DATABASE PROGRAMMING WITH SQL 2 / 2

ORACLE ACADEMY

24 DE OCTUBRE DE 2022

UNIVERSIDAD POLITECNICA DE AGUASCALIENTES
Juan Carlos Herrera Hernández

Contenido

Section 11 – Ensuring Quality Queries Part I

11-1 Ensuring Quality Query Results

Solve a series of problems:

- Solve a series of problems Create a query to produce specified data
- Modify a query to produce specified data

	Oracle	MySQL
DB's	select * from dictionary;	select * from information_schema.schemata
Tables	Select * from user_tables -- (user_tables, tabs, tab)	select * from information_schema.tables
Columns	select * from user_tab_columns	select * from information_schema.columns
	PURGE RECYCLEBIN;	

Section 12 – DML

12-1 INSERT Statements

USER	Someone doing "real work" with the computer, using it as a means rather than an end
Transaction	Consists of a collection of DML statements that form a logical unit of work.
Explicit	Fully and clearly expressed; leaving nothing implied
INSERT INTO	Adds a new row to a table

The table copies will not inherit the associated primary-to-foreign-key integrity rules (relationship constraints) of the original tables.

Copy structure and data	Copy only structure
`CREATE TABLE copy_departments as SELECT * FROM departments;`	`CREATE TABLE copy_departments as (SELECT * FROM departments where 1=2);`

Describe employees	SALARY NUMBER(6,2) Precision 6, Scale 2 [-9999.99, 9999.99]
user	select user from dual;
sysdate	select sysdate from dual; -- default DD-Mon-YYYY
	select to_char(sysdate, 'Month fmdd, yyyy') from dual;

select columns	all columns
`INSERT INTO copy_departments (department_id, department_name, location_id) VALUES (200,'Human Resources', 1500);`	`INSERT INTO copy_departments VALUES (210,'Estate Management', 102, 1700);`

```
INSERT INTO copy_employees
  (employee_id, first_name, last_name, email, hire_date, salary)
  VALUES
  (302,'Grigorz','Polanski', 'GPolanski', TO_DATE('2017-07-20', 'yyyy-mm-dd'), 4200);
```

Insert multiple records at the same time

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

Insert multiple records at the same time
■ MySQL INSERT INTO sales_reps(id, name, salary, commission_pct) VALUES (1,"Preet",12400, .15), (2,"Rich", 10000, 0.0), (3,"Veron", 8000, 0.10);

select * from nls_session_parameters;
alter session set nls_date_format='dd-mm-yyyy';

12-2 Updating Column Values and Deleting Rows

UPDATE	Modifies existing rows in a table
Correlated subquery UPDATE	retrieves information from one table & uses the information to update another table
Integrity Constraint	Ensures that the data adheres to a predefined set of rules
Correlated subquery DELETE	deletes information on a linked table based on what was deleted on the other table
Delete	Removes existing rows from a table

Not Correlated

```
UPDATE copy_employees
SET hire_date = sysdate
WHERE employee_id = 206;
```

Correlated

```
UPDATE copy_employees
SET hire_date = sysdate,
    salary = (SELECT salary FROM copy_employees
                        WHERE employee_id= 205),
    job_id = (SELECT job_id FROM copy_employees
                        WHERE employee_id= 205)
WHERE employee_id = 206;
```

Correlated

```
ALTER TABLE copy_employees
ADD (department_name varchar2(30));

select e.department_id, d.department_id, d.department_name
from employees e, departments d
where e.department_id = d.department_id;

UPDATE copy_employees e
SET e.department_name = (SELECT d.department_name
                         FROM departments d
                         WHERE e.department_id= d.department_id);
```

Not Correlated

```
DELETE FROM departments
WHERE department_id = 50;

DELETE FROM copy_employees
WHERE department_id = 50;
```

Correlated

```
DELETE FROM copy_employees
WHERE department_id =
     (SELECT department_id FROM departments
      WHERE department_name= 'Shipping');
```

Be carefully

```
SELECT * FROM copy_employees e
WHERE e.manager_id IN
     (SELECT d.manager_id
      FROM employees d
      GROUP BY d.manager_id
      HAVING count(d.department_id) < 2);
```

```
DELETE FROM copy_employees e
WHERE e.manager_id IN
     (SELECT d.manager_id
      FROM employees d
      GROUP BY d.manager_id
      HAVING count(d.department_id) < 2);
```

row-level locks, until you issue a COMMIT or ROLLBACK

SELECT e.employee_id, e.salary, d.department_name
FROM employees e JOIN departments d USING (department_id)
WHERE location_id = 1500 AND job_id= 'ST_CLERK'
FOR UPDATE
ORDER BY e.employee_id;
 	
GRANT update, select ON employees TO schemas
 	
User: SCHEMAS
update ESQUEMAS.employees e set salary = salary
where e.employee_id = 141;

12-3 DEFAULT Values, MERGE, and Multi-Table Inserts

A **data warehouse** is a collection of data designed to support business-management decision making. Data warehouses contain a wide variety of data, such as sales data, customer data, payroll, accounting, and personnel data, which presents a coherent picture of business conditions at a single point in time.

```
CREATE TABLE my_employees (
hire_date DATE DEFAULT SYSDATE,
first_name VARCHAR2(15),
last_name VARCHAR2(15));
```

```
-- Explicit
INSERT INTO my_employees
(hire_date, first_name, last_name)
VALUES (DEFAULT, 'Angelina','Wright');
```

```
-- Implicit
INSERT INTO my_employees
(first_name, last_name)
VALUES('Angelina','Wright');
```

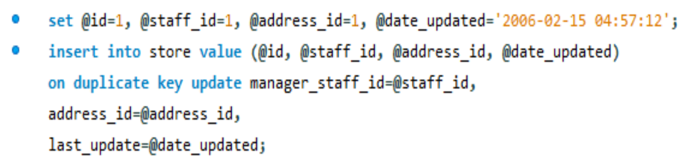
```
UPDATE my_employees
SET hire_date = DEFAULT
WHERE last_name = 'Wright';
```

```
UPDATE my_employees
SET hire_date = '21-SEP-89'
WHERE last_name = 'Wright';
```

```
UPDATE copy_employees
SET hire_date = to_date('1989-09-21', 'yyyy-mm-dd')
WHERE employee_id = 100;
```

```
MERGE will INSERT and UPDATE simultaneously.

MERGE INTO destination-table
     USING source-table
ON matching-condition
WHEN MATCHED THEN UPDATE
SET ……
WHEN NOT MATCHED THEN INSERT
VALUES (……);
```

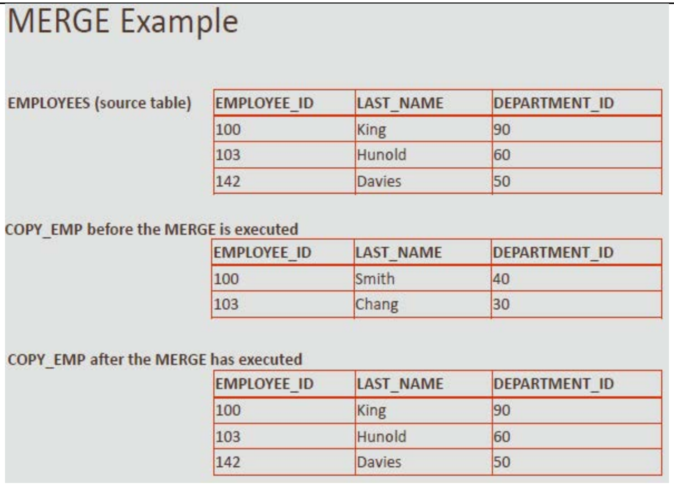
```
MERGE INTO copy_emp c USING employees e
ON (c.employee_id = e.employee_id)
WHEN MATCHED THEN UPDATE
    SET
        c.last_name      = e.last_name,
        c.department_id  = e.department_id
WHEN NOT MATCHED THEN INSERT
    VALUES (e.employee_id, e.last_name,
e.department_id);
```



```
• set @id=1, @staff_id=1, @address_id=1, @date_updated='2006-02-15 04:57:12';
• insert into store value (@id, @staff_id, @address_id, @date_updated)
  on duplicate key update manager_staff_id=@staff_id,
  address_id=@address_id,
  last_update=@date_updated;
```

```
MySQL

INSERT [IGNORE] INTO temp2 values (name,
address)

REPLACE INTO STUDENT (FIRSTNAME, LASTNAME)
VALUES( 'Steven', 'Fall');

REPLACE INTO cities
SET name = 'Phoenix',
    population = 1768980;
```

ALL , FIRST



MERGE Example

EMPLOYEES (source table)

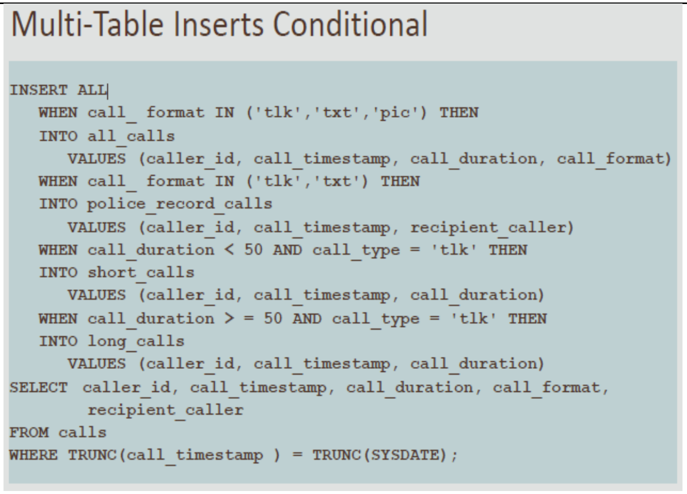
EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID
100	King	90
103	Hunold	60
142	Davies	50

COPY_EMP before the MERGE is executed

EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID
100	Smith	40
103	Chang	30

COPY_EMP after the MERGE has executed

EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID
100	King	90
103	Hunold	60
142	Davies	50



Multi-Table Inserts Conditional

```
INSERT ALL
   WHEN call_ format IN ('tlk','txt','pic') THEN
   INTO all_calls
      VALUES (caller_id, call_timestamp, call_duration, call_format)
   WHEN call_ format IN ('tlk','txt') THEN
   INTO police_record_calls
      VALUES (caller_id, call_timestamp, recipient_caller)
   WHEN call_duration < 50 AND call_type = 'tlk' THEN
   INTO short_calls
      VALUES (caller_id, call_timestamp, call_duration)
   WHEN call_duration > = 50 AND call_type = 'tlk' THEN
   INTO long_calls
      VALUES (caller_id, call_timestamp, call_duration)
SELECT  caller_id, call_timestamp, call_duration, call_format,
        recipient_caller
FROM calls
WHERE TRUNC(call_timestamp ) = TRUNC(SYSDATE);
```

Section 13 – DDL

13-1 Creating Tables

Data dictionary	Created and maintained by the Oracle Server and contains information about the database
Schema	A collection of objects that are the logical structures that directly refer to the data in the database
DEFAULT	Specifies a preset value if a value is omitted in the INSERT statement
Table	Stores data; basic unit of storage composed of rows and columns
CREATE TABLE	Command used to make a new table

Table names are not case sensitive.

Table names should be plural, for example STUDENTS, not student

The main database object types are:

Table	Index	Constraint	View	Sequence	Synonym

```
CREATE TABLE my_cd_collection (
cd_number NUMBER(3),
title VARCHAR2(20) not null,
artist VARCHAR2(20) check(regexp_like(artist,'[a-zA-Z .]')),
purchase DATE DEFAULT SYSDATE);
```

User tables:	Data Dictionary tables (Only Select):

Employees
Departments
	SELECT * FROM DICTIONARY;
	SELECT * FROM USER_TABLES;
	SELECT * FROM USER_INDEXES;
	SELECT * FROM user_objects WHERE object_type= 'SEQUENCE';
	SELECT * FROM USER_SEGMENTS;
	SELECT * FROM ALL_TABLES;

13-2 Using Data Types

BLOB	Binary large object data up to 4 gigabytes
CLOB	Character data up to 4 gigabytes
INTERVAL YEAR TO MONTH	Allows time to be stored as an interval of years and months
INTERVAL DAY TO SECOND	Allows time to be stored as an interval of days to hours, minutes, and seconds
TIMESTAMP	Allows the time to be stored as a date with fractional seconds
TIMESTAMP WITH TIMEZONE	stores a time zone value as a displacement from Universal Coordinated Time or UCT
TIMESTAMP WITH LOCAL TIMEZONE	when a column is selected in a SQL statement the time is automatically converted to the user's timezone

• CHAR	(fixed size,	maximum 2000 characters)
• VARCHAR2	(variable size,	maximum 4000 characters)
• NUMBER	(variable size,	maximum precision 38 digits)
• DATE		range yyyy-mm-dd hh24:mi:ss
• TIMESTAMP		range yyyy-mm-dd hh12:mi:ss and fractions of a second
• INTERVAL DAY [(day_precision)] TO SECOND		The default precisión value is 2

```
select current_timestamp, SYSTIMESTAMP from dual
```

`current_timestamp`	`03-OCT-22 05.22.33.598000000 PM AMERICA/MEXICO_CITY`
`SYSTIMESTAMP        UCT`	`03-OCT-22 05.22.33.598000000 PM -05:00`

MySQL Date yyyy-mm-dd	ORACLE Date yyyy-mm-dd hh:mi:ss

`create table tmp_Formatos(`
`Fecha date,`
`FechaTiempo datetime,`
`TiempoMarca timestamp);`
	`create table tmp_Formatos(`
	`Fecha date,`
	`TiempoMarca timestamp);`

`select now(), sysdate(), current_timestamp();`	`select sysdate, current_date,`
	`       current_timestamp, SYSTIMESTAMP`
	`from dual;`

`insert into tmp_Formatos`
`   values(sysdate(), sysdate(), sysdate());`
	`insert into tmp_Formatos`
	`   values(sysdate, sysdate);`

`Select * from tmp_formatos;`	`select * from tmp_formatos;`

`select  second(fechaTiempo),`
`        extract(second from TiempoMarca)`
`from tmp_formatos;`
	`select to_char(fecha, 'ss'),`
	`       extract(second from TiempoMarca)`
	`from tmp_formatos;`

`create table tmp_Horarios (`
`Fecha date,`
`TS TIMESTAMP,`
`TS_TZ TIMESTAMP WITH TIME ZONE,`
`TS_LTZ TIMESTAMP WITH LOCAL TIME ZONE);`
	`create table tmp_Intervalos (`
	`loan1 INTERVAL YEAR TO MONTH,`
	`loan2 INTERVAL YEAR TO MONTH);`

`insert into tmp_horarios values`
`(sysdate, sysdate, SYSTIMESTAMP, sysdate);`
	`INSERT INTO tmp_Intervalos (loan1, loan2)`
	`VALUES (INTERVAL '121' MONTH(3),`
	`        INTERVAL '3-6' YEAR TO MONTH);`

	`select sysdate+loan1 from tmp_intervalos;`

13-3 Modifying a Table

You can add or modify a column in a table, but you cannot specify where the column appears

```
ALTER TABLE tablename
ADD (column_name data_type [DEFAULT expression],
     column_name data_type [DEFAULT expression], ...);
```

```
ALTER TABLE mod_emp
MODIFY (salary NUMBER(8,2) DEFAULT 50);
```

```
ALTER TABLE tablename
DROP COLUMN columnname;
```

```
-- Dropping a column from a large table can take a long time
ALTER TABLE tablename SET UNUSED (column_name);
```

```
-- when you want to reclaim the extra disk space
ALTER TABLE copy_employees
   DROP UNUSED COLUMNS;
```

```
ALTER SESSION SET RECYCLEBIN = ON;
DROP TABLE table_name;
```

`-- Recovery a Table`
`FLASHBACK TABLE table_name TO BEFORE DROP;`
	`-- Show deleted tables`
	`select * from USER_RECYCLEBIN;`

`-- Drop a table definitely`
`DROP TABLE Table_Name PURGE;`
	`-- Rename a table`
	`RENAME old_name to new_name;`

it does not release storage space	Free up storage space
Delete from Table_Name;	Truncate Table Table_Name;

```
COMMENT ON TABLE Employees is 'Tabla de empleados';
comment on column Employees.last_name is 'Apellido Paterno';
```

```
select * from user_tab_comments;
SELECT * FROM USER_COL_COMMENTS;
```

	Review the changes made (UNDO tablespace) SCN (System Change Number)

UPDATE EMPLOYEES
SET LAST_NAME = 'King Kong'
where employee_id = 100;
	select * from Employees
	VERSIONS BETWEEN SCN MINVALUE AND MAXVALUE
	WHERE employee_id= 100;

Section 14 – Constraints

14-1 Intro to Constraints; NOT NULL and UNIQUE Constraints

Constraint	Database rule.
PRIMARY KEY	Constraint ensures that the column contains no null values and uniquely identifies each row of the table
UNIQUE KEY	An integrity constraint that requires every value in a column or set of columns be unique
UNIQUE constraint	Every value in a column or set of columns (a composite key) must be unique
FOREIGN KEY	Designates a column (child table) that establishes a relationship between a primary key in the same table and a different table (parent table)
REFERENCES	Identifies that table and column in the parent table
NOT NULL constraint	For every row entered into the table, there must be a value for that column
CHECK constraint	Specifies a condition for a column that must be true for each row of data
Table level constraint	References one or more columns and is defined separately from the definitions of the columns in the table
Column-level constraint	Database rule that references a single column

5 Types of constraints: All the constraints have a name

NOT NULL	PRIMARY KEY	FOREIGN KEY	UNIQUE	CHECK

There are two different places in the CREATE TABLE statement that you can specify the constraint details:

- At the **column level** next to the name and data type
- At the **table level** after all the column names are listed

Constraints at the Column Level

```
CREATE TABLE clients (
IDnumber NUMBER(4) primary KEY,
LastName VARCHAR2(20) constraint nn_LN not null,
Email VARCHAR2(20) UNIQUE,
HireDate date default sysdate,
Salary number(6,2) check(salary > 0)
);

system gives the constraint a name,
such as SYS_C00585417

The NOT NULL constraint can be specified only at
the column level, not the table level
```

Constraints at the Table Level

```
CREATE TABLE clients (
IDNumber NUMBER(4),
LastName VARCHAR2(20),
Email VARCHAR2(20),
HireDate date default sysdate,
Salary number(6,2),
CONSTRAINT Clients_IDNumber_pk primary key (IDNumber),
CONSTRAINT uk_Email UNIQUE(Email),--unique(email,phone)
CONSTRAINT check_Salary check(Salary>0)
);

ALTER TABLE clients MODIFY (LastName NOT NULL);
```

14-2 PRIMARY KEY, FOREIGN KEY, and CHECK Constraints

PRIMARY KEY constraint	A column or set of columns that uniquely identifies each row in a table
FOREIGN KEY constraint	Establishes a relationship between the foreign key column and a primary key or unique key in the same table or a different table
NOT NULL	Constraint ensures that the column contains no null values
CHECK constraint	Explicitly defines a condition that must be met
ON DELETE SET NULL	Allows a child row to remain in a table with null values when a parent record has been deleted
ON DELETE CASCADE	Allows a foreign key row that is reference to a primary key row to be deleted

```
Column-level syntax example:
CREATE TABLE employees(
employee_id NUMBER(6,0) CONSTRAINT emp_pk PRIMARY KEY,
first_name VARCHAR2(20),
last_name VARCHAR2(25),
department_id NUMBER(4,0) CONSTRAINT emp_department_id_fk
    REFERENCES departments(department_id) ON DELETE SET NULL,
email VARCHAR2(25));
```

```
Table-level syntax example:
CREATE TABLE employees(
employee_id NUMBER(6,0) CONSTRAINT emp_pk PRIMARY KEY,
first_name VARCHAR2(20),
last_name VARCHAR2(25),
department_id NUMBER(4,0),
email VARCHAR2(25),
CONSTRAINT emp_dept_id_fk FOREIGN KEY (department_id)
                REFERENCES departments(department_id) ON DELETE CASCADE);
```

Composite primary key	

`CREATE TABLE job_history (`
`employee_id   NUMBER(6,0),`
`start_date    DATE,`
`end_date      DATE,`
`job_id        VARCHAR2(10),`
`department_id NUMBER(4,0),`
`CONSTRAINT jh_pk PRIMARY KEY(employee_id, start_date),`
`CONSTRAINT jh_endDate_ck CHECK (end_date> start_date));`
	CHECK constraint cannot contain functions:
	SYSDATE, UID, USER, or USERENV
	Example: SYSDATE >'05-May-1999'
	
	CHECK constraint cannot use:
	CURRVAL, NEXTVAL, LEVEL, or ROWNUM

14-3 Managing Constraints

DISABLE CONSTRAINT	To deactivate an integrity constraint
CASCADE clause	Disables dependent integrity constraints
ALTER TABLE	To add, modify, or drop columns from a table
ENABLE CONSTRAINT	To activate an integrity constraint currently disabled
DROP CONSTRAINT	Removes a constraint from a table
DROP COLUMN	Allows user to delete a column from a table
CASCADE CONSTRAINT clause	Defines the actions the database server takes when a user attempts to delete or update a key to which existing foreign keys point

Write ALTER TABLE statements to add, drop, disable, and enable constraints

select * from **USER_CONSTRAINTS**
WHERE TABLE_NAME='EMPLOYEES';
 	
select * from USER_CONS_COLUMNS
where table_name = 'EMPLOYEES';
	* constraint_name, table_name, constraint_type, status
	constraint_type:
	P PRIMARY KEY
	R REFERENCES (foreign key);
	C CHECK constraint (including NOT NULL);
	U UNIQUE

Sintaxis	Example

`ALTER TABLE table_name`
`ADD [CONSTRAINT constraint_name]`
`     type of constraint (column_name);`
	`ALTER TABLE employees`
	`ADD CONSTRAINT emp_id_pk`
	`    PRIMARY KEY (employee_id);`

`ALTER TABLE tablename`
`ADD [CONSTRAINT constraint_name]`
`         FOREIGN KEY(column_name)`
`REFERENCES tablename(column_name);`
	`ALTER TABLE employees`
	`ADD CONSTRAINT emp_dept_fk`
	`               FOREIGN KEY (department_id)`
	`    REFERENCES departments (department_id);`

`ALTER TABLE table_name`
`MODIFY` `(column_name CONSTRAINT`
`       constraint_name` **`NOT NULL`**`);`
	`ALTER TABLE employees`
	`MODIFY (email CONSTRAINT`
	`        emp_email_nn NOT NULL);`

`ALTER TABLE table_name`
`DROP CONSTRAINT name [CASCADE]`
	`ALTER TABLE departments`
	`DROP CONSTRAINT dept_dept_id_pk;`

Sintaxis	Example
ALTER TABLE table_name **DISABLE CONSTRAINT** constraint_name [CASCADE]	ALTER TABLE departments DISABLE CONSTRAINT dept_dept_id_pk;
ALTER TABLE table_name **ENABLE CONSTRAINT** constraint_name;	ALTER TABLE departments ENABLE CONSTRAINT dept_dept_id_pk;

Section 15 – Views

15-1 Creating Views

View	A subset of data from one or more tables that is generated from a query and stored as a virtual table
VIEW_NAME	Name of view
CREATE VIEW	Statement used to create a new view
REPLACE	Re-creates the view if it already exists
NOFORCE (default)	Creates the view only if the base table exists
FORCE	Creates a view regardless of whether or not the base tables exist
Alias	Specifies a name for each expression selected by the view's query
Subquery	A complete SELECT statement
Simple view	Derives data from one table, no functions or groups, performs DML operations through the view
Complex view	Derives data from one or more tables, contains functions or groups of data, and does not always allow DML operations through the view
CONSTRAINT	Is the name assigned to the CHECK OPTION constraint.
WITH READ ONLY	Ensures that no DML operations can be performed on this view.
WITH CHECK OPTION	Specifies that rows remain accessible to the view after insert or update operations.

Views restrict access to base table data because the view can display selective columns from the table
Views can be used to reduce the complexity of executing queries based on more complicated SELECT statements

```
CREATE [OR REPLACE] [FORCE| NOFORCE] VIEW view [(alias [,alias]...)]
AS subquery
[WITH CHECK OPTION [CONSTRAINT constraint]]
[WITH READ ONLY [CONSTRAINT constraint]];
```

Feature	Simple Views	Complex Views
Number of tables used to derive data	One	One or more
Can contain functions	No	Yes
Can contain groups of data	No	Yes
Can perform DML operations (INSERT, UPDATE, DELETE) through a view	Yes	Not always

Simple View

```
CREATE OR REPLACE VIEW view_euro_countries
AS
SELECT country_id ID, country_name "Country"
FROM wf_countries
WHERE location LIKE '%Europe';
```

```
CREATE OR REPLACE VIEW view_euro_countries(ID, "Country")
AS
SELECT country_id, country_name
FROM wf_countries
WHERE location LIKE '%Europe';
```

Complex View	

CREATE OR REPLACE VIEW view_euro_countries
("ID", "Country", "Region")
AS
SELECT c.country_id, c.country_name, r.region_name
FROM wf_countries c JOIN wf_world_regions r
USING (region_id)
WHERE location LIKE '%Europe';
	CREATE OR REPLACE VIEW view_high_pop
	("Region ID", "Highest population")
	AS
	SELECT region_id, MAX(population)
	FROM wf_countries
	GROUP BY region_id;

```
SELECT * FROM view_high_pop;
```

15-2 DML Operations and Views

ROWNUM	A pseudo-column which assigns a sequential value starting with 1 to each of the rows returned from the subquery
WITH READ ONLY	Ensures that no DML operations can be performed on this view
WITH CHECK OPTION	Specifies that INSERTS and UPDATES performed through the view can't create rows which the view cannot select

CREATE OR REPLACE VIEW view_dept50 AS
SELECT department_id, employee_id, salary
FROM employees
WHERE department_id = 50
WITH CHECK OPTION CONSTRAINT view_dept50_check;
	UPDATE view_dept50
	SET salary = 5800, **BONUS = 0.5**
	WHERE employee_id= 124;

CREATE OR REPLACE VIEW view_dept50 AS
SELECT department_id, employee_id, salary
FROM employees
WHERE department_id = 50
WITH READ ONLY;
	UPDATE view_dept50
	SET salary = 5800
	WHERE employee_id= 124;

15-3 Managing Views

DROP VIEW	Removes a view
INLINE VIEW	Subquery with an alias that can be used within a SQL statement
TOP- N-ANALYSIS	Asks for the N largest or smallest values in a column

Only the creator or users with the DROP ANY VIEW privilege can remove a view: **DROP VIEW viewname**

INLINE VIEW

```
SELECT e.department_id, e.employee_id, d.minsal
FROM employees e,
     (SELECT department_id, min(salary) minsal
      FROM employees
      GROUP BY department_id) d
WHERE e.department_id = d.department_id
AND e.salary= d.minsal;
```

```
with
   min_dep as (SELECT department_id, min(salary) minsal
               FROM employees
               GROUP BY department_id)
   select e.department_id, e.employee_id, d.minsal
   from employees e, min_dep d
   where e.department_id = d.department_id
     and e.salary= d.minsal;
```

TOP_N, LIMIT

```
SELECT ROWNUM AS "Top_N", employee_id,  last_name
FROM (SELECT employee_id, last_name
      FROM employees
      ORDER BY last_name)
WHERE ROWNUM <=5;
```

Mostrar los empleados, con los departamentos que tienen más de un empleado, con salario mínimo por depto.

```
with dmin as (SELECT department_id, min(salary) minsal
              FROM employees
              GROUP BY department_id),
     emin as (SELECT e.department_id, e.employee_id, dmin.minsal
              FROM employees e, dmin
              WHERE e.department_id = dmin.department_id
                AND e.salary= dmin.minsal),
     dmas as (select department_id, count(*)
              from  emin
              group by department_id
              having count(*) > 1 )
select emin.* from emin, dmas
where emin.department_id = dmas.department_id;
```

Section 16 – Sequences and Synonyms

16-1 Working With Sequences

CREATE SEQUENCE	Command that automatically generates sequential number
Sequences	Generates a numeric value
STARTS WITH	Specifies the first sequence number to be generated
INCREMENT BY	Specifies the interval between sequence numbers
CURRVAL	Returns the current sequence value
NEXTVAL	Returns the next available sequence value
MINVALUE	Specifies the minimum sequence value
MAXVALUE	Specifies a maximum or default value the sequence can generate
CYCLE/ NOCYCLE	Specifies whether the sequence continues to generate values after reaching its maximum or minimum values
NOMAXVALUE	Specifies a maximum value of 10^27 for an ascending sequence and -1 for a descending sequence (default)
NOMINVALUE	Specifies a minimum value of 1 for an ascending sequence and – (10^26) for a descending sequence (default)
CACHE/ NOCACHE	Specifies how many values the Server pre-allocates and keeps in memory. (By default, the Oracle server caches 20 values.)

SELECT sequence_name, min_value, max_value, increment_by, last_number
FROM **user_sequences**;

CREATE SEQUENCE sequence
[INCREMENT BY n]
[START WITH n]
[{MAXVALUE n | NOMAXVALUE}]
[{MINVALUE n | NOMINVALUE}]
[{CYCLE | NOCYCLE}]
[{CACHE n | NOCACHE}];
	CREATE SEQUENCE runner_id_seq
	  INCREMENT BY 1
	  START WITH 1
	  MAXVALUE 50000
	  NOCACHE
	  NOCYCLE;
	
	ALTER SEQUENCE runner_id_seq
	INCREMENT BY 1
	MAXVALUE 999999;
	
	DROP SEQUENCE runner_id_seq;
		Create sequence runner_id_seq;
		
		select runner_id_seq.CURRVAL
		from dual;
		
		-- Quemar Folio
		select runner_id_seq.NEXTVAL
		from dual;
		
		SELECT last_number as Next
		FROM USER_SEQUENCES
		WHERE sequence_name= 'RUNNER_ID_SEQ';

```
INSERT INTO departments
      (department_id, department_name, location_id)
VALUES (departments_seq.NEXTVAL, 'Support', 2500);
```

16-2 Indexes and Synonyms

Synonym	Gives alternative names to objects
CREATE PUBLIC SYNONYM	To refer to a table by another name to simplify access
Composite index	An index that you create on multiple columns in a table
Unique index	The Oracle Server automatically creates this index when you define a column in a table to have a PRIMARY KEY or a UNIQUE KEY constraint
Non-unique index	Schema object that speeds up retrieval of rows
DROP INDEX	Removes an index
Confirming index	Confirms the existence of indexes from the USER_INDEXES data dictionary view
Function-based index	Stores the indexed values and uses the index based on a SELECT statement to retrieve the data

index	**Synonym**
`Select * from USER_INDEXES;`	`Select * from USER_SYNONYMS;`
`Select * from USER_IND_COLUMNS;`	

`CREATE [unique] INDEX index_name_idx`
`    ON table_name (column ..., column)`
 	
■ `Function-based Indexes`
`CREATE INDEX upper_last_name_idx`
`  ON employees (UPPER(last_name));`
	CREATE [PUBLIC] SYNONYM synonym FOR object;
	
	CREATE SYNONYM amy_emps FOR amy_copy_employees;

`DROP INDEX upper_last_name_idx;`	`DROP [PUBLIC] SYNONYM name_of_synonym;`
	`DROP SYNONYM amy_emps;`

Section 17 – Privileges and Regular Expressions

17-1 Controlling User Access

Grant and Revoke privileges.
Compare the difference between **object privileges** and **system privileges.**
Database security can be classified into two categories: **Data security** and **System security.**

Data security (also known as object security) relates to object privileges which covers access to and use of the database objects, and the actions that those users can have on the objects. These privileges include being able to execute DML statements	**System security** covers access and use of the database at the system level, such as creating users, allocating disk space to users, and granting the system privileges that users can perform such as creating tables, views, and sequences.

Roles: are named groups of related privileges.
The **DBA**: is a high-level user with the ability to grant users access to the database and its objects.
A **schema** is a collection of objects, such as tables, views, and sequences. The schema is owned by a database user and has the same name as that user.

System Privilege	**Operations Authorized**
CREATE USER	Grantee can create other Oracle users (a privilege required for a DBA role)
DROP USER	Grantee can drop another user
DROP ANY TABLE	Grantee can drop a table in any schema
BACKUP ANY TABLE	Grantee can backup any table in any schema with the export utility
SELECT ANY TABLE	Grantee can query tables, views, or snapshots in any schema
CREATE ANY TABLE	Grantee can create tables in any schema

```
CREATE USER user
IDENTIFIED BY password;
```

```
ALTER USER user
IDENTIFIED BY password;
```

Granting System Privileges

```
GRANT privilege [, privilege...] TO user [, user| role, PUBLIC...];

GRANT create session, create table, create sequence, create view TO Scott;
GRANT UPDATE (salary) ON employees TO Scott;
GRANT select ON scott.departments TO PUBLIC;
```

You can't grant SELECT on individual columns, but you can create a VIEW and granting SELECT privilege

System Privilege	**Operations Authorized**
CREATE SESSION	Connect to the database
CREATE TABLE	Create tables in the user's schema
CREATE SEQUENCE	Create a sequence in the user's schema
CREATE VIEW	Create a view in the user's schema
CREATE PROCEDURE	Create a procedure, function, or package in the user's schema

Object Privilege	Table	View	Sequence	Procedure
ALTER	X		X	
DELETE	X	X		
EXECUTE				X
INDEX	X	X		
INSERT	X	X		
REFERENCES	X			
SELECT	X	X	X	
UPDATE	X	X		

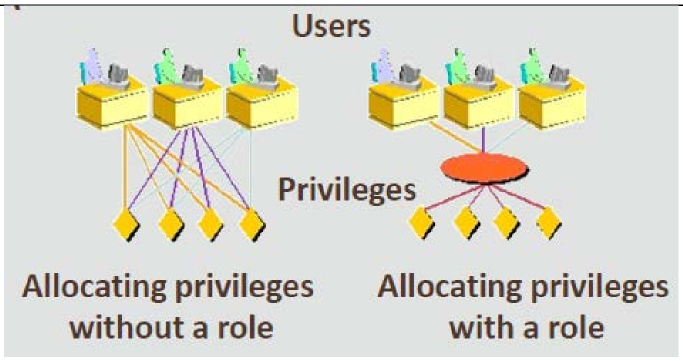
Data Dictionary View	Description
ROLE_SYS_PRIVS	System privileges granted to roles
ROLE_TAB_PRIVS	Table privileges granted to roles
USER_ROLE_PRIVS	Roles accessible by the user
USER_TAB_PRIVS_MADE	Object privileges granted on the user's objects
USER_TAB_PRIVS_RECD	Object privileges granted to the user
USER_COL_PRIVS_MADE	Object privileges granted on the columns of the user's objects
USER_COL_PRIVS_RECD	Object privileges granted to the user on specific columns
USER_SYS_PRIVS	Lists system privileges granted to the user

17-2 Creating and Revoking Object Privileges

A role is a named group of related privileges that can be granted to a user.

1. To create and assign a role, first the DBA must create the role
2. Then the DBA can assign privileges to the role, and the role to users.

```
CREATE ROLE manager;
GRANT create table, create view TO manager;
GRANT manager TO Scott;
```


Users
Privileges
Allocating privileges without a role
Allocating privileges with a role

Granting Object Privileges

Construct a GRANT..ON..TO..WITH GRANT OPTION

```
GRANT object_priv[(column_list)]
ON object_name
TO {user|role|PUBLIC}
[WITH GRANT OPTION];
```

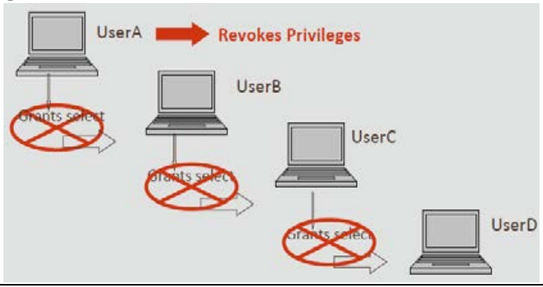
Scott is the owner:

```
GRANT SELECT, insert ON clients TO PUBLIC;

GRANT UPDATE(first_name, last_name)
ON clients
TO King, manager;
```

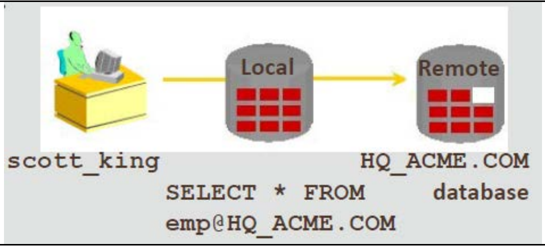
King execute:

```
Select * from Scott.clients;
```

Syntax	**Defined**
object_priv	is an object privilege to be granted
column_list	specifies a column from a table or view on which privileges are granted
ON object_name	is the object on which the privileges are granted
TO user|role	identifies the user or role to whom the privilege is granted
PUBLIC	grants object privileges to all users
WITH GRANT OPTION	Allows the grantee to grant the object privileges to other users and roles. Permite al beneficiario otorgar privilegios de objeto a otros usuarios y roles. If the owner revokes a privilege from a user who granted privileges to other users, the revoke statement cascades to all privileges granted

■ Revoking Object Privileges
REVOKE {privilege [, privilege...]|ALL}
ON object
FROM {user[, user...]|role|PUBLIC}
[CASCADE CONSTRAINTS];
	if user A revokes privileges from user B, then those privileges granted to users C and D are also revoked.
	 UserA
	Revokes Privileges
	UserB
	UserC
	UserD
	Grants select
	Grants select
	Grants select

Database Links.
A local user can access a remote database without having to be a user on the remote database

Select * form USER_DB_LINKS;
 	
CREATE PUBLIC SYNONYM HQ_EMP FOR emp@HQ.ACME.COM;
 	
SELECT * FROM HQ_EMP;
	 Local
	Remote
	scott_king
	HQ_ACME.COM database
	SELECT * FROM emp@HQ_ACME.COM

17-3 Regular Expressions

LIKE and wildcards _ %

The use of regular expressions is based on the use of meta characters

Symbol	Description
. (dot)	Matches any character in the supported character set, except NULL
?	Matches zero or one occurrence
*	Matches zero or more occurrences
+	Matches one or more occurrences
()	Grouping expression, treated as a single sub-expression
\	Escape character
|	Alternation operator for specifying alternative matches
^/$	Matches the start-of-line/end-of-line
[ ]	Bracket expression for a matching list matching any one of the expressions represented in the list

Where column like 'a_c'   =   Where REGEXP_LIKE(column, 'a.c')

Name	Description
REGEXP_LIKE	Similar to the LIKE operator, but performs regular expression matching instead of simple pattern matching
REGEXP_REPLACE	Searches for a regular expression pattern and replaces it with a replacement string
REGEXP_INSTR	Searches for a given string for a regular expression pattern and returns the position where the match is found
REGEXP_SUBSTR	Searches for a regular expression pattern within a given string and returns the matched substring
REGEXP_COUNT	Returns the number of times a pattern appears in a string. You specify the string and the pattern. You can also specify the start position and matching options (for example, c for case sensitivity).

```
SELECT first_name, last_name
FROM employees
WHERE REGEXP_LIKE(first_name, '^Ste(v|ph)en$');

CREATE TABLE my_contacts(
first_name VARCHAR2(15),
last_name VARCHAR2(15),
email VARCHAR2(30) CHECK(REGEXP_LIKE(email, '.+@.+\..+'))
);
```

Section 18 – TCL

18-1 Database Transactions

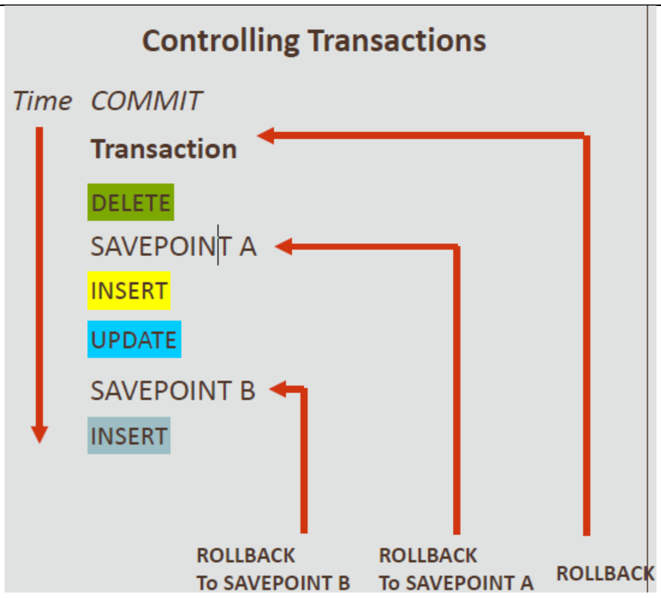
Commit	Ends the current transaction making all pending data changes permanent
Rollback	Enables the user to discard changes made to the database
Savepoint	Creates a marker in a transaction, which divides the transaction into smaller pieces
Transaction	a collection of DML statements that form a logical unit of work
Read consistency	guarantees a consistent view of the data by all users at all times
Locks	Mechanisms that prevent destructive interaction between transactions accessing the same resource that can be granted to the user

Transactions allow users to make changes to data and then decide whether to save or discard the work.
"All or Nothing"   "All or not at all"

A transaction consists of one of the following:
- DML statements which constitute one consistent change to the data
- The DML statements include INSERT, UPDATE, DELETE, and MERGE
- One DDL statement such as CREATE, ALTER, DROP, RENAME, or TRUNCATE
- One DCL statement such as GRANT or REVOKE

Transactions are controlled using the following statements:
- COMMIT: *When a COMMIT statement is issued, the current transaction ends making all pending changes permanent.*
- ROLLBACK: *When a ROLLBACK statement is issued, all pending changes are discarded.*
- SAVEPOINT: Creates a marker in a transaction, which divides the transaction into smaller pieces.
- ROLLBACK TO SAVEPOINT: Allows the user to roll back the current transaction to a specified savepoint.

```
UPDATE copy_departments
SET manager_id= 101
WHERE department_id= 60;

SAVEPOINT one;

   INSERT INTO copy_departments
   (department_id, department_name, manager_id,
location_id)
   VALUES(130, 'Estate Management', 102, 1500);

   UPDATE copy_departments
   SET department_id= 140;    -- WHERE clause omitted

ROLLBACK TO SAVEPOINT one;

COMMIT;
```



A transaction begins with the first DML.
A transaction ends when one of the following occurs: A COMMIT or ROLLBACK, A DDL, A DCL.
COMMIT, ROLLBACK and SAVEPOINT are known as Transaction Control Language, or TCL.