Lesson 1 SELECT

Monday, February 13, 2017 9:56 PM

Lesson 1 -- SELECT

DML Data Manipulation Language => SELECT, INSERT, UPDATE, DELETE, MERGE
DDL Data Definition Language => CREATE, ALTER, DROP, RENAME, TRUNCATE, COMMENT
DCL Data Control Language => GRANT, REVOKE
Transaction Control => COMMIT, ROLLBACK, SAVEPOINT

```
SELECT *                                => All Columns
FROM departments;

SELECT department_id, lcoation_id       => Specific Columns
FROM departments;
```

SQL & iSQL*Plus Rules

- SQL statements are not case sensitive
- Can have 1 or more lines
- Clauses are usually palced on different lines
- Indent for better readability
- Semicolons are optional on iSQL*Plus , but required at the end of multiple statements
- Semicolones are requiredon SQL*Plus

Concatenate Operator
Links ||

```
SELECT last_name| |job_id AS "Employees"
FROM employees
```

Links with literal strings

```
SELECT last_name|' is a' |job_id AS "Employees Details"
FROM employees
```

q Operator (just like the example above)

```
SELECT last_name ||
        q' [, it's assigned Manager ID:]'
        || manager_id
        AS 'Department and Manager'
FROM departments
```

Arithmetic Expressions
+ - * /

Using () parenthesis for complicated Equations if fine

Example:

```
SELECT salary + 300
FROM employees;
```

NULL is not the same as zero or blank space

ALIAS (use alias for better readability)

SELECT last_name AS Name, pct AS Percentage

SELECT last_name AS Last Name (this is an error there is an space in the alias name)

Heading formatting Alias

SELECT last_name AS name => NAME
SELECT last_name AS "Name" => Name

DISTINCT will display repeated rows only 1 time, removing Duplicated rows

```
SELECT DISTINCT department_id
FROM employees;
```

DESCRIBE tablename
*will display table structure completely

Lesson 2 WHERE

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SELECT *
FROM table
WHERE condition(s)
....
WHERE last_name= "Whelan"
WHERE department_id = 90

The default Date format is DD-MON-RR
WHERE hire_date = '17-FEB-96'

Comparison and Condition Operators
= > >= < <=   (this is easy)

<>	Not equal too
BETWEEN... AND	Inclusive
IN(set)	Match a list of values
LIKE	Match a character pattern
IS NULL	Is a null value

!= AND ^=   are equivalent to NOT EQUAL too

WHERE manager_id IN (100,101,102,103)
WHERE salary BETWEEN 2500 AND 3500

Search conditions
%   => denotes zero or many characters
_   => denotes one character

Example:
Getting all first name starting with S
WHERE first_name LIKE 'S%'

One character , "o" after and zero or many characters after
WHERE last_name LIKE '_o%'

ORDER BY with ALIAS
SELECT last_name (1), job_id (2), hire_date (3)
FROM employees
ORDER BY 2;

Using variables
SELECT employee_id
FROM employees
WHERE employee_id = &employee_num

To escape identifier
ESCAPE

WHERE job_id LIKE '%_%'
In order to escape _
We do
WHERE job_id LIKE '%_%' ESCAPE '\'

Using NULL condition
WHERE manager_id IS NULL

Logical Operators
AND   OR   NOT

WHERE salary >= 10000
AND job_id LIKE '%MAN%'

WHERE salary >= 10000
OR job_id LIKE '%MAN%'

WHERE job_id
          NOT IN('IT_PROG','ST_CLERK')

In order to override operators use ( )

WHERE (job_id = 'SA_REP'
OR   job_id = 'AS_PRES')
AND   salary > 15000;

Order By is the last statement always
ORDER BY hire_date
ORDER BY hire_Date DESC

DEFAULT is ASC

&& => Use double ampersand to maintain
Column names

SELECT &&column_name

```
FROM employees
WHERE employee_id = &employee_num
```

**this will prompt for an employee number

To use a character string use quotes

```
WHERE job_id = '&job_title'
```

It is ok to use it on Heading too

```
SELECT employee_id, &column_name
```

```
SELECT &&column_name
```

To remove it

```
UNDEFINE column_name
```

Using DEFINE

```
DEFINE employee_num = 200
SELECT …..
FROM ……
WHERE employee_id = &employee_num
UNDEFINE employee_num
```

Lesson 3 Using single Row Functions

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There are two types of functions

Single-row functions	one result per row
Multiple-row functions	one result per group of rows

Functions

LOWER	Lowercase
UPPER	Uppercase
INITCAP	Capitalize
SUBSTR	Cut string

Example:
SUBSTR('Hello World', 1 , 5) => Hello

CONCAT	Join together

Example:
CONCAT('Hello','World') => HelloWorld

LENGTH	Length of the string
INSTR	Character positions

Example:
INSTR('Hello', 'e') => 2

LPAD	Left Padding
RPAD	Right Padding

Example:
LPAD(salary,10,'*') => *****24000

REPLACE	Replace values

REPLACE('JACK','J','R') => RACK

TRIM	Remove whitespace or characters

TRIM ('H' FROM 'HelloWorld') => elloWorld

ROUND(SYSDATE, 'MONTH')
Will round a July 25 to August 1
ROUND('SYSDATE','YEAR')
TRUNC('SYSDATE','MONTH')
TRUNC('SYSDATE','YEAR')

Conversion for numbers, chars and dates

TO_CHAR(number, 'format_model')

Example:
WHERE SUBSTR(last_name, -1 , 1) = 'n'
-1 means 1 from the end , 1 means 1 space
Checking last cahracter in other words

Number Fucntions

ROUND	Round to specified decimal
TRUNC	Truncate to specified decimal
MOD	Remainder of division (like % on C)

ROUND(45.926 , 2) => 45.93
TRUNC(45.926 , 2) => 45.92
MOD(1600, 300) => 100

Example
SELECT salary, round(salary, -3)
3100 => 3000

Get Date and Time from System

SELECT SYSDATE
FROM DUAL

Examples
(SYSDATE-hire_date)/7 AS WEEKS

MONTHS_BETWEEN	Number of months between two dates
ADD_MONTHS	Add calendar months to date
NEXT_DAY	Next day of the date specified
LAST_DAY	Last day of the month
ROUND	Round date
TRUNC	Truncate date

Conversion for Dates

TO_CHAR (hire_date, 'YYYY-Month-DD')

Elements

YYYY -> year in numbers
YEAR -> year in english
MM -> two digit month
MONTH -> month in english
MON -> three letter abbreviation
DY -> three letter abbreviation
DAY -> day in english

Conversion for numbers, chars and dates

TO_CHAR(number, 'format_model')
TO_NUMBER(char, 'format_model')
TO_DATE(char, 'format_model')

TO_CHAR(salary, '$99,999.00') as SALARY
Add the $ sign

Handling NULLs

NVL (expr1, expr2)
=> Converts a null value to an actual value

SELECT last_name, salary, salary* nvl(commission_pct,0)
NVL (city , 'Unavailable')

MONTH -> month in english
MON -> three letter abbreviation
DY -> three letter abbreviation
DAY -> day in english
DD -> numeric day

Nesting Functions

F3(F2(F1(col,arg1),arg2),arg3)

Using CASE

```
SELECT last_name, job_id, salary
        CASE job_id WHEN 'IT_PROG' THEN 1.10*salary
                    WHEN 'ST_CLERK' THEN 1.15*salary
        ELSE            salary END      "REVISED_SALARY"
FROM EMPLOYEES;
```

Lesson 4 Group Functions

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GROUP FUNCTIONS

AVG	Average Value (ignores NULL)
COUNT	Count rows
MAX	Maximum value
MIN	Minimum value
STDDEV	Standard deviation of n
SUM	Sum values
VARIANCE	Variance of n, ignoring nulls

DISTINCT => Makes the function consider only non-duplicates
Use **NVL** to substitute NULL for 0 for example

Examples:

```
SELECT  COUNT (DISTINCT department_id)
FROM    employees;

SELECT  AVG (NVL (commission_pct , 0))
FROM    employees;
```

GROUP BY

Example

```
SELECT  DEPARTMENT_ID, AVG(SALARY)
FROM    EMPLOYEES
GROUP BY DEPARTMENT_ID;
```

**Usually we need an ORDER BY with GROUP BY

```
SELECT          DEPARTMENT_ID, AVG(SALARY)
FROM            EMPLOYEES
GROUP BY        DEPARTMENT_ID
ORDER BY        DEPARTMENT_ID;
```

HAVING

Example:

```
SELECT  department_id, MAX(salary)
FROM employees
GROUP BY department_id
HAVING MAX(salary)>10000;
```

Lesson 5 Join Tables

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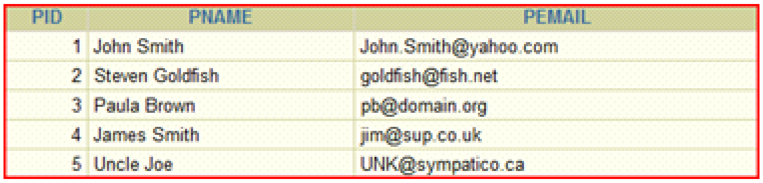
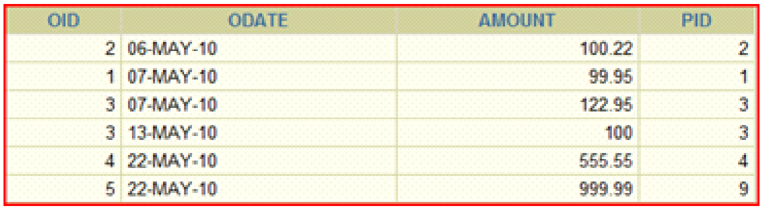
CUSTOMERS



PID	PNAME	PEMAIL
1	John Smith	John.Smith@yahoo.com
2	Steven Goldfish	goldfish@fish.net
3	Paula Brown	pb@domain.org
4	James Smith	jim@sup.co.uk
5	Uncle Joe	UNK@sympatico.ca

ORDERS



OID	ODATE	AMOUNT	PID
2	06-MAY-10	100.22	2
1	07-MAY-10	99.95	1
3	07-MAY-10	122.95	3
3	13-MAY-10	100	3
4	22-MAY-10	555.55	4
5	22-MAY-10	999.99	9

SAMPLE JOIN

```
SELECT  DEPARTMENT_ID,  DEPARTMENT_NAME,  D.LOCATION_ID,  CITY
FROM    DEPARTMENTS  D,
        LOCATIONS L
WHERE D.LOCATION_ID = L.LOCATION_ID
```

JOINING COLUMN NAMES -- USING

```
SELECT  EMPLOYEES.EMPLOYEE_ID,
             EMPLOYEES.LAST_NAME,
             DEPARTMENTS.LOCATION_ID,
             DEPARTMENT_ID
FROM    EMPLOYEES JOIN DEPARTMENTS
USING   (DEPARTMENT_ID);
```

INNER JOIN (Default Join also)

The INNER JOIN will select all rows from both tables → as long as there is a match between the columns we are matching on.

```
SELECT  employee_id, last_name, department_name
FROM    employees INNER JOIN departments
ON      employees.Department_ID = departments.Department_ID;
```

Another way

```
SELECT  employee_id, last_name, department_name
FROM    employees, departments
WHERE employees.Department_ID = departments.Department_ID;
```

How much did a customer purchase?

```
SELECT          pname,
                Amount AS "Sales Per Customer"
FROM            Customers, Orders
WHERE           Customers.pid = orders.pid;
```

NATURAL JOIN

```
SELECT  DEPARTMENT_ID, DEPARTMENT_NAME, LOCATION_ID,
CITY
FROM    DEPARTMENTS
NATURAL JOIN LOCATIONS;
```

Natural join, naturally check headers names without the need of letters to implicit declare tables

Creating Joins with the USING Clause

```
SELECT l.city, D.department_name
        FROM   locations L JOIN departments D USING (location_id)
        WHERE  location_id = 1400;
```

Creating JOINS with the ON clause

```
SELECT  e.employee_id, e.last_name, e.department_id,
        d.department_id, d.location_id
FROM    employees e  JOIN  departments d
ON      (e.department_id = d.department_id;
```

Three way joins

```
SELECT employee_id, city, department_name
FROM   employees e
JOIN   departments d
ON     d.department_id = e.department_id
JOIN   locations l
ON     d.location_id = l.location_id;
```

3 Types of OUTER JOINS

LEFT => Includes left side even if they don't match
RIGHT => Includes right
FULL => Includes both (everything)

```
SELECT  pname,
                SUM(Amount) AS SalesPerCustomer
FROM            Customers LEFT JOIN Orders
ON              Customers.pid = orders.pid
GROUP BY        PNAME
```

Lesson 6 Using SubQueries

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Subquery Syntax

```
SELECT select_list
FROM table
WHERE expr operator
              (SELECT   select_list
               FROM         table);
```

A Subquery is a SELECT statement that is imbedded in a clause of another SELECT statement.

Useful when you need to select rows from a table with a condition that depend so on data from the same table or other tables.

Example:

```
SELECT last_name
FROM employees
WHERE salary >   ( SELECT salary
                   FROM employees
                   WHERE last_name = "Abel"
```

Single-Row Subqueries

```
SELECT last_name, job_id, salary
FROM employees
WHERE job_id =
                    (SELECT job_id
                    FROM employees
                    WHERE employee_id = 141)
AND  salary >
                    (SELECT salary
                    FROM employees
                    WHERE employee_id = 143)
```

Multiple-Row Subqueries

```
SELECT  department_id, employee_id, last_name, salary
FROM            employees
WHERE salary IN          (SELECT min (salary)
                          FROM          employees
                          GROUP BY      department_id)
```

Using the ANY Operator in Multiple Row Subqueries

```
SELECT employee_id, last_name, job_id, salary
FROM employees
WHERE salary < ANY
```

Guidelines for using Subqueries:

→ A Subquery must be enclosed in parenthesis.

→ Place the Subquery on the right side of the comparison operator for readability
You can do it the other way
SELECT * from employees
WHERE (select salary from employees where last_name = 'Abel') < salary

→ ORDER BY clause in the Subquery is only needed when performing TOP-N analysis
- Normally the order by clause is only found at the end of the SQL statement.
- TOP-N analysis refers two finding the top number of rows.
    - Example top seven salaries

→ 2 types of Subqueries are used:
Single-row operators
Multiple-row operators

Group Functions in a Subquery

```
SELECT LAST_NAME, JOB_ID, SALARY
FROM EMPLOYEES
WHERE SALARY = ( SELECT MIN (SALARY)
FROM EMPLOYEES);
```

**** Oracle executes subqueries first**
**** Oracle return results into the HAVING Clause of the main query**

```
SELECT  job_id, AVG (salary)
FROM   employees
GROUP BY        job_id
HAVING          AVG (salary) =   (SELECT MIN ( AVG
(salary) )
                    FROM            employees
                    GROUP BY        job_id );
```

Using the ALL Operator in Multiple Row Subqueries

```
SELECT employee_id, last_name, job_id, salary
FROM employees
WHERE salary < ALL
(SELECT salary
FROM employees
WHERE job_id = 'IT_PROG')
AND job_id != 'IT_PROG'
```

```
SELECT employee_id, last_name, job_id, salary
FROM employees
WHERE salary < ANY
                              (SELECT salary
                              FROM employees
                              WHERE job_id = 'IT_PROG')
AND job_id != 'IT_PROG'
```

NOTE:
< ANY -- less than any will mean less than the maximum return
> ANY -- greater than any means more than the minimum value returned
= ANY -- equal to any is the equivalent of the IN operator

```
WHERE job_id = 'IT_PROG')
AND job_id != 'IT_PROG'
```

NOTE:
> ALL -- greater than all means more than the maximum
< ALL -- less than all means less than the minimum

The NOT operator can be used with any of these. Caution is recommended the use of the not operator just as it was in other programming languages.

Lesson 7 Data Modelling

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Self-Study ERD Diagram

Lesson 8 Set Operators

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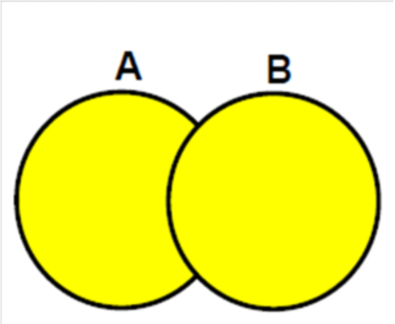
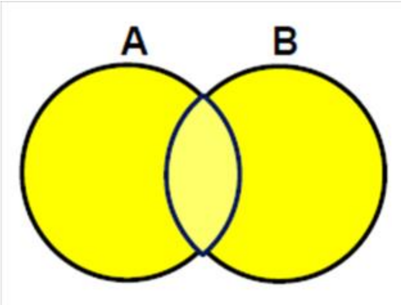
UNION



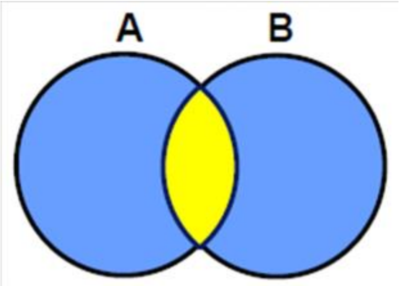
UNION of all the rows in A
With ALL the rows in B
With NO DUPLICATES

UNION ALL



UNION of ALL the rows in A and B
including duplicates

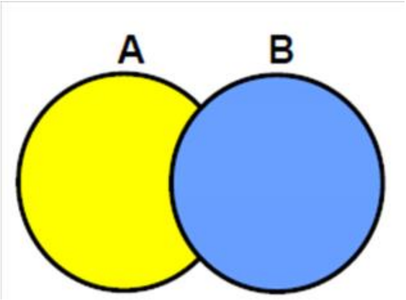
INTERSECT



The rows in common to both tables only

A intersect B
same as
B intersect A

MINUS



Rows in the first query A
That are not in second query B

PRECEDENCE – equal – evaluated left to right

Caution recommended. Use brackets with INTERSECT

```
SELECT employee_id, job_id, salary
FROM   employees
UNION
SELECT employee_id, job_id, 0
FROM   job_history;
```

Matching columns
If no salary will show 0

```
SELECT department_id, TO_NUMBER (null) as
location, hire_date
FROM   employees
UNION
SELECT department_id, location_id, TO_DATE
(null)
FROM   departments;
```

Note the location because
TO_NUMBER (null) does not
make a good column heading

```
SELECT employee_id, job_id, salary
FROM employees
UNION
SELECT employee_id, job_id, 0
FROM job_history
ORDER BY 2; ← to change default of sorting
on employee-Id
```

The ORDER BY clause can appear only once at the end of the compound query. Same as before – at the end

Lesson 9A DML-Insert

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DML – Data Manipulation Language

What is it?

The SQL that manipulates data.
Data can be added, changed or deleted

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 – such as inserting students registering

INSERT – by COPYING FROM ANOTHER TABLE

Use 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%';
```

-> No VAUES clause
-> Number of columns must match
-> Data type must match

TRUNCATE statement

Removes ALL rows from a table, but leaves the table structure

```
TRUNCATE        employees;
```

WHY USE?
More efficient than DELETE
Delete checks all delete triggers
Truncate is a DDL statement and does nt create a copy to allow for ROLLBACK

If the table is the parent you need to drop constraint of the FK to do be able to do this

Example

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

```
INSERT INTO departments
VALUES (100, 'Finance', NULL, NULL);
```

SYSDATE => Server current date and time

Update employee 113

A) JOB ID SAME AS EMPLOYEE 205
B) SALARY SAME AS 205

Method 1:

```
UPDATE          employees
SET             job_id = (SELECT job_id
FROM employees
WHERE employee_id = 205),
salary = (SELECT salary
          FROM employees
          WHERE employee_id = 205)
WHERE employee_id = 113;
```

Method 2:

```
UPDATE          employees
SET             (job_id, salary) = (SELECT job_id, salary
FROM employees
WHERE employee_id = 205)
WHERE employee_id = 113;
```

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

UPDATE...
SAVEPOINT update_done;   <- receive a message
SAVEPOINT update_done succeeded
INSERT...
ROLLBACK TO update_done; <- receive a message ROLLBACK succeeded

State of data after a ROLLBACK

Example

1. Remove departments 290 and 300 in the DEPARTMENTS table
2. Update a row in the EMPLOYEES table.
3. Save the data change.

1

```
DELETE FROM departments
WHERE department_id IN (290, 300);
```

2

```
UPDATE employees
SET department_id = 80
WHERE employee_id = 206;
```

3

```
COMMIT;
```

State of data after a 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 employees;
ROLLBACK;
```

Lesson 10 Create & Manage Tables

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```
CREATE TABLE dept
(       deptno          NUMBER(2),
        dname           VARCHAR2(14),
        loc             VARCHAR2(13),
       create_date      DATE);
```

Data types available

VARCHAR2 (size)   Maximum size need to be specified (up to 4000)
CHAR   Fixed Length size to maximum 2000
NUMBER (p, s)   P is precision or total number of decimal digit and
S is scale or number of digits to the right of the decimal point
EX: NUMBER (5, 2) means 5 all together and 2 decimal places
The value 1000 will be rejected by the server as that is 6 wide

DATE   Date and Time value to the nearest second
Range: Jan 1, 4712 BC and Dec 31, 9999

==

LONG   data type is variable length up to @GB

CLOB   character data up to 4GB

DATETIME data types

TIMESTAMP   - By default this is in microsecond
- EX: 12-MAR-15 08:45.23.123456 🡐 6 decimals for microseconds

TIMESTAMP (0)   - removes part seconds
TIMESTAMP (9)   - can go to nanoseconds

• Overview of constraints: NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY, CHECK constraints

NOT NULL	- SPECIFY DATA CANNOT BE null
UNIQUE	- PREVENTS DUPLICATION OF DATA INTHAT ROW
PRIMARY KEY	Unique identifier for each row in a table Aside: It is both NT NULL and UNIQUE
FOREIGN KEY	Establishes and enforces a referential integrity between the column and a column of the referenced table such that values in one table match values in another table
CHECK	Specifies a TRUE condition

UNIQUE CONSTRAINT

Example: At the TABLE LEVEL

```
CREATE TABLE employees(
employee_id     NUMBER(6),
last_name       VARCHAR2(25) NOT NULL,
email           VARCHAR2(25),
salary          NUMBER(8,2),
commission_pct NUMBER(2,2),
hire_date DATE NOT NULL,
...
CONSTRAINT emp_email_uk UNIQUE(email));
```

CHECK CONSTRAINT

Defines a condition that each row must satisfy in order to be added to the table

EXAMPLE:

```
CREATE TABLE EMPLOEES
( …. other columns

salary NUMBER(2)
CONSTRAINT employees_salary_min CHECK
(salary > 0),
...
)
```

Foreign Key – table level

```
CREATE TABLE employees(
employee_id NUMBER(6),
last_name VARCHAR2(25) NOT NULL,
email VARCHAR2(25),
salary NUMBER(8,2),
commission_pct NUMBER(2,2),
hire_date DATE NOT NULL,
...
department_id NUMBER(4),
CONSTRAINT emp_dept_fk FOREIGN KEY
(department_id)
REFERENCES departments(department_id),
CONSTRAINT emp_email_uk UNIQUE(email));
```

Foreign Key – column level

```
CREATE TABLE employees
(...
department_id NUMBER(4) CONSTRAINT
emp_deptid_fk
REFERENCES departments(department_id),
...
)
```

NOTE:
Foreign Key not stated as the reference handles that concept
Still need to name it and specify what if references

Lesson 11 Alter

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SYNTAX

ALTER

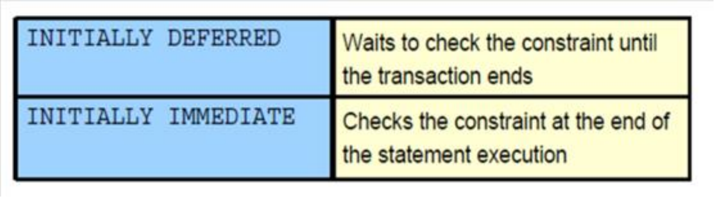
TABLE - name of the table

ADD – MODIFY – DROP is the type of modification

COLUMN -- name of column effected

DATATYPE -- datatype and length of the column

DEFAULT expr – specifies he default value for a column



INITIALLY DEFERRED	Waits to check the constraint until the transaction ends
INITIALLY IMMEDIATE	Checks the constraint at the end of the statement execution

PUBLIC SYNONYM – created by DBA

```
CREATE PUBLIC SYNONYM  STUDLIST
FOR                    registration.STUDENT;
```

Allows access to table STUDENT owned by user REGISTRATION.

SYNONYM

PURPOSE

1 To shorten lengthy object names

2 Refer to table owned by another user – really the same as 1

CREATING SYNONYM

```
CREATE SYNONYM      d_sum
FOR                 dept_sum_vu;
```

REMOVING SYNONYM

```
DROP   SYNONYM      d_sum;
```

Lesson 12 Views

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Generic Syntax

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

VIEW – Examples

```
CREATE VIEW empvu80
AS      SELECT  employee_id,
last_name,
salary
FROM employees
WHERE department_id = 80;
```

```
DESCRIBE empvu80
```

VIEW – Examples – with aliases

Column aliases

```
CREATE VIEW salvu50
AS SELECT       employee_id ID_NUMBER,
last_name NAME,
salary*12 ANN_SALARY
FROM employees
WHERE department_id = 50;
```

REMOVING A VIEW

Removing a view does not remove the data

```
DROP VIEW empvu80;
```

View – Retrieving Data

```
SELECT *
FROM salvu50;
```

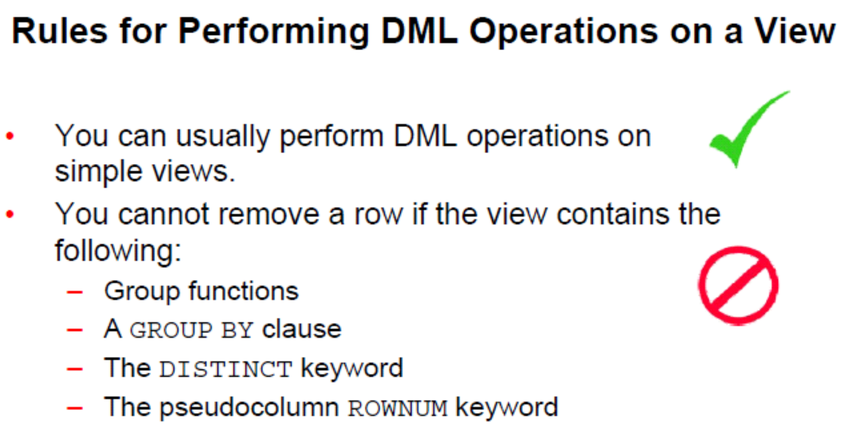
MODIFY – CHANGE a VIEW

Requires

CREATE OR REPLACE ← it saves deleting and creating – and re granting privileges

Example: Modify the previous empvu80 to add aliases

```
CREATE OR REPLACE VIEW empvu80
(id_number, name, sal, department_id)
AS      SELECT  employee_id,
first_name || ' ' || last_name,
salary,
department_id
FROM employees
WHERE department_id = 80;
```



Rules for Performing DML Operations on a View

- You can usually perform DML operations on simple views.
- You cannot remove a row if the view contains the following:
  - Group functions
  - A GROUP BY clause
  - The DISTINCT keyword
  - The pseudocolumn ROWNUM keyword

CREATE SEQUENCE Statement
Generic syntax

```
CREATE SEQUENCE sequence              <- name of sequence
[INCREMENT BY n]                      <- specifies increment value
[START WITH n]                  <- Starting (default 1 if omitted
[{MAXVALUE n | NOMAXVALUE}]           <- maximum value – default is nomax
[{MINVALUE n | NOMINVALUE}] <- this is default if not stated
[{CYCLE | NOCYCLE}]             <- allows recycling of numbers–reuse
[{CACHE n | NOCACHE}];                <- allows caching x values-faster
```

Example:

CREATE SEQUENCE dept_deptid_seq ← note the naming convention

```
INCREMENT BY 10
START WITH 120
MAXVALUE 9999
NOCACHE
NOCYCLE;
```

NEXTVAL and CURRVAL Pseudo columns

• NEXTVAL
- used to extract successive sequence number
- returns the next available sequence value.
It returns a unique value every time it is referenced, even for different users.

Specify NEXTVAL and the sequence name

• CURRVAL obtains the current sequence value.

• NEXTVAL must be issued for that sequence before CURRVAL contains a value.

Create and DROP index

How Are Indexes Created?

Automatically:
A unique index is created automatically when you define a
- PRIMARY KEY or
- UNIQUE constraint in a table definition.

Manually:
Developers can create nonunique indexes on other columns to speed up access to rows.

```
CREATE INDEX emp_last_name_idx  <-  note naming convention
ON       employees (last_name);
```

INSERT INTO departments
(department_id, department_name, location_id)

VALUES (dept_deptid_seq.NEXTVAL, 'Support', 2500);

You can also ALTER or DROP Sequences

DROP SEQUENCE dept_deptid_seq;

SOME RULES ON INDEXES

1 The column is used often in a where clause and the table is large.
2 The table is very large and most retrievals display a small amount of data.

REMOVE INDEX

DROP INDEX emp_last_name_idx;

Lesson 13 Creating Indexes and Sequences + Practice

Tuesday, February 14, 2017 1:18 AM

CLASS EXERCISE, CHAPTER 10 and 11 -- CREATING INDEXES and SEQUENCES plus DATA DICTIONARY VIEWS

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REMOVING and RESTORING TABLES

*Firstly, we will create two tables to play with *

```
SQL> CREATE TABLE  STAFF AS
   SELECT  employee_id, last_name, hire_date, job_id,
        salary, department_id
   FROM    employees;

Table created.

SQL> CREATE TABLE  MINISTAFF AS
   SELECT  employee_id, last_name, hire_date, job_id, salary
   FROM     employees
   WHERE   department_id IN   (10,20,60,80);

Table created.

SQL> SELECT * FROM ministaff;

EMPLOYEE_ID  LAST_NAME      HIRE_DAT         JOB_ID  SALARY
200       Whalen            87-09-17          AD_ASST         4400
201       Hartstein         96-02-17          MK_MAN          13000
202       Fay       97-08-17          MK_REP          6000
103       Hunold 90-01-03         IT_PROG         9000
104       Ernst    91-05-21          IT_PROG         6000
107       Lorentz           99-02-07          IT_PROG         4200
149       Zlotkey 00-01-29         SA_MAN          10500
174       Abel     96-05-11          SA_REP          11000
176       Taylor  98-03-24          SA_REP          8600
9 rows selected.
SQL> DROP TABLE STAFF;

Table dropped.              → this was temporary removal to recyclebin

SQL> SELECT original_name, droptime
FROM    recyclebin ;

ORIGINAL_NAME           DROPTIME
STAFF    2006-12-03:11:13:47

SQL> DESC staff

ERROR:
ORA-04043: object staff does not exist

SQL> FLASHBACK TABLE staff TO BEFORE DROP;
```

SEQUENCES

```
SQL> CREATE SEQUENCE staff_empid_seq
   START WITH 111
   MAXVALUE   200
   NOCACHE ;    → Default value for CACHE is 20
values

Sequence created.

SQL> INSERT INTO staff VALUES
(staff_empid_seq.NEXTVAL,'Moore',sysdate,'IT_PR
OG',8000,60);

1 row created.
→ We used AUTO option for generation of UNIQUE
integer values with SEQUENCENAME.NEXTVAL
here

SQL> SELECT * FROM staff
   WHERE   hire_date = sysdate;

No rows selected.          -- be careful when
equalling dates

SQL> SELECT * FROM staff
   WHERE   to_date(hire_date,'RR-MM-DD') =
        to_date(sysdate, 'RR-MM-DD');

EMPLOYEE_ID   LAST_NAME      HIRE_DAT
        JOB_ID  SALARY          DEPARTMENT_ID
111       Moore  06-12-03          IT_PROG
        8000     60

SQL> SELECT sequence_name, last_number
   FROM   user_sequences ;

SEQUENCE_NAME          LAST_NUMBER
DEPARTMENTS_SEQ        280
EMPLOYEES_SEQ          207
LOCATIONS_SEQ          3300
STAFF_EMPID_SEQ        112
```

→ Column Last_Number means actually NEXT available number (if NOCACHE option is used)

```
ORA-04043: object staff does not exist

SQL> FLASHBACK TABLE staff TO BEFORE DROP;

Flashback complete.      → this was restore from recyclebin

SQL> DESC staff

Name    Null?    Type
EMPLOYEE_ID              NUMBER(6)
LAST_NAME     NOT NULL        VARCHAR2(25)
HIRE_DATE     NOT NULL        DATE
JOB_ID  NOT NULL        VARCHAR2(10)
SALARY                   NUMBER(8,2)
DEPARTMENT_ID                   NUMBER(4)


SQL> DROP TABLE ministaff PURGE;

Table dropped.  → this was permanent removal (no recyclebin)

SQL> SELECT original_name, droptime
FROM    recyclebin ;

no rows selected

SQL> FLASHBACK TABLE ministaff TO BEFORE DROP;

FLASHBACK TABLE ministaff TO BEFORE DROP
*
ERROR at line 1:
ORA-38305: object not in RECYCLE BIN
```

→ we could not restore this table, it was not in the recycle bin after PURGE option

INDEXES

```
SQL> CREATE INDEX staff_salary_idx ON staff(salary);

Index created.   → We created a SINGLE index

SQL> CREATE INDEX staff_lname_idx ON staff(last_name);

Index created.

SQL> DROP INDEX staff_lname_idx;

Index dropped.

SQL> CREATE INDEX staff_lname_salary_idx
             ON staff(last_name, salary);

Index created.
```

→ In order to modify an Index we need to drop it and re-create it again. Here we created a COMPOSITE Index that will serve a dual purpose: for two columns and for the first mentioned one (that is why we do NOT

_ _

→ Column Last_Number means actually NEXT available number (if NOCACHE option is used)

```
SQL> ALTER SEQUENCE staff_empid_seq
   MAXVALUE  140
   CACHE 10;

Sequence altered.


SQL> SELECT sequence_name, last_number,
cache_size
   FROM   user_sequences
   WHERE  sequence_name LIKE ‘STAFF%’;

SEQUENCE_NAME        LAST_NUMBER
         CACHE_SIZE
STAFF_EMPID_SEQ       122      10
```

→ Column Last_Number means actually FIRST number from the NEXT set of cached values (if CACHE option is used)

```
SQL> INSERT INTO staff VALUES
(staff_empid_seq.NEXTVAL,'Dunn',sysdate,'IT_PRO
G',7000,60);

1 row created.

SQL> ROLLBACK;

Rollback complete.

SQL> INSERT INTO staff VALUES
(staff_empid_seq.NEXTVAL,'Markov',sysdate,'IT_PR
OG',11000,60);

1 row created.

SQL> SELECT * FROM staff
   WHERE   to_date(hire_date,'RR-MM-DD') =
        to_date(sysdate, 'RR-MM-DD');

EMPLOYEE_ID  LAST_NAME     HIRE_DAT
        JOB_ID SALARY          DEPARTMENT_ID
111      Moore  06-12-03        IT_PROG
        8000    60
113      Markov          06-12-03          IT_PROG
        11000   60
```

→ So, if we perform any rollback, then we create gaps in the sequence values (employee Dunn got number 112 and that number was lost after rollback) need an index just for the last name anymore, it is given with this composite one)

```
SQL> SELECT index_name, uniqueness FROM user_indexes
    WHERE  table_name = ‘STAFF’ ;

INDEX_NAME    UNIQUENESS
STAFF_SALARY_IDX        NONUNIQUE
STAFF_LNAME_SALARY_IDX       NONUNIQUE

SQL> SELECT index_name, column_name, column_position
    FROM user_ind_columns
    WHERE  table_name = ‘STAFF’ ;
```

→ In order to see column name that is indexed and their relative position (if index is a composite one) use user_ind_columns view

```
INDEX_NAME    COLUMN_NAME           COLUMN_POSITION
STAFF_SALARY_IDX        SALARY              1
STAFF_LNAME_SALARY_IDX       SALARY             2
STAFF_LNAME_SALARY_IDX       LAST_NAME      1
```