Oracle PL/SQL

Subquery, Format Models, Literals, and Database Objects

Agenda

01 PL/SQL Subquery

02 PL/SQL Format Models

03 Literals

04 PL/SQL Database Objects

PL/SQL Subquery

Subquery

- It is a query within a query
- A subquery is a SELECT statement within another SQL statement
- The SQL statement can be SELECT, WHERE clause, FROM clause, INSERT, UPDATE, DELETE, etc.
- Useful to select rows from a table with a condition that depends on a data in the same table or another table.
- It allows you to use the results of inner query in the outer query.

Scalar Subquery

- Scalar subqueries return one value, i.e., they return one row and one column

Find name, job of employees who have the same job as Jones

```
SELECT name, job
        FROM employee
        WHERE deptno = ( SELECT job FROM employee
            WHERE name = 'JONES');
```

Outer Query

name	job
JONES	MANAGER
BLAKE	MANAGER
CLARK	MANAGER

3 rows in set (0.00 sec)

Subquery or Inner query

job
MANAGER

1 row in set (0.00 sec)

Subquery That Returns a List of Values

- If subquery returns more than one value, use ‘IN’ or ‘NOT IN’ between the comparison operator (=,!=) and the subquery.

•‘IN’ is exactly same as '= any’

‘NOT IN’ is exactly same as '!= all’

Subquery That Returns a List of Values

Display name, job of employees in deptno 10 with the same job as anyone in deptno 30

```
SELECT name, job
       FROM employee
       WHERE deptno = 10 and job in (SELECT job FROM employee
                                     WHERE deptno = 30);
```

Name	job
Smith	clerk
Allen	salesman
Ward	salesman
Jones	manager
Martin	salesman
Blake	manager
Turner	salesman
Adams	clerk
James	clerk
Miller	clerk

Job
Salesman
Salesman
Salesman
Manager
Salesman
Clerk

Subquery That Returns a Set of Values

If a subquery returns more than one value, then use ‘ANY’ or ‘ALL’ between the comparison operator (=.!=, >. <. >= <=) and the subquery.

Display information about employees who earn more than any employee in deptno 30 in the decreasing order

```
SELECT salary FROM employee
WHERE deptno = 30;
```

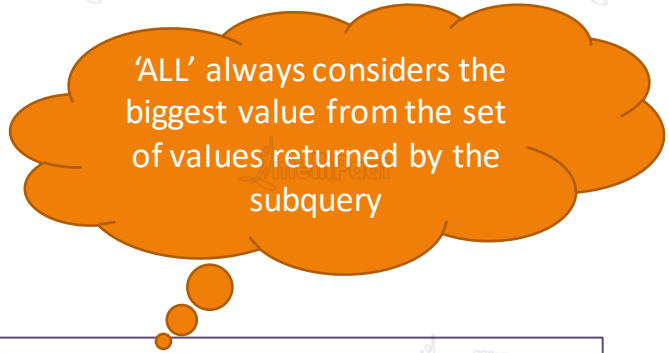
```
SELECT name, job, salary, deptno FROM
employee
WHERE salary > 950 ORDER BY salary DESC
```

Using Subqueries

```
SELECT name, job, salary, deptno FROM employee WHERE salary> ANY (select salary from
employee WHERE deptno=30) ORDER BY salary DESC;
```

Subquery That Returns a Set of Values

Using Subqueries




```
SELECT name, job, salary, deptno FROM employee WHERE salary> ALL (select salary from
employee WHERE deptno=30) ORDER BY salary DESC;
```

Subqueries That Refer to More Than One Table

A subquery can retrieve information from more than one table.

List name, job of employees who are working in the same dept as employees located in 'Chicago'

Common column existing in both tables

name	job
ALLEN	SALESMAN
WARD	SALESMAN
MARTIN	SALESMAN
BLAKE	MANAGER
TURNER	SALESMAN
JAMES	CLERK

```
SELECT name, job FROM emp WHERE deptno = (SELECT
deptno FROM dept WHERE location = 'chicago');
```

Multiple Subqueries

- Consider replacing with: "Multiple subqueries are used when a clause of a query contains any combination of ordinary conditions and also when it contains any number of conditions with subqueries, connected by the operators AND and OR

Find name, job of employees who have the same job as Jones

```
SELECT name, job, salary FROM emp
WHERE job = (SELECT job FROM emp WHERE name = 'JONES')
 or salary >= (SELECT salary FROM emp WHERE name =
'FORD');
```

name	job	salary
JONES	MANAGER	2975
BLAKE	MANAGER	2850
CLARK	MANAGER	2450
SCOTT	ANALYST	3000
KING	PRESIDENT	5000
FORD	ANALYST	3000

Correlated Subquery

- It is a subquery that contains a reference to the table of the outer query.
- Execute the inner query repeatedly like a loop once for every row considered for selection by the outer query.
- It is called ‘correlated nested query,’ because each execution of the subquery is correlated with the value of the column in one of the outer query's candidate row.

Correlated Subquery

Find the deptno, name, location of all depts which contain employees

```
SELECT * FROM dept d WHERE, EXISTS (SELECT * FROM
emp WHERE deptno = d.deptno);
```

Evaluates to True whenever the inner query does not return the data, i.e., matching the condition in the where clause

dept no	name	location
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO

Correlated Subquery

Find the deptno, name, location of all departments which do not contain employees

```
SELECT * FROM dept d WHERE, NOT EXISTS  (SELECT *
FROM emp WHERE deptno = d.deptno);
```

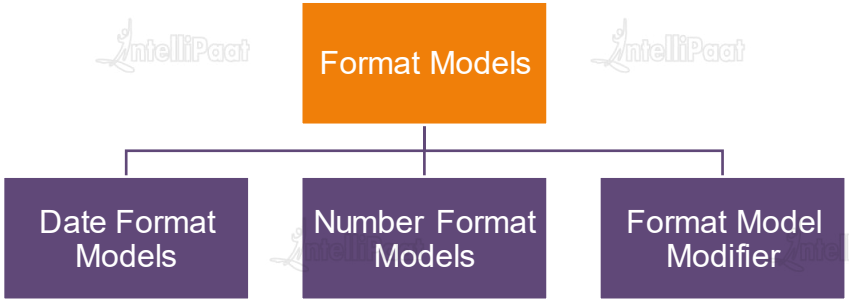
Evaluates to True whenever the inner query does not return the data, i.e., matching the condition in the where clause

dept no	name	location
40	OPERATIONS	BOSTON

PL/SQL Format Models

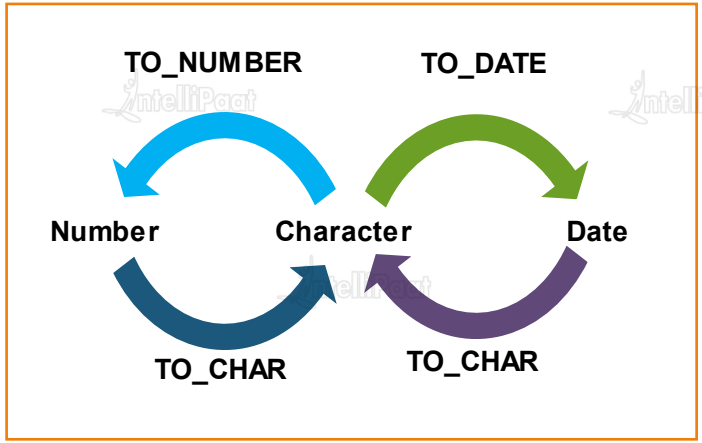
Format Models

- It describes the format of datetime or numeric data stored in a character string.
- It does not change the internal representation of the value in the database.
- It determines how Oracle Database interprets the string, when a character string is converted into a date or number, a character literal



Format Models

- Use a format model as an argument of TO_CHAR and TO_DATE functions to specify:
  - The format for Oracle to use to return a value from the database
  - The format for a value to store in the database



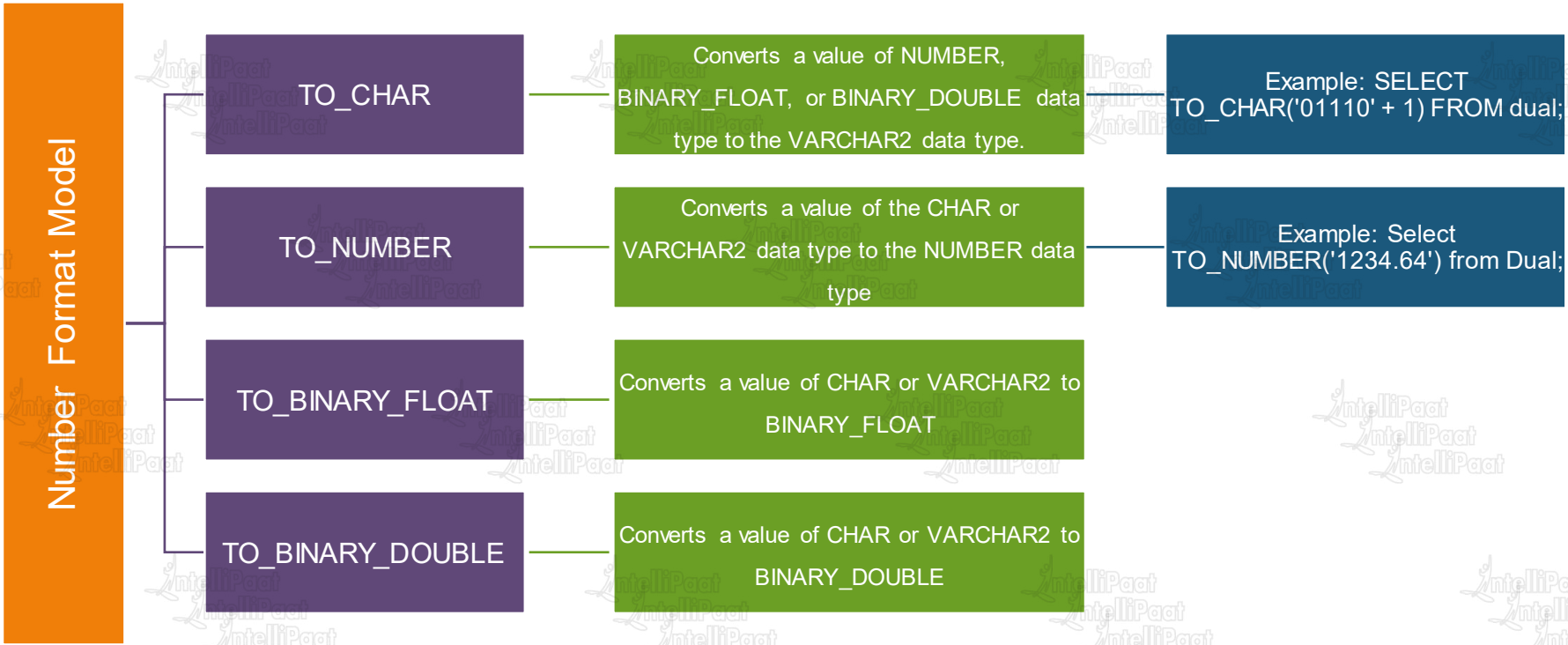
For example:

The datetime format model for the string '17:45:29' - 'HH24:MI:SS'

The datetime format model for the string '11-Nov-1999' - 'DD-MM-YYYY'

The number format model for the string '$2,304.25' - '$9,999.99'

Number Format Models



Number Format Models

- With number format models, all numbers are rounded to the specified number of significant digits
- If a value has more digits to the left of the decimal place than are specified in the format, then pound sign (#) replaces the values

Element	Result
9	Represents a number
0	Forces a zero to be displayed
$	Places a floating dollar sign
L	Uses the floating local currency symbol
.	Prints a decimal point
,	Prints a comma as a thousands indicator

```
SQL> select to_char(marks,'099.99') as marks from student;

MARKS
-------
 056.00


 067.00
 089.00


7 rows selected.

SQL> select to_char(marks,'9.9') as grade from student;

GRAD
----
####
```

Date and Time Format Suffixes

- Used to format the datetime value output. They cannot be used with input format models (e.g., with TO_DATE).

The available suffixes are:

TH	**- Converts numbers to ordinal numbers**
SP	**- Converts numbers to words**
SPTH	**- Converts numbers to ordinal words**

```
select
  to_char( timestamp '2007-04-03 02:01:01', 'yyyyTH, mmTH, ddTH, hhTH, miTH, ssTH' ) as output
from dual ;   -- output: 2007th, 04th, 03rd, 02nd, 01st, 01st
```

```
select
  to_char( timestamp '2000-04-03 02:01:00', 'mmSP, ddSP, hh24SP, miSP, ssSP' ) as output
from dual ; -- output: four, three, two, one, zero

select
  to_char ( timestamp '2000-04-03 02:01:00', 'mmSPTH, ddTHSP hh24SPTH, miTHSP, ssSPTH' ) as output
from dual ; -- output: fourth, third second, first, zeroeth
```

Format Model Modifier

- FM and FX: Two modifiers in format models for the TO_CHAR function to control blank padding and exact format checking
- They can appear more than once in a format model, where each subsequent occurrence toggles the effects of the modifier.
- FM ‘Fill mode’: It toggles the suppression of blank padding in character format elements like ""MONTH" and leading zeros in numeric format elements like "YYYY""

Note: FM will not, however, suppress blanks in number elements.

```
select TO_CHAR (SYSDATE, 'Month DD, YYYY') from dual; -- without FM 'May 05, 2016’
select TO_CHAR (SYSDATE, 'FMMonth DD, FMYYYY') from dual; -- with FM 'May 4, 2016'
```

Format Exact Modifier (FX)

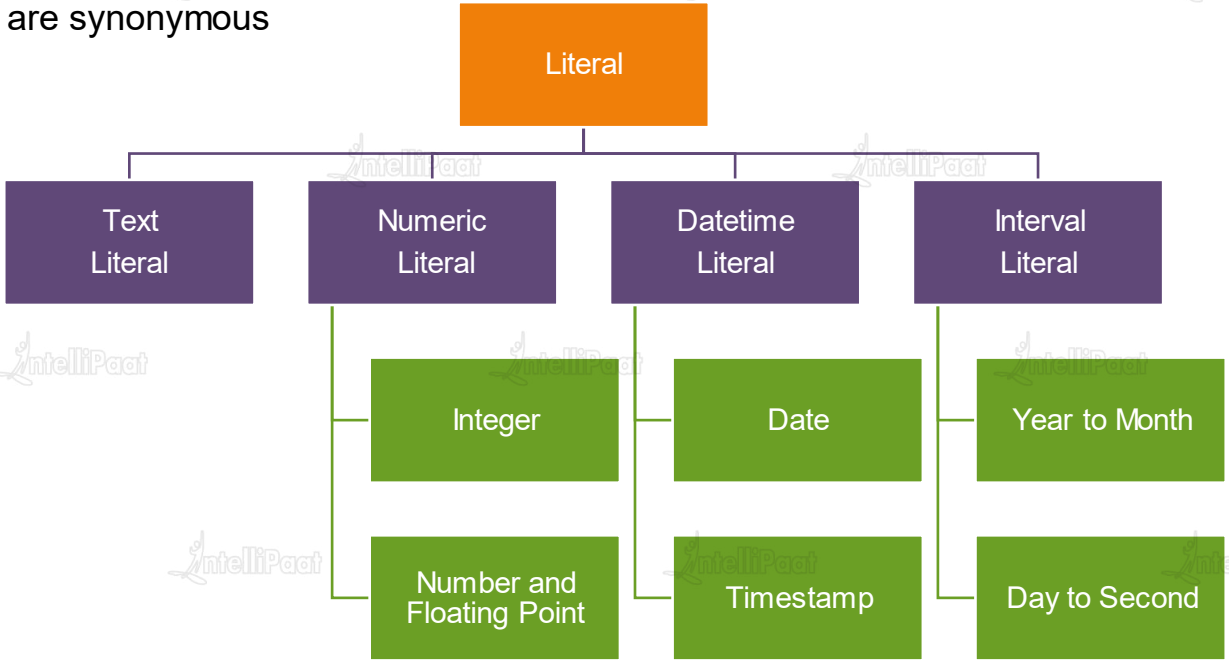
- Toggles exact format matching on or off
- Used only in input format models (e.g., with TO_DATE)
- Has no effect when used in output format models (e.g., with TO_CHAR)
- When it is on, FX forces the function to perform an exact match between the format model and the character argument

```
select to_date( '123', 'FXyyyy' ) as a from dual ;  select to_date( '123', 'FXyyyy' ) as a from dual;
                                                    *
ERROR at line 1: ORA-01862: the numeric value does  not match the length of the format item
```

Literals

Literals

- ‘Literal’ refers to ‘a fixed data value’
- Literal and constant value are synonymous



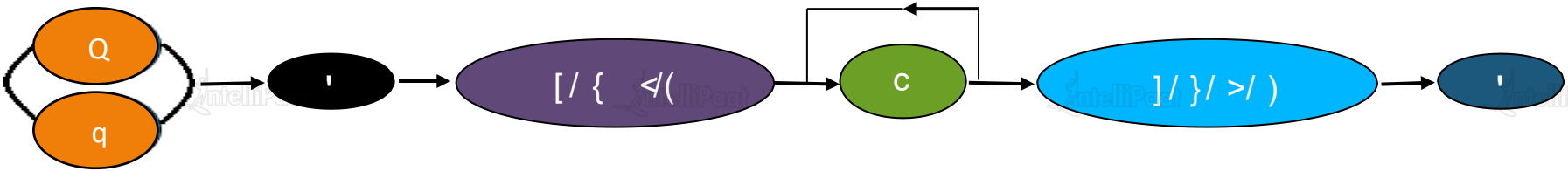
Text Literals

- Use the terms text literal, character literal, and string, interchangeably
- ' ' - two single quotation marks that begin and end text literals

Example:

```
'Hello‘
'ORACLE.dbs‘
'Jackie"s raincoat‘
'09-MAR-98'
```

```
q'!name LIKE '%DBMS_%%'!'
q'<'So,' she said, 'It's finished.'>'
q'{SELECT * FROM employees WHERE last_name =
 'Smith';}‘  q'"name like '[""
```



Text Literals

```
Select * from students
```

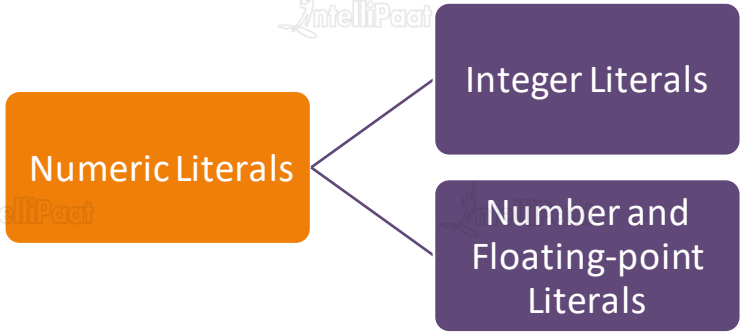
	RNO	SNAME	MARKS
1	101	Asha	56
2	102	Ravi	(null)
3	103	Ram	(null)
4	1	Arun	67
5	2	Aruna	89
6	3	Ravi	(null)
7	4	Raj	(null)

```
Select 'Marks secured by' || sname || 'is' || marks as results from student;
```

	RESULTS
1	Marks secured by Asha is 56
2	Marks secured by Ravi is
3	Marks secured by Ram is
4	Marks secured by Arun is 67
5	Marks secured by Aruna is 89
6	Marks secured by Ravi is
7	Marks secured by Raj is

Numeric Literals

- Specify fixed and floating-point numbers




```
SQL> SELECT 2 * 1.23, 3 * 2,34 FROM DUAL;

    2*1.23         3*2         34
---------- ---------- ----------
      2.46          6         34

SQL> SELECT 2 * 1.23, 3 * 2.34 FROM DUAL;

    2*1.23     3*2.34
---------- ----------
      2.46       7.02

SQL> SELECT 2 * 1.23, 3 * '2.34' FROM DUAL;

    2*1.23   3*'2.34'
---------- ----------
      2.46       7.02

SQL> SELECT 2 * 1.23, 3 * '2,34' FROM DUAL;
SELECT 2 * 1.23, 3 * '2,34' FROM DUAL
                     *
ERROR at line 1:
ORA-01722: invalid number
```

Date/Timestamp Literals

For the DATE data type, there is only one form of literal, the ANSI date literal, which uses the format, ‘YYYY-MM-DD’

```
DATE '-2400-01-01'      -- 2400 BC: the abacus invented in Babylonia

DATE '-500-1-1'         -- 500 BC: first known use of zero by mathematicians in ancient
                                -- India

DATE '+0820-01-1'       -- 820 AD: Persian mathematician Al-Khwarizmi described rudiments
                        -- of modern algebra (the term "algorithm" comes from
                        -- al-Khwarizmi's Latinized name "Algoritmi")

DATE '1947-12-16'       -- the transistor invented in USA by Shockley, Bardeen and Brattain
```

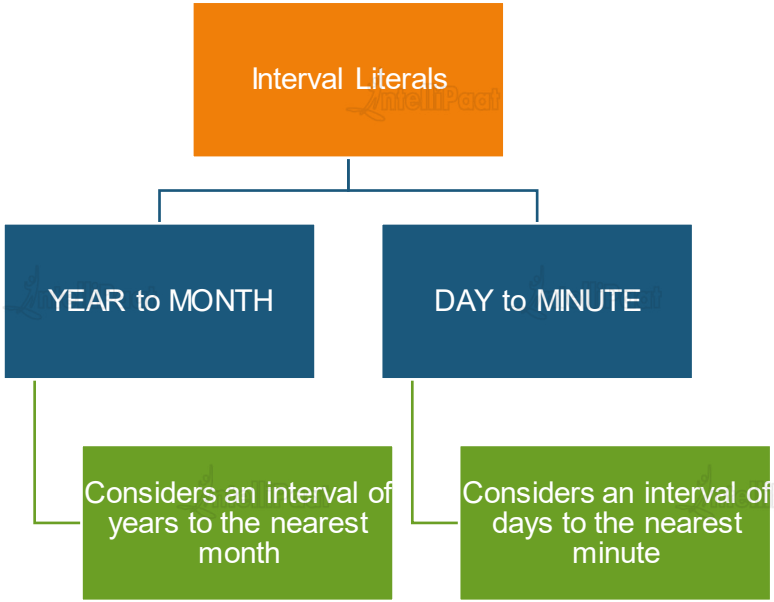
Interval Literals

An interval literal specifies a period of time in terms of years and months, or in terms of days, hours, minutes, and seconds

Each type contains a leading field and may contain a trailing field

Leading field: Basic unit of date or time being measured. The valid range of the leading field precision is 0 to 9, and its default value is 2

Trailing field: Smallest increment of the basic unit being considered

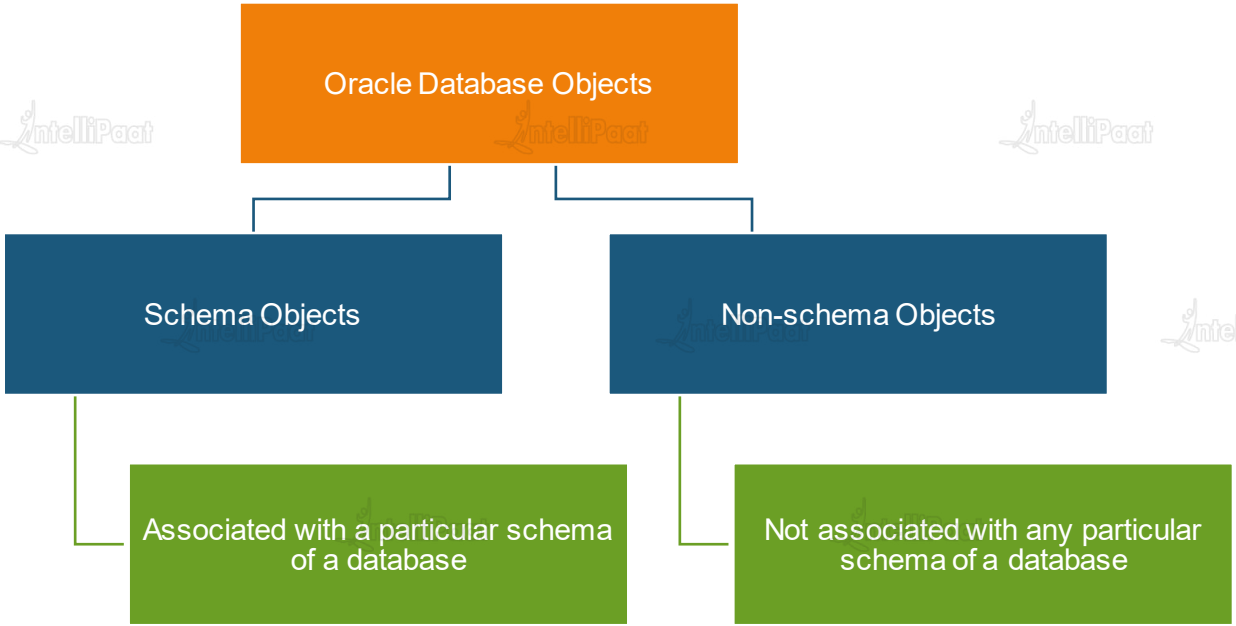


SQL Database Objects

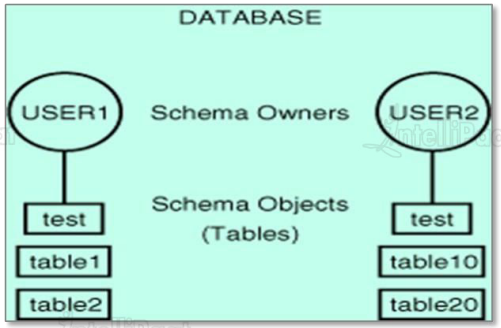
Database Objects

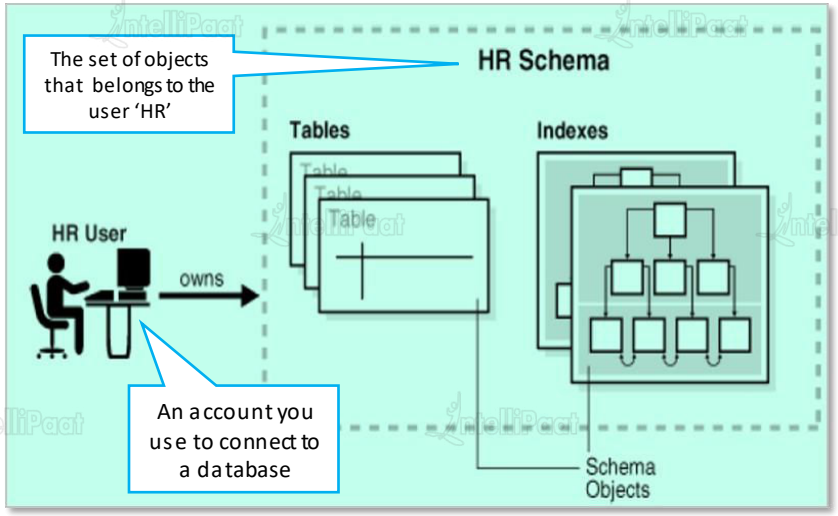
A database object is any defined object in a database that is used to store or reference data.

Examples: Tables, views, clusters, sequences, indexes, synonyms, etc.



Database Schema Objects Vs. the User

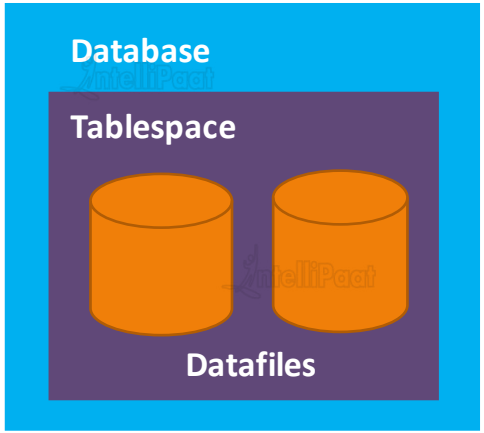




How Objects Are Stored Within a Database?

Oracle stores data logically in tablespaces and physically in datafiles.

Tablespaces	Datafiles
• Can belong to only one database at a time • Consist of one or more files • Are further divided into logical units of storage	• Can belong to only one tablespace and one database • Are repository for schema object's data



The user needs to have a quota allocated within the tablespace for creating a table. Multiple users can store their database objects in the same tablespace.

Table

- An object which is used to store data. It is a collection of rows and columns.
- Each vertical section is called a column, and the horizontal section is called a row/record.

Rules for Naming a Table/Column:

- The table name should start with an alphabet, which contains 1 to (maximum) 30 characters.
- It should not contain spaces or any special characters such as except _# and 0 to 9.
- A table can have minimum 1 to maximum 1000 columns.
  - A table can have 0 to *n* number of records up to our hard disk capacity.
- Oracle reserved keywords and words should not be used as column names or table names.
  - Rules which we are following for table names are applicable for column names as well.
- The numeric precision for a column must be 1 to 38.

Cluster, Constraints, Indexes, and Synonyms

•A **cluster** stores related rows of different tables at the same physical location based on the common column (cluster key) of different tables

Constraints are rules applied to the data of a database in order to allow the storage of legal instances into the database

Indexes are used in Oracle to provide quick access to rows in a table. An index creates an entry for each value that appears in the indexed columns of a table

A **synonym** is simply an alias of Oracle Database objects like table, view, etc. It requires no storage other than its definition in the data dictionary

Views, Sequences, Database Link, and Triggers

•A **view** is a virtual table that does not physically exist. Rather, it is created by a query joining one or more tables, referred to as base tables of the views

A **sequence** is used to generate a number sequences. This can be useful when you need to create a unique auto number to act as a primary key

A **database link** allows you to reference objects in a remote database/another database. When accessing a remote object over a database link, the local database acts as an Oracle client. Here, the another database need not be an Oracle database

Database triggers are procedures that are implicitly executed when an INSERT, UPDATE, or DELETE statement is issued against the associated table

Non-schema Objects

- Objects that are not contained in a schema
- Other types of objects stored in the database
- Can be created and manipulated with SQL

•Contexts

- Create a namespace for a context

Directory

- Is a database object that is an alias for a file

Edition

- Is effectively a copy of the entire original database

Restore Points

- Enable us to rewind the database back in time to

Roles

- A set or group of privileges that can be granted to users or another role. This is a great way for database administrators to save time and effort

Rollback Segments

- Objects that Oracle Database uses to store data necessary to reverse, or undo, changes made by transactions

Tablespace

- Is a storage location where the actual data of underlying database objects can be kept

Users

- Account you use to connect to a database

Database Object Names and Qualifiers

Database Object Naming Rules

Every database object has a name.

In a SQL statement, you represent the name of an object with a quoted/non-quoted identifier. Names must be from 1 to 30 characters long with these exceptions:

- Names of databases are limited to 8 characters.
- Names of database links can be as long as 128 characters.
- Names cannot contain quotation marks. Names are not case-sensitive.
- Non-quoted identifiers must begin with an alphabetic character of database character set. Quoted identifiers can begin with any character.
- Names can only contain alphanumeric characters from database character set and the characters _, $, and #. But keep the usage of $ and # minimum.
- If your database character set contains multi-byte characters, It is recommended that each name for a user or a role contains at least one single-byte character.
- Names of database links can also contain periods (.) and ampersands (&).
- A name cannot be Oracle's reserved keyword, this includes words followed by an asterisk (*) which are ANSI reserved words. DUAL should not be used as a name for an object or part.

Database Object Naming Rules

A name must be unique across its namespace.

Schema objects share one namespace

- Tables
- Views
- Sequences
- Private Synonyms
- Stored Functions
- Packages
- Snapshots

- Indexes
- Constraints
- Clusters
- Database Triggers
- Private Database Links

Schema objects have their own namespace

Object Naming Guidelines

Use a full, descriptive, pronounceable name (or well-known abbreviations)

Use consistent naming rules

Use the same name to describe the same entity or attribute across tables

Quiz

Quiz 1

In a PL/SQL block, a variable is declared as NUMBER without an initial value. What will its value be when it is first used in the executable section of the PL/SQL block?

A	Null
B	0
C	Results in a compilation error
D	An exception will be raised

Answer 1

In a PL/SQL block, a variable is declared as NUMBER without an initial value. What will its value be when it is first used in the executable section of the PL/SQL block?

A	Null
B	0
C	Results in a compilation error
D	An exception will be raised

Quiz 2

Which physical file contains the name and location of datafiles?

A	Parameter File
B	Redo log file
C	Control file
D	Password File

Answer 2

Which physical file contains the name and location of datafiles?

A	Parameter File
B	Redo log file
C	Control file
D	Password File

Quiz 3

What is UNISTR(x) used for?

A	Converts the characters in x to the national language character set
B	Converts the characters in x to the national language character set (VARCHAR)
C	Converts the characters in x to the national language character set (CHAR)
D	Converts the characters in x to the national language character set (NCHAR)

Answer 3

What is UNISTR(x) used for?

A	Converts the characters in x to the national language character set
B	Converts the characters in x to the national language character set (VARCHAR)
C	Converts the characters in x to the national language character set (CHAR)
D	Converts the characters in x to the national language character set (NCHAR)

Quiz 4

Maximum number of column a table can have in Oracle?

A	500
B	1000
C	2000
D	100

Quiz 4

Maximum number of column a table can have in Oracle?

A	500
B	1000
C	2000
D	100

Quiz 5

SQL views can be used to hide:

A	Columns and rows only.
B	complicated SQL syntax only.
C	both of the above can be hidden by an SQL view.
D	None of the above is correct.

Answer 5

SQL views can be used to hide:

A	Columns and rows only.
B	complicated SQL syntax only.
C	both of the above can be hidden by an SQL view.
D	None of the above is correct.

India: +91-7847955955

US: 1-800-216-8930 (TOLL FREE)

sales@intellipaat.com

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