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# Oracle Database 10g: SQL Fundamentals I

Electronic Presentation

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**ORACLE®**

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# I Introduction

# Lesson Objectives

**After completing this lesson, you should be able to do the following:**

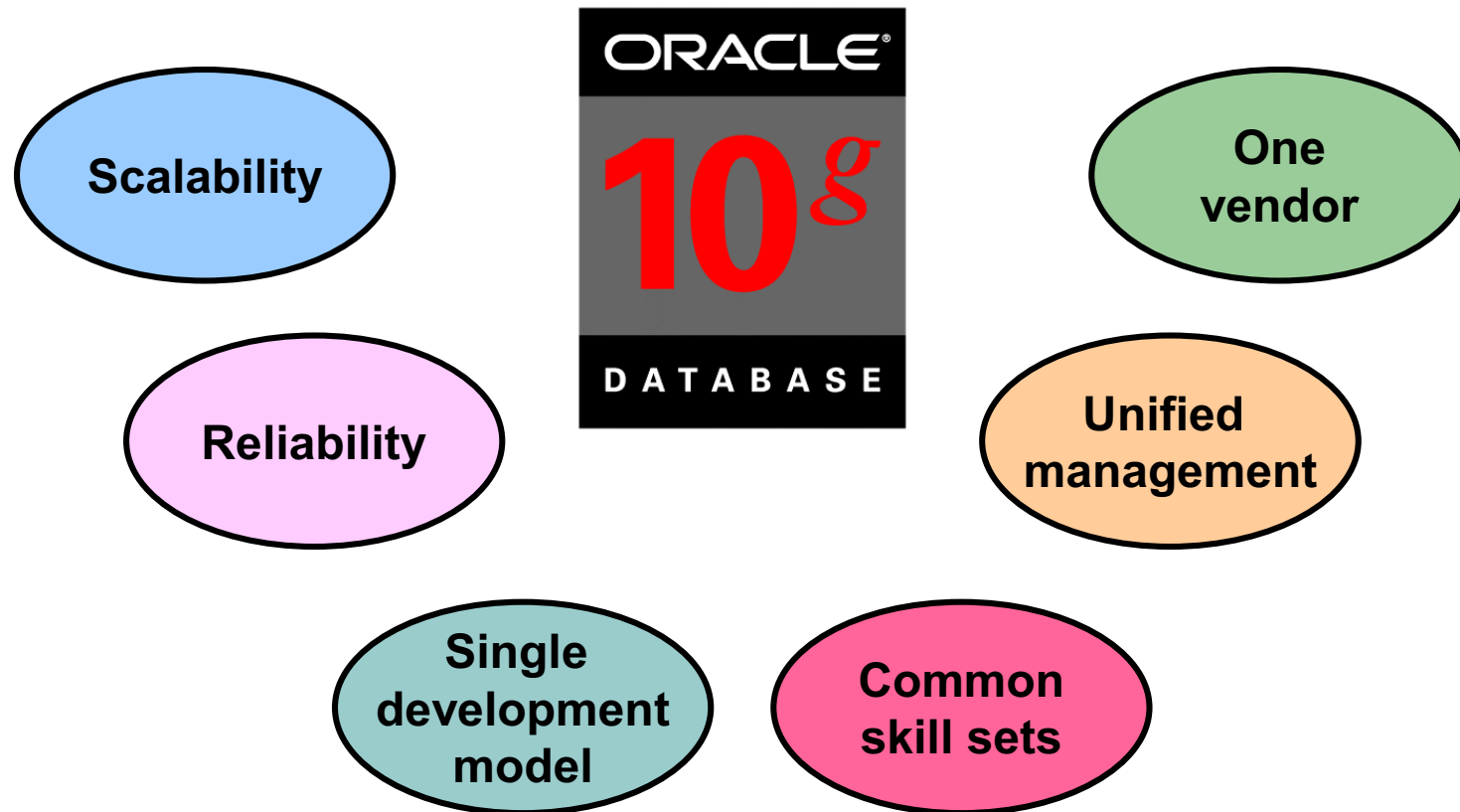
- **List the features of Oracle10g**
- **Discuss the theoretical and physical aspects of a relational database**
- **Describe the Oracle implementation of the RDBMS and ORDBMS**
- **Understand the goals of the course**

# Goals of the Course

**After completing this course, you should be able to do the following:**

- **Identify the major structural components of Oracle Database 10g**
- **Retrieve row and column data from tables with the `SELECT` statement**
- **Create reports of sorted and restricted data**
- **Employ SQL functions to generate and retrieve customized data**
- **Run data manipulation language (DML) statements to update data in Oracle Database 10g**
- **Obtain metadata by querying the dictionary views**

# Oracle10g




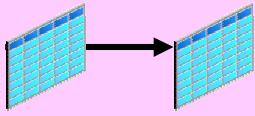
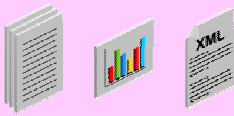


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# Oracle10g



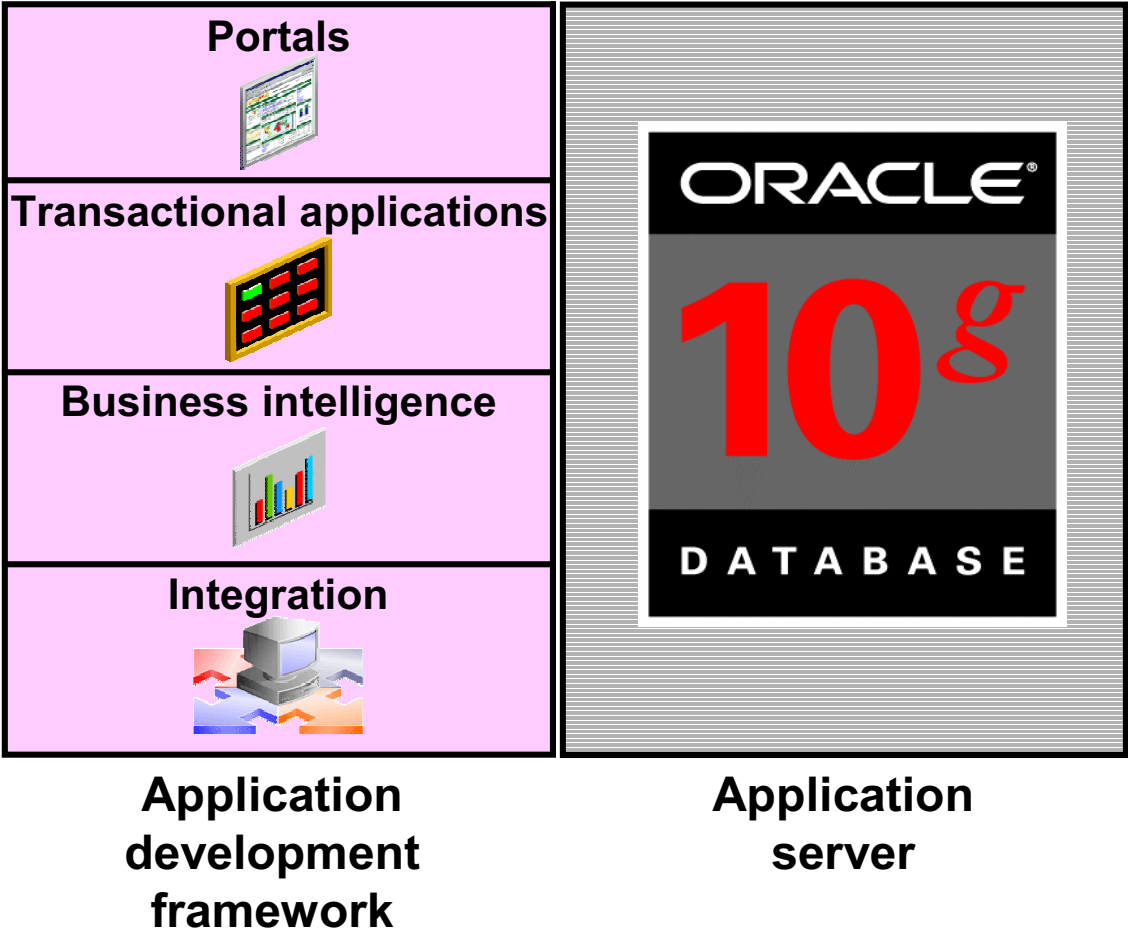
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# Oracle Database 10g

	<b>Object relational data</b> 
	<b>Documents</b> 
	<b>Multimedia</b> 
	<b>Messages</b> 



# Oracle Application Server 10g



# Oracle Enterprise Manager 10g Grid Control

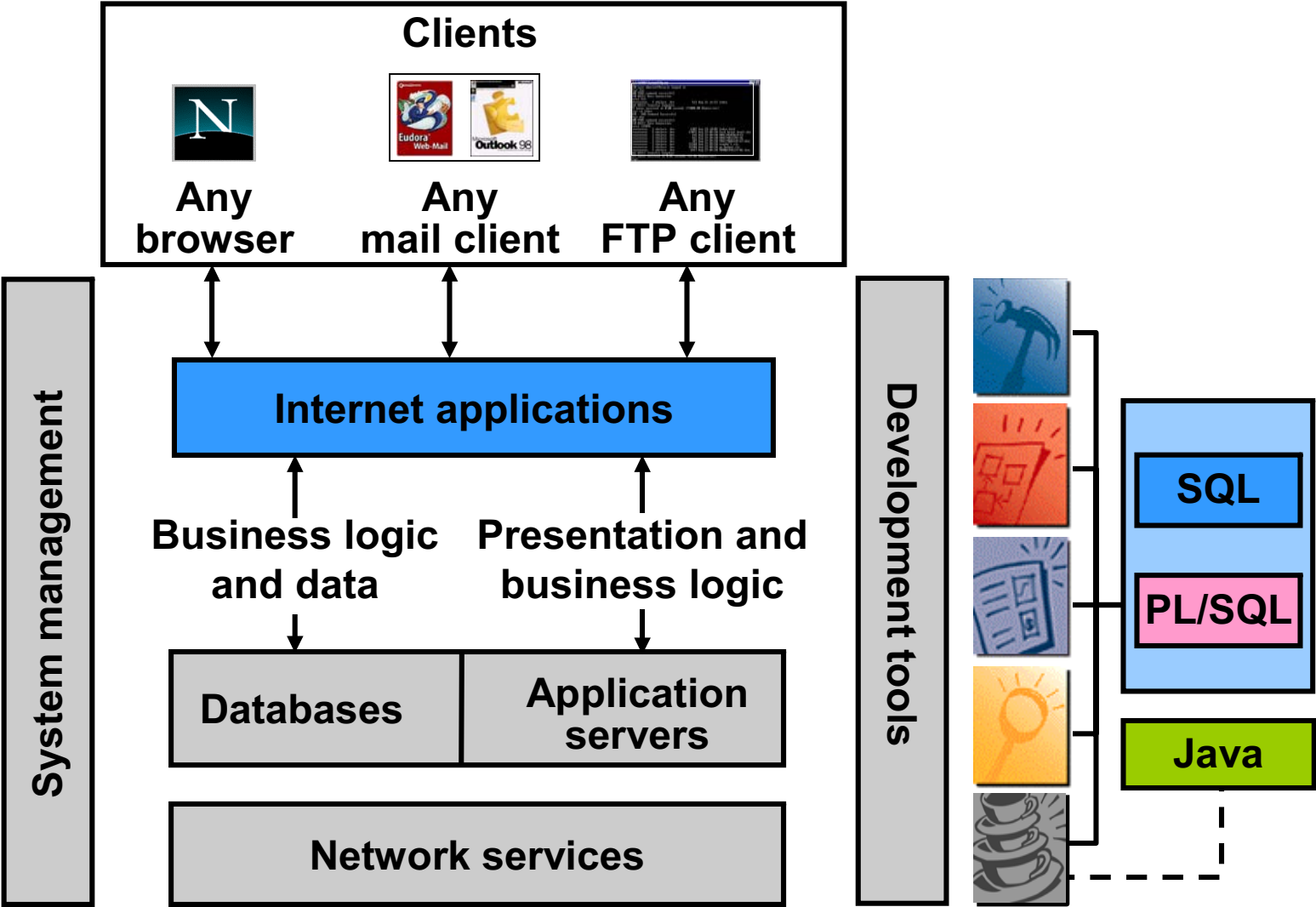
- Software provisioning
- Application service level monitoring



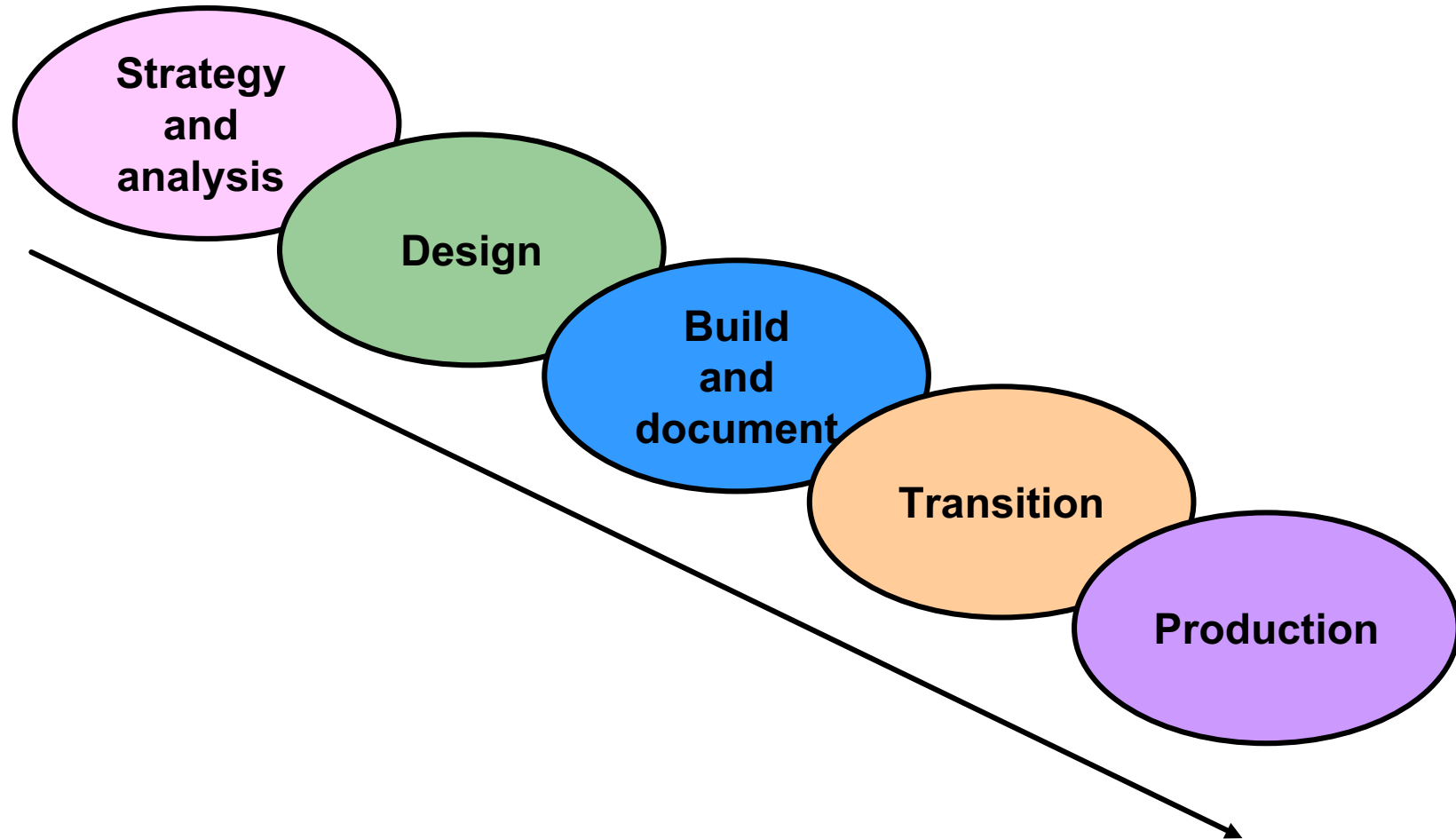
# Relational and Object Relational Database Management Systems

- **Relational model and object relational model**
- **User-defined data types and objects**
- **Fully compatible with relational database**
- **Support of multimedia and large objects**
- **High-quality database server features**

# Oracle Internet Platform



# System Development Life Cycle



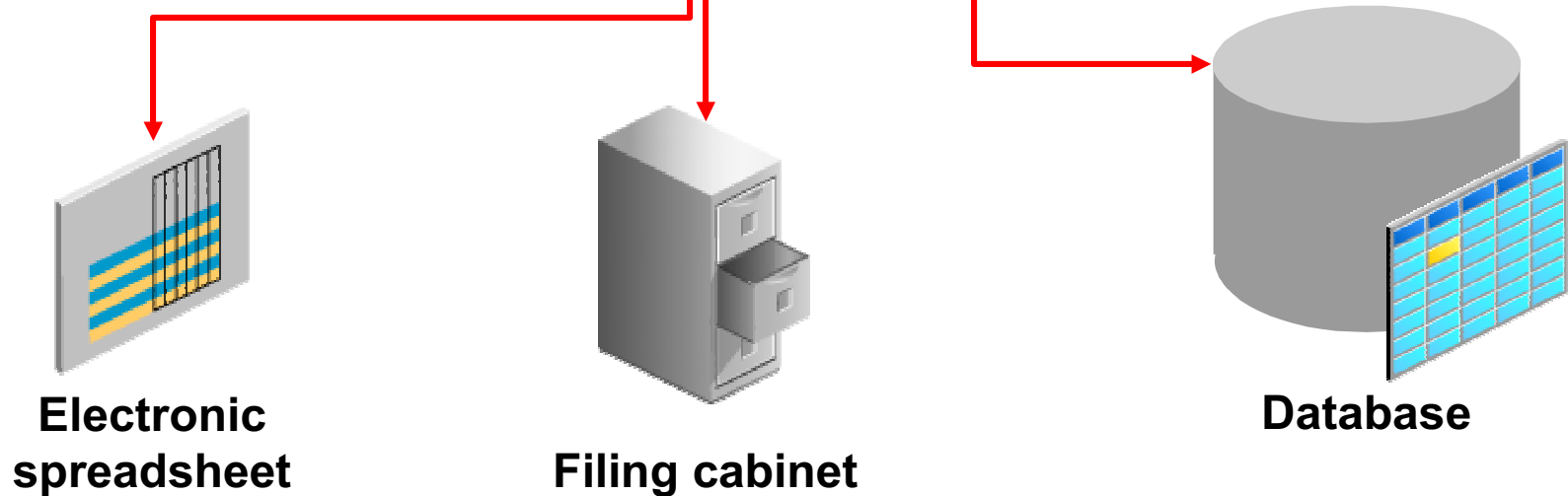
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# Data Storage on Different Media

DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
10	Administration	200	
20	Marketing	201	
50	Shipping	124	
60	IT	103	
80	Sales	149	
90	Executive	100	
110	Accounting	205	
190	Contracting		

GRA	LOWEST_SAL	HIGHEST_SAL
A	1000	2999
B	3000	5999
C	6000	9999
D	10000	14999
E	15000	24999
F	25000	40000

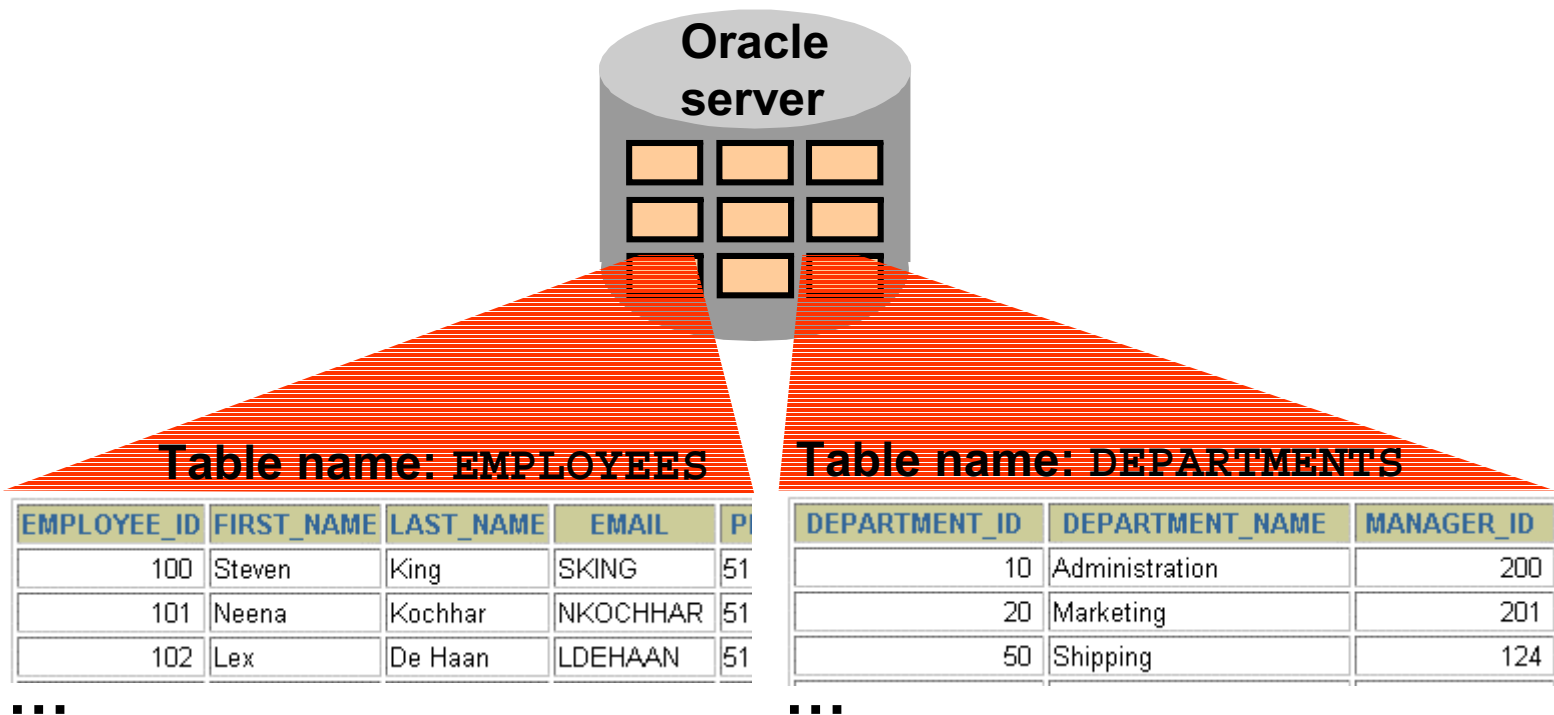


# Relational Database Concept

- **Dr. E. F. Codd proposed the relational model for database systems in 1970.**
- **It is the basis for the relational database management system (RDBMS).**
- **The relational model consists of the following:**
  - **Collection of objects or relations**
  - **Set of operators to act on the relations**
  - **Data integrity for accuracy and consistency**

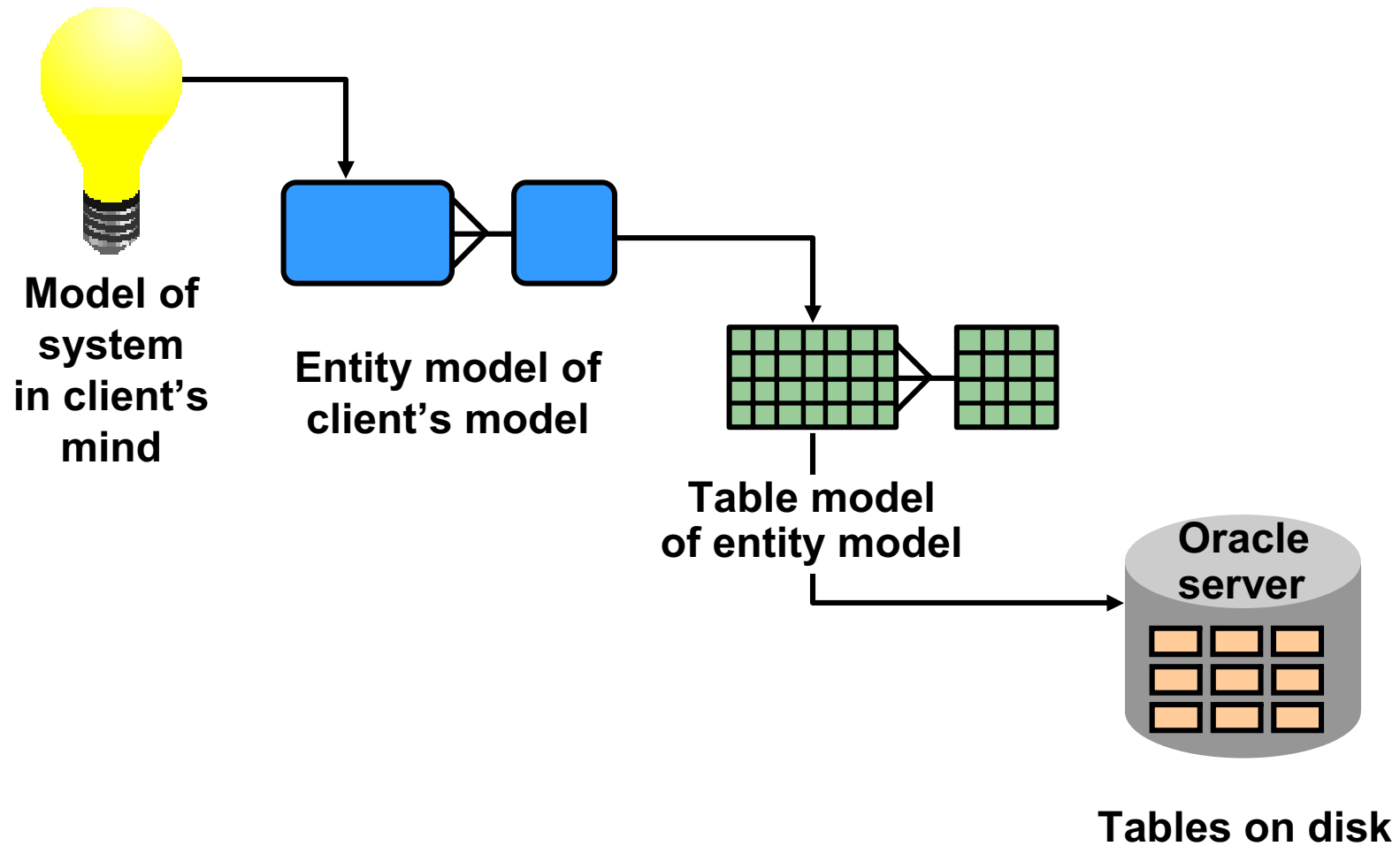
# Definition of a Relational Database

A relational database is a collection of relations or two-dimensional tables.





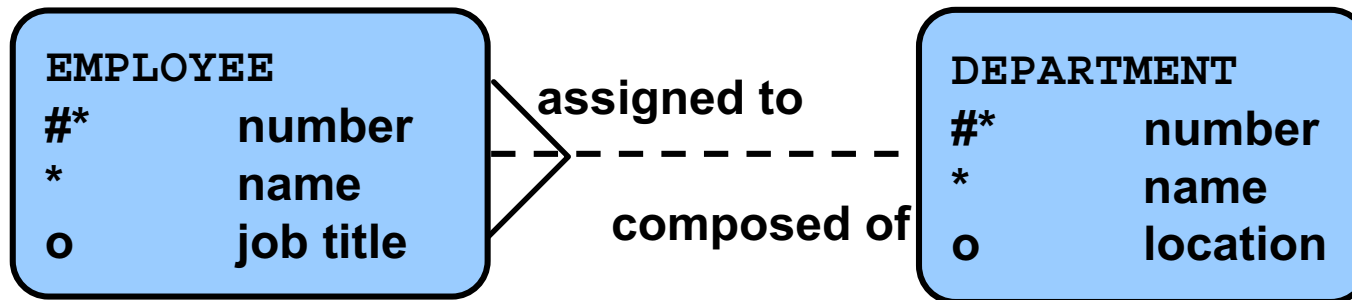
# Data Models



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# Entity Relationship Model

- Create an entity relationship diagram from business specifications or narratives:



- Scenario
  - "... Assign one or more employees to a department ..."
  - "... Some departments do not yet have assigned employees ..."

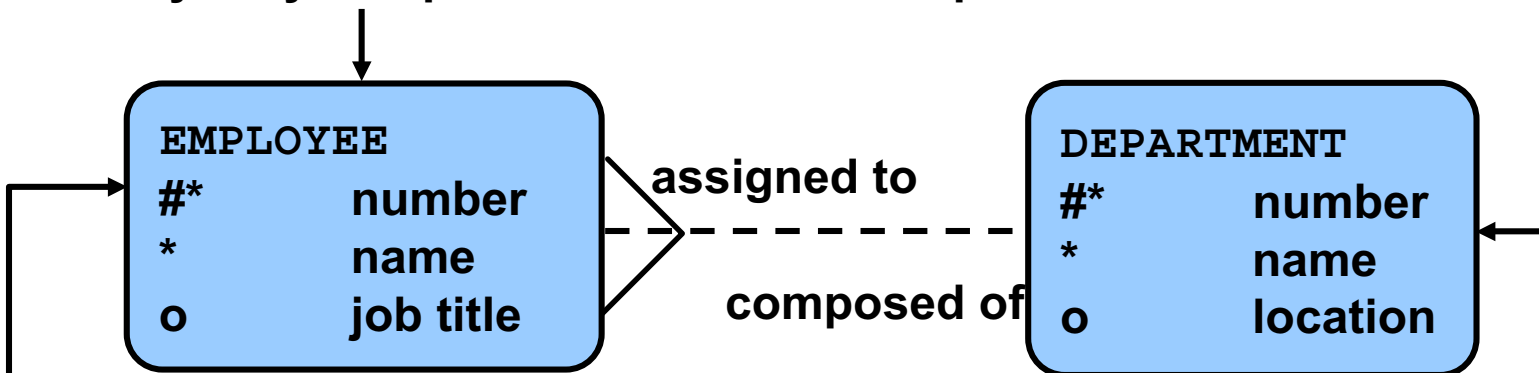
# Entity Relationship Modeling Conventions

## Entity

- Singular, unique name
- Uppercase
- Soft box
- Synonym in parentheses

## Attribute

- Singular name
- Lowercase
- Mandatory marked with \*
- Optional marked with “o”



## Unique identifier (UID)

Primary marked with “#”

Secondary marked with “(#)”

# Relating Multiple Tables

- Each row of data in a table is uniquely identified by a primary key (PK).
- You can logically relate data from multiple tables using foreign keys (FK).

Table name: EMPLOYEES

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	DEPARTMENT_ID
174	Ellen	Abel	80
142	Curtis	Davies	50
102	Lex	De Haan	90
104	Bruce	Ernst	60
202	Pat	Fay	20
206	William	Gietz	110

...

Primary key

Foreign key

Primary key

Table name: DEPARTMENTS

DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
10	Administration	200	1700
20	Marketing	201	1800
50	Shipping	124	1500
60	IT	103	1400
80	Sales	149	2500
90	Executive	100	1700
110	Accounting	205	1700
190	Contracting		1700

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# Relational Database Terminology

EMPLOYEE_ID	LAST_NAME	FIRST_NAME	SALARY	COMMISSION_PCT	DEPARTMENT_ID
100	King	Steven	24000		90
101	Kochhar	Neena	17000		90
102	De Haan	Lex	17000		90
103	Hunold	Alexander	9000		60
104	Ernst	Bruce	6000		60
107	Lorentz	Diana	4200		60
124	Mourgos	Kevin	5800		50
141	Rajs	Trenna	3500		50
142	Davies	Curtis	3100		50
143	Matos	Randall	2600		50
144	Vargas	Peter	2500		50
149	Zlotkey	Eleni	10500	.2	80
174	Abel	Ellen	11000	.3	80
176	Taylor	Jonathon	8600	.2	80
178	Grant	Kimberely	7000	.15	
200	Whalen	Jennifer	4400		10
201	Hartstein	Michael	13000		20
202	Fay	Pat	6000		20
205	Higgins	Shelley	12000		110
206	Gietz	William	8300		110

# Relational Database Properties

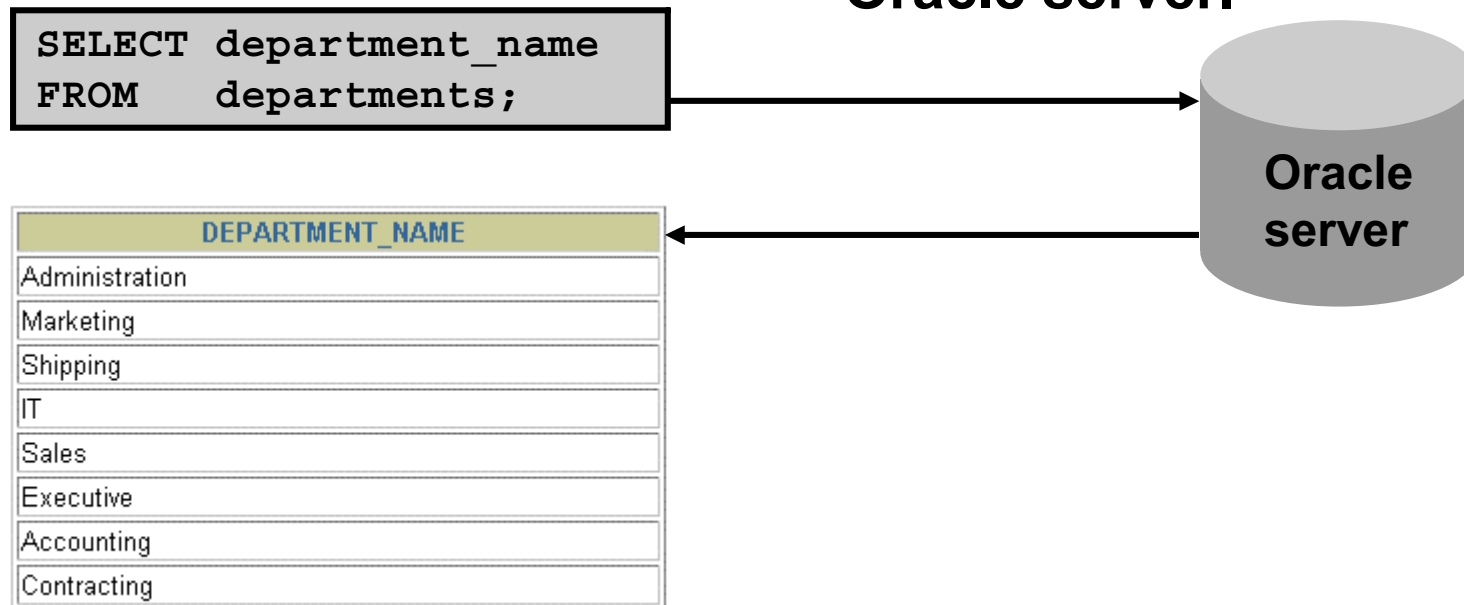
## A relational database:

- **Can be accessed and modified by executing structured query language (SQL) statements**
- **Contains a collection of tables with no physical pointers**
- **Uses a set of operators**

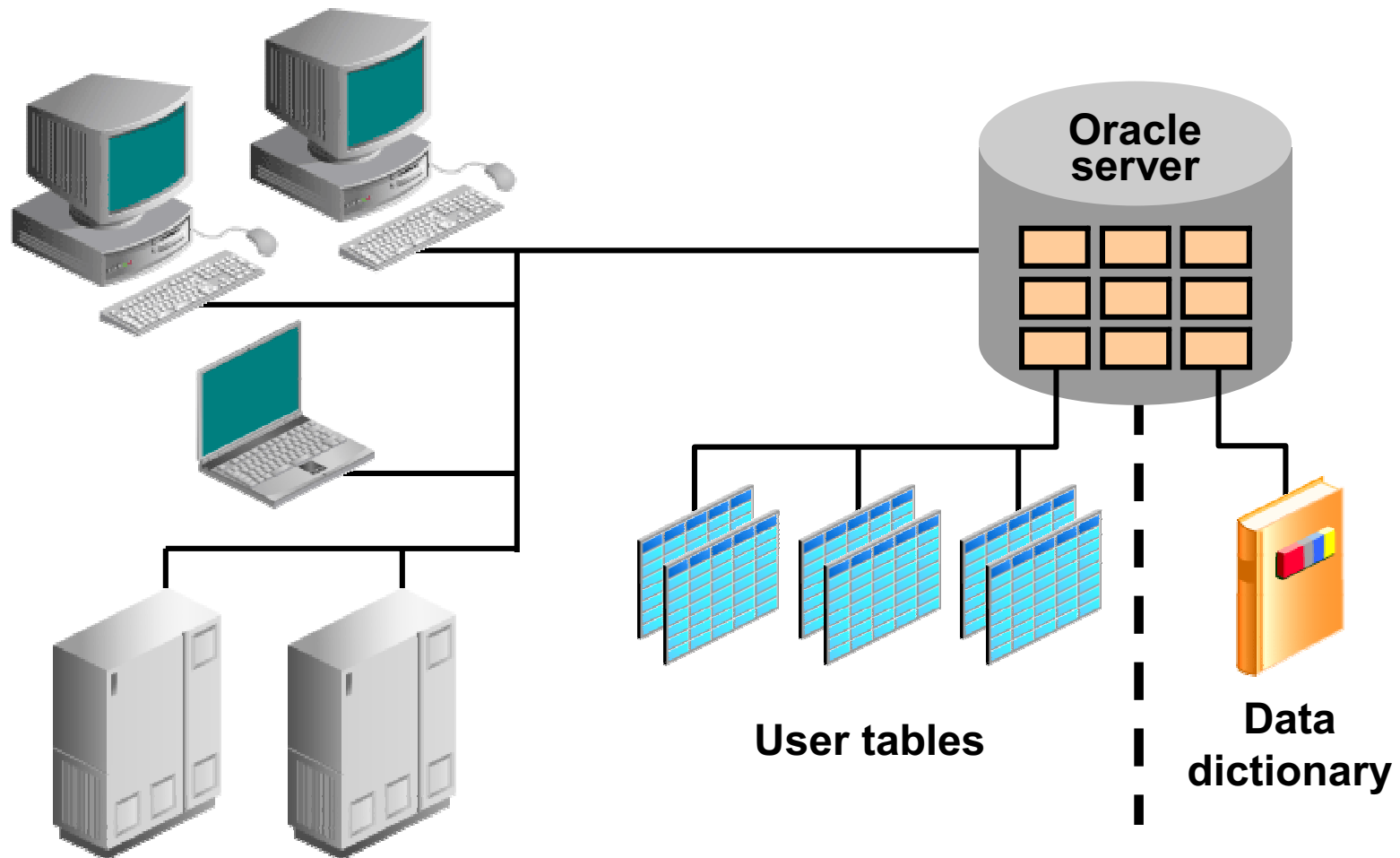
# Communicating with an RDBMS Using SQL

SQL statement is entered.

Statement is sent to  
Oracle server.



# Oracle's Relational Database Management System



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# SQL Statements

**SELECT**  
**INSERT**  
**UPDATE**  
**DELETE**  
**MERGE**

**Data manipulation language (DML)**

**CREATE**  
**ALTER**  
**DROP**  
**RENAME**  
**TRUNCATE**  
**COMMENT**

**Data definition language (DDL)**

**GRANT**  
**REVOKE**

**Data control language (DCL)**

**COMMIT**  
**ROLLBACK**  
**SAVEPOINT**

**Transaction control**

# Tables Used in the Course

## EMPLOYEES

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALA
100	Steven	King	SKING	515.123.4567	17-JUN-87	AD_PRES	240
101	Neena	Kochhar	NKOCHHAR	515.123.4568	21-SEP-89	AD_VP	170
102	Lex	De Haan	LDEHAAN	515.123.4569	13-JAN-93	AD_VP	170
103	Alexander	Hunold	AHUNOLD	590.423.4567	03-JAN-90	IT_PROG	90
104	Bruce	Ernst	BERNST	590.423.4568	21-MAY-91	IT_PROG	60
107	Diana	Lorentz	DLORENTZ	590.423.5567	07-FEB-99	IT_PROG	42
124	Kevin	Mourgos	KMOURGOS	650.123.5234	16-NOV-99	ST_MAN	58
141	Trenna	Rajs	TRAJS	650.121.8009	17-OCT-95	ST_CLERK	35
142	Curtis	Davies	CDAVIES	650.121.2994	29-JAN-97	ST_CLERK	31

DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
10	Administration	200	1700
20	Marketing	201	1800
50	Shipping	124	1500
60	IT	103	1400
80	Sales	149	2500
90	Executive	100	1700
110	Accounting	205	1700
190	Contracting		1700

1.2874	15-MAR-98	ST_CLERK	26
1.2004	09-JUL-98	ST_CLERK	25
1.24440000	20-JAN-99	SA_MAN	400

GRA	LOWEST_SAL	HIGHEST_SAL
A	1000	2999
B	3000	5999
C	6000	9999
D	10000	14999
E	15000	24999
F	25000	40000

## DEPARTMENTS

## JOB\_GRADES

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# Summary

- **Oracle Database 10g is the database for grid computing.**
- **The database is based on the object relational database management system.**
- **Relational databases are composed of relations, managed by relational operations, and governed by data integrity constraints.**
- **With the Oracle server, you can store and manage information by using the SQL language and PL/SQL engine.**

# Retrieving Data Using the SQL `SELECT` Statement

# Objectives

**After completing this lesson, you should be able to do the following:**

- **List the capabilities of SQL `SELECT` statements**
- **Execute a basic `SELECT` statement**
- **Differentiate between SQL statements and `iSQL*Plus` commands**

# Capabilities of SQL `SELECT` Statements

## Projection


Table 1

## Selection


Table 1


Table 1

Join




Table 2

# Basic SELECT Statement

```
SELECT * | { [DISTINCT] column | expression [alias], ... }  
FROM      table;
```

- **SELECT** identifies the columns to be displayed
- **FROM** identifies the table containing those columns

# Selecting All Columns

```
SELECT *  
FROM departments;
```

DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
10	Administration	200	1700
20	Marketing	201	1800
50	Shipping	124	1500
60	IT	103	1400
80	Sales	149	2500
90	Executive	100	1700
110	Accounting	205	1700
190	Contracting		1700

8 rows selected.



# Selecting Specific Columns

```
SELECT department_id, location_id  
FROM departments;
```

DEPARTMENT_ID	LOCATION_ID
10	1700
20	1800
50	1500
60	1400
80	2500
90	1700
110	1700
190	1700

8 rows selected.

# Writing SQL Statements

- **SQL statements are not case-sensitive.**
- **SQL statements can be on one or more lines.**
- **Keywords cannot be abbreviated or split across lines.**
- **Clauses are usually placed on separate lines.**
- **Indents are used to enhance readability.**
- **In *iSQL\*Plus*, SQL statements can optionally be terminated by a semicolon (;). Semicolons are required if you execute multiple SQL statements.**
- **In *SQL\*plus*, you are required to end each SQL statement with a semicolon (;).**

# Column Heading Defaults

- ***i*SQL\*Plus:**
  - Default heading alignment: Center
  - Default heading display: Uppercase
- **SQL\*Plus:**
  - Character and Date column headings are left-aligned
  - Number column headings are right-aligned
  - Default heading display: Uppercase

# Arithmetic Expressions

Create expressions with number and date data by using arithmetic operators.

Operator	Description
+	Add
-	Subtract
*	Multiply
/	Divide

# Using Arithmetic Operators

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

LAST_NAME	SALARY	SALARY+300
King	24000	24300
Kochhar	17000	17300
De Haan	17000	17300
Hunold	9000	9300
Ernst	6000	6300

■■■  
20 rows selected.

# Operator Precedence

```
SELECT last_name, salary, 12*salary+100
FROM employees;
```

1

LAST_NAME	SALARY	12*SALARY+100
King	24000	288100
Kochhar	17000	204100
De Haan	17000	204100

20 rows selected.

```
SELECT last_name, salary, 12*(salary+100)
FROM employees;
```

2

LAST_NAME	SALARY	12*(SALARY+100)
King	24000	289200
Kochhar	17000	205200
De Haan	17000	205200

20 rows selected.

# Defining a Null Value

- A null is a value that is unavailable, unassigned, unknown, or inapplicable.
- A null is not the same as a zero or a blank space.

```
SELECT last_name, job_id, salary, commission_pct  
FROM employees;
```

LAST_NAME	JOB_ID	SALARY	COMMISSION_PCT
King	AD_PRES	24000	
Kochhar	AD_VP	17000	
...			
Zlotkey	SA_MAN	10500	.2
Abel	SA_REP	11000	.3
Taylor	SA_REP	8600	.2
...			
Gietz	AC_ACCOUNT	8300	

20 rows selected.

# Null Values in Arithmetic Expressions

Arithmetic expressions containing a null value evaluate to null.

```
SELECT last_name, 12*salary*commission_pct  
FROM employees;
```

LAST_NAME	12*SALARY*COMMISSION_PCT
King	
Kochhar	
...	
Zlotkey	25200
Abel	39600
Taylor	20640
...	
Gietz	

20 rows selected.



# Defining a Column Alias

**A column alias:**

- **Renames a column heading**
- **Is useful with calculations**
- **Immediately follows the column name (There can also be the optional `AS` keyword between the column name and alias.)**
- **Requires double quotation marks if it contains spaces or special characters or if it is case-sensitive**

# Using Column Aliases

```
SELECT last_name AS name, commission_pct comm  
FROM employees;
```

NAME	COMM
King	
Kochhar	
De Haan	

...

20 rows selected.

```
SELECT last_name "Name" , salary*12 "Annual Salary"  
FROM employees;
```

Name	Annual Salary
King	288000
Kochhar	204000
De Haan	204000

...

20 rows selected.

# Concatenation Operator

A concatenation operator:

- Links columns or character strings to other columns
- Is represented by two vertical bars (||)
- Creates a resultant column that is a character expression

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

Employees
KingAD_PRES
KochharAD_VP
De HaanAD_VP

•••

20 rows selected.

# Literal Character Strings

- **A literal is a character, a number, or a date that is included in the `SELECT` statement.**
- **Date and character literal values must be enclosed by single quotation marks.**
- **Each character string is output once for each row returned.**

# Using Literal Character Strings

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

Employee Details
King is a AD_PRES
Kochhar is a AD_VP
De Haan is a AD_VP
Hunold is a IT_PROG
Ernst is a IT_PROG
Lorentz is a IT_PROG
Mourgos is a ST_MAN
Rajs is a ST_CLERK

...

20 rows selected.

# Alternative Quote (q) Operator

- Specify your own quotation mark delimiter
- Choose any delimiter
- Increase readability and usability

```
SELECT department name ||  
       q'[, it's assigned Manager Id: ]'  
       || manager_id  
       AS "Department and Manager"  
FROM departments;
```

## Department and Manager

Administration, it's assigned manager ID: 200

Marketing, it's assigned manager ID: 201

Shipping, it's assigned manager ID: 124

...

8 rows selected.

# Duplicate Rows

The default display of queries is all rows, including duplicate rows.

```
SELECT department_id  
FROM employees;
```

1

DEPARTMENT_ID
90
90
90

...

20 rows selected.

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

2

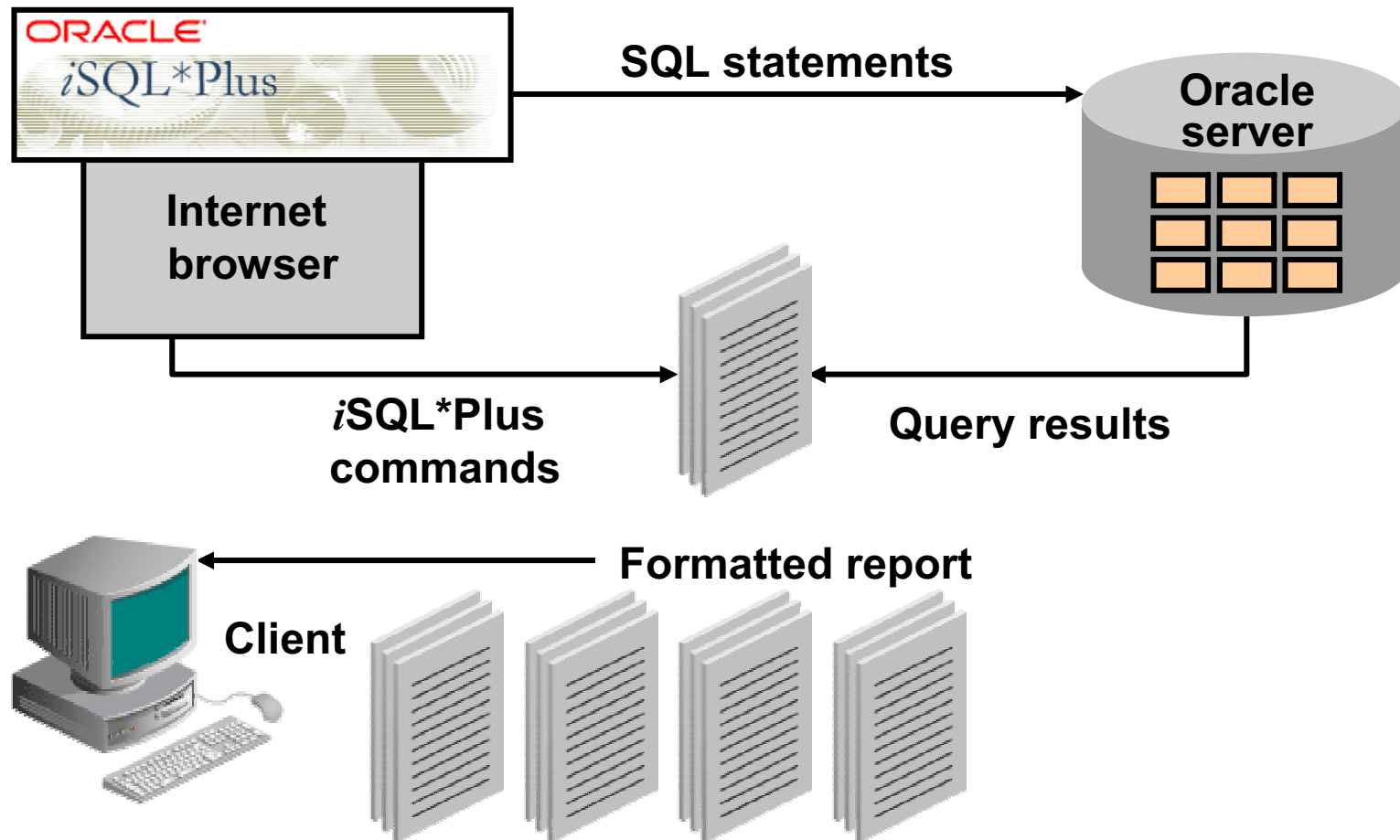
DEPARTMENT_ID
10
20
50

...

8 rows selected.

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# SQL and *iSQL\*Plus* Interaction





# SQL Statements Versus *i*SQL\*Plus Commands

## SQL

- A language
- ANSI standard
- Keyword cannot be abbreviated
- Statements manipulate data and table definitions in the database

SQL  
statements

## *i*SQL\*Plus

- An environment
- Oracle-proprietary
- Keywords can be abbreviated
- Commands do not allow manipulation of values in the database
- Runs on a browser
- Centrally loaded; does not have to be implemented on each machine

*i*SQL\*Plus  
commands

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# Overview of *iSQL\*Plus*

After you log in to *iSQL\*Plus*, you can:

- Describe table structures
- Enter, execute, and edit SQL statements
- Save or append SQL statements to files
- Execute or edit statements that are stored in saved script files

# Logging In to *i*SQL\*Plus

From your browser environment:

Address <http://esslin05:5560/isqlplus/> Go

Links [Class Accounts!](#) [Classroom Support Links](#) [Global Education](#) [Oracle Online Evaluations](#)

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*i*SQL\*Plus [Help](#)

---

### Login

\* Indicates required field

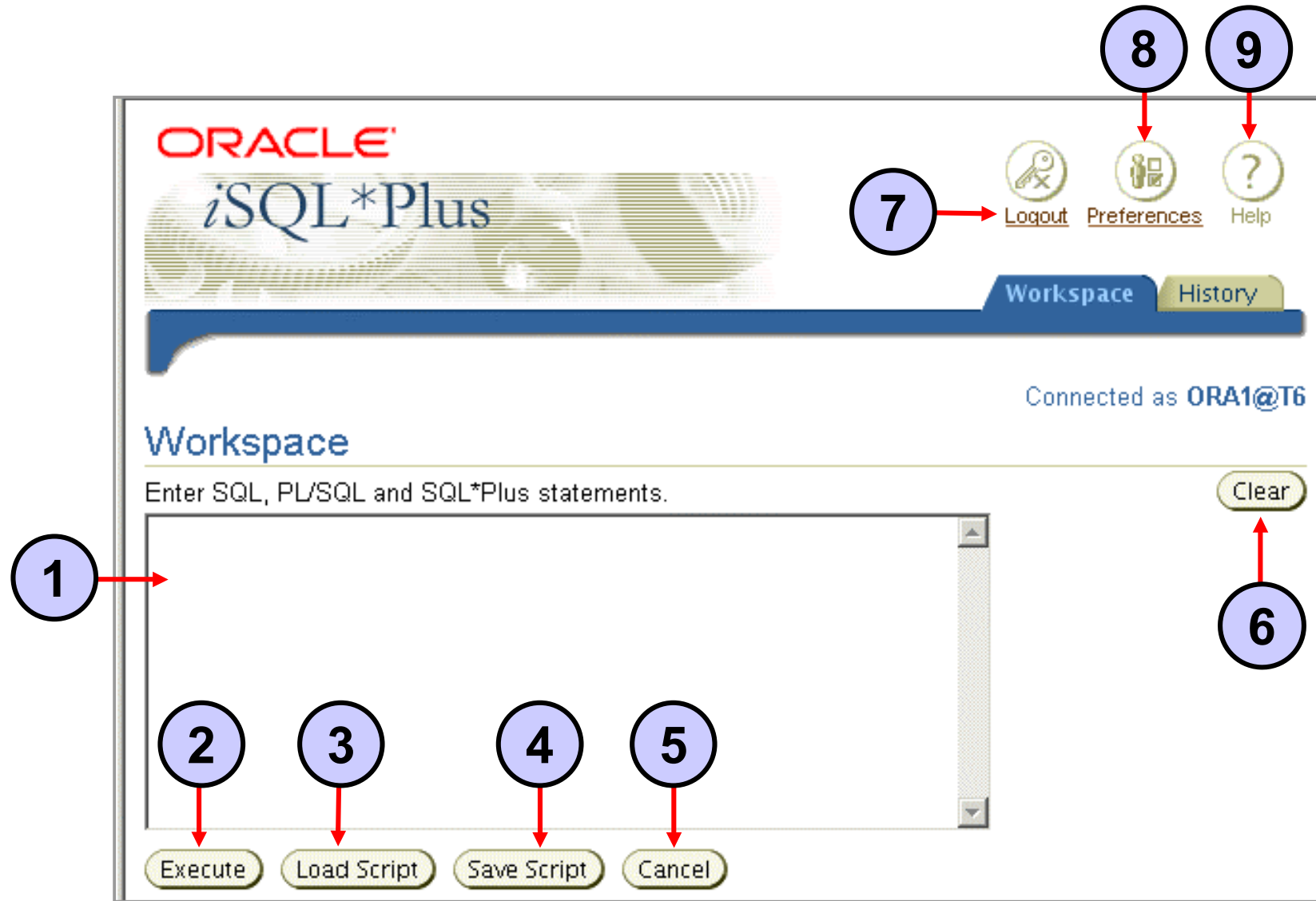
\* Username

\* Password

Connect Identifier

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# iSQL\*Plus Environment



# Displaying Table Structure

Use the *iSQL\*Plus* DESCRIBE command to display the structure of a table:

```
DESC [RIBE] tablename
```

# Displaying Table Structure

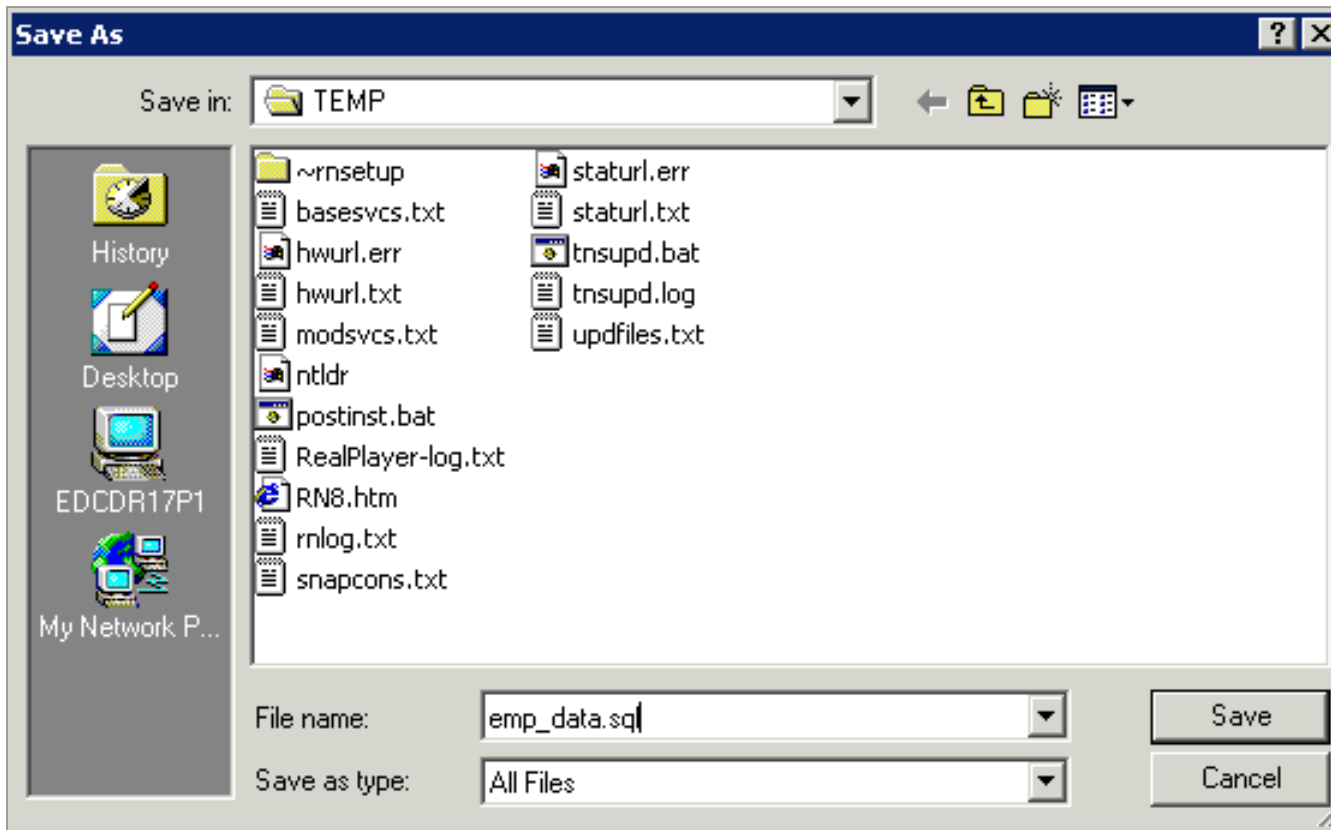
```
DESCRIBE employees
```

Name	Null?	Type
EMPLOYEE_ID	NOT NULL	NUMBER(6)
FIRST_NAME		VARCHAR2(20)
LAST_NAME	NOT NULL	VARCHAR2(25)
EMAIL	NOT NULL	VARCHAR2(25)
PHONE_NUMBER		VARCHAR2(20)
HIRE_DATE	NOT NULL	DATE
JOB_ID	NOT NULL	VARCHAR2(10)
SALARY		NUMBER(8,2)
COMMISSION_PCT		NUMBER(2,2)
MANAGER_ID		NUMBER(6)
DEPARTMENT_ID		NUMBER(4)

# Interacting with Script Files

The screenshot displays the Oracle iSQL\*Plus workspace interface. At the top left, the Oracle logo and 'iSQL\*Plus' text are visible. On the top right, there are icons for Logout, Preferences, and Help. Below these are tabs for 'Workspace' and 'History'. The user is connected as 'ORA1@T6'. The main workspace area contains a text input field with the SQL statement: `SELECT last_name, hire_date, salary FROM employees;`. A red arrow labeled '1' points to the end of the SQL statement. Below the text field, a red arrow labeled '2' points to the 'Save Script' button. At the bottom of the workspace, there are buttons for 'Execute', 'Load Script', 'Save Script', and 'Cancel'. A 'Clear' button is located in the top right corner of the workspace area.

# Interacting with Script Files





# Interacting with Script Files

The screenshot displays the Oracle iSQL\*Plus web interface. At the top left, the Oracle logo and 'iSQL\*Plus' text are visible. On the top right, there are icons for Logout, Preferences, and Help. Below these, there are tabs for 'Workspace' and 'History'. The main area is titled 'Workspace' and contains a text input field with the prompt 'Enter SQL, PL/SQL and SQL\*Plus statements.' and a 'Clear' button. Below the input field, there are four buttons: 'Execute', 'Load Script', 'Save Script', and 'Cancel'. A red arrow points from a blue circle containing the number '1' to the 'Load Script' button.

# Interacting with Script Files

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iSQL\*Plus

Logout Preferences Help

Workspace History

Connected as **ORA1@T6**

### Load Script

Enter a URL, or a path and file name of the script to load. Cancel Load

URL

File  Browse...

Cancel Load

**2** [Workspace](#) | [History](#) | [Logout](#) | [Preferences](#) | [Help](#)

**3**

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# iSQL\*Plus History Page

Workspace History **3**

Connected as ORA1@T6

## History

The scripts listed are for the current session. Script history is not available for previous sessions.

Select scripts and ... Delete Load **2**

Select All | Select None

Select	Script
<input type="checkbox"/>	SELECT DISTINCT department_id FROM employees;
<input type="checkbox"/>	SELECT department_id FROM employees;
<input type="checkbox"/>	SELECT department_name    ', '    q'X it's assigned manager ID: X'    manager
<input type="checkbox"/>	SELECT last_name    ' is a '    job_id AS "Employee Details" FROM employees;
<input type="checkbox"/>	SELECT last_name    job_id AS "Employees" FROM employees;
<input checked="" type="checkbox"/>	SELECT last_name "Name", 12 * salary "Annual Salary" FROM employees;
<input type="checkbox"/>	SELECT last_name AS name, commission_pct AS comm FROM employees;
<input checked="" type="checkbox"/>	SELECT last_name, 12 * salary * commission_pct FROM employees;
<input type="checkbox"/>	SELECT last_name, job_id, salary, commission_pct FROM employees;
<input type="checkbox"/>	SELECT last_name, salary, 12 * (salary + 100) FROM employees;

**1**

# iSQL\*Plus History Page

**ORACLE**  
*iSQL\*Plus*

Logout Preferences Help

**3** → Workspace History

Connected as **ORA1@T6**

### Workspace

Enter SQL, PL/SQL and SQL\*Plus statements. Clear

```
SELECT last_name, 12 * salary * commission_pct  
FROM employees;  
SELECT last_name "Name", 12 * salary "Annual Salary"  
FROM employees;
```

**4** ↓

Execute Load Script Save Script Cancel

# Setting iSQL\*Plus Preferences

**ORACLE**  
*iSQL\*Plus*

Logout Preferences Help

Workspace History

**1**

**2**

**3**

## Interface Configuration

Configure settings that affect the iSQL\*Plus user interface.

Cancel Apply

### History Size

Set the number of scripts displayed in the script history.

Scripts

### Input Area Size

Set the size of the script input area.

Width

Height

### Output Location

- **Interface Configuration**
- System Configuration
  - [Script Formatting](#)
  - [Script Execution](#)
  - [Database Administration](#)
- [Change Password](#)

# Setting the Output Location Preference

**Interface Configuration**

Configure settings that affect the iSQL\*Plus user interface. Cancel Apply

**History Size**

Set the number of scripts displayed in the script history.  
Scripts

**Input Area Size**

Set the size of the script input area.  
Width   
Height

**Output Location**

Set where script output is displayed.

- Below Input Area
- Save to HTML File
- Printable output in new browser window
- Printable output in same browser window

1

2

# Summary

In this lesson, you should have learned how to:

- **Write a `SELECT` statement that:**
  - Returns all rows and columns from a table
  - Returns specified columns from a table
  - Uses column aliases to display more descriptive column headings
- **Use the `iSQL*Plus` environment to write, save, and execute SQL statements and `iSQL*Plus` commands**

```
SELECT * | { [DISTINCT] column/expression [alias], ... }  
FROM table;
```

# Practice 1: Overview

**This practice covers the following topics:**

- **Selecting all data from different tables**
- **Describing the structure of tables**
- **Performing arithmetic calculations and specifying column names**
- **Using *iSQL\*Plus***