Lab 1 – Introduction to Oracle

Topics

1. Oracle versions
2. Database Users (Scott and System), Login screen
3. Oracle follows client server architecture
4. SQL and PL/SQL
5. Introduction to DDL, DML, DCL and TCL
6. DQL select statement
7. Where clause (AND, OR and NOT), IN statement
8. Relational operators (=, <>, !=,^=,<,>,<=,>=)
9. Removing duplicates (Unique and distinct)
10. Between and clause (Range Searching)
11. Like Clause (pattern matching)
12. Column Renaming
13. Null values
14. Dual table
15. Order by clause (ASC and DESC)

Q.1. Display the details of all employees.

SQL >

OUTPUT :

```
EMPNO ENAME      JOB              MGR HIREDATE         SAL       COMM     DEPTNO
---------- ---------- --------- ---------- --------- ---------- ---------- ----------
      7369 SMITH      CLERK           7902 17-DEC-80        800                    20
      7499 ALLEN      SALESMAN        7698 20-FEB-81       1600        300         30
      7521 WARD       SALESMAN        7698 22-FEB-81       1250        500         30
      7566 JONES      MANAGER         7839 02-APR-81       2975                    20
      7654 MARTIN     SALESMAN        7698 28-SEP-81       1250       1400         30
      7698 BLAKE      MANAGER         7839 01-MAY-81       2850                    30
      7782 CLARK      MANAGER         7839 09-JUN-81       2450                    10
      7788 SCOTT      ANALYST         7566 09-DEC-82       3000                    20
      7839 KING       PRESIDENT            17-NOV-81       5000                    10
      7844 TURNER     SALESMAN        7698 08-SEP-81       1500          0         30
      7876 ADAMS      CLERK           7788 12-JAN-83       1100                    20
      7900 JAMES      CLERK           7698 03-DEC-81        950                    30
      7902 FORD       ANALYST         7566 03-DEC-81       3000                    20
      7934 MILLER     CLERK           7782 23-JAN-82       1300                    10

14 rows selected.
```

Q.2 Display the details of all departments.

SQL >

OUTPUT :

```
    DEPTNO DNAME          LOC
---------- -------------- -------------
        10 ACCOUNTING     NEW YORK
        20 RESEARCH       DALLAS
        30 SALES          CHICAGO
        40 OPERATIONS     BOSTON
```

Q.3 Display the name and job for all employees.

SQL >

OUTPUT :

```
ENAME      JOB
---------- ---------
SMITH      CLERK
ALLEN      SALESMAN
WARD       SALESMAN
JONES      MANAGER
MARTIN     SALESMAN
BLAKE      MANAGER
CLARK      MANAGER
SCOTT      ANALYST
KING       PRESIDENT
TURNER     SALESMAN
ADAMS      CLERK
JAMES      CLERK
FORD       ANALYST
MILLER     CLERK

14 rows selected.
```

Q.4 Display the name of department which is located in 'CHICAGO'.

SQL >

OUTPUT :

```
DNAME
--------------
SALES
```

Q.5 Display the names of all employees who are working in department number 10.

SQL >

OUTPUT :

```
ENAME
----------
CLARK
KING
MILLER
```

Q.6 Display the names of all employees working as clerks and drawing a salary greater than 1000.

SQL >

OUTPUT :

```
ENAME
----------
ADAMS
MILLER
```

Q.7 Display employee number and names for employees who earn commission.

SQL >

OUTPUT :

```
EMPNO ENAME
---------- ----------
      7499 ALLEN
      7521 WARD
      7654 MARTIN
```

Q.8 Display names of employees who are not eligible for commission.

SQL >

OUTPUT :

```
ENAME
----------
SMITH
JONES
BLAKE
CLARK
```

```
SCOTT
KING
ADAMS
JAMES
FORD
MILLER

10 rows selected.
```

Q.9 Display the names of employees who are working as clerk, salesman or analyst and drawing a salary more than 2500.

SQL >

OUTPUT :

```
ENAME
----------
SCOTT
FORD
```

Q.10 Display the names of employees who are working in department number 10 and are manager.

SQL >

OUTPUT :

```
ENAME
----------
CLARK
```

Q.11 Display the list of employees who have joined the company before 30th june 90 or after 31st dec 90.

SQL >

OUTPUT :

```
ENAME
----------
SMITH
ALLEN
WARD
JONES
MARTIN
BLAKE
CLARK
```

```
SCOTT
KING
TURNER
ADAMS
JAMES
FORD
MILLER

14 rows selected.
```

Q.12 Display the names of all employees who do not get commission.

SQL >

OUTPUT :

```
ENAME
----------
SMITH
JONES
BLAKE
CLARK
SCOTT
KING
TURNER
ADAMS
JAMES
FORD
MILLER

11 rows selected.
```

Q.13 Display the names of employees working in department number 10 or 20 or employees working as clerks, salesman or analyst.

SQL >

OUTPUT :

```
ENAME
----------
SMITH
ALLEN
WARD
JONES
MARTIN
CLARK
SCOTT
KING
TURNER
ADAMS
```

```
JAMES
FORD
MILLER

13 rows selected.
```

Q.14 Display the names of employees whose name starts with alphabet S.

SQL >

OUTPUT :

```
ENAME
----------
SMITH
SCOTT
```

Q.15 Display employee name from employees whose name ends with alphabet S.

SQL >

OUTPUT :

```
ENAME
----------
JONES
ADAMS
JAMES
```

Q.16 Display the names of employees whose names have second alphabet A in their names.

SQL >

OUTPUT :

```
ENAME
----------
WARD
MARTIN
JAMES
```

Q.17 Display the names of employees whose name is exactly four characters in length.

SQL >

OUTPUT :

```
ENAME
----------
WARD
KING
FORD
```

Q.18 Display unique jobs available in company.

SQL >

OUTPUT :

```
JOB
---------
CLERK
SALESMAN
PRESIDENT
MANAGER
ANALYST
```

Q.19 Display the names of employees and their salaries in descending order of salary.

SQL >

OUTPUT :

```
ENAME                SAL
---------- ----------
KING                5000
FORD                3000
SCOTT               3000
JONES               2975
BLAKE               2850
CLARK               2450
ALLEN               1600
TURNER              1500
MILLER              1300
WARD                1250
MARTIN              1250
ADAMS               1100
JAMES                950
SMITH                800

14 rows selected.
```

Q.20 Display the names of employees in ascending order of their names.

SQL >

OUTPUT :

```
ENAME
----------
ADAMS
ALLEN
BLAKE
CLARK
FORD
JAMES
JONES
KING
MARTIN
MILLER
SCOTT
SMITH
TURNER
WARD

14 rows selected.
```

Q.21 Display the names and salaries of employees in ascending order of salary and descending order of names.

SQL >

OUTPUT :

```
ENAME                SAL
---------- ----------
SMITH                800
JAMES                950
ADAMS               1100
WARD                1250
MARTIN              1250
MILLER              1300
TURNER              1500
ALLEN               1600
CLARK               2450
BLAKE               2850
JONES               2975
SCOTT               3000
FORD                3000
KING                5000

14 rows selected.
```

Q.22 Display the name of employees and job as "SCOTT – ANALYST".

SQL >

OUTPUT :

```
ename-job
--------------------
SMITH-CLERK
ALLEN-SALESMAN
WARD-SALESMAN
JONES-MANAGER
MARTIN-SALESMAN
BLAKE-MANAGER
CLARK-MANAGER
SCOTT-ANALYST
KING-PRESIDENT
TURNER-SALESMAN
ADAMS-CLERK
JAMES-CLERK
FORD-ANALYST
MILLER-CLERK

14 rows selected.
```

Q.23 Display the name of the president.

SQL >

OUTPUT :

```
ENAME
----------
KING
```

Q.24 Display the names of employees who are not managers.

SQL >

OUTPUT :

```
ENAME
----------
SMITH
ALLEN
WARD
MARTIN
```

```
SCOTT
KING
TURNER
ADAMS
JAMES
FORD
MILLER

11 rows selected.
```

Q.25 Display the names, salary and department number of all employees and order them department wise using relative position of their select list.

SQL >

OUTPUT :

```
ENAME                SAL     DEPTNO
---------- ---------- ----------
CLARK              2450         10
KING               5000         10
MILLER             1300         10
JONES              2975         20
FORD               3000         20
ADAMS              1100         20
SMITH               800         20
SCOTT              3000         20
WARD               1250         30
TURNER             1500         30
ALLEN              1600         30
JAMES               950         30
BLAKE              2850         30
MARTIN             1250         30

14 rows selected.
```

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Lab 2 Oracle Functions

1. Arithmetic Functions

SN	Function	Description
1.	sin(x)	Returns the sine of x where x is in radians.
2.	cos(x)	Returns the cosine of x where x is in radians.
3.	tan(x)	Returns the tangent of x where x is in radians.
4.	sinh(x)	Returns the hyperbolic sine of x.
5.	cosh(x)	Returns the hyperbolic cosine of x.
6.	tanh(x)	Returns the hyperbolic tangent of x.
7.	asin(x)	Returns the arc sine of x.
8.	acos(x)	Returns the arc cosine of x.
9.	atan(x)	Returns the arc tangent of x.
10.	sign(x)	Returns the sign value of x.
11.	abs(x)	Returns the absolute value of x.
12.	mod(m,n)	Returns the reminder of m divided by n. [mod(m, n) = m – n *floor(m/n)]
13.	trunc(m,n)	Returns a number truncated to n number of decimal places.
14.	round(m,n)	Returns a number rounded to n number of decimal places.
15.	ceil(x)	Returns the smallest integer greater than or equal to the number x.
16.	floor(x)	Returns the greatest integer smaller than or equal to the number x.
17.	log(m,n)	Returns the logarithm of n base m.
18.	ln(x)	Returns the natural logarithm of x.
19.	sqrt(x)	Returns the square root of x.
20.	exp(x)	Returns e raised to the nth power, where e = 2.71828183.
21.	power(m,n)	Returns m raised to the nth power.
22.	greatest(m,n,p,…..)	Returns the greatest value in a list of expressions.
23.	least(m,n,p……)	Returns the least value in a list of expressions.

2. Aggregate Functions (Group Functions)

SN	Function	Description
1.	count(colname)	Returns the number of rows in the column name specified.
2.	count(*)	Returns the number of rows in the table.
3.	min(colname)	Returns the min value for an expression.
4.	max(colname)	Returns the max value for an expression.
5.	avg(colname)	Returns the avg value for an expression.
6.	sum(colname)	Returns the sum value for an expression.
7.	stddev(colname)	Returns the standard deviation for an expression.
8.	variance(colname)	Returns the variance for an expression.

Q.1. List name, salary and pf amount of all the employees. Pf is calculated as 10% of salary.

SQL >

OUTPUT :

```
ENAME              SAL         PF
---------- ---------- ----------
SMITH              800         80
ALLEN             1600        160
WARD              1250        125
JONES             2975      297.5
MARTIN            1250        125
BLAKE             2850        285
CLARK             2450        245
SCOTT             3000        300
KING              5000        500
TURNER            1500        150
ADAMS             1100        110
JAMES              950         95
FORD              3000        300
MILLER            1300        130

14 rows selected.
```

Q.2 List the number of employees working in the company.

SQL >

OUTPUT :

```
   NOOFEMP
----------
        14
```

Q.3 List the number of jobs available in the company.

SQL >

OUTPUT :

```
  NOOFJOBS
----------
         5
```

Q.4 List the total salary payable to employees.

SQL >

OUTPUT :

```
  TOTALSAL
----------
     29025
```

Q.5 List the minimum, maximum and average salary payable to employees.

SQL >

OUTPUT :

```
    MINSAL     MAXSAL     AVGSAL
---------- ---------- ----------
       800       5000 2073.21429
```

Q.6 List the maximum salary and number of employees working as "SALESMAN".

SQL >

OUTPUT :

```
    MAXSAL    NOOFEMP
---------- ----------
      1600          4
```

Q.7 List the average salary and number of employees working on department number 20.

SQL >

OUTPUT :

```
    AVGSAL    NOOFEMP
---------- ----------
      2175          5
```

Q.8 Display 10% increased salary of all the employees.

SQL >

OUTPUT :

```
    INCSAL
----------
       880
      1760
      1375
    3272.5
      1375
      3135
      2695
      3300
      5500
      1650
      1210
      1045
      3300
      1430

14 rows selected.
```

Q.9 Display the maximum salary paid to "CLERK".

SQL >

OUTPUT :

```
    MAXSAL
----------
      1300
```

Q.10 List the department numbers and number of employees in each department.

SQL >

OUTPUT :

```
    DEPTNO    NOOFEMP
---------- ----------
        30          6
        20          5
        10          3
```

Q.11 List the department number and total salary payable to each department.

SQL >

OUTPUT :

```
    DEPTNO   TOTALSAL
---------- ----------
        30       9400
        20      10875
        10       8750
```

Q.12 List the jobs and the number of employees in each job. The result should be in the descending order of the number of jobs.

SQL >

OUTPUT :

```
JOB          NUMOFEMP
--------- ----------
CLERK               4
SALESMAN            4
MANAGER             3
ANALYST             2
PRESIDENT           1
```

Q.13 List the job wise total salary, average salary and minimum salary of employees.

SQL >

OUTPUT :

```
JOB          TOTALSAL     AVGSAL     MINSAL
--------- ---------- ---------- ----------
CLERK            4150     1037.5        800
SALESMAN         5600       1400       1250
PRESIDENT        5000       5000       5000
MANAGER          8275 2758.33333       2450
ANALYST          6000       3000       3000
```

Q.14 List the total salary of employees, job wise for department 20 only.

SQL >

OUTPUT :

```
JOB          TOTALSAL
---------  ----------
CLERK            1900
MANAGER          2975
ANALYST          6000
```

Q.15 Find out maximum salaries department wise excluding those who are having salary less than 3000.

SQL >

OUTPUT :

```
    DEPTNO     MAXSAL
----------  ----------
        30        2850
        20        2975
        10        2450
```

Q.16 List the job wise total salary, average salary of employees of department number 20 and display only those rows having average salary greater than 1000.

SQL >

OUTPUT :

```
JOB          TOTALSAL     AVGSAL
---------  ----------  ----------
MANAGER          2975        2975
ANALYST          6000        3000
```

Q.17 Display the department numbers with more than three employees in each department.

SQL >

OUTPUT :

```
    DEPTNO    NOOFEMP
----------  ----------
        30           6
        20           5
```

Q.18 Display the various jobs along with total salary for each of the jobs where total salary is greater than 5000.

SQL >

OUTPUT :

```
JOB          TOTALSAL
--------- ----------
SALESMAN         5600
MANAGER          8275
ANALYST          6000
```

Q.19 Display the various jobs along with total number of employees in each job. The output should contain only those jobs with more than three employees.

SQL >

OUTPUT :

```
JOB           NOOFEMP
--------- ----------
CLERK               4
SALESMAN            4
```

Q.20 Multiply all the department number from department table.

SQL >

OUTPUT :

```
  MULTIPLY
----------
    240000
```

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Lab 3 String and Date Functions

3. String Functions

SN	Function	Description
1.	concat(s1, s2)	Concatenates string s1 with s2.
2.	length(s)	Finds the length of the string s.
3.	upper(s)	Converts into upper case.
4.	lower(s)	Converts into lower case.
5.	initcap(s)	Converts first letter into upper case and rest into lower case.
6.	replace(s, 'm', 'n')	Replaces every sequence of characters into another sequence.
7.	translate(s, 'm', 'n')	Replaces every sequence of characters into another sequence.
8.	ltrim(s, 'm')	Removes all specified characters from left hand side of string.
9.	rtrim(s, 'm')	Removes all specified characters from right hand side of string.
10.	trim(leading|trailing|both 'm' from s)	Removes all specified characters either from leading or trailing.
11.	lpad(s, len, 'm')	Pads the left side of the string a specified set of characters.
12.	rpad(s, len, 'm')	Pads the right side of the string a specified set of characters.
13.	soundex(s)	Returns a phonetic representation of a string.
14.	ascii(s)	Returns the ascii value of given character.
15.	chr(num)	Returns the character based on ascii value specified.
16.	instr(s, 'm', stpos, occur)	Returns the location of substring m in string s.
17.	substr(s, stpos, len)	Extracts a substring from a string.
18.	reverse(s)	Returns the reverse of the string.

4. Date Functions

SN	Function	Description
1.	Sysdate	Returns the current date and time for the local database.
2.	current_date	Returns the current date in the time zone of the current SQL session.
3.	last_day(date)	Returns the last day of the months based on the date specified.
4	next_day(date, weekday)	Returns the first weekday that is greater than a date.
5	months_between(date1, date2)	Returns the number of months between date1 and date2.
6	add_months(date, num)	Returns a date plus num months.
7	to_date(date, 'fmt')	Converts a number or date to a string.
8	to_char(date, 'fmt')	Converts a string to a date.
9	new_time(date, 'tz1', 'tz2')	Returns a date in time zone tz1 to time zone tz2.

List of time zones for new_time function

SN	Value	Description
1.	AST	Atlantic Standard Time
2.	ADT	Atlantic Daylight Time
3.	BST	Bering Standard Time
4.	BDT	Bering Daylight Time
5.	CST	Central Standard Time
6.	CDT	Central Daylight Time
7.	EST	Eastern Standard Time
8.	EDT	Eastern Daylight Time
9.	GMT	Greenwich Mean Time
10.	HST	Alaska – Hawaii Standard Time
11.	HDT	Alaska – Hawaii Daylight Time
12.	MST	Mountain Standard Time
13.	MDT	Mountain Daylight Time
14.	NST	Newfoundland Standard Time
15.	PST	Pacific Standard Time
16.	PDT	Pacific Daylight Time
17.	YST	Yukon Standard Time
18.	YDT	Yukon Daylight Time

Soundex algorithm

1. **Capitalize all letters in the word and drop all punctuation marks. Pad the word with rightmost blanks as needed during each procedure step.**
2. **Retain the first letter of the word.**
3. **Change all occurrence of the following letters to '0' (zero):**
   'A', E', 'I', 'O', 'U', 'H', 'W', 'Y'.
4. **Change letters from the following sets into the digit given:**
   1 = 'B', 'F', 'P', 'V'
   2 = 'C', 'G', 'J', 'K', 'Q', 'S', 'X', 'Z'
   3 = 'D','T'
   4 = 'L'
   5 = 'M','N'
   6 = 'R'
5. **Remove all pairs of digits which occur beside each other from the string that resulted after step (4).**
6. **Remove all zeros from the string that results from step 5.0 (placed there in step 3)**
7. **Pad the string that resulted from step (6) with trailing zeros and return only the first four positions, which will be of the form <uppercase letter> <digit> <digit> <digit>.**

List of valid parameters for to_char function

Parameter	Explanation
YEAR	Year, spelled out.
YYYY	4-digit year.
YYY YY Y	Last 3, 2, or 1 digit(s) of year.
IYY IY I	Last 3, 2, or 1 digit(s) of ISO year.
IYYY	4-digit year based on the ISO standard.
Q	Quarter of year (1, 2, 3, 4; JAN-MAR = 1).
MM	Month (01-12; JAN = 01).
MON	Abbreviated name of month.
MONTH	Name of month, padded with blanks to length of 9 characters.
RM	Roman numeral month (I-XII; JAN = I).
WW	Week of year (1-53) where week 1 starts on the first day of the year and continues to the seventh day of the year.
W	Week of month (1-5) where week 1 starts on the first day of the month and ends on the seventh.
IW	Week of year (1-52 or 1-53) based on the ISO standard.
D	Day of week (1-7).
DAY	Name of day.
DD	Day of month (1-31).
DDD	Day of year (1-366).
DY	Abbreviated name of day.
J	Julian day; the number of days since January 1, 4712 BC.
HH	Hour of day (1-12).
HH12	Hour of day (1-12).
HH24	Hour of day (0-23).
MI	Minute (0-59).
SS	Second (0-59).
SSSSS	Seconds past midnight (0-86399).
FF	Fractional seconds.

Q.1 Display the names of all employees in upper case, lower case and proper case.

SQL >

OUTPUT :

```
UP         LOW        PROPER
---------- ---------- ----------
SMITH      smith      Smith
ALLEN      allen      Allen
WARD       ward       Ward
JONES      jones      Jones
MARTIN     martin     Martin
BLAKE      blake      Blake
CLARK      clark      Clark
SCOTT      scott      Scott
KING       king       King
TURNER     turner     Turner
ADAMS      adams      Adams
JAMES      james      James
FORD       ford       Ford
MILLER     miller     Miller

14 rows selected.
```

Q.2 Display the names along with length of names of all employees.

SQL >

OUTPUT :

```
ENAME           LENAME
---------- ----------
SMITH                5
ALLEN                5
WARD                 4
JONES                5
MARTIN               6
BLAKE                5
CLARK                5
SCOTT                5
KING                 4
TURNER               6
ADAMS                5
JAMES                5
FORD                 4
MILLER               6

14 rows selected.
```

Q.3 Display your name along with length of name.

SQL >

SAMPLE OUTPUT :

```
'DINES LENGTH('DINESH')
------ ----------------
dinesh                6
```

Q.4 Display the name of employees concatenated with employee numbers as '7369-SMITH'.

SQL >

OUTPUT :

```
empno-ename
--------------------------------------------------
7369-SMITH
7499-ALLEN
7521-WARD
7566-JONES
7654-MARTIN
7698-BLAKE
7782-CLARK
7788-SCOTT
7839-KING
7844-TURNER
7876-ADAMS
7900-JAMES
7902-FORD
7934-MILLER

14 rows selected.
```

Q.5 Use appropriate functions & extract 3 characters starting from 2nd character for the string 'ORACLE'.

SQL >

OUTPUT :

```
EXT
---
RAC
```

Q.6 Find the first occurrence of character 'a' from the string 'Computer Maintenance Corporation'.

SQL >

OUTPUT :

```
    FIRSTO
----------
        11
```

Q.7 Replace every occurrence of 'A' with 'B' in the string 'ALLENS'.

SQL >

OUTPUT :

```
REPLAC
------
BLLENS
```

Q.8 Display the name of employees, job title and department numbers of all employees where job is 'MANAGER' it should be displayed as 'BOSS'.

SQL >

OUTPUT :

```
ENAME                                  REPLACEBOSS       DEPTNO
-------------------------------------- ---------         ----------
SMITH                                  CLERK             20
ALLEN                                  SALESMAN          30
WARD                                   SALESMAN          30
JONES                                  BOSS              20
MARTIN                                 SALESMAN          30
BLAKE                                  BOSS              30
CLARK                                  BOSS              10
SCOTT                                  ANALYST           20
KING                                   PRESIDENT         10
TURNER                                 SALESMAN          30
ADAMS                                  CLERK             20
JAMES                                  CLERK             30
FORD                                   ANALYST           20
MILLER                                 CLERK             10

14 rows selected.
```

Q.9 Display the first and second occurrence of 'C' in 'CHICAGO'.

SQL >

OUTPUT :

```
  FIRSTOCC  SECONDOCC
---------- ----------
         1          4
```

Q.10 Display the substring from fifth character from string 'BHILAI INSTITUTE OF TECHNOLOGY'.

SQL >

OUTPUT :

```
SUBS
-------------------------
AI INSTITUTE OF TECHNOLOGY
```

Q.11 Display the name of all employees' right align 8 characters.

SQL >

OUTPUT :

```
RIGHTAL
--------------------------------
   SMITH
   ALLEN
    WARD
   JONES
  MARTIN
   BLAKE
   CLARK
   SCOTT
    KING
  TURNER
   ADAMS
   JAMES
    FORD
  MILLER

14 rows selected.
```

Q.12 Display the names of employees who have joined the organization on Monday.

SQL >

OUTPUT :

```
ENAME
----------
MARTIN
```

Q.13 Display your age in days.

SQL >

SAMPLE OUTPUT : (IF THE DOB IS 06-JUN-1983)

```
 AGEINDAYS
----------
     13561
```

Q.14 Display your age in months.

SQL >

SAMPLE OUTPUT : (IF THE DOB IS 06-JUN-1983)

```
  AGEINMON
----------
       446
```

Q.15 Display the current day as '17th JULY TWO THOUSAND TWELVE'.

SQL >

OUTPUT :

```
CURRENTDATE
------------------------------------------------------------
30th jul twenty nineteen
```

Q.16 Display the following output for each row from emp table.
'Scott has joined the company on Wednesday 9 Dec Nineteen Eighty Two'

SQL >

OUTPUT :

```
OUTP
--------------------------------------------------------------------------------
-------------------------------------------
Smith Has Joined The Company On Wednesday 17 Dec Nineteen Eighty
Allen Has Joined The Company On Friday    20 Feb Nineteen Eighty-One
Ward Has Joined The Company On Sunday    22 Feb Nineteen Eighty-One
Jones Has Joined The Company On Thursday  02 Apr Nineteen Eighty-One
Martin Has Joined The Company On Monday    28 Sep Nineteen Eighty-One
Blake Has Joined The Company On Friday    01 May Nineteen Eighty-One
Clark Has Joined The Company On Tuesday   09 Jun Nineteen Eighty-One
Scott Has Joined The Company On Thursday  09 Dec Nineteen Eighty-Two
King Has Joined The Company On Tuesday   17 Nov Nineteen Eighty-One
Turner Has Joined The Company On Tuesday   08 Sep Nineteen Eighty-One
Adams Has Joined The Company On Wednesday 12 Jan Nineteen Eighty-Three
James Has Joined The Company On Thursday  03 Dec Nineteen Eighty-One
Ford Has Joined The Company On Thursday  03 Dec Nineteen Eighty-One
Miller Has Joined The Company On Saturday  23 Jan Nineteen Eighty-Two

14 rows selected.
```

Q.17 Find the date for nearest Saturday after current date.

SQL >

SAMPLE OUTPUT :

```
CURRDATE  NEXTSAT
--------- ---------
30-JUL-19 03-AUG-19
```

Q.18 Display current date and time.

SQL >

SAMPLE OUTPUT :

```
CURDT
----------------------------
30-jul-2019 12:12:43
```

Q.19 Display the date 3 months before the current date.

SQL >

SAMPLE OUTPUT :

```
CURRDATE  BEF3MON
--------- ---------
30-JUL-19 30-APR-19
```

Q.20 Display the names of employees who are more than 39 years old in the organization.

SQL >

OUTPUT :

```
ENAME
----------
SMITH
ALLEN
WARD
JONES
BLAKE
CLARK

6 rows selected.
```

Q.21 Display the quarter of the year in which employees have joined.

SQL >

OUTPUT :

```
Q
-
4
1
1
2
3
2
2
4
4
3
1
4
4
1

14 rows selected.
```

Q.22 Display the names of the employees who length of the name contains more than 4 characters.

SQL >

OUTPUT :

```
ENAME
----------
SMITH
ALLEN
JONES
MARTIN
BLAKE
CLARK
SCOTT
TURNER
ADAMS
JAMES
MILLER

11 rows selected.
```

Q.23 Display the name of those employees whose name contains 'A'. [Use instr function].

SQL >

OUTPUT :

```
ENAME
----------
ALLEN
WARD
MARTIN
BLAKE
CLARK
ADAMS
JAMES

7 rows selected.
```

Q.24 Display the half of the employee names in upper case and remaining in lower case.

SQL >

OUTPUT :

```
EMPNAME
--------------------------------------------------------------------------------
SMith
ALlen
WArd
JOnes
MARtin
BLake
CLark
SCott
KIng
TURner
ADams
JAmes
FOrd
MILler

14 rows selected.
```

Q.25 Display the name of those employees whose name starts with letter 'A'. [Use instr function].

SQL >

OUTPUT :

```
ENAME
----------
ALLEN
ADAMS
```

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Lab – 4 Multi Table Queries

Topics

1. Set Operations (Union, intersection, set difference)
2. Types of Joins
   (a) Cross Join (Cartisian Product)
   (b) Inner Join (Equi and Non Equi)
   (c) Natural Join
   (d) Outer Join (Left, Right and Full)
   (e) Self Join

Q.1. List employee number, name, his department and the department name.

SQL >

OUTPUT :

```
     EMPNO ENAME          DEPTNO DNAME
---------- ---------- ---------- --------------
      7369 SMITH              20 RESEARCH
      7499 ALLEN              30 SALES
      7521 WARD               30 SALES
      7566 JONES              20 RESEARCH
      7654 MARTIN             30 SALES
      7698 BLAKE              30 SALES
      7782 CLARK              10 ACCOUNTING
      7788 SCOTT              20 RESEARCH
      7839 KING               10 ACCOUNTING
      7844 TURNER             30 SALES
      7876 ADAMS              20 RESEARCH
      7900 JAMES              30 SALES
      7902 FORD               20 RESEARCH
      7934 MILLER             10 ACCOUNTING

14 rows selected.
```

Q.2 List employee name, his department name and the department location.

SQL >

OUTPUT :

```
ENAME      DNAME          LOC
---------- -------------- -------------
SMITH      RESEARCH       DALLAS
ALLEN      SALES          CHICAGO
WARD       SALES          CHICAGO
JONES      RESEARCH       DALLAS
MARTIN     SALES          CHICAGO
BLAKE      SALES          CHICAGO
```

```
CLARK      ACCOUNTING     NEW YORK
SCOTT      RESEARCH       DALLAS
KING       ACCOUNTING     NEW YORK
TURNER     SALES          CHICAGO
ADAMS      RESEARCH       DALLAS
JAMES      SALES          CHICAGO
FORD       RESEARCH       DALLAS
MILLER     ACCOUNTING     NEW YORK

14 rows selected.
```

Q.3 List employee name, department name for all the clerks in the company.

SQL >

OUTPUT :

```
ENAME      DNAME
---------- --------------
MILLER     ACCOUNTING
ADAMS      RESEARCH
SMITH      RESEARCH
JAMES      SALES
```

Q.4 List employee number, name, job, his manager's name and manager's job.

SQL >

OUTPUT :

```
    EMPLNO EMPLNAME   EMPLJOB   MGRNAME    MGRJOB
---------- ---------- --------- ---------- ---------
      7902 FORD       ANALYST   JONES      MANAGER
      7788 SCOTT      ANALYST   JONES      MANAGER
      7900 JAMES      CLERK     BLAKE      MANAGER
      7844 TURNER     SALESMAN  BLAKE      MANAGER
      7654 MARTIN     SALESMAN  BLAKE      MANAGER
      7521 WARD       SALESMAN  BLAKE      MANAGER
      7499 ALLEN      SALESMAN  BLAKE      MANAGER
      7934 MILLER     CLERK     CLARK      MANAGER
      7876 ADAMS      CLERK     SCOTT      ANALYST
      7782 CLARK      MANAGER   KING       PRESIDENT
      7698 BLAKE      MANAGER   KING       PRESIDENT
      7566 JONES      MANAGER   KING       PRESIDENT
      7369 SMITH      CLERK     FORD       ANALYST

13 rows selected.
```

Q.5 List the jobs common to department 20 and 30.

SQL >

OUTPUT :

```
JOB
---------
CLERK
MANAGER
```

Q.6 List the jobs unique to department 20.

SQL >

OUTPUT :

```
JOB
---------
ANALYST
```

Q.7 List the employees belonging to the department of 'MILLER'.

SQL >

OUTPUT :

```
EMPLNAME
----------
CLARK
KING
MILLER
```

Q.8 List all the employees who have the same job as 'SCOTT'.

SQL >

OUTPUT :

```
EMPLNAME
----------
SCOTT
FORD
```

Q.9 Display the names of the employees who are working in sales or research department.

SQL >

OUTPUT :

```
ENAME
----------
SMITH
ALLEN
WARD
JONES
MARTIN
BLAKE
SCOTT
TURNER
ADAMS
JAMES
FORD

11 rows selected.
```

Q.10 Display name and salary of the employees who is working in 'CHICAGO'.

SQL >

OUTPUT :

```
ENAME                SAL
---------- ----------
ALLEN              1600
WARD               1250
MARTIN             1250
BLAKE              2850
TURNER             1500
JAMES               950

6 rows selected.
```

Q.11 List the details of employees in department 10 who have the same job as in department 30.

SQL >

OUTPUT :

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7782	CLARK	MANAGER	7839	09-JUN-81	2450		10
7934	MILLER	CLERK	7782	23-JAN-82	1300		10

Q.12 List the employee name, length of his name, his manager's name whose name length is greater than their managers name length.

SQL >

OUTPUT :

EMPLNAME	LEMPL	MGRNAME
TURNER	6	BLAKE
MARTIN	6	BLAKE
MILLER	6	CLARK
CLARK	5	KING
BLAKE	5	KING
JONES	5	KING
SMITH	5	FORD

7 rows selected.

Q.13 List employees and his manager's details, where that employee's salary is greater than his manager's salary.

SQL >

OUTPUT :

EMPNAME	EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
FORD	7566	JONES	MANAGER	7839	02-APR-81	2975		20
SCOTT	7566	JONES	MANAGER	7839	02-APR-81	2975		20

Q.14 List those employee names whose manager name is 'JONES'.

SQL >

OUTPUT :

EMPNAME
SCOTT
FORD

Q.15 Display employee name, department name, salary and commission for those employees whose salary in between 2000 and 5000 while the department location is 'CHICAGO'.

SQL >

OUTPUT :

```
ENAME      DNAME                    SAL       COMM
---------- -------------- ---------- ----------
BLAKE      SALES                  2850
```

Q.16 Display those employees who are working in the same department where his manager is work.

SQL >

OUTPUT :

```
EMPNAME
----------
FORD
SCOTT
JAMES
TURNER
MARTIN
WARD
ALLEN
MILLER
ADAMS
CLARK
SMITH

11 rows selected.
```

Q.17 Display those employee names who joined the company before '31-Dec-82' while the department location is 'NEWYORK' or 'CHICAGO'.

SQL >

OUTPUT :

```
ENAME
----------
ALLEN
WARD
MARTIN
BLAKE
```

```
TURNER
JAMES

6 rows selected.
```

Q.18 Display the employee name, job and his managers. Display also the employees who are without manager.

SQL >

OUTPUT :

```
EMPNAME    EMPJOB    MGRNAME
---------- --------- ----------
FORD       ANALYST   JONES
SCOTT      ANALYST   JONES
JAMES      CLERK     BLAKE
TURNER     SALESMAN  BLAKE
MARTIN     SALESMAN  BLAKE
WARD       SALESMAN  BLAKE
ALLEN      SALESMAN  BLAKE
MILLER     CLERK     CLARK
ADAMS      CLERK     SCOTT
CLARK      MANAGER   KING
BLAKE      MANAGER   KING
JONES      MANAGER   KING
SMITH      CLERK     FORD
KING       PRESIDENT

14 rows selected.
```

Q.19 Display the name of the department where no employee is working.

SQL >

OUTPUT :

```
DNAME
--------------
OPERATIONS
```

Q.20 Display the details of all the employees who are sub – ordinate to 'BLAKE'.

SQL >

OUTPUT :

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7499	ALLEN	SALESMAN	7698	20-FEB-81	1600	300	30
7521	WARD	SALESMAN	7698	22-FEB-81	1250	500	30
7654	MARTIN	SALESMAN	7698	28-SEP-81	1250	1400	30
7844	TURNER	SALESMAN	7698	08-SEP-81	1500	0	30
7900	JAMES	CLERK	7698	03-DEC-81	950		30

Q.21 Display the employee name and department name even if there are no employees working in a particular department.

SQL >

OUTPUT :

ENAME	DNAME
SMITH	RESEARCH
ALLEN	SALES
WARD	SALES
JONES	RESEARCH
MARTIN	SALES
BLAKE	SALES
CLARK	ACCOUNTING
SCOTT	RESEARCH
KING	ACCOUNTING
TURNER	SALES
ADAMS	RESEARCH
JAMES	SALES
FORD	RESEARCH
MILLER	ACCOUNTING
	OPERATIONS

15 rows selected.

Q.22 Display the department name and total number of employees in each department.

SQL >

OUTPUT :

DNAME	NOOFEMP
ACCOUNTING	3
RESEARCH	5
SALES	6

Q.23 Display the department name along with total salary in each department.

SQL >

OUTPUT :

```
DNAME            TOTOLSAL
-------------- ----------
ACCOUNTING           8750
RESEARCH            10875
SALES                9400
```

Q.24 List the jobs common to department 'RESEARCH' and 'SALES'.

SQL >

OUTPUT :

```
JOB
---------
CLERK
MANAGER
```

Q.25 List the jobs unique to department 'RESEARCH'.

SQL >

OUTPUT :

```
JOB
---------
ANALYST
```

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LAB 5 Sub Query, Correlated Query, Top – N Analysis

Topics

1. What is Sub Query?
2. Types of Sub Query (Single Row Sub Query and Multi Row Sub Query)
3. What is Correlated Query?
4. Difference between Sub Query and Correlated Query.
5. Semi Join and Anti Join (Exists and Not Exists)
6. Top – N Analysis (Rowid and Rownum)

Q.1. Display the employee number and name of employee working as 'CLERK' and earning highest salary among clerks.

SQL >

OUTPUT :

```
     EMPNO ENAME
---------- ----------
      7934 MILLER
```

Q.2 Display the names of 'SALESMAN' who earns a salary more than the highest salary of any 'CLERK'.

SQL >

OUTPUT :

```
ENAME
----------
ALLEN
TURNER
```

Q.3 Display the names of clerks who earn a salary more than the lowest salary of any 'SALESMAN'.

SQL >

OUTPUT :

```
ENAME
----------
MILLER
```

Q.4 Display the names of employees who earn a salary more than that of 'JONES' or that of salary greater than that of 'SCOTT'.

SQL >

OUTPUT :

```
ENAME
----------
SCOTT
KING
FORD
```

Q.5 Display the names of employees who earn highest salary in their respective departments.

SQL >

OUTPUT :

```
EMPNAME
----------
BLAKE
SCOTT
KING
FORD
```

Q.6 Display the names of the employees who earn highest salaries in their respective job groups.

SQL >

OUTPUT :

```
EMPNAME
----------
ALLEN
JONES
SCOTT
KING
FORD
MILLER

6 rows selected.
```

Q.7 Display the employee names who are working in 'ACCOUNTING' department.

SQL >

OUTPUT :

```
ENAME
----------
MILLER
KING
CLARK
```

Q.8 Display the employee names who are working in 'CHICAGO'.

SQL >

OUTPUT :

```
ENAME
----------
JAMES
TURNER
BLAKE
MARTIN
WARD
ALLEN

6 rows selected.
```

Q.9 Display the job groups having total salary greater than the maximum salary for managers.

SQL >

OUTPUT :

```
JOB
---------
CLERK
SALESMAN
PRESIDENT
MANAGER
ANALYST
```

Q.10 Display the names of employees from department number 10 with salary greater than that of any employee working in other department.

SQL >

OUTPUT :

```
EMPNAME
----------
CLARK
KING
MILLER
```

Q.11 Display the names of the employees from department number 10 with salary greater than that of all employees working in other department.

SQL >

OUTPUT :

```
EMPNAME
----------
KING
```

Q.12 Display the name of employee who is getting highest salary in the organization.

SQL >

OUTPUT :

```
ENAME
----------
KING
```

Q.13 Display the name of employee who is getting second highest salary in the organization.

SQL >

OUTPUT :

```
ENAME
----------
SCOTT
FORD
```

Q.14 Display the name of employee who is getting fourth highest salary in the organization.

SQL >

OUTPUT :

```
EMPNAME
----------
BLAKE
```

Q.15 Display first 5 rows from emp table.

SQL >

OUTPUT :

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7369	SMITH	CLERK	7902	17-DEC-80	800		20
7499	ALLEN	SALESMAN	7698	20-FEB-81	1600	300	30
7521	WARD	SALESMAN	7698	22-FEB-81	1250	500	30
7566	JONES	MANAGER	7839	02-APR-81	2975		20
7654	MARTIN	SALESMAN	7698	28-SEP-81	1250	1400	30

Q.16 Display last 5 rows from emp table.

SQL >

OUTPUT :

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7844	TURNER	SALESMAN	7698	08-SEP-81	1500	0	30
7876	ADAMS	CLERK	7788	12-JAN-83	1100		20
7900	JAMES	CLERK	7698	03-DEC-81	950		30
7902	FORD	ANALYST	7566	03-DEC-81	3000		20
7934	MILLER	CLERK	7782	23-JAN-82	1300		10

Q.17 Display 3rd to 7th rows from emp table.

SQL >

OUTPUT :

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7521	WARD	SALESMAN	7698	22-FEB-81	1250	500	30
7566	JONES	MANAGER	7839	02-APR-81	2975		20
7654	MARTIN	SALESMAN	7698	28-SEP-81	1250	1400	30
7698	BLAKE	MANAGER	7839	01-MAY-81	2850		30
7782	CLARK	MANAGER	7839	09-JUN-81	2450		10

Q.18 Display even rows from emp table.

SQL >

OUTPUT :

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7499	ALLEN	SALESMAN	7698	20-FEB-81	1600	300	30
7566	JONES	MANAGER	7839	02-APR-81	2975		20
7698	BLAKE	MANAGER	7839	01-MAY-81	2850		30
7788	SCOTT	ANALYST	7566	09-DEC-82	3000		20
7844	TURNER	SALESMAN	7698	08-SEP-81	1500	0	30
7900	JAMES	CLERK	7698	03-DEC-81	950		30
7934	MILLER	CLERK	7782	23-JAN-82	1300		10

7 rows selected.

Q.19 Display odd rows from emp table.

SQL >

OUTPUT :

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7369	SMITH	CLERK	7902	17-DEC-80	800		20
7521	WARD	SALESMAN	7698	22-FEB-81	1250	500	30
7654	MARTIN	SALESMAN	7698	28-SEP-81	1250	1400	30
7782	CLARK	MANAGER	7839	09-JUN-81	2450		10
7839	KING	PRESIDENT		17-NOV-81	5000		10
7876	ADAMS	CLERK	7788	12-JAN-83	1100		20
7902	FORD	ANALYST	7566	03-DEC-81	3000		20

7 rows selected.

Q.20 Display every 3rd row from emp table.

SQL >

OUTPUT :

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7521	WARD	SALESMAN	7698	22-FEB-81	1250	500	30
7698	BLAKE	MANAGER	7839	01-MAY-81	2850		30
7839	KING	PRESIDENT		17-NOV-81	5000		10
7900	JAMES	CLERK	7698	03-DEC-81	950		30

Q.21 Display 3rd max salary from all the employees.

SQL >

OUTPUT :

THIRDMAX
2975

Q.22 Display 3rd min salary from all the employees.

SQL >

OUTPUT :

THIRDMIN
1100

Q.23 Who was the last employee hired in each department.

SQL >

OUTPUT :

EMPNAME
ADAMS
JAMES
MILLER

Q.24 Display all the employees who have the same job as 'SCOTT'.

SQL >

OUTPUT :

```
EMPNAME
----------
FORD
SCOTT
```

Q.25 List the employees who earn more than the average salary in their own department.

SQL >

OUTPUT :

```
EMPNAME
----------
ALLEN
JONES
BLAKE
SCOTT
KING
FORD

6 rows selected.
```

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Lab 6 DDL, DML, DCL, Constraints

Table S

SN	NAME	ST	CITY
S1	Smith	20	London
S2	Jones	10	Paris
S3	Blake	30	Paris
S4	Clark	20	London
S5	Adams	30	Athens

Table J

JN	NAME	CITY
J1	Sorter	Paris
J2	Punch	Rome
J3	Reader	Athens
J4	Console	Athens
J5	Collator	London
J6	Terminal	Oslo
J7	Tape	London

Table P

PN	NAME	COLOR	WEIGHT	CITY
P1	Nut	Red	12	London
P2	Bolt	Green	17	Paris
P3	Screw	Blue	17	Rome
P4	Screw	Red	14	London
P5	Cam	Blue	12	Paris
P6	Cog	Red	19	London

Table SPJ

SN	PN	JN	QTY
S1	P1	J1	200
S1	P1	J4	700
S2	P3	J1	400
S2	P3	J2	200
S2	P3	J3	200
S2	P3	J4	500
S2	P3	J5	600
S2	P3	J6	400
S2	P3	J7	800
S2	P5	J2	100
S3	P3	J1	200
S3	P4	J2	500
S4	P6	J3	300
S4	P6	J7	300
S5	P2	J2	200
S5	P2	J4	100
S5	P5	J5	500
S5	P5	J7	100
S5	P6	J2	200
S5	P1	J4	100
S5	P3	J4	200
S5	P4	J4	800
S5	P5	J4	400
S5	P6	J4	500

Q.1. Get all the data of all jobs.

SQL >

OUTPUT :

```
JNO   JNAME                CITY
----- -------------------- ----------
J1    Sorter               Paris
J2    Punch                Rome
J3    Reader               Athens
J4    Console              Athens
J5    Collator             London
J6    Terminal             Oslo
J7    Tape                 London

7 rows selected.
```

Q.2. Get all the data on all jobs in London.

SQL >

OUTPUT :

```
JNO   JNAME                CITY
----- -------------------- ----------
J5    Collator             London
J7    Tape                 London
```

Q.3. Get supplier numbers for suppliers (S table) who supply (SPJ table) job J1, in supplier number order.

SQL >

OUTPUT :

```
SNO
-----
S1
S2
S3
```

Q.4. Get all shipments (SPJ table) where the quantity is in the range 300 to 750 inclusive.

SQL >

OUTPUT :

```
SNO   PNO   JNO           QTY
----- ----- ----- ----------
S1    P1    J4            700
S2    P3    J1            400
S2    P3    J4            500
S2    P3    J5            600
S2    P3    J6            400
S3    P4    J2            500
S4    P6    J3            300
S4    P6    J7            300
S5    P5    J5            500
S5    P5    J4            400
S5    P6    J4            500

11 rows selected.
```

Q.5. For each supplier, tell the total number of parts supplied to some project.

SQL >

OUTPUT :

```
SNO     SUM(QTY)
----- ----------
S1            900
S2           3200
S3            700
S4            600
S5           3100
```

Q.6. Get a list of all part-color, part-city combinations, with duplicate (color, city) eliminated.

SQL >

OUTPUT :

```
COLOR      CITY
---------- ----------
Red        London
Blue       Paris
Green      Paris
Blue       Rome
```

Q.7. Get the total number of jobs supplied by supplier S1.

SQL >

OUTPUT :

```
COUNT(DISTINCTJNO)
------------------
                 2
```

Q.8. Get the total quantity of part P1 supplied by supplier S1.

SQL >

OUTPUT :

```
  SUM(QTY)
----------
       900
```

Q.9. For each part being supplied to a job, get the part number, the job number and the corresponding total quantity.

SQL >

OUTPUT :

```
JNO   PNO      SUM(QTY)
----- ----- ----------
J4    P1            800
J6    P3            400
J2    P6            200
J4    P5            400
J1    P1            200
J4    P6            500
J1    P3            600
J4    P3            700
J4    P2            100
J5    P3            600
J2    P5            100
J3    P6            300
J4    P4            800
J7    P6            300
J3    P3            200
J7    P3            800
J2    P4            500
J2    P2            200
J2    P3            200
J5    P5            500
J7    P5            100

21 rows selected.
```

Q.10. Get part numbers for parts supplied to some job in the average quantity of more than 320.

SQL >

OUTPUT :

```
PNO
-----
P4
P1
P3
P6
P5
```

Q.11. Get all shipments where the quantity is non-null.

SQL >

OUTPUT :

```
SNO   PNO   JNO           QTY
----- ----- ----- ----------
S1    P1    J1            200
S1    P1    J4            700
S2    P3    J1            400
S2    P3    J2            200
S2    P3    J3            200
S2    P3    J4            500
S2    P3    J5            600
S2    P3    J6            400
S2    P3    J7            800
S2    P5    J2            100
S3    P3    J1            200
S3    P4    J2            500
S4    P6    J3            300
S4    P6    J7            300
S5    P2    J2            200
S5    P2    J4            100
S5    P5    J5            500
S5    P5    J7            100
S5    P6    J2            200
S5    P1    J4            100
S5    P3    J4            200
S5    P4    J4            800
S5    P5    J4            400
S5    P6    J4            500

24 rows selected.
```

Q.12. Get project numbers and cities where the city has an "o" as the second letter of its name.

SQL >

OUTPUT :

```
JNO   CITY
----- ----------
J2    Rome
J5    London
J7    London
```

Q.13. Get supplier names which start with the letters 'Sm'.

SQL >

OUTPUT :

```
SNAME
--------------------
Smith
```

Q.14. Get supplier names that have a letter 'e' somewhere in their name.

SQL >

OUTPUT :

```
SNAME
--------------------
Jones
Blake
```

Q.15. Get the part number and total shipment quantity for each part.

SQL >

OUTPUT :

```
PNO     SUM(QTY)
----- ----------
P4          1300
P1          1000
```

```
P2            300
P3           3500
P6           1300
P5           1100

6 rows selected.
```

Q.16. Get the last five shipments.

SQL >

OUTPUT :

```
SNO   PNO   JNO           QTY
----- ----- ----- ----------
S5    P6    J4            500
S5    P5    J4            400
S5    P4    J4            800
S5    P3    J4            200
S5    P1    J4            100
```

Q.17. Get the first five shipments.

SQL >

OUTPUT :

```
SNO   PNO   JNO           QTY
----- ----- ----- ----------
S1    P1    J1            200
S1    P1    J4            700
S2    P3    J1            400
S2    P3    J2            200
S2    P3    J3            200
```

Q.18. Get part numbers for all parts supplied by more than two supplier

SQL >

OUTPUT :

```
PNO
-----
P1
P3
P6
P5
```

Q.19. Get part numbers for parts supplied to some project in Paris.

SQL >

OUTPUT :

```
PNO
-----
P1
P3
```

Q.20. Get part numbers for parts that are not supplied to any project in Paris.

SQL >

OUTPUT :

```
PNO
-----
P2
P4
P5
P6
```

Q.21. Get all supplier-number, part-number, job-number triples such that the indicated supplier, part, job are in the same city.

SQL >

OUTPUT :

```
SNO   PNO   JNO
----- ----- -----
S1    P1    J7
S1    P4    J7
S1    P6    J7
S1    P1    J5
S1    P4    J5
S1    P6    J5
S2    P2    J1
S2    P5    J1
S3    P2    J1
S3    P5    J1
S4    P1    J7
S4    P4    J7
S4    P6    J7
S4    P1    J5
S4    P4    J5
S4    P6    J5

16 rows selected.
```

Q.22. Get part number for parts supplied (SPJ table) by a supplier in London.

SQL >

OUTPUT :

```
PNO
-----
P1
P6
```

Q.23. Get part numbers for parts supplied by a supplier in London to a job in Paris.

SQL >

OUTPUT :

```
PNO
-----
P1
```

Q.24. Get all pairs of city names such that a supplier in the first city supplies a job in the second city.

SQL >

OUTPUT :

```
FCITY      SCITY
---------- ----------
Paris      Oslo
Athens     London
Paris      Rome
Paris      Athens
Paris      London
London     London
Athens     Rome
Paris      Paris
Athens     Athens
London     Paris
London     Athens

11 rows selected.
```

Q.25. Get part numbers for parts supplied to any job by a supplier in the same city as the job.

SQL >

OUTPUT :

```
PNO
-----
P3
P3
P6
P1
P2
P3
P4
P5
P6

9 rows selected.
```

Q.26. Get job numbers for jobs supplied by at least one supplier not in the same city.

SQL >

OUTPUT :

```
JNO
-----
J2
J7
J3
J6
J5
J1
J4

7 rows selected.
```

Q.27. Get all pairs of part numbers such that the same supplier supplies both the indicated parts.

SQL >

OUTPUT :

```
PNO   PNO
----- -----
P3    P5
P2    P5
P3    P6
P2    P4
P4    P5
P1    P3
P1    P4
P1    P6
P2    P3
P2    P6
P4    P6
P3    P4
P1    P2
P5    P6
P1    P5

15 rows selected.
```

Q.28. Get job names for jobs supplied by supplier S1.

SQL >

OUTPUT :

```
JNAME
--------------------
Sorter
Console
```

Q.29. Get colors for parts supplied by supplier S1.

SQL >

OUTPUT :

```
COLOR
----------
Red
```

Q.30. Get part numbers for parts supplied to any job in London.

SQL >

OUTPUT :

```
PNO
-----
P3
P6
P5
```

Q.31. Get job numbers for jobs using at least one part available from supplier S1.

SQL >

OUTPUT :

```
JNO
-----
J1
J4
```

Q.32. Get supplier numbers for suppliers supplying at least one part supplied by at least one supplier who supplies at least one red part.

SQL >

OUTPUT :

```
SNO
-----
S3
S4
S5
S2
S1
```

Q.33. Get supplier numbers for suppliers with status lower than that of supplier S1.

SQL >

OUTPUT :

```
SNO
-----
S2
```

Q.34. Get job numbers for jobs whose city is first in the alphabetic list of such cities.

SQL >

OUTPUT :

```
JNO
-----
J3
J4
```

Q.35. Get job numbers for jobs supplied with part P1 in an average quantity greater than the greatest quantity in which any part is supplied to project J3.

SQL >

OUTPUT :

```
JNO
-----
J4
```

Q.36. Get supplier numbers for suppliers supplying some job with part P1 in a quantity greater than the average shipment quantity of part P1 for that project.

SQL >

OUTPUT :

```
SNO
-----
S1
```

Q.37. Get part numbers from parts supplied to any job in London.

SQL >

OUTPUT :

```
PNO
-----
P3
P6
P5
```

Q.38. Get job numbers for jobs using at least one part available from suppliers S1 i.e, we know that S1 shipped that part.

SQL >

OUTPUT :

```
JNO
-----
J1
J4
```

Q.39. Get job numbers for jobs not supplied with any red part by any London supplier.

SQL >

OUTPUT :

```
JNO
-----
J2
J5
J6
```

Q.40. Get job numbers for jobs supplied entirely by supplier S2.

SQL >

OUTPUT :

```
JNO
-----
J6
```

Q.41. Get part numbers for parts supplied to all jobs in London.

SQL >

OUTPUT :

```
PNO
-----
P3
P5
```

Q.42. Construct a list of all cities in which at least one supplier, part, or job is located.

SQL >

OUTPUT :

```
CITY
----------
Athens
London
Oslo
Paris
Rome
```

Q.43. Get the colors of parts either whose city is london, or paris or both.

SQL >

OUTPUT :

```
COLOR
----------
Blue
Green
Red
```

Q.44. How many suppliers in Athens that supply red parts?

SQL >

OUTPUT :

```
COUNT(SPJ.SNO)
--------------
             4
```

Q.45. Find sname of suppliers who do not supply any part heavier than 18 (to any project).

SQL >

OUTPUT :

```
SNAME
--------------------
Blake
Jones
Smith
```

Q.46. Find number and name of suppliers that supplies a 'Nut'.

SQL >

OUTPUT :

```
SNAME
--------------------
Adams
Smith
```

Q.47. Find number of projects that do not use any locally made parts (i.e., if the project takes place in city x, then it does not use any part made in city x).

SQL >

OUTPUT :

```
PNO
-----
P1
P2
P4
P5
```

Q.48. Get suppliers for whom the total shipment quantity, taken over all shipments for the supplier is less than 1000.

SQL >

OUTPUT :

```
SNO   SNAME                STATUS CITY
----- -------------------- ---------- ----------
S1    Smith                    20 London
S4    Clark                    20 London
S3    Blake                    30 Paris
```

Q.49. Get suppliers for whom the minimum shipment quantity is less than half the maximum shipment quantily (taken overall shipments for the supplier in both cases).

SQL >

OUTPUT :

SNO	SNAME	STATUS	CITY
S1	Smith	20	London
S2	Jones	10	Paris
S3	Blake	30	Paris
S5	Adams	30	Athens

Q.50. For each supplier, find supplier details and total, maximum, and minimum shipment quantity, taken over all shipments for the supplier.

SQL >

OUTPUT :

SNO	SNAME	STATUS	CITY	TOTQ	MAXQ	MINQ
S2	Jones	10	Paris	3200	800	100
S1	Smith	20	London	900	700	200
S4	Clark	20	London	600	300	300
S5	Adams	30	Athens	3100	800	100
S3	Blake	30	Paris	700	500	200

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Lab 7 Introduction to view, synonym, sequence, index

One of the important features of RDBMS is the Data Abstraction. The Data Abstraction gives different view of data to different users. All the information in a database need not be accessible to all the users. Sometimes, in an application, a different view of the data or the information is described and the relevant data changes from user to user. This is handled in ORACLE using the VIEWS.

A SYNONYM is a simple alias for a table, view, sequence, or other database objects. Synonyms can be used for giving meaningful alternative names for database objects.

A SEQUENCE is a database object used to generate the series of unique integers. Sequences are typically used with primary key or unique columns.

Views

What is a View?

The table of a database defines the structure and the organization of its data. Once they are defined they always present the data in a particular way. Sometimes, in an application, a different view of the data or the information in a different format is described. This is handled in ORACLE using the VIEWS.

A VIEW is a virtual table in the database. The contents of a view are defined by a query.

A view can represent a subset of the data in a table. This could be a horizontal subset consisting of some of the rows from the base table or vertical subset consisting of some of the columns from the base table. The data from multiple tables can be also combined together using a view.

Characteristics of a View

Views do not exist physically. Views are virtual tables that exist only as definitions in the system catalogue. Views are stored in the data dictionary in the table called USER_VIEWS.

Advantages of Views

Views provide several advantages and can be useful in various ways. In small (desktop) applications, views can be used to simplify the data requests. In large database applications like production data views can be used to restrict access to the data and enforcing security.

The major advantages of views are

Security

Each user can be given permission to access the database only through a small set of views that contains the specific data the user is authorized to see, rather than the entire table, thus restricting the user's access to stored data.

Query Simplicity

A view can draw data from several different tables and present it to the user as a single table, turning what would have been multi-table queries into single table queries against the view.

Structural Simplicity

Views can give a user a "personalized" view of the database structure, presenting the database as a set of virtual tables that make sense for the user.

Insulation from Change

A view can present a consistent, unchanged image of the structure of the database, even if the underlying source tables are split, restructured or renamed.

Data Integrity

If data is accessed and entered through a view, the DBMS can automatically check the data to ensure that it meets specified integrity constraints.

Disadvantages of Views

While views provide substantial advantages as discussed above, there are also two major disadvantages of using a view instead of a real table.

Performance

Views give the appearance of a table, but the DBMS must still translate the queries against the view into queries against the underlying source tables. If the view is defined by a complex, multi-table query, then even a simple query against the view becomes a complicated join, and it may take a long time to execute.

Update Restrictions

When a user tries to update rows of a view, the DBMS must translate the request into an update on the rows of the underlying source tables. This is possible for simple views, but more complex views cannot be updated; they are "read-only".
The above disadvantages mean that we cannot indiscriminately define views and use them instead of the source tables. Instead, we must in each case weigh the pros and cons of creating a view for a given situation.

Creating a View

A view can be created by using a CREATE VIEW command.

The general syntax of the command is

CREATE [OR REPLACE] [FORCE/ NOFORCE]
[(column_list)]
VIEW view_name
AS Query
[WITH CHECK OPTION]
[WITH READ ONLY];

Where

- **CREATE** – creates the view with the name specified.

- **OR REPLACE** – replaces the view if it already exists. This option is used to change the definition of an existing view.
- **FORCE** – creates the view (with compilation errors) regardless of whether the view's base table exists or the owner has the privilege on them. But to view the VIEW the owner must have the privileges and the base table must exist.
- **NOFORCE** – creates the view only if the base table exists and the owner has the privileges on them. (This is the default).
- **COLUMN_LIST** – specifies different column names than their original names. These new column names can be only used while referring to views.

Example on creating a View:

Create a view on emp table which gives access to the employee number, employee name and designation information of employees working in the department 30 only. This can be done using following query.

CREATE OR REPLACE VIEW empview30 AS
SELECT empno, ename, job
FROM emp
WHERE deptno = 30;

Points to Remember

- The view's default column names are same as the table's column names.
- New column names if specified in the CREATE VIEW clause have one-to-one relationship with the column names in the SELECT clause of the query.
- The GROUP BY clause can be used in the definition of a view.
- Views may be joined or nested with other views or tables.
- Views may be used in the SELECT statement while defining other views.

Querying a View

A view can be queried and used just like database tables. For example, if we want to see the structure of view (in the SQL*PLUS environment) we use the DESCRIBE command. This is the same command we used earlier for tables.

Syntax:
Desc[ribe] view_name

Example:
Display the structure of the view empview30.

Query
SQL> Desc empview30

We can query a view just like a database table. This can be seen in the following examples.

Example1
List the details of employees working as clerk from department 30.

Query
```
SQL> SELECT *
      FROM empview30
     WHERE job = 'CLERK';
```

Example2
List the details of employees working as salesman from department 30 in the ascending order of their name.

Query

```
SQL> SELECT *
     FROM empview30
     WHERE job = 'SALESMAN'
     ORDER BY ename;
```

Types of View

The definition of a view decides what operations can be performed on a view. On this basis views are categorized as

- Simple or Updateable Views.
- Complex or Non-updateable Views.

Complex or Non-updateable Views
The Complex or Non-updateable views are used only to retrieve the corresponding data from the table. We cannot use the DML statements like INSERT, UPDATE, or DELETE with these views.

Simple or Updateable View

When we refer to the term updating the views what actually implies is the updating of the underlying source table using the view. Views can be updated much the same way we update the tables i.e. by using the DML commands.

For an updateable view there are certain restrictions imposed by the ANSI/ ISO SQL standard.

These restrictions are as follows.

- The FROM clause must specify only one updateable tables.
- DISTINCT must not be specified i.e. duplicate rows must not be excluded from the query result.
- Each SELECT item must be a simple column reference; the SELECT list cannot contain expressions, calculated columns, or column function.
- The WHERE clause must not include a sub-query. Simple row-by-row search conditions may be used.
- The query must not include a GROUP BY or HAVING clause.

Manipulating Base Tables Using Views

We can manipulate the base table using views. The DML commands Insert, Update, or Delete can be used with views.

The following restrictions apply, while manipulating base tables through views.

- The view must be based on a single table.
- It must not have columns that are aggregate functions.
- It must not have expression in its definition.
- It must not use distinct in its definition.
- It must not use group by or having clause in its definition.
- It must not use sub queries.
- We cannot insert if the underlying table has any NOT NULL columns that don't appear in the view.

Some of the view definitions and remarks about the way they can be updated are as follows

Example 1:

```
SQL> CREATE OR REPLACE VIEW empview AS
     SELECT *
     FROM emp
     WHERE deptno = 30;
```

Remark

The view empview is updateable because it does not violet any of the restrictions mentioned above:

Example 2:

```
SQL> CREATE OR REPLACE VIEW empsalview (empno, ename, sal, Totalsal)
     AS
     SELECT empno, ename, sal, sal + NVL(comm,0)
     FROM emp
     WHERE deptno = 30;
```

Remark

The view empsalview is not updateable because it contains an expression.
Specific restrictions on a view for DML operations are discussed in the following sections.

Delete Restrictions

We cannot delete the rows when the row contains

- Group Function
- DISTINCT Clause
- GROUP BY Clause
- Join Condition

Example: The following view has a delete restriction because it is based on two tables.

```
SQL> CREATE OR REPLACE VIEW empview AS
     SELECT emp.*, dept.dname
     FROM emp, dept;
```

Update Restrictions

We cannot update a view when view contains an expression such as SAL+COMM.

Other restrictions are same as stated for delete.

For example, the following view has an update restriction because it contains an expression.

```
SQL> CREATE OR REPLACE VIEW empsalview (empno, ename, sal, Totalsal)
     AS SELECT empno, ename, sal, sal + NVL(comm,0) FROM emp;
```

Insert Restrictions

We cannot insert a row using view when a view does not contain all the NOT NULL columns of the base table.

Other restrictions are same as stated for delete and update.

For example, the following view has a insert restriction. This is because it does not include empno column.

SQL> CREATE OR REPLACE VIEW empsalview (ename, sal, comm) AS
SELECT ename, sal, comm.
FROM emp;

WITH CHECK OPTION

Sometimes, INSERT or UPDATE operations on a view can result in data that the view can't retrieve. In such case you might want to restrict the view so that the view does not accept the data that it can't display.

Example:
SQL> CREATE OR REPLACE VIEW empview30 AS
SELECT empno, ename, deptno
FROM emp
WHERE deptno = 30;

The above view can display records for department number 30 only. Being Simple or updateable view you can execute following DML on it.

SQL> INSERT INTO empview30

However, when you query on empview30, it cannot display above inserted information. The WITH CHECK OPTION can be used with CREATE VIEW statement for preventing user against entering data though view which can't be displayed by view.

SQL> CREATE OR REPLACE VIEW empview30 AS
SELECT empno, ename, deptno
FROM emp
WHERE deptno = 30
WITH CHECK OPTION;

WITH READ ONLY Option

Sometimes you may want to prevent users from making changes to the base table through view. In such case use WITH READ ONLY option with CREATE VIEW command.

Example
SQL> CREATE OR REPLACE VIEW empview AS
SELECT empno, ename, job, deptno
FROM emp
WITH READ ONLY;

Dropping a View

We can drop a view using following command.

Syntax:
DROP VIEW view_name;

Synonyms

A SYNONYM is a simple alias for a database object. Synonyms can be used for giving meaningful alternative names for database objects. In this section we describe the concept and use of synonyms.

What is a Synonym?

A synonym is a simple alias for a table, view, sequence, or other database objects. Because a synonym is just an alternative name for an object it requires no storage space. ORACLE stores only definition of a synonym in the data dictionary. ORACLE allows us to create both, public or private synonyms. A public synonym is a synonym that is available to every used in a database. A private synonym is a synonym within the schema of a specific user.

Creating a Synonym

As we know, a synonym is an alternative name for a table, view, sequence, procedure, stored function, package, snapshot or another synonym.

To create a synonym CREATE SYNONYM command is used.

Syntax
CREATE [PUBLIC] SYNONYM [schema.]synonym_name
FOR [schema.]object;

Where

- **PUBLIC** – Creates a public synonym that is accessible to all users in a database. If we omit this option, the synonym is private and is accessible only within our schema.
  For creating PUBLIC synonym you must have DBA priviledges.
- **Schema** – This is the schema to contain the synonym. If we omit schema, ORACLE creates the synonym in our own schema.
- **Synonym_name** – Name of the synonym to be created.
- **Object** – Identfies the object for which the synonym is created. This object can be of following types:
  1. Table
  2. View
  3. Sequence and
  4. Subprograms like a stored procedure, a function or a package.

Example:
Create a synonym employee for emp table. This can be done as follows.

Query
SQL> CREATE SYNONYM employee
FOR emp;

Now, we can use the synonym employee for emp table and write queries. For example,
SQL> SELECT *
FROM employee;

Deleting a Synonym

To delete the synonym from the database use the DROP command.

Syntax
DROP [PUBLIC] SYNONYM [schema.]synonym_name

Where

- **PUBLIC** – To drop the public synonym, we must specify the PUBLIC keyword.
- **Schema** – This is the schema name containing the synonym. ORACLE assumes the synonym is in our own schema. If we omit this option.
- **Synonym_name** – Name of the synonym to be deleted from database.

Sequences

A sequence is a database object used to generate the series of unique integers for use as primary keys. When an application inserts a new row into a table, the application simply requests a database sequence to provide the next available value in the sequence for the new row. Multiple users can use same sequence.

Creating a Sequence

To create a sequence, use the CREATE SEQUENCE command.

Syntax
CREATE SEQUENCE sequence_name
[INCREMENT BY n]
[START WITH n];

Where

- **Sequence_name** – The name of the sequence object to be created.
- **Incremented by** – Specifies the incremented value between sequence numbers. This value can be positive or negative, but it cannot be 0. If this value is negative, then the sequence is created in descending order. If the increment is positive, then the sequence is created in ascending order. If we omit this clause, the interval defaults to 1.

Creating a sequence is shown in the following example.

Example:
Create a sequence for generating employee numbers starting with 7700.

Query
SQL> CREATE SEQUENCE empseq
INCREMENT BY 1
START WITH 7700;

Using a Sequence

A sequence can be used with database operations. It is used with INSERT and UPDATE DML commands. Sequences provide two attributes for using the value generated using the sequence. These attributes are CURRVAL and NEXTVAL. Their use is as follows.

- **Sequence_name.currval** – Returns the current value in the sequence.
- **Sequence_name.nextval** – Increments are current value in the sequence and returns it.

The use of a sequence can be seen in the following example.

Example
Insert a new employee 'BILL' with a designation 'CLERK' and salary of 1000. He is to be posted to the department 20.

This can be done using the following query.

Query
SQL> INSERT INTO emp (empno, ename, job, sal, dept)
VALUES (empseq.nextval, 'BILL', 'CLERK', 1000, 20);

Deleting a Sequence

To delete a sequence from the database use DROP SEQUENCE command.

Syntax
DROP SEQUENCE [schema.]sequence_name

Where
- **Schema** – It is the schema containing the sequence. The default assumes the sequence is in our own schema.
- **Sequence_name** – The name of the sequence to be dropped.

For example, to drop the sequence empseq use the following command.

SQL> DROP SEQUENCE empseq;

Q.1. Create a view emp30 which display the name and job titles of employee working in department 30.

SQL >

OUTPUT :

```
SQL> select * from emp30;

ENAME      JOB
---------- ---------
ALLEN      SALESMAN
WARD       SALESMAN
MARTIN     SALESMAN
BLAKE      MANAGER
TURNER     SALESMAN
JAMES      CLERK

6 rows selected.
```

Q.2. Create a view empcount which counts the number of employees working in each department.

SQL >

OUTPUT :

```
SQL> select * from empcount;

    DEPTNO    NOOFEMP
---------- ----------
        30          6
        20          5
        10          3
```

Q.3. Create a view empsales which display the name and job titles of employee working in department 'SALES'.

SQL >

OUTPUT :

```
SQL> select * from empsales;

ENAME      JOB
---------- ---------
ALLEN      SALESMAN
WARD       SALESMAN
MARTIN     SALESMAN
BLAKE      MANAGER
TURNER     SALESMAN
JAMES      CLERK

6 rows selected.
```

Q.4. Create a view emploc which display the name and job of employees working in location 'CHICAGO'.

SQL >

OUTPUT :

```
SQL> select * from emploc;

ENAME      JOB
---------- ---------
ALLEN      SALESMAN
WARD       SALESMAN
MARTIN     SALESMAN
BLAKE      MANAGER
TURNER     SALESMAN
JAMES      CLERK

6 rows selected.
```

Q.5. Create a view emptotalsal which find the name and total salary employees department wise and display only those departments which have at least 5 employees.

SQL >

OUTPUT :

```
SQL> select * from emptotalsal;

    DEPTNO   TOTALSAL
---------- ----------
        30       9400
        20      10875
```

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Lab 8 Introduction to PL/ SQL

Q.1. Write a PL/SQL program to input a name and display it.

PL/ SQL Program :

OUTPUT :

```
Enter value for name: dinesh
old   4:    name := '&name';
new   4:    name := 'dinesh';
Your name is dinesh

PL/SQL procedure successfully completed.
```

Q.2. Write a PL/SQL program to input 2 numbers and display addition, subtraction, multiplication, division and modulus of these 2 numbers.

PL/ SQL Program :

OUTPUT :

```
Enter value for a: 5
old   2:    a number := &a;
new   2:    a number := 5;
Enter value for b: 2
old   3:    b number := &b;
new   3:    b number := 2;
Addition = 7
Subtraction = 3
Multiplication = 10
Division = 2.5
Modulus = 1

PL/SQL procedure successfully completed.
```

Q.3. Write a PL/SQL program to input a 5 digit number and display the reverse of that number.

PL/ SQL Program :

OUTPUT :

```
Enter value for n: 12345
old   2:    n number := &n;
new   2:    n number := 12345;
Reverse = 54321

PL/SQL procedure successfully completed.
```

Q.4. Write a PL/SQL program to read the radius from the keyboard and insert it into table CIRCLE the radius along with area, the CIRCLE table has two columns defined as radius and area.

PL/ SQL Program :

OUTPUT :

```
Enter value for r: 5
old   2:    r number := &r;
new   2:    r number := 5;
Radius and area inserted in circle table

PL/SQL procedure successfully completed.

SQL> select * from circle;

    RADIUS       AREA
---------- ----------
         5       78.5
```

Q.5. Write a PL/SQL program to input the employee number and display its total salary (i.e. sal + comm, and if comm is null assume it to be 0).

PL/ SQL Program :

OUTPUT :

```
Enter value for eno: 7369
old   2:    eno emp.empno%type := &eno;
new   2:    eno emp.empno%type := 7369;
Totalsal = 800

PL/SQL procedure successfully completed.
```

Q.6. Write a PL/SQL program to input a number and find whether it is even or odd, if it is even insert it into the table EVEN or insert it into table ODD, both tables have only one column i.e. NUM.

PL/ SQL Program :

OUTPUT :

```
Enter value for n: 5
old   2:    n number := &n;
new   2:    n number := 5;

PL/SQL procedure successfully completed.

SQL> select * from even;

no rows selected

SQL> select * from odd;

       NUM
----------
         5
```

Q.7. Write a PL/SQL program to input a number and find the factorial of that number using
(i) For loop (ii) Simple loop (iii) While loop

PL/ SQL Program using for loop :

PL/ SQL Program using simple loop :

PL/ SQL Program using while loop :

OUTPUT :

```
Enter value for n: 5
old   2:    n number := &n;
new   2:    n number := 5;
Factorial of 5 is = 120

PL/SQL procedure successfully completed.
```

Q.8. Write a PL/SQL program to display the following patterns.

PL/ SQL Program :

OUTPUT :

```
1
2 3
4 5 6
```

PL/ SQL Program :

OUTPUT :

```
    1
  2 3
4 5 6
```

PL/ SQL Program :

OUTPUT :

```
        1
    1   2   1
1   2   3   2   1
```

PL/ SQL Program :

OUTPUT :

A
A B
A B C

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Lab 9

Cursor

Topics

(i) What is Cursor?
(ii) Types of Cursors
(iii) Cursor attributes
(iv) Syntax of Cursor for loop

Cursors :

Oracle uses work area to execute SQL statements and to store processing information. Every time user executes SQL statements of any sort, there will be an activity on database that involves **cursors.**

Cursor is a memory (work) area that oracle engine uses for its internal processing for executing and storing the results of SQL statements and this work area is reserved for SQL's operations also called Oracle's private area or cursor.

The set of rows returned by a SQL query is called the result set. This result set is called **Active Data Set,** because data in cursor is ready to undergo any kind of processing. The size of cursor is the same as the size required by the number of rows in Active Data Set.

E.g., When a user fires a select statement as

Select empno, ename, job, sal from emp where deptno = 10;

All the rows returned by the query are stored in the cursor at the server and will be displayed at the client end.

Types of Cursors

Cursors may be categorized on the situations under which they are opened. Basically oracle has highlighted its two types :

1. Implicit Cursor
2. Explicit Cursor

1. **Implicit Cursor :** Implicit cursors are declared by PL/ SQL implicitly for all SQL statements. They are opened and managed by oracle engine internally. So there is no need to open and manage by the users, these operations are performed automatically.
2. **Explicit Cursor :** Explicit Cursors are user defined cursors for processing of multiple records returned by a query. Explicit cursors are declared explicitly, along with other identifiers to be used in a block, and manipulated through specific statements within the block's executable actions. These are user defined cursors defined in the declare section of the PL/ SQL block. The user defined cursors needs to be opened, before the reading of the rows can be done, after which the cursor is closed. Cursor marks the current position in an active set.

General Cursor Attributes :

Whenever any cursor is opened and used, the oracle engine creates a set of four system variables, which keeps track of the current status of a cursor. These cursor variables can be accessed and used in a PL/ SQL block. Both implicit and explicit cursor has four attributes. They described as

Attributes	Description
%isopen	**It returns true if cursor is open, false otherwise.**
%found	**It returns true if record was fetched successfully from the opened cursor and false otherwise.**
%notfound	**It returns true if record was not fetched successfully and false otherwise.**
%rowcount	**It returns number of records processed from cursor.**

Steps for explicit cursor

1. Declare a cursor mapped to a SQL select statement that receive data for processing.
2. Open the cursor.
3. Fetch data from the cursor one row at a time into memory variables.
4. Process the data held in the memory variables as required using a loop.
5. Exit from the loop after processing is complete.
6. Closes the cursor.

PL/SQL Programs

Q.1. Write a PL/SQL program to display a message to check whether the record is deleted or not. [Using %found]

PL/ SQL Program :

OUTPUT :

```
Enter value for eno: 1000
old   2:    delete from emp where empno = &eno;
new   2:    delete from emp where empno = 1000;
Record not deleted

PL/SQL procedure successfully completed.
```

Q.2. Write a PL/SQL program to display a message to check whether the record is deleted or not. [Using %notfound]

PL/ SQL Program :

OUTPUT :

```
Enter value for eno: 1000
old   2:    delete from emp where empno = &eno;
new   2:    delete from emp where empno = 1000;
Record not deleted

PL/SQL procedure successfully completed.
```

Q.3. Write a PL/SQL program to display a message to give the number of records deleted by the delete statement issued in a PL/SQL block.

PL/ SQL Program

OUTPUT :

```
Enter value for eno: 7369
old   4:    delete from emp where empno = &eno;
new   4:    delete from emp where empno = 7369;
Total number of records deleted 1

PL/SQL procedure successfully completed.
```

Q.4. Write a PL/SQL program to display the empno, ename, job of employees of department number 10. [Using variables]

PL/ SQL Program :

OUTPUT :

```
empno : 7782
ename :CLARK
job :MANAGER
empno : 7839
ename :KING
job :PRESIDENT
empno : 7934
ename :MILLER
job :CLERK

PL/SQL procedure successfully completed.
```

Q.5. Write a PL/SQL program to display the empno, ename, job of employees of department number 10. [Using records]

PL/ SQL Program :

OUTPUT :

```
empno : 7782
ename :CLARK
job :MANAGER
empno : 7839
ename :KING
job :PRESIDENT
empno : 7934
ename :MILLER
job :CLERK

PL/SQL procedure successfully completed.
```

Q.6. Write a PL/SQL program to display the empno, ename, job of employees of department number 10. [Using cursor for loop]

PL/ SQL Program :

OUTPUT :

```
empno : 7782
ename :CLARK
job :MANAGER
empno : 7839
ename :KING
job :PRESIDENT
empno : 7934
ename :MILLER
job :CLERK

PL/SQL procedure successfully completed.
```

Lab 9

Procedures and Functions

Stored Procedures

A **stored procedure** or in simple a **proc** is a named PL/SQL block which performs one or more specific task. This is similar to a procedure in other programming languages. A procedure has a header and a body. The header consists of the name of the procedure and the parameters or variables passed to the procedure. The body consists or declaration section, execution section and exception section similar to a general PL/SQL Block. A procedure is similar to an anonymous PL/SQL Block but it is named for repeated usage.

We can pass parameters to procedures in three ways.

1) IN-parameters
2) OUT-parameters
3) IN OUT-parameters

A procedure may or may not return any value.

General Syntax to create a procedure is :

```
CREATE [OR REPLACE] PROCEDURE proc_name [list of parameters]
IS
        Declaration section
BEGIN
        Execution section
EXCEPTION
        Exception section
END;
```

IS - marks the beginning of the body of the procedure and is similar to DECLARE in anonymous PL/SQL Blocks. The code between IS and BEGIN forms the Declaration section.

The syntax within the brackets [ ] indicate they are optional. By using CREATE OR REPLACE together the procedure is created if no other procedure with the same name exists or the existing procedure is replaced with the current code.

The below example creates a procedure 'employer_details' which gives the details of the employee.

```
1> CREATE OR REPLACE PROCEDURE employer_details
2> IS
3> CURSOR emp_cur IS
4> SELECT first_name, last_name, salary FROM emp_tbl;
5> emp_rec emp_cur%rowtype;
6> BEGIN
7> FOR emp_rec in sales_cur
8> LOOP
9> dbms_output.put_line(emp_cur.first_name || ' ' ||emp_cur.last_name
10> || ' ' ||emp_cur.salary);
11> END LOOP;
12>END;
13> /
```

How to execute a Stored Procedure?

There are two ways to execute a procedure.

1) From the SQL prompt.

```
        EXECUTE [or EXEC] procedure_name;
```

2) Within another procedure – simply use the procedure name.

```
        procedure_name;
```

NOTE: In the examples given above, we are using backward slash '/' at the end of the program. This indicates the oracle engine that the PL/SQL program has ended and it can begin processing the statements.

PL/SQL Functions

A function is a named PL/SQL Block which is similar to a procedure. The major difference between a procedure and a function is, a function must always return a value, but a procedure may or may not return a value.

The General Syntax to create a function is:

```
CREATE [OR REPLACE] FUNCTION function_name [parameters]
RETURN return_datatype;
IS
        Declaration_section
BEGIN
        Execution_section
        Return return_variable;
EXCEPTION
        exception section
        Return return_variable;
END;
```

1) **Return Type:** The header section defines the return type of the function. The return datatype can be any of the oracle data type like varchar, number etc.
2) The execution and exception section both should return a value which is of the datatype defined in the header section.

For example, let's create a frunction called "employer_details_func' similar to the one created in stored proc

```
1> CREATE OR REPLACE FUNCTION employer_details_func
2> RETURN VARCHAR(20);
3> IS
5> emp_name VARCHAR(20);
6> BEGIN
7> SELECT first_name INTO emp_name
8> FROM emp_tbl WHERE empID = '100';
9> RETURN emp_name;
10> END;
11> /
```

In the example we are retrieving the 'first_name' of employee with empID 100 to variable 'emp_name'.
The return type of the function is VARCHAR which is declared in line no 2.
The function returns the 'emp_name' which is of type VARCHAR as the return value in line no 9.

How to execute a PL/SQL Function?

A function can be executed in the following ways.

1) Since a function returns a value we can assign it to a variable.
   employee_name := employer_details_func;
   If 'employee_name' is of datatype varchar we can store the name of the employee by assigning the return type of the function to it.
2) As a part of a SELECT statement
   SELECT employer_details_func FROM dual;
3) In a PL/SQL Statements like,
   dbms_output.put_line(employer_details_func);
   This line displays the value returned by the function.

Parameters in Procedure and Functions

In PL/SQL, we can pass parameters to procedures and functions in three ways.

1) **IN type parameter:** These types of parameters are used to send values to stored procedures.
2) **OUT type parameter:** These types of parameters are used to get values from stored procedures. This is similar to a return type in functions.
3) **IN OUT parameter:** These types of parameters are used to send values and get values from stored procedures.

NOTE: If a parameter is not explicitly defined a parameter type, then by default it is an IN type parameter.

1) IN parameter :

This is similar to passing parameters in programming languages. We can pass values to the stored procedure through these parameters or variables. This type of parameter is a read only parameter. We can assign the value of IN type parameter to a variable or use it in a query, but we cannot change its value inside the procedure.

The General syntax to pass a IN parameter is

CREATE [OR REPLACE] PROCEDURE procedure_name (
param_name1 IN datatype, param_name12 IN datatype ...)

Where

param_name1, ıparam_name2... are unique parameter names.
datatype - defines the datatype of the variable.
· IN - is optional, by default it is a IN type parameter.

2) OUT Parameter :

The OUT parameters are used to send the OUTPUT from a procedure or a function. This is a write-only parameter i.e, we cannot pass values to OUT parameters while executing the stored procedure, but we can assign values to OUT parameter inside the stored procedure and the calling program can receive this output value.

The General syntax to create an OUT parameter is

CREATE [OR REPLACE] PROCEDURE proc2 (param_name OUT datatype)

The parameter should be explicitly declared as OUT parameter.

3) IN OUT Parameter:

The IN OUT parameter allows us to pass values into a procedure and get output values from the procedure. This parameter is used if the value of the IN parameter can be changed in the calling program.

By using IN OUT parameter we can pass values into a parameter and return a value to the calling program using the same parameter. But this is possible only if the value passed to the procedure and output value have a same data type. This parameter is used if the value of the parameter will be changed in the procedure.

The General syntax to create an IN OUT parameter is

CREATE [OR REPLACE] PROCEDURE proc3 (param_name IN OUT datatype)

The below examples show how to create stored procedures using the above three types of parameters.

Example1 :

Using IN and OUT parameter:

Let's create a procedure which gets the name of the employee when the employee id is passed.

```
1> CREATE OR REPLACE PROCEDURE emp_name (id IN NUMBER, emp_name OUT NUMBER)
2> IS
3> BEGIN
4> SELECT first_name INTO emp_name
5> FROM emp_tbl WHERE empID = id;
6> END;
7> /
```

We can call the procedure 'emp_name' in this way from a PL/SQL Block.

```
1> DECLARE
2> empName varchar(20);
```

```
3> CURSOR id_cur SELECT id FROM emp_ids;
4> BEGIN
5> FOR emp_rec in id_cur
6> LOOP
7> emp_name(emp_rec.id, empName);
8> dbms_output.putline('The employee ' || empName || ' has id ' || emp-rec.id);
9> END LOOP;
10> END;
11> /
```

In the above PL/SQL Block
In line no 3; we are creating a cursor 'id_cur' which contains the employee id.
In line no 7; we are calling the procedure 'emp_name', we are passing the 'id' as IN parameter and 'empName' as OUT parameter.
In line no 8; we are displaying the id and the employee name which we got from the procedure 'emp_name'.

Example 2:
Using IN OUT parameter in procedures:

```
1> CREATE OR REPLACE PROCEDURE emp_salary_increase
2> (emp_id IN emptbl.empID%type, salary_inc IN OUT emptbl.salary%type)
3> IS
4> tmp_sal number;
5> BEGIN
6> SELECT salary
7> INTO tmp_sal
8> FROM emp_tbl
9> WHERE empID = emp_id;
10> IF tmp_sal between 10000 and 20000 THEN
11> salary_inout := tmp_sal * 1.2;
12> ELSIF tmp_sal between 20000 and 30000 THEN
13> salary_inout := tmp_sal * 1.3;
14> ELSIF tmp_sal > 30000 THEN
15> salary_inout := tmp_sal * 1.4;
16> END IF;
17> END;
18> /
```

The below PL/SQL block shows how to execute the above 'emp_salary_increase' procedure.

```
1> DECLARE
2> CURSOR updated_sal is
3> SELECT empID,salary
4> FROM emp_tbl;
5> pre_sal number;
6> BEGIN
7> FOR emp_rec IN updated_sal LOOP
8> pre_sal := emp_rec.salary;
9> emp_salary_increase(emp_rec.empID, emp_rec.salary);
10> dbms_output.put_line('The salary of ' || emp_rec.empID ||
11> ' increased from '|| pre_sal || ' to '||emp_rec.salary);
12> END LOOP;
13> END;
14> /
```

Q.1 Write a PL/ SQL program to create a procedure which input a number and find the factorial of a number.

PL/ SQL Program :

OUTPUT :

```
SQL> variable n number
SQL> execute proc_fact(5,:n);

PL/SQL procedure successfully completed.

SQL> print n

         N
----------
       120
```

Q.2 Write a PL/SQL procedure called MULTI_TABLE that takes two numbers as parameter and displays the multiplication table of the first parameter till the second parameter.

PL/ SQL Program :

OUTPUT :

```
SQL> execute multi_table(2,5)
2 * 1 = 2
2 * 2 = 4
2 * 3 = 6
2 * 4 = 8
2 * 5 = 10

PL/SQL procedure successfully completed.
```

Q.3 Write a PL/SQL function called POW that takes two numbers as argument and return the value of the first number raised to the power of the second.

PL/ SQL Program :

OUTPUT :

```
SQL> select pow(2,5) from dual;

  POW(2,5)
----------
        32
```

Q.4 Write a PL/ SQL program to create a function which input a number and find the factorial of a number.

PL/ SQL Program :

OUTPUT :

```
SQL> select factorial(5) from dual;

FACTORIAL(5)
------------
         120
```

Q.5 Write a PL SQL program to create a function that accepts radius of a circle and returns the area of that circle.

PL/ SQL Program :

OUTPUT :

```
SQL> select printarea(4) from dual;

PRINTAREA(4)
------------
       50.24
```

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Lab 10

Trigger

Topics

1. **Explain Trigger.**
2. **Syntax for creating trigger in Oracle.**
3. **Use of Trigger.**
4. **Types of Triggers**
   - **(a) Row Level Trigger with applications**
   - **(b) Statement Level Trigger with applications.**

Trigger

A database trigger is a stored procedure that is fired when an INSERT, UPDATE or DELETE statements is issued against the associate table. The name trigger is appropriate, as these are triggered (fired) whenever the above mentioned commands are executed. A trigger defines an action the database should take when some database related event occurs. A trigger can include SQL and PL/SQL statements to execute as a unit and can invoke other stored procedures. Triggers may use to provide referential integrity, to enforce complex business rules, or to audit changes to data. The code within a trigger, called the trigger body is made up of PL/SQL blocks.

A trigger is automatically executed without any action required by the user. A stored procedure on the other hand needs to be explicitly invoked. This is the main difference between a trigger and a stored procedure.

Uses of Database Trigger

Database triggers can be used for the following purposes.

1. **To derive column values automatically.**
2. **To enforce complex integrity constraints.**
3. **To enforce complex business rules.**
4. **To customize complex security authorizations.**
5. **To maintain replicate tables.**
6. **To audit data modifications.**

Parts of a trigger

A database trigger has 3 parts

1. **Triggering event or statement.**
2. **Triggering constraint (optional)**
3. **Trigger action**

1. Triggering event or statement

A triggering event or statement is the SQL statement that causes a trigger to be fired. A triggering event can be an INSERT, DELETE or UPDATE statement for a specific table.

2. Trigger Constraint or Restriction

A trigger restriction specifies a Boolean (logical) expression that must be TRUE for the trigger to fire. The trigger action is not executed if the trigger restriction evaluates to false. A trigger restriction is an option available for triggers that are fired for each row. Its function is to conditionally control the execution of a trigger. A trigger restriction is specified using a WHEN clause. It is an optional part of trigger.

3. Trigger Action

A trigger action is the procedure (PL/ SQL block) that contains the SQL statements and PL/SQL code to be executed when a triggering statement is issued and the trigger restriction is issued and the trigger restriction evaluates to TRUE.

Type of Triggers

A trigger's type is defined by the type of triggering transactions and by the level at which the trigger is executed. Oracle has the following types of triggers depending on the different applications.

1. **Row Level Triggers.**
2. **Statement Level Triggers.**
3. **Before Triggers.**
4. **After Triggers.**

1. Row Level Triggers

Row Level Triggers execute once for each row in a transaction, the commands that enables the trigger. For e.g., if an update statement updates multiple rows of a table, a row trigger is fired once for each row affected by the update statement. If the triggering statement affects no rows, the trigger is not executed at all. Row Level Triggers are created using the for each row clause in the create trigger command.

Applications

Consider a case when our requirement is to prevent updation of 100 records of emp then whenever update statement update records there must be PL/SQL block that will be fired automatically by update statement to check that it must not be 100, so we have to use row level triggers for that type of applications.

2. Statement Level Triggers

Statement Level Triggers are triggered only once for each transaction, for e.g., when a update command update 15 rows, the commands contains in the trigger are executed only once, and not with every processed row. Statement level triggers are the default types of triggers created via the create trigger commands.

Applications

Consider a case where our requirement is to prevent the delete operation during Sunday. For this whenever delete statement deletes records, there must be PL/SQL block that will be fired only once by delete statement to check that day must not be Sunday by referencing system date, so we have to use statement level trigger for which fires only once for above application.

Before and After Triggers

Since triggers are executed by event, they may be set to occur immediately before or after those events. When a trigger is defined, you can specify whether the trigger must occur before or after the triggering event, i.e., INSERT, UPDATE or DELETE commands.

Before trigger execute the trigger action before the triggering statement. These types of triggers are commonly used in the following situation.

Before triggers are used when the trigger action should determine whether or not the triggering statement should be allowed to complete. By using a before trigger, you can eliminate unnecessary processing of the triggering statement. For e.g., to prevent deletion on Sunday for this we have to use statement level before trigger on delete statement.

Before triggers are used to derive specific column values before completing a triggering INSERT or UPDATE statement.

After trigger executes the trigger action after the triggering statement is executed. After triggers are used when you want the triggering statements to complete before executing the trigger action for e.g., to perform cascade delete operation, it means that user delete the record for one table, but the corresponding records in other tables are deleted automatically by a trigger which fired after the execution of delete statement issued by the user.

When combining the different types of triggering actions, there are mainly 12 possible valid trigger types available to use. The possible configurations are :-

1. Before Insert Row
2. Before Insert Statement
3. After Insert Row
4. After Insert Statement
5. Before Update Row
6. Before Update Statement
7. After Update Row
8. After Update Statement
9. Before Delete Row
10. Before Delete Statement
11. After Delete Row
12. After Delete Statement

Syntax for creating a Trigger

```
CREATE [OR REPLACE] TRIGGER TRIGGER_NAME
[BEFORE/ AFTER]
[DELETE [OR] INSERT OR UPDATE of column_name,….]
On table_name
[referencing [OLD as old, NEW as new]]
[FOR EACH ROW [WHEN CONDITION]]
DECLARE
        VAR DECLARATION
        CONSTANT DECLARATION
BEGIN
        PL/ SQL SUBPROGRAM BODY
[EXCEPTION]
        EXCEPTION HADLING CODE
END;
/
```

1. Write a PL/SQL program to create a trigger for the student table which makes the entry in student name column in upper case.

PL/SQL Program :

OUTPUT :

SQL > insert into student values (1, 'SUMIT', 5, 'cse', 90, 121);

1 row inserted

SQL > select * from student;

ROLLNO	SNAME	SEM	BRANCH	MARKS	PNO
8	SUMIT	5	cse	90	121

2. Write a PL/SQL program to create a trigger on the student table which shows the old values and new values of student name after updation on student name of student table.

PL/SQL Program :

OUTPUT :

SQL > update student set sname = 'DINESH' where sname = 'SUMIT';
Old student name is = SUMIT
New student name is = DINESH

3. Write a PL/SQL program to create a trigger on student table which copies the row which is deleted from student table into student1 table.

PL/SQL Program :

OUTPUT :

SQL > delete from student where rollno = 1;

Old data stored in backup table

SQL > select * from student1;

ROLLNO	SNAME	SEM	BRANCH	MARKS	PNO
1	RAM	3	CSE	40	121

4. Write a PL/SQL program to create a trigger that displays a message prior to an insert operation on the student table.

PL/SQL Program :

OUTPUT :

SQL > insert into student values (7, 'SUMIT', 5, 'CSE', 90, 121);
New students are about to be added
1 row created

5. Write a PL/SQL program to create a trigger for every insert, update and delete operation on the student table, a row is added to the log table recording the date, user and action.

PL/SQL Program :

OUTPUT :

```
SQL > insert into student values (8, 'SAURABH', 5, 'CSE', 48, 122);
SQL> select * from logtable;
DT        USR                  ACTION
--------- -------------------- --------------------
30-JUL-19 DINESH               INSERT
```

6. Write a PL/SQL program to create a trigger so that no operation can be performed on student table on Sunday.

PL/SQL Program :

OUTPUT :

```
SQL> delete from student;
delete from student
            *
ERROR at line 1:
ORA-20022: No Operation on Sunday
ORA-06512: at "STUDENT_SUNDAY", line 3
ORA-04088: error during execution of trigger 'STUDENT_SUNDAY'
```

7. Write a PL/SQL program to create a trigger which will verify that no record has the marks value greater than 90 in the student table.

PL/SQL Program :

OUTPUT :

```
SQL> update student set marks = 95 where branch = 'CSE';
update student set marks = 95 where branch = 'CSE'
       *
ERROR at line 1:
ORA-20000: Record is illegal
ORA-06512: at "REC_CHECK", line 3
ORA-04088: error during execution of trigger 'REC_CHECK'
```

8. Write a PL/SQL program which verifies that the updated marks of student is greater than his/ her previous marks.

PL/SQL Program :

OUTPUT :

```
SQL> update student set marks = 30 where rollno = 1;
update student set marks = 30 where rollno = 1
       *
ERROR at line 1:
ORA-20107: Updated marks is less
ORA-06512: at "TRIGGER7", line 3
ORA-04088: error during execution of trigger 'TRIGGER7'
```

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