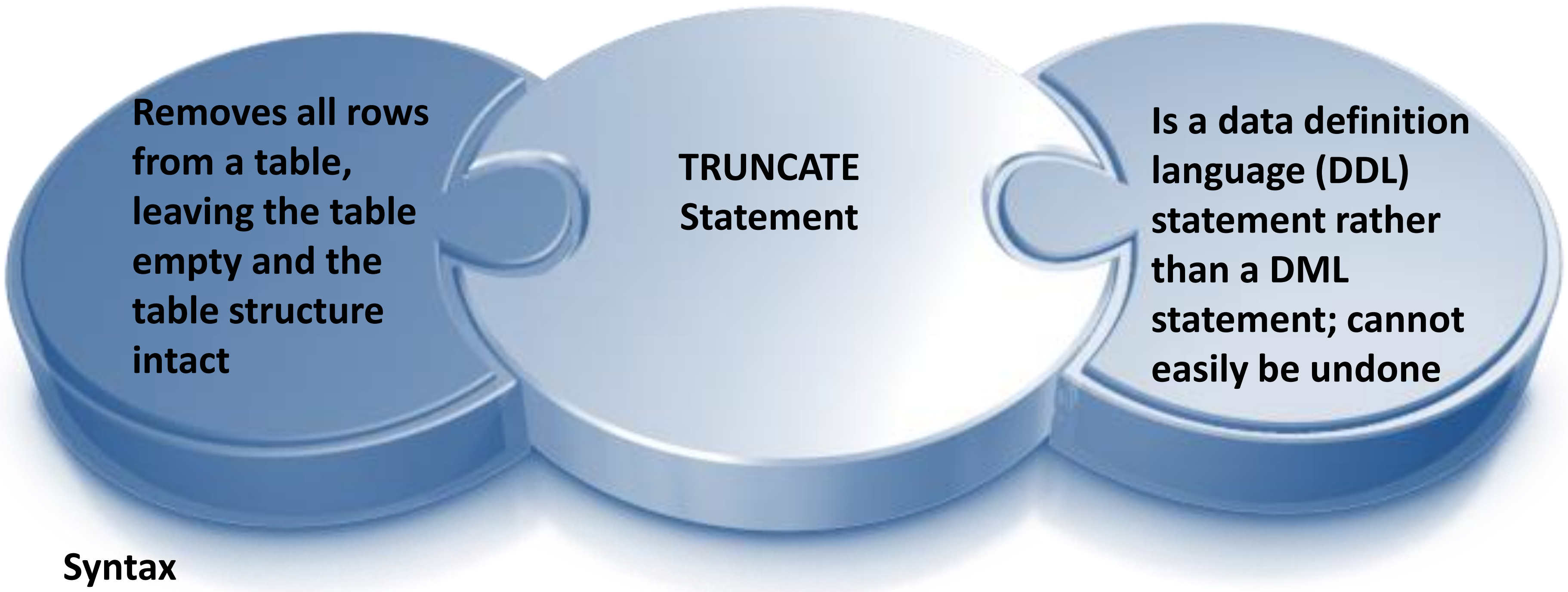
Deleting Rows Based on Another Table

•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
TRUNCATE Statement
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;
```

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

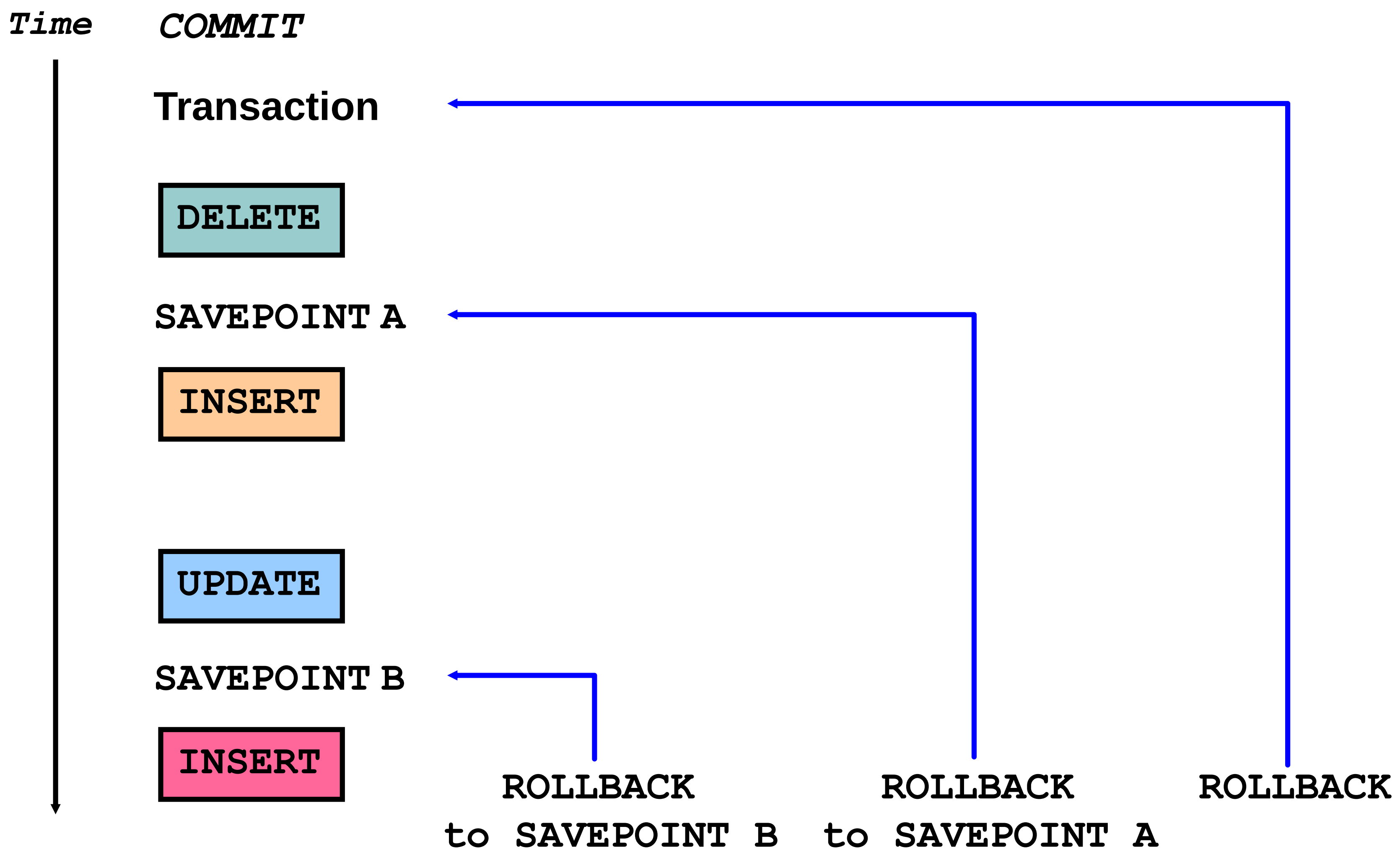
Begin when the first DML SQL statement is executed.

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.

Explicit Transaction Control Statements



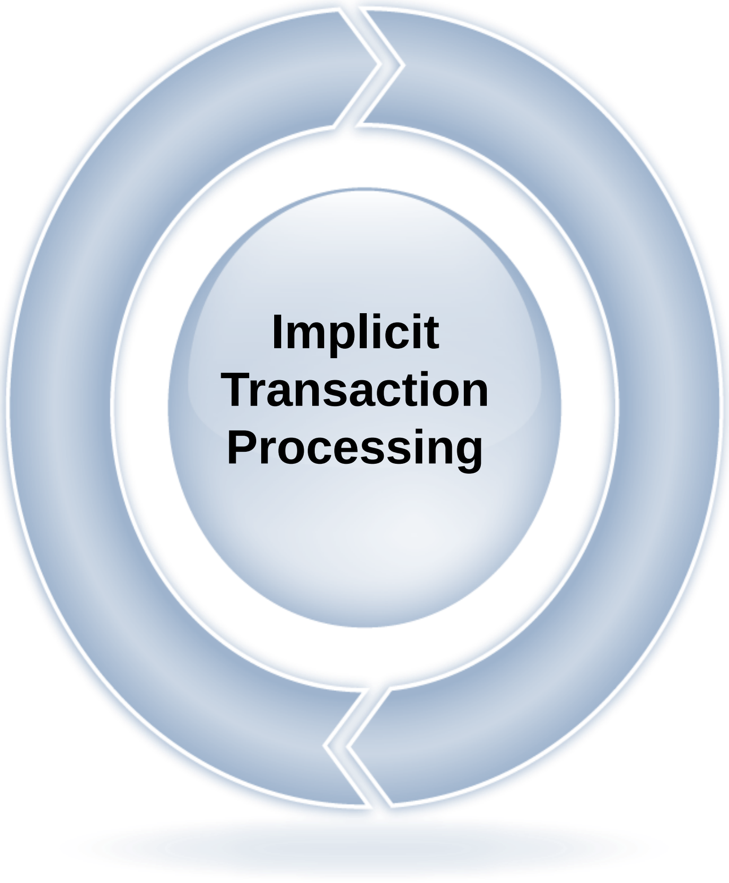
Rolling Back Changes to a Marker

- 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 rollback occurs when there is an abnormal termination of SQL Developer or SQL*Plus or a system failure



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

State of the Data Before `COMMIT` or `ROLLBACK`

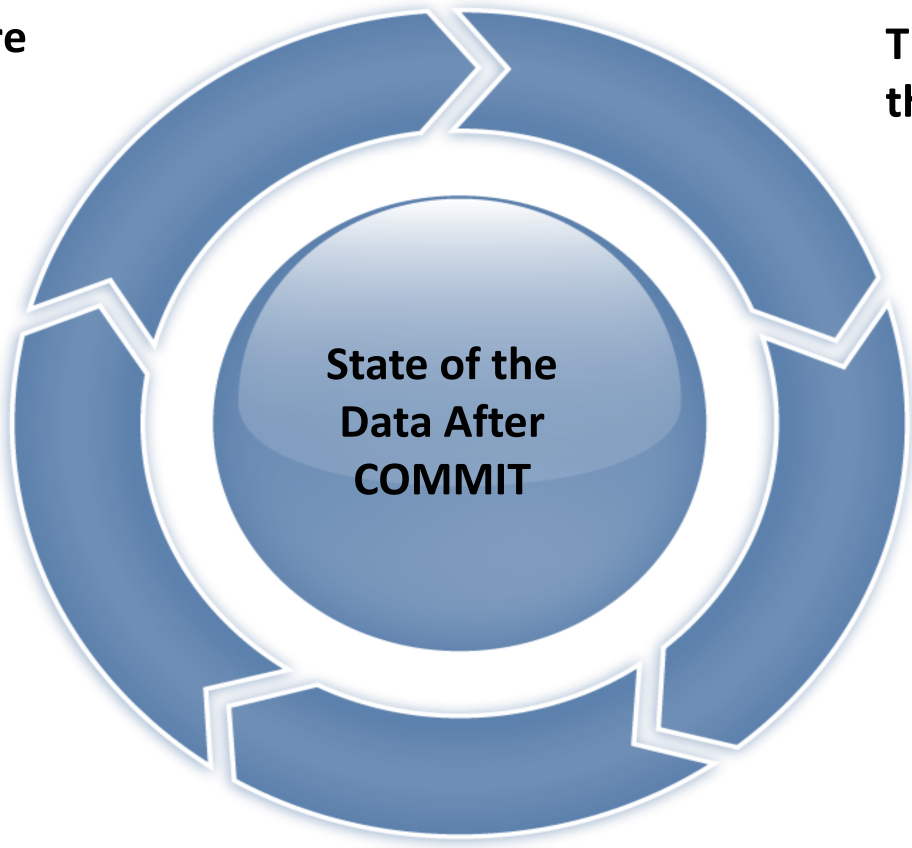
The previous state of the data can be recovered.

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 save points are erased.

Committing Data

– **Make the changes:**

```
DELETE   FROM  inventories
WHERE   product_id  =  2458  ;
```

```
1 rows deleted
```

```
INSERT   INTO   Inventories
VALUES (2670, 6, 159);
```

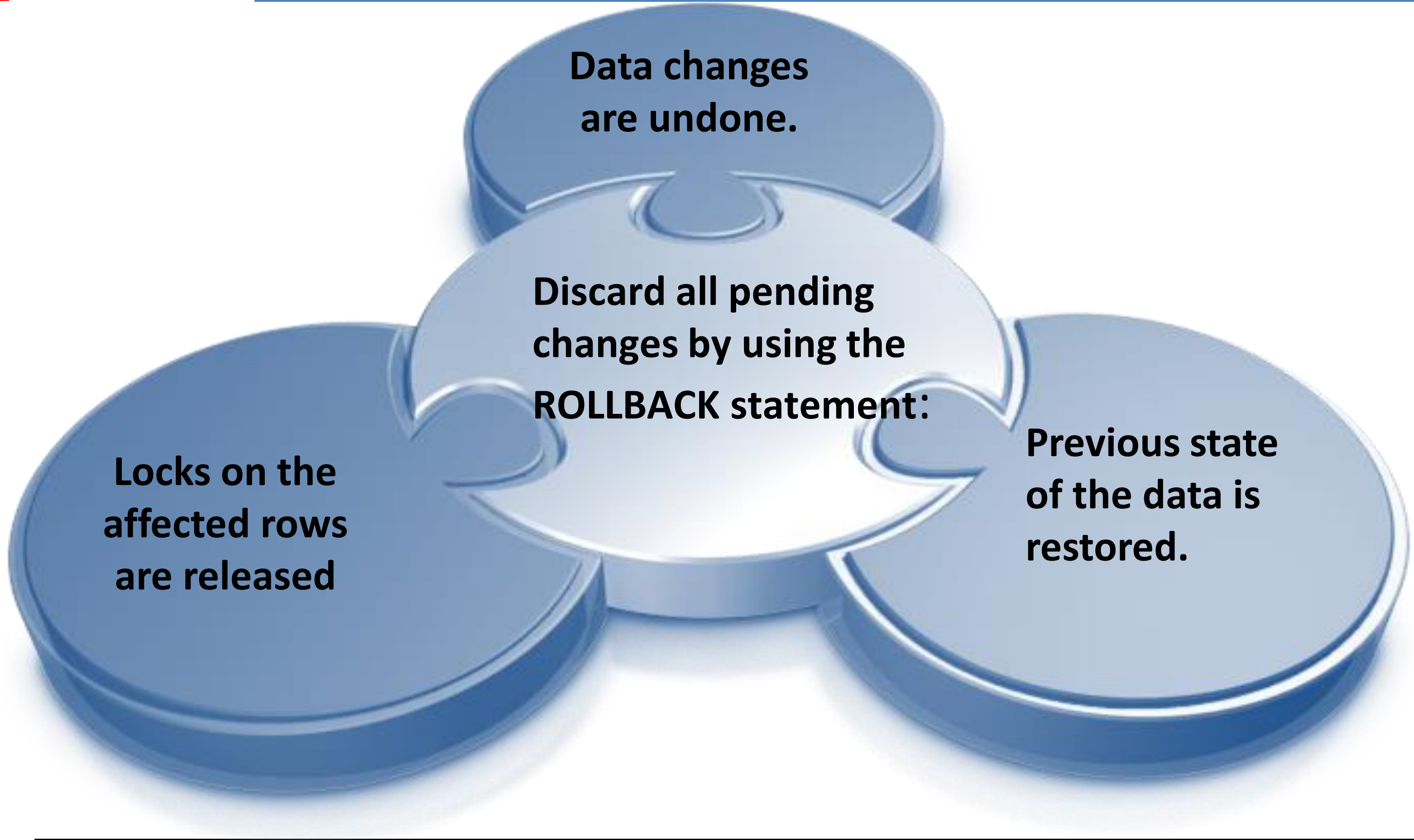
```
1 rows inserted
```

– **Commit the changes:**

```
COMMIT;
```

```
COMMIT succeeded.
```

State of the Data After `ROLLBACK`


Data changes are undone.
Discard all pending changes by using the ROLLBACK statement:
Locks on the affected rows are released
Previous state of the data is restored.

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

State of the Data After `ROLLBACK`: Example

```
DELETE FROM order_items;
603 rows deleted.

ROLLBACK;
Rollback complete.

DELETE FROM order_items WHERE  product_id = 2348;
1 row deleted.

SELECT * FROM   order_id WHERE  product_id = 2348;
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.

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

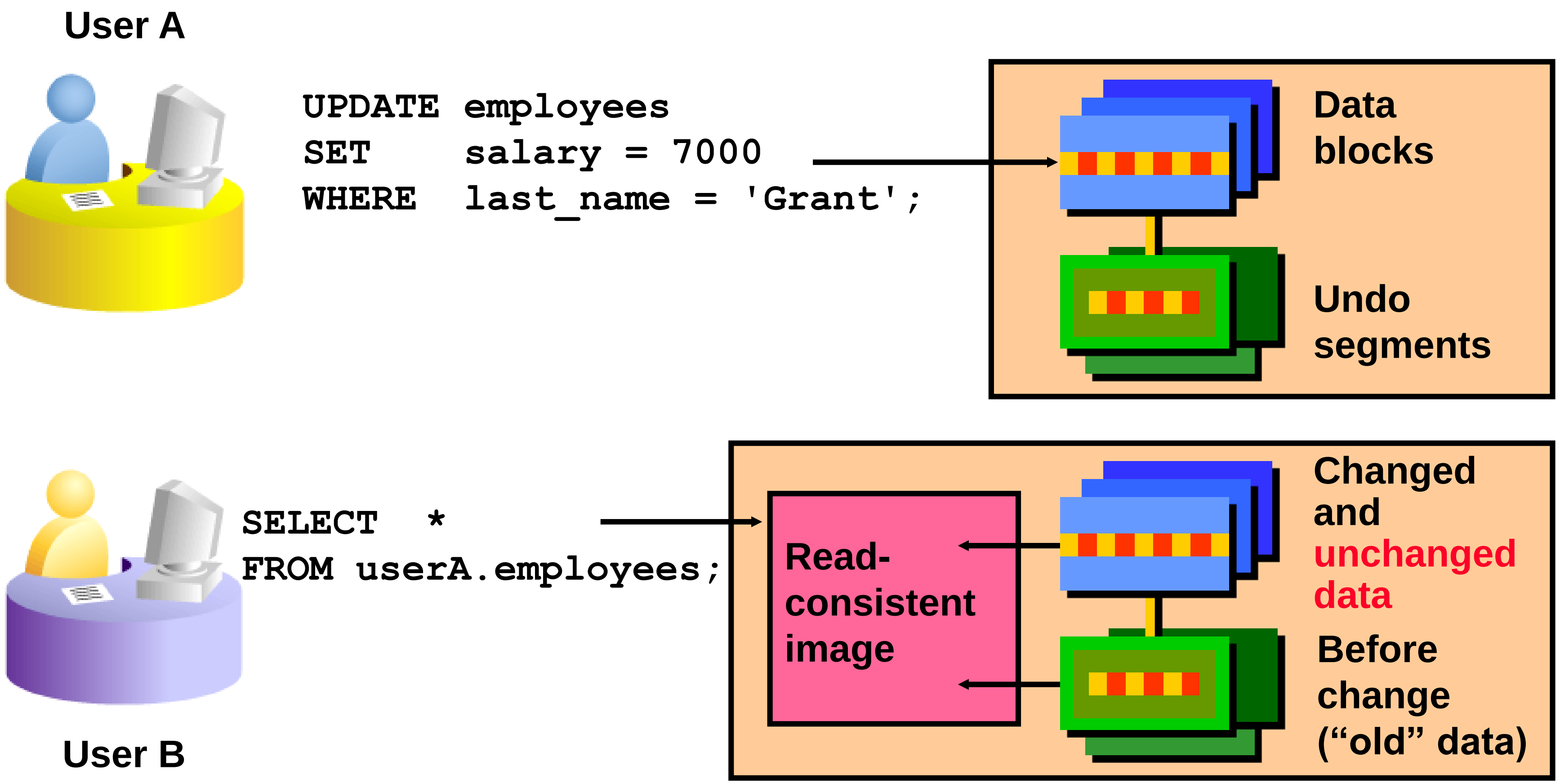
FOR UPDATE Clause in a SELECT Statement

– Locks the rows in the ORDERS table where ORDER_id is 2348.

```
SELECT   order_id,  order_date,  order_mode,  customer_id
FROM  orders
WHERE   order_id  =  ' 2348 '
FOR   UPDATE
ORDER  BY  order_id ;
```

– 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.

Implementing Read Consistency



User A

```
UPDATE employees
SET    salary = 7000
WHERE  last_name = 'Grant';
```

User B

```
SELECT  *
FROM userA.employees;
```

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.**

FOR UPDATE with NOWAIT 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 WAIT/NOWAIT <NO OF SEC>
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**

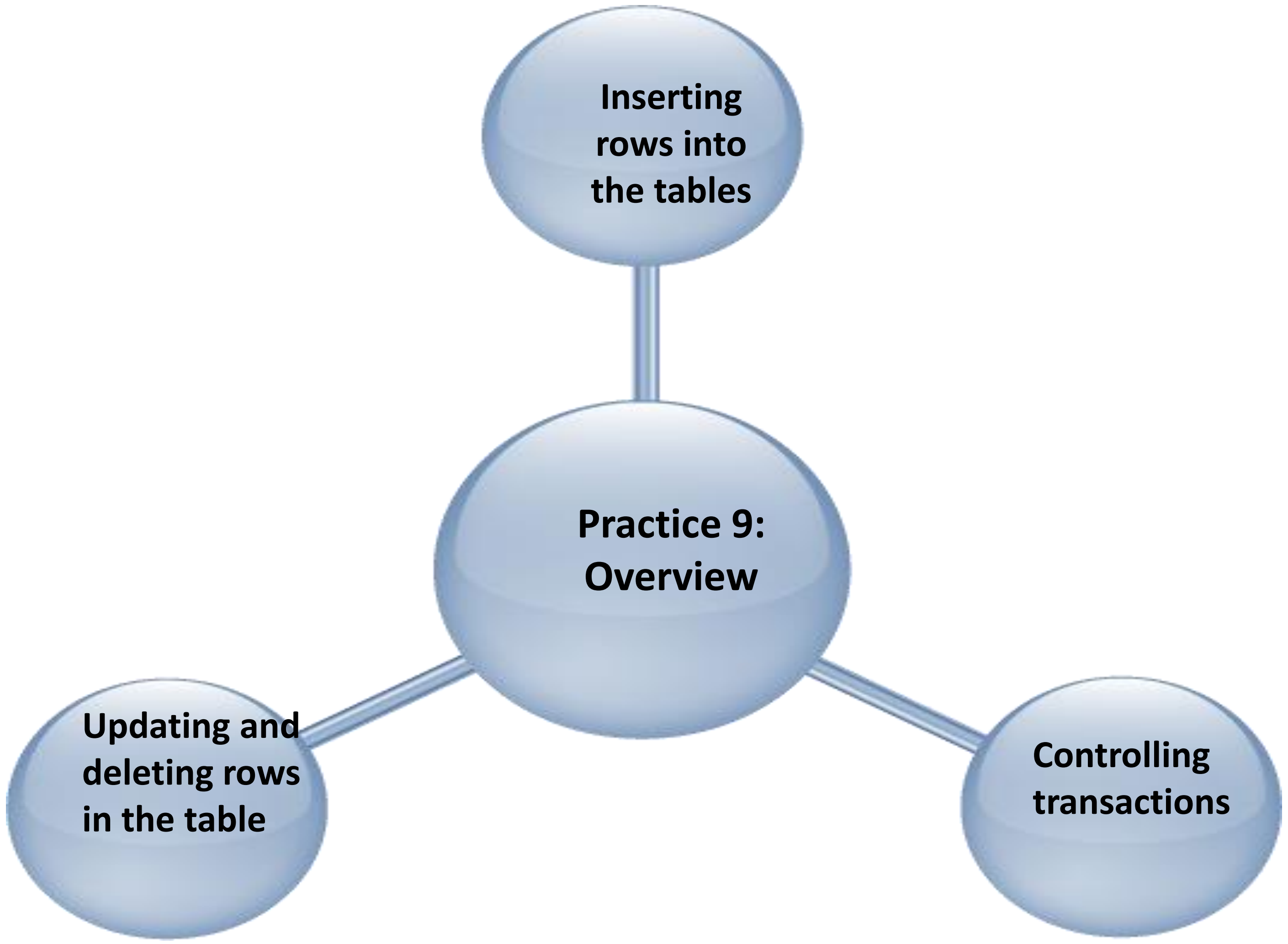
Summary

•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

ORACLE

Practice 9: Overview This practice covers the following topics:


Inserting rows into the tables
Practice 9: Overview
Updating and deleting rows in the table
Controlling transactions