COMP 3311
Database Management Systems

Lab 2

Oracle Database, SQL*Plus and SQL Developer

Lab Topics

- What is Oracle Database.

- What is SQL*Plus.

- What is an SQL*Plus script file.

- How to connect to Oracle Database using Oracle SQL Developer.

- How to create and execute SQL*Plus script files in Oracle SQL Developer.

- How to create, modify and list the contents of an Oracle Database table.

Why Oracle Database?

- ☐ Oracle Database is one of the most widely used commercial DBMSs – you are likely to use it at some point in the future.

- ☐ Other relational DBMSs are very similar to Oracle Database.

- ☐ You should be able to program with any other relational DBMS if you are familiar with Oracle Database.

Oracle Database

☐ The first commercially available relational DBMS.

☐ The CSE labs provide Oracle Database 19c.

Earlier versions can also be used for the course.

☐ You can download the free Oracle Database Express Edition (XE) to install on your own computer from

https://www.oracle.com/database/technologies/xe-downloads.html

■ Requires registration/login; only Windows, Linux available.
(Sorry Mac users; you should complain to Oracle.)

The Oracle Client/Server Model (1)

The database resides on a server and is managed by Oracle Database.

Clients access a database through various interfaces.
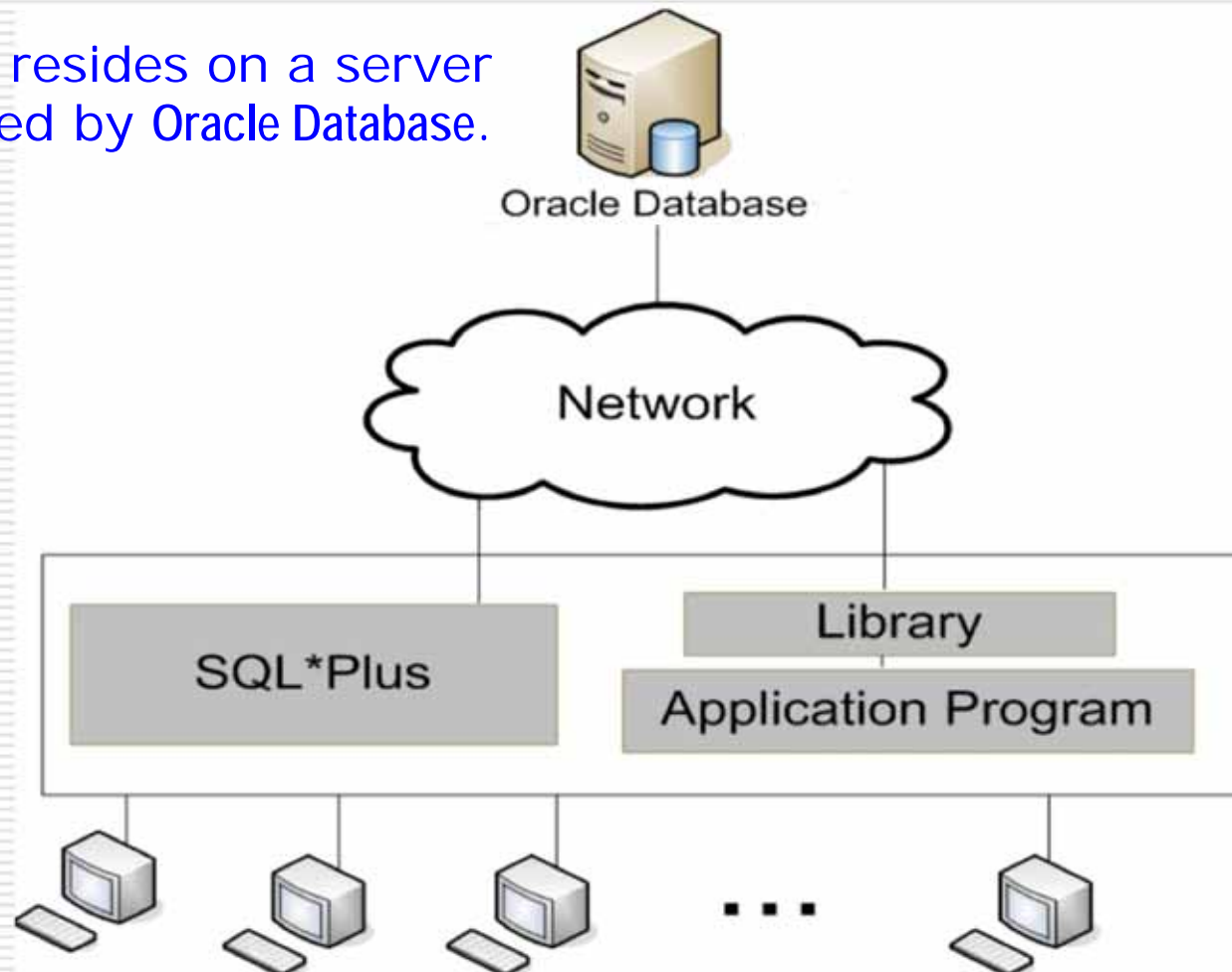
The Oracle Client/Server Model (2)

☐ The Oracle client accepts SQL statements or commands from users and sends them to the Oracle Database server over a network.

☐ The Oracle Database server executes the queries and returns the results to the client, which then delivers the results to the user.

☐ The Oracle Database server for this course is dbsvr1.cse.ust.hk.

The Oracle Database server can be accessed directly only from the computers in Lab 4 (room 4210). From other computers, including other CSE labs, it needs to be accessed using the HKUST VPN (see http://itsc.ust.hk/apps/vpn/ for how to connect to the HKUST VPN).

SQL*Plus

□ SQL*Plus is an interactive and batch query tool that enables SQL, PL/SQL, SQL*Plus and operating system commands to be executed.

□ SQL*Plus allows users to:

- format, perform calculations on, store, and print query results;

- examine table and object definitions;

- develop and run batch scripts;

- perform database administration.

SQL*Plus Client
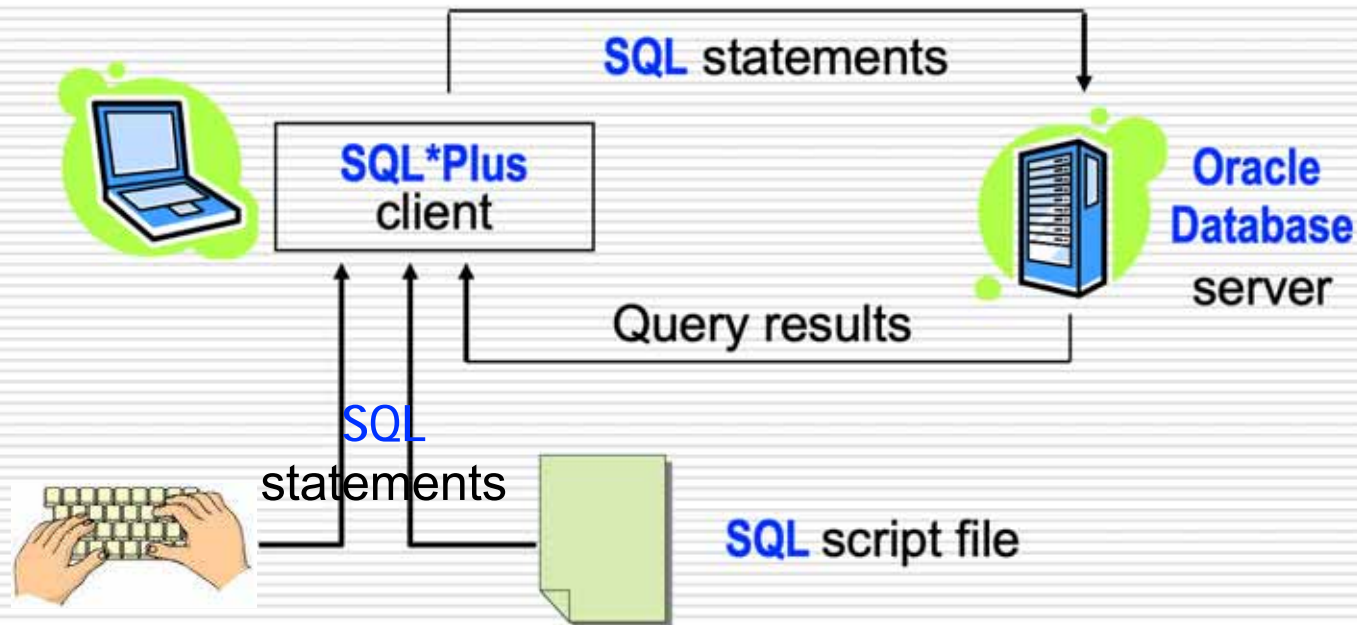
☐ The SQL*Plus client can be run from SQL Developer or from an OS command line.

Oracle SQL Developer

- ☐ Oracle SQL Developer provides a desktop-like interface to SQL*Plus client that allows users to:
    - ■ browse, create, edit, and delete tables;
    - ■ run SQL statements and scripts;
    - ■ edit and debug PL/SQL code;
    - ■ manipulate and export data;
    - ■ view and create reports.

- ☐ **Reminder:** Download Oracle SQL Developer from

    https://www.oracle.com/tools/downloads/sqldev-downloads.html

    - ■ Requires registration/login; Windows, Mac, Linux available. Latest version is 19.4 (requires JDK 8 or 11).

Connecting To Oracle Database Using Oracle SQL Developer (1)

1. Run the program "sqldeveloper".

   In Lab 4, search for the app "sql" and double click it.

Oracle SQL Developer opens in the Start Page shown above.

Connecting To Oracle Database Using Oracle SQL Developer (2)

2. Select the green "+" symbol in the Connections navigator (left-side) pane.

New
Connection
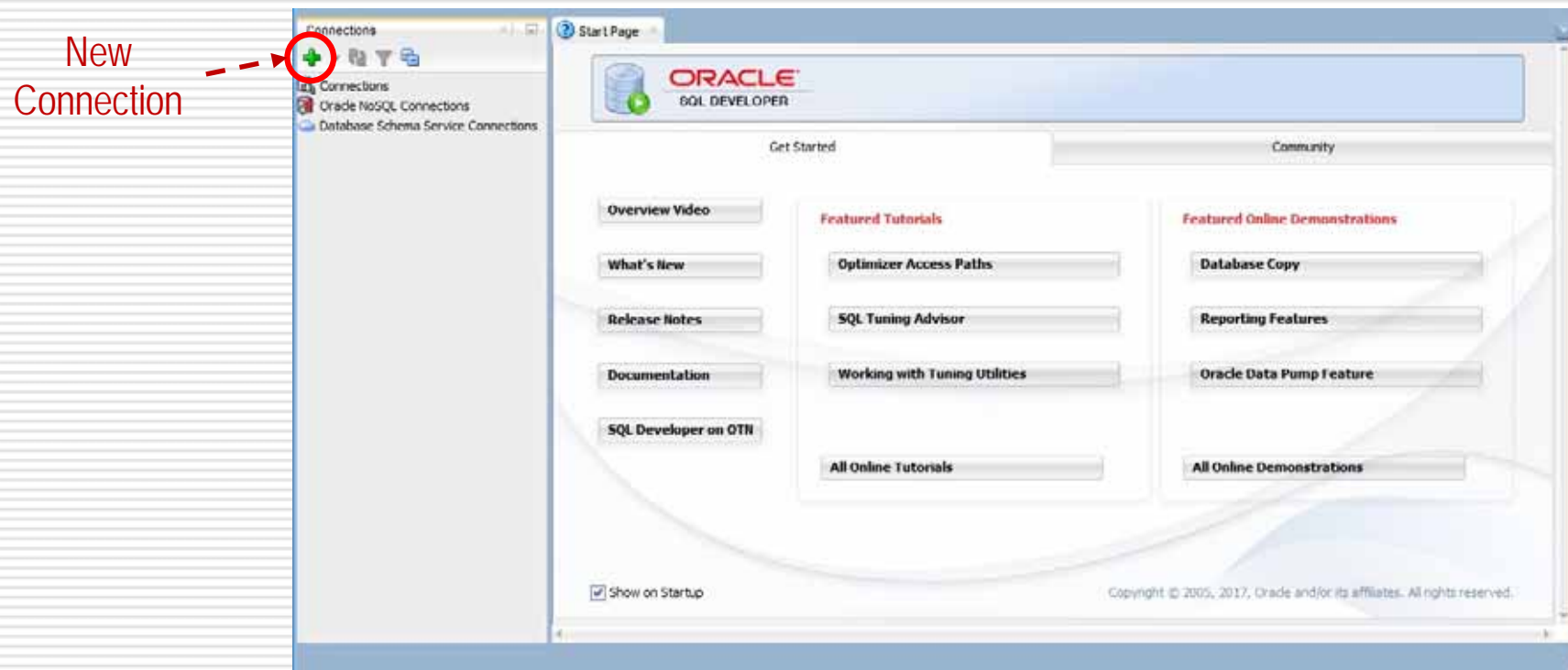
The New / Select Database Connection dialog appears as shown on the next slide.

Connecting To Oracle Database Using Oracle SQL Developer (3)

3. Enter the information outlined below in red using your Oracle username and password for the Username and Password fields, respectively.

Connecting To Oracle Database Using Oracle SQL Developer (4)

4. Select the Test button to check that the information entered is correct.

   You should see the message Status: Success in the Status field near the lower left of the New / Select Database Connection dialog just above the Help button. Correct any errors.

5. Select the Save button to save the connection information for future use.

6. Select the Connect button.

   You should see a screen similar to that shown on the next slide.

Connecting To Oracle Database Using Oracle SQL Developer (5)

Enter SQL
Statement
box
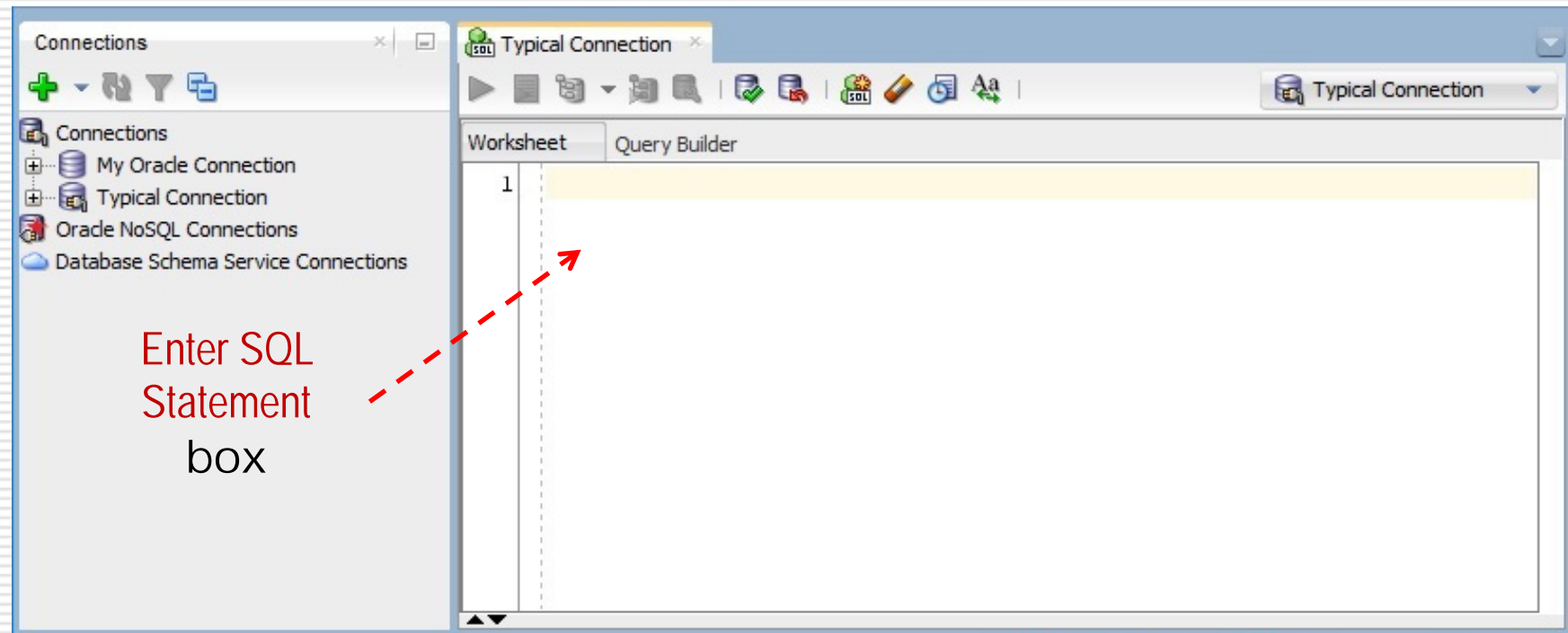
SQL Worksheet

☐ An SQL Worksheet is used to enter and execute SQL, PL/SQL and SQL*Plus statements.

☐ There can be multiple worksheets open for a given connection.

☐ You can create an SQL Worksheet by:

- right-clicking a connection in the Connections navigator and selecting Open SQL Worksheet,

- selecting Tools and then SQL Worksheet, or

- selecting (the SQL Worksheet icon) in the Oracle SQL Developer menu bar.

SQL Worksheet Toolbar

☐ The SQL Worksheet toolbar contains the following buttons (among others).

Run Statement executes a *single statement* at the cursor or *several* selected *statements* in the Enter SQL Statement box.

Run Script executes *all statements* in the Enter SQL Statement box using the Script Runner.

Commit writes any changes to the database, ends the transaction and clears the Query Result and Script Output tabs.

Rollback discards any changes without writing them to the database, ends the transaction and clears the Query Result and Script Output tabs.

Clear erases the statements in the Enter SQL Statement box.

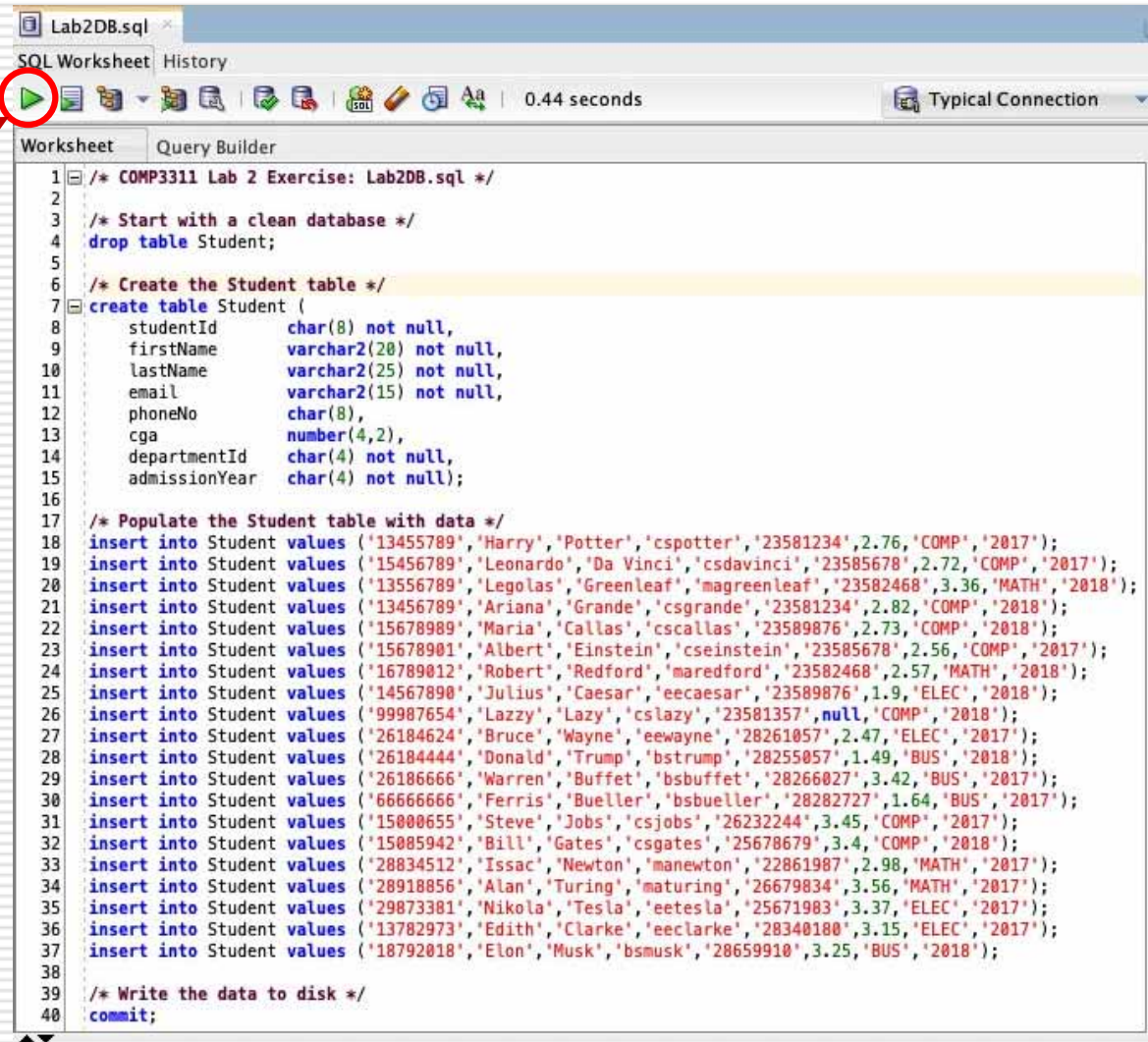# Opening And Executing A Script File

□ To open a script file:

1. select File→Open in the Oracle SQL Developer menu bar or select 📁 (the Open button) in the toolbar;

2. in the Open dialog, navigate to the script file;

3. double-click the script file or select it and select the Open button.

Alternatively, you can drag and drop a script file onto any worksheet in Oracle SQL Developer.

□ To execute (run) a script file, select 📄 (the Run Script button) shown in the example script on the next slide.

Example Script File

Run Script

```
Lab2DB.sql ×
SQL Worksheet  History
▷ 📄 🔁 ▾ 📄 🔍 | 📄 📄 | 🔷 ✏ 📄 Aa |  0.44 seconds                    📇 Typical Connection    ▾
Worksheet    Query Builder
 1  /* COMP3311 Lab 2 Exercise: Lab2DB.sql */
 2
 3  /* Start with a clean database */
 4  drop table Student;
 5
 6  /* Create the Student table */
 7  create table Student (
 8      studentId        char(8) not null,
 9      firstName        varchar2(20) not null,
10      lastName         varchar2(25) not null,
11      email            varchar2(15) not null,
12      phoneNo          char(8),
13      cga              number(4,2),
14      departmentId     char(4) not null,
15      admissionYear    char(4) not null);
16
17  /* Populate the Student table with data */
18  insert into Student values ('13455789','Harry','Potter','cspotter','23581234',2.76,'COMP','2017');
19  insert into Student values ('15456789','Leonardo','Da Vinci','csdavinci','23585678',2.72,'COMP','2017');
20  insert into Student values ('13556789','Legolas','Greenleaf','magreenleaf','23582468',3.36,'MATH','2018');
21  insert into Student values ('13456789','Ariana','Grande','csgrande','23581234',2.82,'COMP','2018');
22  insert into Student values ('15678989','Maria','Callas','cscallas','23589876',2.73,'COMP','2018');
23  insert into Student values ('15678901','Albert','Einstein','cseinstein','23585678',2.56,'COMP','2017');
24  insert into Student values ('16789012','Robert','Redford','maredford','23582468',2.57,'MATH','2018');
25  insert into Student values ('14567890','Julius','Caesar','eecaesar','23589876',1.9,'ELEC','2018');
26  insert into Student values ('99987654','Lazzy','Lazy','cslazy','23581357',null,'COMP','2018');
27  insert into Student values ('26184624','Bruce','Wayne','eewayne','28261057',2.47,'ELEC','2017');
28  insert into Student values ('26184444','Donald','Trump','bstrump','28255057',1.49,'BUS','2018');
29  insert into Student values ('26186666','Warren','Buffet','bsbuffet','28266027',3.42,'BUS','2017');
30  insert into Student values ('66666666','Ferris','Bueller','bsbueller','28282727',1.64,'BUS','2017');
31  insert into Student values ('15000655','Steve','Jobs','csjobs','26232244',3.45,'COMP','2017');
32  insert into Student values ('15085942','Bill','Gates','csgates','25678679',3.4,'COMP','2018');
33  insert into Student values ('28834512','Issac','Newton','manewton','22861987',2.98,'MATH','2017');
34  insert into Student values ('28918856','Alan','Turing','maturing','26679834',3.56,'MATH','2017');
35  insert into Student values ('29873381','Nikola','Tesla','eetesla','25671983',3.37,'ELEC','2017');
36  insert into Student values ('13782973','Edith','Clarke','eeclarke','28340180',3.15,'ELEC','2017');
37  insert into Student values ('18792018','Elon','Musk','bsmusk','28659910',3.25,'BUS','2018');
38
39  /* Write the data to disk */
40  commit;
```

Script Output Tab

□ The Script Output tab displays the result of executing a script file; it's toolbar has the following buttons:

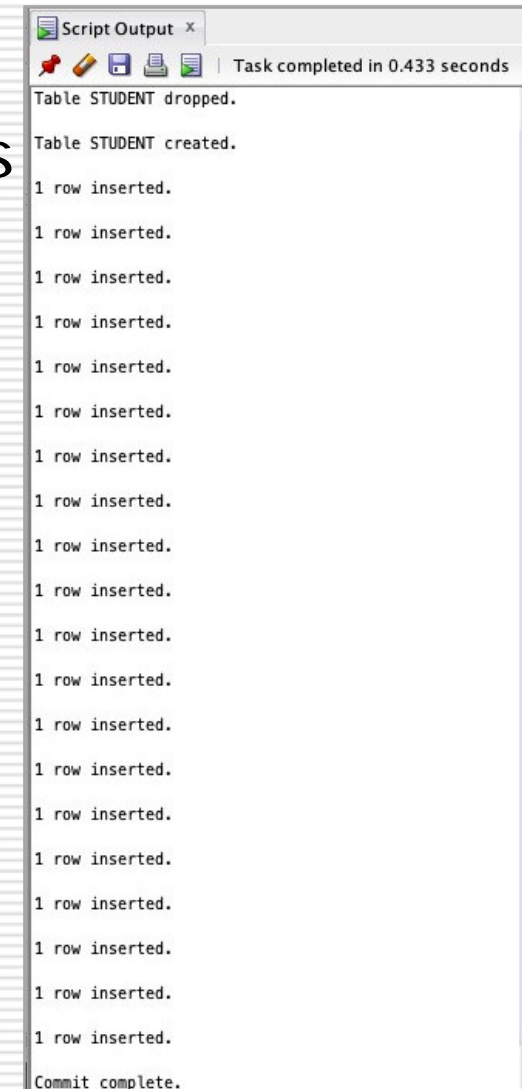Pin keeps the tab's contents in the window when another object is selected in the Connections navigator.

Clear erases the tab's contents.
Note: It is strongly recommended to clear a tab's contents before running a script again.

Save File saves the tab's contents to a file.

Print sends the tab's contents to a printer.

Run Script Output as Script executes the tab's contents as a script file.

Script Output ✕

Task completed in 0.433 seconds

Table STUDENT dropped.

Table STUDENT created.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

1 row inserted.

Commit complete.

Creating A Script File

1. Select *File→New* in the **Oracle SQL Developer** menu bar or select ⊡ (the *New* button) in the toolbar.

2. In the *New Gallery* dialog, select *Database Files* in the *Categories* pane and select the **OK** Button.

3. In the *Create SQL File* dialog, enter a name in the *File Name* text box, navigate to or enter the name of the *Directory* where the script file should be stored and select the **OK** button.
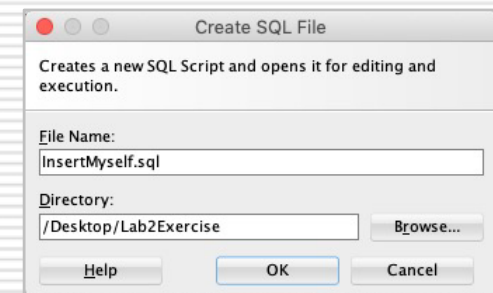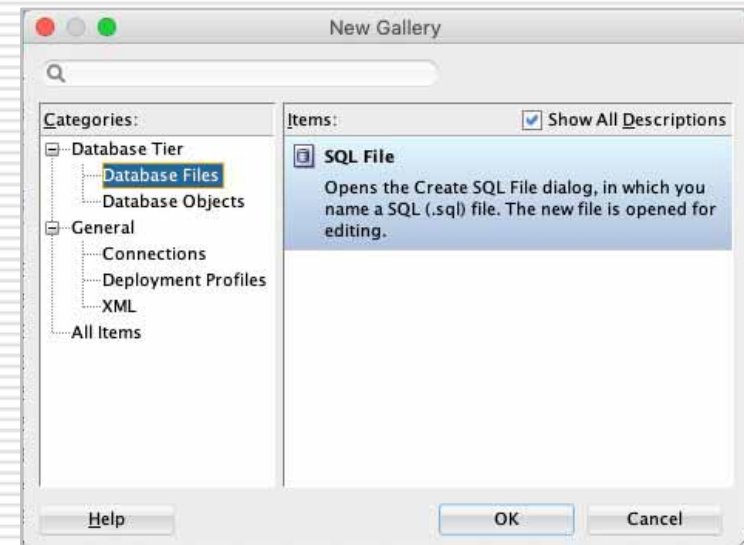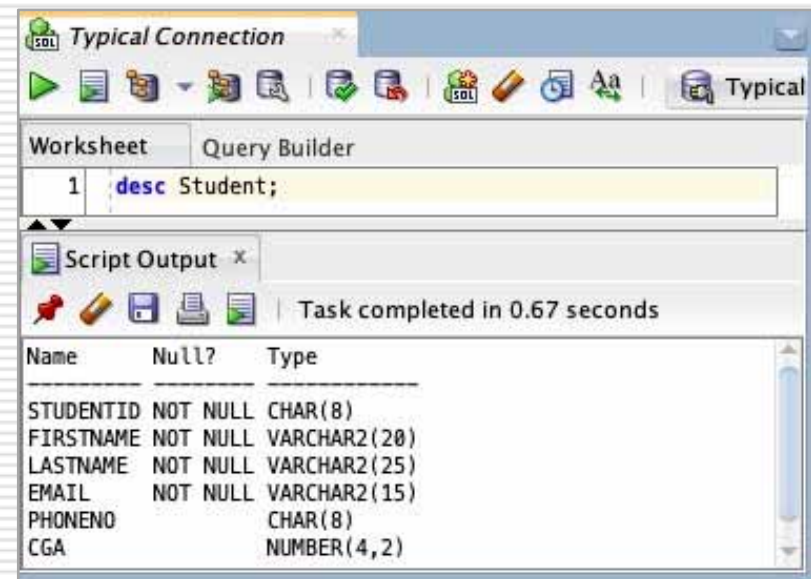
Displaying The Structure Of A Table (1)

SQL command: desc[ribe] *<tablename>*;

☐ Open a new SQL Worksheet and connect to Oracle Database using an available connection.

☐ In the Enter SQL Statement box, type "desc Student;" and select ▷ (the Run Statement button).

☐ The Script Output tab displays the result as shown in the figure.
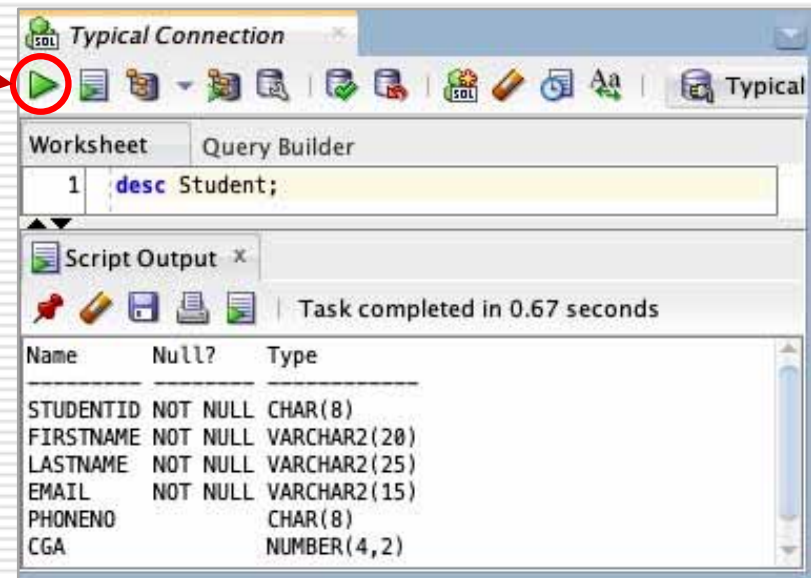
Displaying The Structure Of A Table (2)

□ The Script Output tab shows:

  ■ Name – The name of the attribute.

  ■ Null? – Indicates whether a column must contain data.

  ■ Type – The data type of the column.

    □ CHAR(s) – A character string of fixed length s.

    □ VARCHAR2(s) – A variable length character string of maximum length s.

    □ NUMBER(p, s) – A number with a total of p digits with s digits to the right of the decimal point.
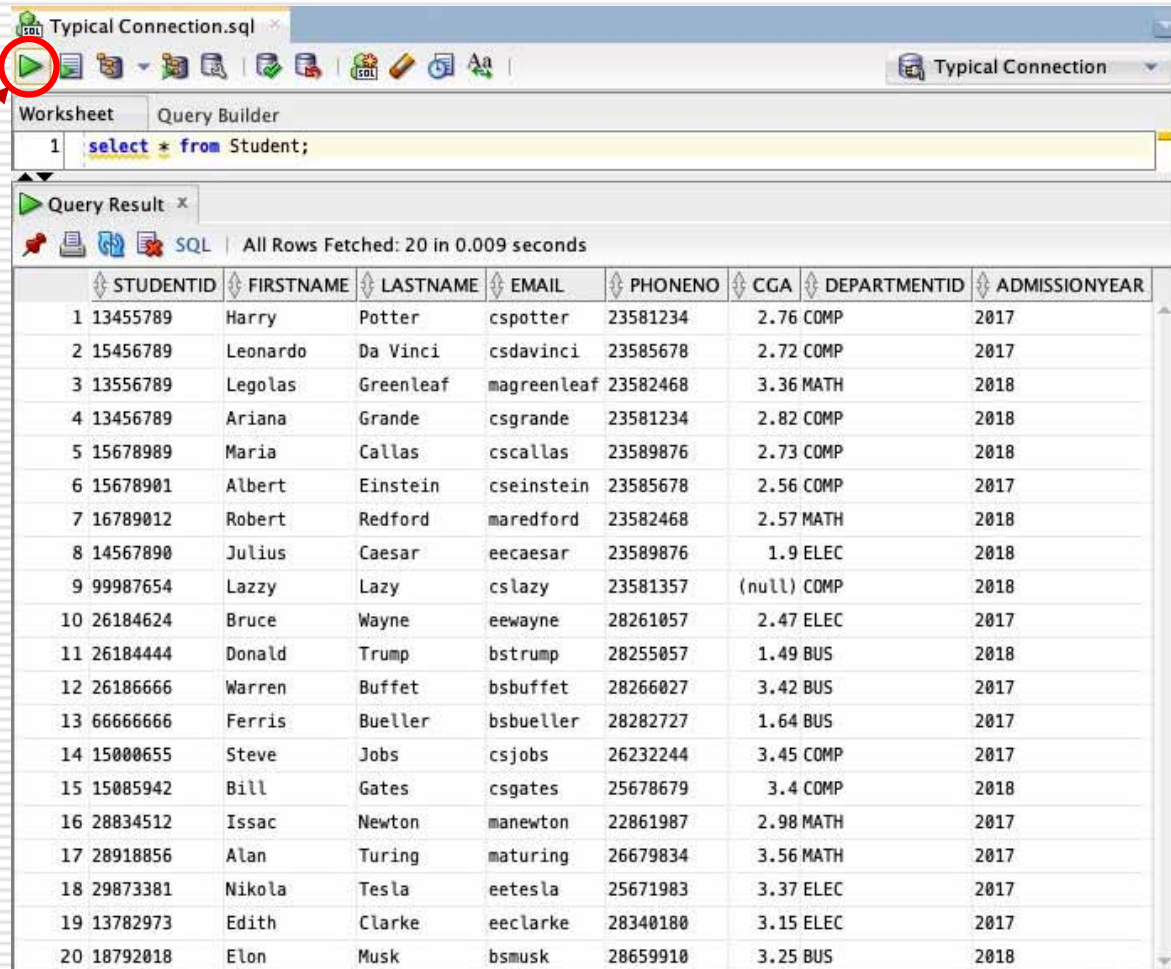
```
SQL Typical Connection                                    ▼  Typical
▶ ▤ ▥ ▾ ▥ ▨ | ▨ ▨ | ▨ ✏ ▨ Aa |   ▨ Typical

Worksheet    Query Builder
   1  desc Student;
▲▼
Script Output ×
📌 ✏ 💾 🖨 ▨    Task completed in 0.67 seconds

Name        Null?        Type
─────────   ────────     ────────────
STUDENTID   NOT NULL     CHAR(8)
FIRSTNAME   NOT NULL     VARCHAR2(20)
LASTNAME    NOT NULL     VARCHAR2(25)
EMAIL       NOT NULL     VARCHAR2(15)
PHONENO                  CHAR(8)
CGA                      NUMBER(4,2)
```

22

Displaying The Contents Of A Table

SQL command: select * from *<tablename>*;

- In the Enter SQL Statement box, type "select * from Student;" and select (the **Run Statement** button).

- The Query Result tab displays the SQL statement result as shown in the figure.

Query Result Tab

- The Query Result tab displays the result of executing a single SQL statement; its toolbar contains the following buttons:

  Pin keeps the tab's contents in the window when another object is selected in the Connections navigator.

  Print sends the tab's contents to a printer.

  Refresh executes the SQL statement again to refresh the result.

  Delete Persisted Settings delete persisted settings such as any sort order specifications.

  SQL displays the SQL statement that produced the result.

Change Oracle Database Password

☐ To change your Oracle Database password, type

    alter user <username> identified by "<new_password>";

in the Enter SQL Statement box and select ▷ (the Run Statement button) where <username> and <new_password> are replaced with your Oracle username and your new password. Remember to add a ";" at the end of the SQL statement, because all SQL statements end with a ";".

The following example changes the password to 123456:

    alter user comp3311stu000 identified by "123456";

NOTE: DO NOT USE SPECIAL CHARACTERS IN YOUR PASSWORD!

Please remember your new password!

Install Oracle Database Express Edition (XE)

1. Download Oracle Database Express Edition (XE) from
    https://www.oracle.com/database/technologies/xe-downloads.html

2. Run setup inside the downloaded folder to install Oracle XE.
    (Note: Run setup again if the installation fails.)

3. When installation completes, note the information shown in the InstallShield Wizard dialog as shown on the right for future reference.

4. In SQL Developer, create a connection to your Oracle XE database as the DBA as shown in the example on the next slide.
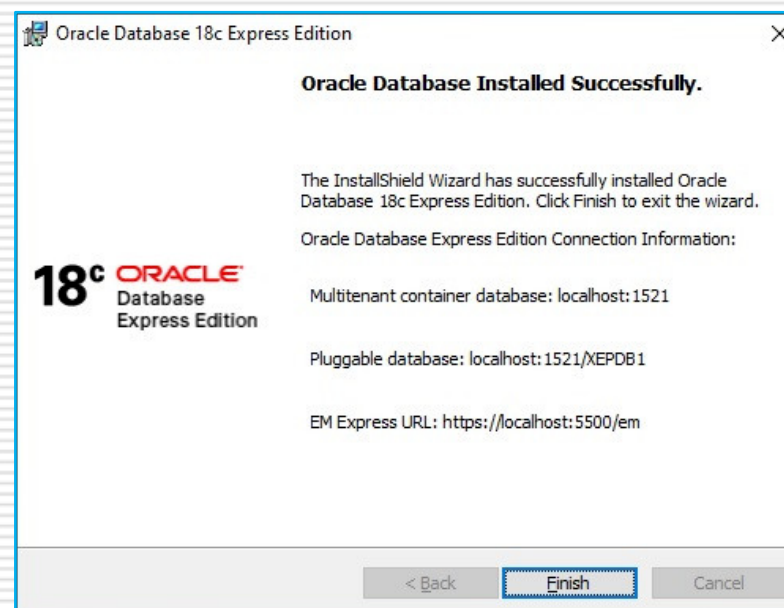
Connect To Oracle Database Express Edition (XE) As DBA Using SQL Developer

Enter or select the information outlined below in red.
Leave all other information as shown.

Create User

5. To create a database user, run the script file CreateUser.sql as the DBA where you replace the text *<username>* with the username of the user you want to create and *<password>* with the password you want to assign to the user.

6. Create a connection in SQL Developer for the user created in step 5 to create tables and run queries.