SQL - Revision

Assoc. Prof. David Taniar

SQL - Revision

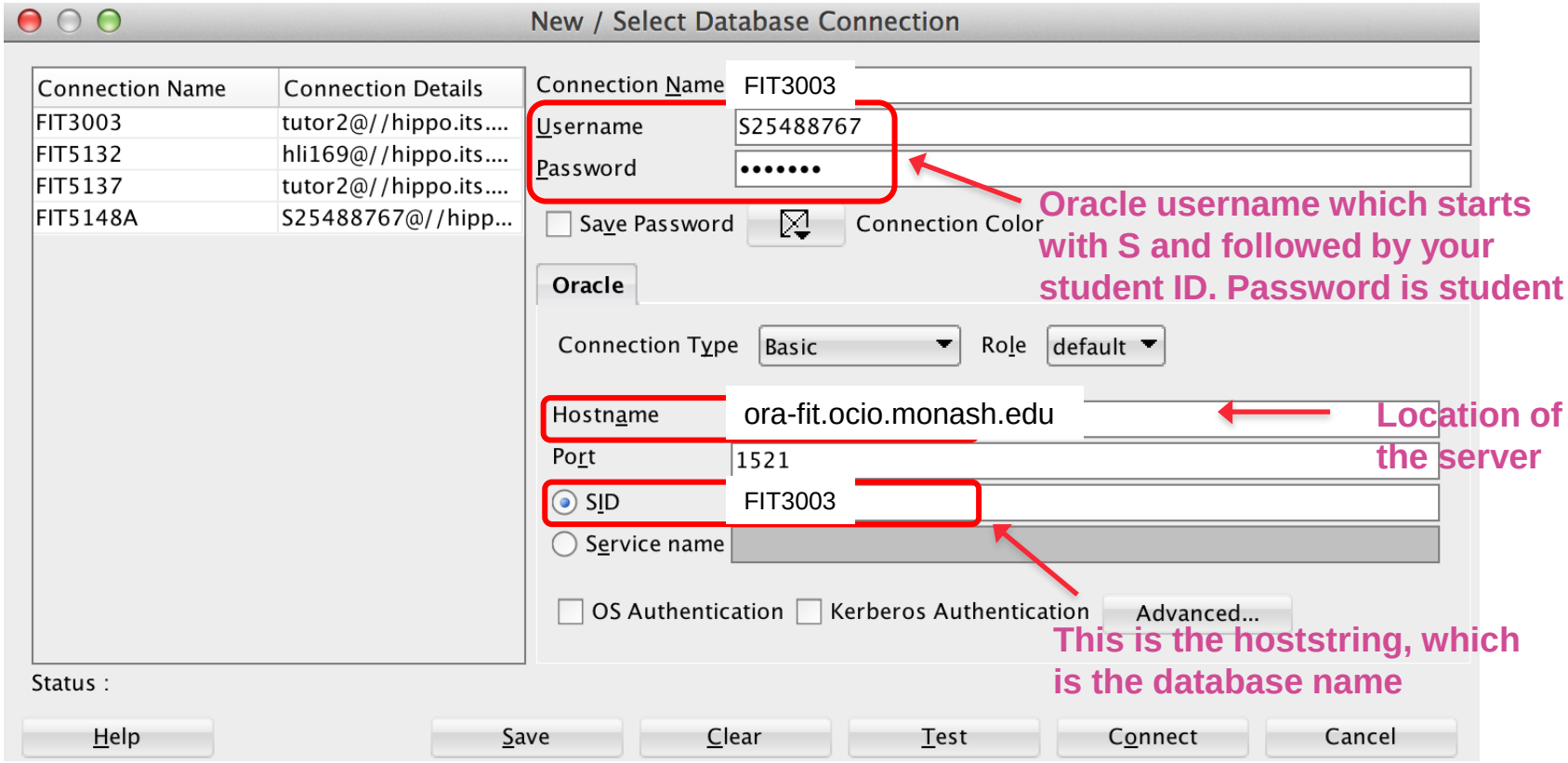
Outline:

A. Introduction to SQL client environment
B. Create tables
C. Insert into
D. Simple query retrieval
E. Updating and deleting records
F. Commit
G. Joining multiple tables
H. Aggregate functions and group by
I. Alter tables

A. Introduction to SQL client

- **There are several SQL client software:**
  - SQL Developer
  - SQL*Plus (Windows, Mac, Unix)
- **Login details:**
  - Username: S12345678 (12345678 is your student id)
  - Password: student
  - Host string: the unit code

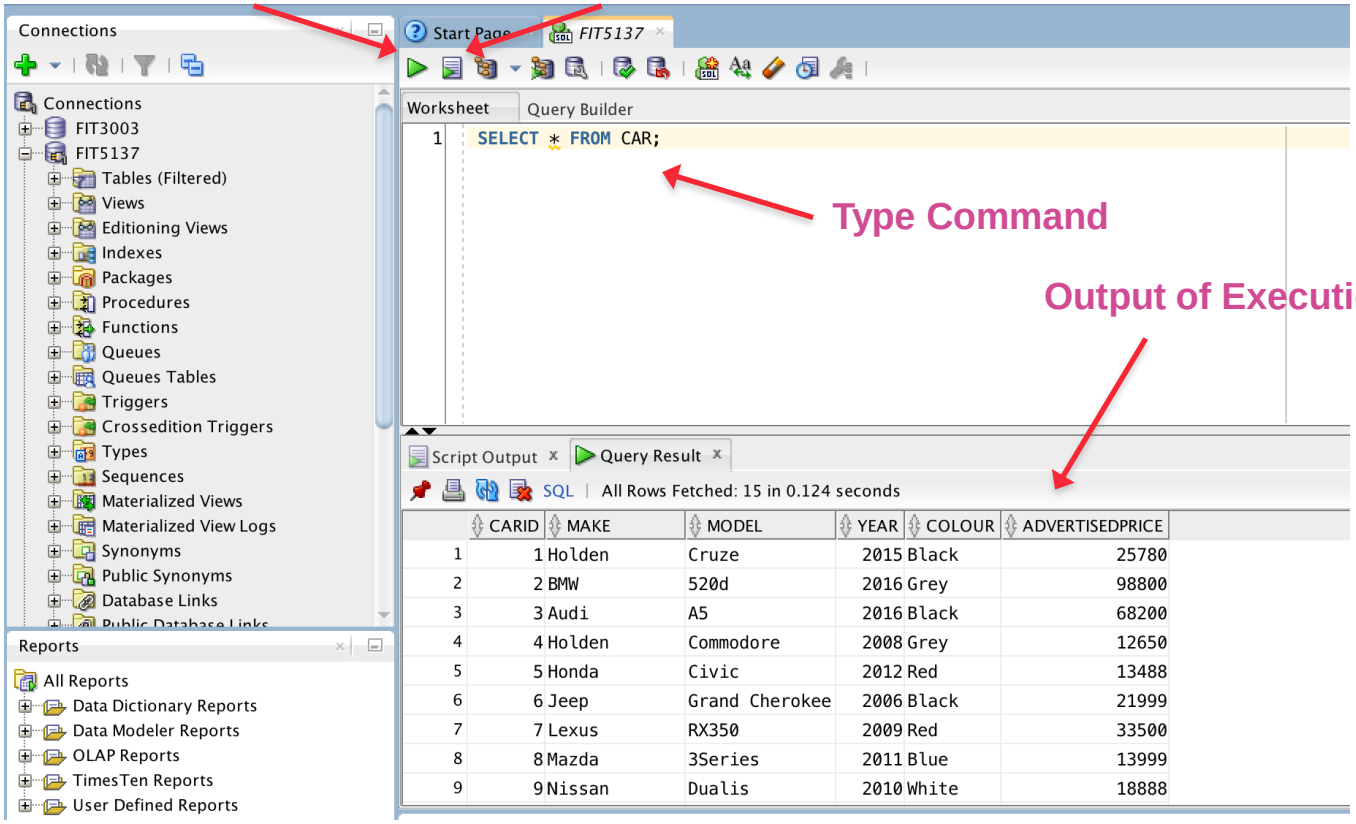
Introduction to SQL Developer



Introduction to SQL Developer

Single Statement Execution

Script Execution



	CARID	MAKE	MODEL	YEAR	COLOUR	ADVERTISEDPRICE
1	1	Holden	Cruze	2015	Black	25780
2	2	BMW	520d	2016	Grey	98800
3	3	Audi	A5	2016	Black	68200
4	4	Holden	Commodore	2008	Grey	12650
5	5	Honda	Civic	2012	Red	13488
6	6	Jeep	Grand Cherokee	2006	Black	21999
7	7	Lexus	RX350	2009	Red	33500
8	8	Mazda	3Series	2011	Blue	13999
9	9	Nissan	Dualis	2010	White	18888

B. Create Tables

- General Syntax:

```
CREATE TABLE <table_name>
    (attribute1        data_type    <NOT NULL>,
     attribute2        data_type,
     …
    PRIMARY KEY (attribute1),
    FOREIGN KEY (attribute1)
            REFERENCES <references table_name> (key_attribute));
```

Create Tables – Data Types

- Data type denotes a kind of data of an attribute value
  - Character data types: VARCHAR2 and CHAR

    Make VARCHAR2(20)
    Model VARCHAR2(30)

  - Number data types: NUMBER

    Year NUMBER(4)
    StampDuty NUMBER(8,2)

  - Date data type: DATE

    Salesdate DATE

Create Tables – Data Types

- Date Data Type
  - DATE stores dates from 1/1/4712 BC to 12/31/4712 AD
  - Default date format: DD-MON-YYYY
    - example: 05-JUN-2011
  - Example declaration: *salesDate DATE*
  - DATE data type also stores time values

Create Tables – Data Types

- Default **time** format: HH:MI:SS A.M.
  - If no time value is given when a date is inserted, default value is 12:00:00 A.M.
  - If no date value is given when a time is inserted, default date is first day of current month
  - Example salesDate field: 07-JUN-2016 12:00:00 A.M.

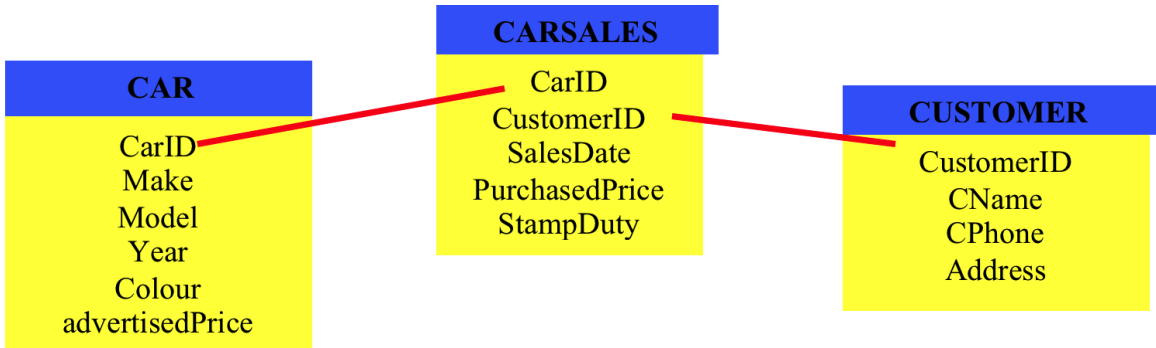
Create Tables – Constraints

- Integrity Constraints
  - Primary Key attribute
  - NOT NULL constraints
    - Specifies that a field cannot be NULL
    - Sample Declaration: *Field_name data_type NOT NULL*
  - Foreign Key attribute in a table refers to another record in another table

Create Tables – Example 1

- **Example:** *create CAR, CARSALES and CUSTOMER tables*
  - Commands:
    - CAR table

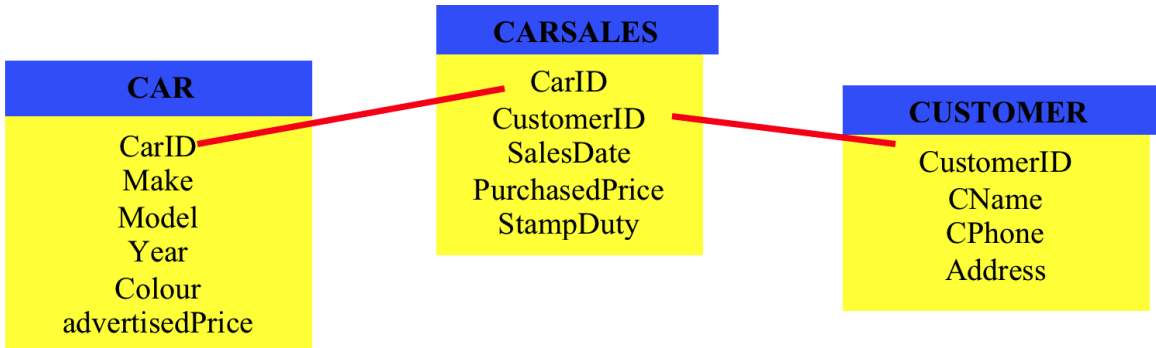
```
CREATE TABLE Car
(carID            NUMBER(5) NOT NULL,
 make             VARCHAR2(20) NOT NULL,
 model            VARCHAR2(30),
 year             NUMBER(4),
 colour           VARCHAR2(25),
 advertisedPrice  NUMBER(10),
 PRIMARY KEY (carID)
);
```



Create Tables – Example 2

- CUSTOMER table

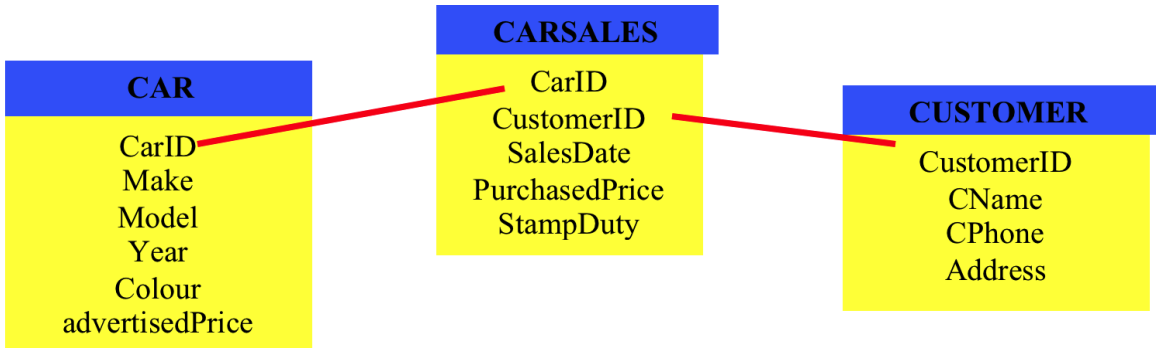
```
CREATE TABLE Customer
(customerID NUMBER(5) NOT NULL,
 cNAME      VARCHAR2(20) NOT NULL,
 cPhone     VARCHAR2(10),
 address    VARCHAR2(50),
 PRIMARY KEY (customerID)
);
```



Create Tables – Example 3

- CARSALES table

```
CREATE TABLE Carsales
(carID            NUMBER(5) NOT NULL,
 customerID       NUMBER(5) NOT NULL,
 salesDate        DATE NOT NULL,
 purchasedPrice   NUMBER(10) NOT NULL,
 stampDuty        NUMBER(8,2) NOT NULL,
 PRIMARY KEY (carID,customerID),
 FOREIGN KEY (carID) REFERENCES Car(carID),
 FOREIGN KEY (customerID) REFERENCES Customer(customerID)
);
```



Create Tables – by Copying

- You can create a new table by copying from an existing table:

```
CREATE TABLE <table_name>
    AS SELECT *
    FROM …    ;
```

- For example:

```
CREATE TABLE car
    AS SELECT *
    FROM dtaniar.car;
```

- Notes:
  - It creates and copy the records from the existing table
  - However, it does not copy the PK and FK
  - In the above example, it copies the table from dtaniar account.

Create Tables – View Tables

- **Viewing Information about Tables**
  - To view <u>all tables</u> in the database, the general syntax is:

    SELECT * FROM TAB;

    - For example:

      SELECT * FROM tab;

```
TNAME                          TABTYPE  CLUSTERID
------------------------------ -------  ----------
CAR                            TABLE
CARSALES                       TABLE
CUSTOMER                       TABLE
```

Create Tables – Describe Tables

- To view the table structure, the general syntax is:

  DESCRIBE <table_name>

  - For example:

    DESC car;

```
Name              Null     Type
----------------- -------- ------------
CARID             NOT NULL NUMBER(5)
MAKE              NOT NULL VARCHAR2(20)
MODEL                      VARCHAR2(30)
YEAR                       NUMBER(4)
COLOUR                     VARCHAR2(25)
ADVERTISEDPRICE            NUMBER(10)
```

Create Tables – Drop Tables

- To drop an unwanted table, the general syntax is:

  DROP TABLE <table_name>;

  - For example:

    DROP TABLE Car;

    - If the table that you want to delete (e.g. table Car) is being used as a FK by another table (e.g. table Carsales), then you cannot delete table Car.
    - In this case, you need to delete table Carsales first, before deleting table Car.

C. Insert Into

- **General Syntax**
  - To insert values for every single attribute in a record:

    INSERT INTO <table_name>

    VALUES (attribute1_value, attribute2_value,….);

    - **Example:**

      INSERT INTO *Car*

      VALUES *(1, 'Holden', 'Cruze', 2015, 'Black', 25780);*

  - Strings are enclosed in single quotes (‘) and are case-sensitive (e.g. ‘General Practice’ is different from ‘general practice’)

Insert Into

- To insert a value of selected attributes:

  INSERT INTO <table_name> (attribute1,attribute2,…)

  VALUES (attribute1_value, attribute2_value,….)

  - **Example:**

    INSERT INTO Car (*carID, make****) VALUES (****'16', 'Audi'****);***

Insert Into

- The TO_DATE function:
  - **TO_DATE** (‘date_value’, ’format mask’);
  - **Example:**

```
INSERT INTO Carsales

VALUES (1,4, TO_DATE('04/Feb/2015', 'DD/MON/YYYY'),25780,824.96);
```

Insert Into

- The common DATE format masks

Format Mask	Formatted Data
DD-MON-YYYY	05-FEB-2007
MM/DD/YYYY	02/05/2007
HH:MI AM	02:30 PM
MONTH DAY, YYYY	FEB 5, 2007
MM/DD/YYYY HH:MI AM	02/05/2007 02:30 PM

Sample DATE format masks

Insert Into

- Insert multiple records **one-by-one**:

```
INSERT INTO Car VALUES (2, 'BMW', '520d', 2016, 'Grey', 98800);
INSERT INTO Car VALUES (3, 'Audi', 'A5', 2016, 'Black', 68200);
INSERT INTO Car VALUES (4, 'Holden', 'Commodore', 2008, 'Grey', 12650);
```

- Insert multiple records at **once**:

```
INSERT ALL
INTO Car VALUES (2, 'BMW', '520d', 2016, 'Grey', 98800)
INTO Car VALUES (3, 'Audi', 'A5', 2016, 'Black', 68200)
INTO Car VALUES (' 4, 'Holden', 'Commodore', 2008, 'Grey', 12650)
SELECT * FROM DUAL;
```

D. Simple Query Retrieval

- **Simple Retrieval**
  - **Retrieve all Records**
    - **General Syntax :**

      SELECT *

      FROM <table_name>;

- Output:

CARID	MAKE	MODEL	YEAR	COLOUR	ADVERTISEDPRICE
1	Holden	Cruze	2015	Black	25780
2	BMW	520d	2016	Grey	98800
3	Audi	A5	2016	Black	68200
4	Holden	Commodore	2008	Grey	12650
5	Honda	Civic	2012	Red	13488
6	Jeep	Grand Cherokee	2006	Black	21999
7	Lexus	RX350	2009	Red	33500
8	Mazda	3Series	2011	Blue	13999
9	Nissan	Dualis	2010	White	18888
10	Volkwagen	Golf	2015	White	39888
11	Mercedes Benz	C200	2006	Blue	16995
12	Subaru	Outback	2014	null	33950
13	Honda	City	2010	Grey	7490
14	Mini	Cooper	2009	Black	19750
15	Toyota	Corolla	2013	White	23888

15 rows selected

- **Example:** retrieve everything from the CAR table:

  ***SELECT** * **FROM** car;*

Simple Query Retrieval

- Output:

```
MODEL
------------------
Cruze
520d
A5
Commodore
Civic
Grand Cherokee
RX350
3Series
Dualis
Golf
C200
Outback
City
Cooper
Corolla

 15 rows selected
```

- **Retrieve Specific Fields**
  - **General Syntax:**

    SELECT <attribute1, attribute2…>

    FROM <table_name>;

  - **Example:** *select only the model from the CAR table*

    SELECT *model* ***FROM*** *car;*

Simple Query Retrieval

- **Eliminating Duplicated Records *(DISTINCT qualifier)***
  - **General Syntax:**

    SELECT DISTINCT <attribute1,attribute2,…>

    FROM <table_name>;

  - **Example:** eliminating duplicates for the MAKE values:

    SELECT DISTINCT *make* ***FROM*** *car;*

Simple Query Retrieval

- Original Output (without DISTINCT):

```
MAKE
--------------------
Holden
BMW
Audi
Holden
Honda
Jeep
Lexus
Mazda
Nissan
Volkwagen
Mercedes Benz
Subaru
Honda
Mini
Toyota

 15 rows selected
```

- Output (with DISTINCT):

```
MAKE
--------------------
Holden
Lexus
Subaru
BMW
Mazda
Nissan
Audi
Volkwagen
Toyota
Honda
Mercedes Benz
Jeep
Mini

 13 rows selected
```

Simple Query Retrieval

- **DISTINCT Multiple Attributes**
  - **Example:** eliminating duplicates for the MAKE and YEAR values:

```
SELECT DISTINCT make, year
FROM car;
```

```
MAKE                 YEAR
-------------------- ----------
Volkwagen                  2015
Toyota                     2013
Mini                       2009
Holden                     2015
BMW                        2016
Honda                      2012
Subaru                     2014
Holden                     2008
Jeep                       2006
Mazda                      2011
Audi                       2016
Lexus                      2009
Honda                      2010
Nissan                     2010
Mercedes Benz              2006

 15 rows selected
```

Simple Query Retrieval

- **Conditional Retrieval**
  - Search Conditions specified for more complex data retrieval
  - **The WHERE Clause**
    - Operators:
      - equal (=)
      - greater than (>)
      - less than (<)
      - greater than or equal to (>=)
      - less than or equal to (<=)
      - Not equal (<>)

Simple Query Retrieval

- **General Syntax:**

  SELECT <attribute1,attribute2,…>

  FROM <ownername.table_name1>

  WHERE <search condition>;

- **Example:**

  SELECT *year, model, advertisedPrice*

  FROM *car*

  WHERE *make='Holden'*

YEAR	MODEL	ADVERTISEDPRICE
2015	Cruze	25780
2008	Commodore	12650

Simple Query Retrieval

- **“BETWEEN”**
  - **Example:** *list the carid, salesDate and purchasedPrice after 2014 and before 2016*

```
SELECT carid, salesdate, purchasedPrice
FROM carsales
WHERE salesdate
BETWEEN TO_DATE('01-JAN-2014', 'DD-MON-YYYY')
AND TO_DATE('31-DEC-2015','DD-MON-YYYY');
```

```
     CARID SALESDATE   PURCHASEDPRICE
---------- ----------- --------------
         1 04-FEB-2015          25780
         8 12-DEC-2015          13999
```

Simple Query Retrieval

- **Using a String Comparison**
  - **Example:** *list the carid, salesDate and purchasedPrice after 2014 and before 2016*

```
SELECT carid, salesdate, purchasedPrice
FROM carsales
WHERE TO_CHAR(salesdate, 'YYYYMMDD') >'20140101'
AND TO_CHAR(salesdate, 'YYYY'MMDD') < '20151231';
```

```
     CARID SALESDATE   PURCHASEDPRICE
---------- ----------- --------------
         1 04-FEB-2015          25780
         8 12-DEC-2015          13999
```

Simple Query Retrieval

- **“AND” or “OR”**
  - AND: both conditions must be true
    - **Example:**

```
SELECT make, model, year
FROM car
WHERE year>2014  AND make='Holden';
```

```
MAKE      MODEL           YEAR
--------- --------------- ----------
Holden    Cruze           2015
```

Simple Query Retrieval

- OR: either one of the condition is true
  - **Example:**

```
SELECT make, model, colour, year, advertisedPrice
FROM car
WHERE colour='Red' OR year>2014;
```

```
MAKE       MODEL      COLOUR          YEAR  ADVERTISEDPRICE
---------- ---------- ---------- ---------- ---------------
Holden     Cruze      Black            2015           25780
BMW        520d       Grey             2016           98800
Audi       A5         Black            2016           68200
Honda      Civic      Red              2012           13488
Lexus      RX350      Red              2009           33500
Volkwagen  Golf       White            2015           39888
 6 rows selected
```

Simple Query Retrieval

- **Other Conditions**
  - **LIKE/NOT LIKE**
    - **Example:** *displaying all MAKE from car table that has their first character as 'M'*

```
SELECT make
FROM CAR
WHERE make LIKE 'M%';
```

```
MAKE
---------------
Mazda
Mercedes Benz
Mini
```

Simple Query Retrieval

- **IN/NOT**
  - suitable to perform a set member search
  - **Example:**
    - IN **-** *displaying all MODEL that its MAKE is either 'Holden' or 'Honda'*

```
SELECT make, model
FROM car
WHERE make IN ('Holden', 'Honda');
```

```
MAKE                 MODEL
-------------------- -------------
Holden               Cruze
Holden               Commodore
Honda                Civic
Honda                City
```

Simple Query Retrieval

- **IN/NOT**
  - **Example:**
    - NOT IN - *displaying make, model and colour of cars that are not 'Black' and 'White'*

```
SELECT make, model, colour
FROM car
WHERE colour NOT IN ('Black', 'White');
```

MAKE	MODEL	COLOUR
BMW	520d	Grey
Holden	Commodore	Grey
Honda	Civic	Red
Lexus	RX350	Red
Mazda	3Series	Blue
Mercedes Benz	C200	Blue
Honda	City	Grey

Simple Query Retrieval

- **NULL/NOT NULL**
  - **Example:**
    - NULL Operator:

SELECT carid, make

FROM car

*WHERE colour **IS NULL**;*

```
CARID  MAKE
------ ---------
    12 Subaru
```

Simple Query Retrieval

- NOT NULL Operator:

```
SELECT carid, make
FROM car
WHERE colour IS NOT NULL;
```

```
 CARID MAKE
------- --------------------
      1 Holden
      2 BMW
      3 Audi
      4 Holden
      5 Honda
      6 Jeep
      7 Lexus
      8 Mazda
      9 Nissan
     10 Volkwagen
     11 Mercedes Benz
     13 Honda
     14 Mini
     15 Toyota
14 rows selected
```

Simple Query Retrieval

- **MULTIPLE OPERATORs**
  - **Example:** *list cars make start with 'M' and was made before 2016*

```
SELECT year, make, model
FROM car
WHERE make LIKE 'M%'
AND year<2016;
```

```
YEAR MAKE                MODEL
---- ------------------- -------------
2011 Mazda               3Series
2006 Mercedes Benz       C200
2009 Mini                Cooper
```

Simple Query Retrieval

- **Sorting**
  - specify to sort the output by using ORDER BY
  - **General Syntax:**

```
SELECT <attribute1,attribtue2,..>
FROM <table_name>
ORDER BY <attribute_name> [DESC];
```

Simple Query Retrieval

- **Example:** *retrieving all make, model, advertisedPrice and colour in a descending order of the advertisedPrice*

```
SELECT make, model, advertisedPrice, colour
FROM car
ORDER BY advertisedPrice DESC;
```

```
MAKE            MODEL               ADVERTISEDPRICE  COLOUR
--------------- ------------------- ---------------  --------
BMW             520d                98800            Grey
Audi            A5                  68200            Black
Volkwagen       Golf                39888            White
Subaru          Outback             33950            NULL
Lexus           RX350               33500            Red
Holden          Cruze               25780            Black
Toyota          Corolla             23888            White
Jeep            Grand Cherokee      21999            Black
Mini            Cooper              19750            Black
Nissan          Dualis              18888            White
Mercedes Benz   C200                16995            Blue
Mazda           3Series             13999            Blue
Honda           Civic               13488            Grey
Holden          Commodore           12650            Grey
Honda           City                 7490            Grey
15 rows selected
```

Simple Query Retrieval

- **"AS":** to rename a column
  - **Example:** *list all SalesDate, PurchasedPrice, StampDuty and TotalPrice (TotalPrice = PurchasedPrice+StampDuty)*

```
SELECT salesdate, purchasedPrice, stampduty,
       (purchasedPrice+StampDuty) as TotalPrice
FROM carSales;
```

SALESDATE	PURCHASEDPRICE	STAMPDUTY	TOTALPRICE
04-FEB-2015	25780	824.96	26604.96
13-JUL-2016	12650	506	13156
12-DEC-2015	13999	559.96	14558.96
14-JUN-2016	39888	1276.42	41164.42
18-MAY-2016	98800	5631.6	104431.6

E. Updating and Deleting Records

- In the created tables
  - **UPDATE** command – updating
  - **DELETE** command – deletion

Updating Records

- **Update**
  - **General Syntax:**

```
UPDATE <table_name>
SET <attribute_name> = <new_value>
WHERE <expression> <operator> <expression>;
```

    - records can be updated in only one table at a time
    - update multiple fields that are within the same table
    - WHERE clause - make the command updates specific records only

Updating Records

- **Example:**
  - *Updating colour of carID ‘5’ from ‘Red’ to ‘Grey’*

```
UPDATE car
SET colour='Grey'
WHERE carID =5;
```

Deleting Records

- **Delete**
  - **General Syntax:**

    DELETE FROM <table_name>

    WHERE <search_condition>;

    - remove specific records from a database table
    - use WHERE clause to specify multiple records to delete multiple records at one time
    - If the search condition is omitted, all records in the table are deleted.

Deleting Records

- **Example:**
  - deleting a single record from the CAR table

    DELETE FROM *car*

    WHERE *carid= 5;*
  - deleting multiple records from the CAR table that contain MAKE starting with ‘M’

    DELETE FROM *car*

    WHERE *make LIKE ‘M%’;*
  - deleting all records from the CAR table

    DELETE FROM *car;*

Deleting Records

- **Notice:**
  - not allowed to delete a primary key record that has its corresponded foreign key somewhere else in another table
  - **Example:** *delete a primary key CarId is 5 in the CAR table that has a foreign key record that CarId is 5 in the CARSALES table*

```
DELETE FROM car WHERE carid=5;

DELETE FROM car
*
ERROR at line 1:
ORA-02292: integrity constraint (SYSTEM.SYS_C005453) violated - child
    record found
```

F. Commit

- **Commit**
  - When inserted data by issuing the INSERT command
    - the changes are only saved in the local database buffer
    - are not saved in the database
    - until you COMMIT the transaction
  - *it is important to remember to COMMIT whenever you have finished inserting values or make changes to the database values*

Commit

- **General Syntax:**
  - Sample of inserting a new record with commit

```
CARID MAKE            MODEL            YEAR COLOUR    ADVERTISEDPRICE
----- --------------- ------------ ---------- --------- ---------------
    1 Holden          Cruze              2015 Black                25780
    2 BMW             520d               2016 Grey                 98800
    3 Audi            A5                 2016 Black                68200
    4 Holden          Commodore          2008 Grey                 12650
    5 Honda           Civic              2012 Red                  13488
    6 Jeep            Grand Cherokee     2006 Black                21999
    7 Lexus           RX350              2009 Red                  33500
    8 Mazda           3Series            2011 Blue                 13999
    9 Nissan          Dualis             2010 White                18888
   10 Volkwagen       Golf               2015 White                39888
   11 Mercedes Benz   C200               2006 Blue                 16995
   12 Subaru          Outback            2014 null                 33950
   13 Honda           City               2010 Grey                  7490
   14 Mini            Cooper             2009 Black                19750
   15 Toyota          Corolla            2013 White                23888
 15 rows selected
SQL> INSERT INTO CAR
  2  VALUES(16,'Holden', 'Cruze', 2016, 'Black', 27800);
1 row created;

SQL> commit;

Commit complete;
```

All original records are currently in CAR table

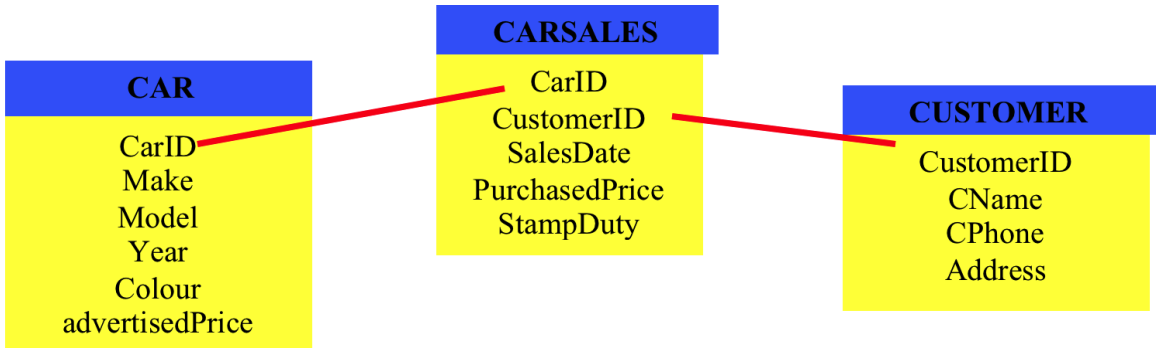
Insert a new record '16' with commit

Effect of Inserting New Record with Commit

G. Joining Multiple Tables

- **Join**
  - database query to join multiple database tables together
    - the data needed or the conditions specified come from more than one table.
  - **Syntax:**

```
SELECT <attribute1,attribute2,… >
FROM <table_name1,table_name2,…>
WHERE <table_name1.join_attribute> = <table_name2.join_attribut>
AND <search_condition>
```



Joining Multiple Tables

- joining the CAR, CARSALES and CUSTOMER tables:

```
SELECT customer.cname, customer.cphone, carsales.salesdate, carsales.purchasedPrice,
    carsales.stampDuty, car.make, car.model
FROM customer, carsales, car
WHERE customer.customerID = carsales.customerID
AND   car.carID = carsales.carID;
```

- using prefix when joining tables:
  - when more than one table is involved, a prefix for each attribute is recommended to avoid ambiguity

```
SELECT ct.cname, ct.cphone, cs.salesdate,
cs.purchasedPrice,cs.stampDuty,
c.make, c.model
FROM customer ct, carsales cs, car c
WHERE ct.customerID = cs.customerID
AND   c.carID = cs.carID;;
```

- **The output of both example:**

CNAME	CPHONE	SALESDATE	PURCHASEDPRICE	STAMPDUTY	MAKE	MODEL
Leonard	0434251160	18-MAY-2016	98800	5631.6	BMW	520d
Molly	0412908876	17-JUN-2016	98800	5631.6	BMW	520d
Ben	0433521126	18-MAY-2016	68200	3887.4	Audi	A5
Lily	0470457441	13-JUL-2016	12650	506	Holden	Commodore
Jone	0471257980	14-JUN-2016	13488	539.52	Honda	Civic
Rex	0456231879	12-DEC-2015	13999	559.96	Mazda	3Series
Tomas	0498896110	14-JUN-2016	39888	1276.42	Volkwagen	Golf
Tomas	0498896110	13-JUL-2016	7490	299.6	Honda	City
Tina	0498698221	13-JUL-2016	23888	955.52	Toyota	Corolla
Bill	0423784435	04-FEB-2015	25780	824.96	Holden	Cruze

Joining Multiple Tables

- **Subquery**
  - **Example:** *retrieving the make, model and advertisedPrice of the cars that are not sold*

```
SELECT make, model, advertisedPrice FROM car
WHERE carid NOT IN
      (SELECT carid FROM carsales);
```

```
MAKE                 MODEL                ADVERTISEDPRICE
-------------------- -------------------- ---------------
Subaru               Outback              33950
Lexus                RX350                33500
Mini                 Cooper               19750
Nissan               Dualis               18888
Mercedes Benz        C200                 16995
Jeep                 Grand Cherokee       21999
6 rows selected
```

H. Aggregate Functions and Group By

- **Aggregate Functions**
  - summarize the input table
  - often used include:
    - COUNT - count number of records in the input table
    - SUM - calculate the sum of a numerical attribute
    - MIN and MAX - find the smallest and the largest value of a certain attribute

Aggregate Functions

- **Count(*)**
- **Example:** *returning the number of records that is available from the CAR table*

```
SELECT COUNT(*)
FROM car;

COUNT(*)
------------------
15
```

Aggregate Functions

COUNT(attribute) & COUNT(DISTINCT attribute)

Output:

```
COLOUR
----------
Black
Grey
Black
Grey
Red
Black
Red
Blue
White
White
Blue
null
Grey
Black
White

15 rows selected
```

15 records include one NULL value

- **Example:** *returning the number of values of colour that is available from the CAR table*

SELECT ***COUNT(colour)*** *FROM car;*

```
COUNT(COLOUR)
-------------
           14
```

Cause by a record with null value

- **Example:** *returning the number of distinct values of colour that is available from the CAR table*

SELECT ***COUNT(DISTINCT colour)*** *FROM car;*

```
COUNT(DISTINCTCOLOUR)
---------------------
                    5
```

Aggregate Functions

- ***MIN and MAX***
- **Example:** *calculate the minimum and maximum advertisedPrice of the cars*

*SELECT **MIN**(advertisedPrice) AS "Lowest Price", **MAX**(advertisedPrice) AS "Highest Price"*

FROM car;

```
Lowest Price Highest Price
------------ --------------
        7490          98800
```

Aggregate Functions and Group By

- **Group By**
  - group an input table into a number of groups based on one or more nominated attributes
  - often used in conjunction with aggregate functions
    - *CAR table: group by Make*

```
SELECT make, count(*)
FROM car
GROUP BY make;
```

MAKE	COUNT(*)
Holden	2
Lexus	1
Subaru	1
BMW	1
Mazda	1
Nissan	1
Audi	1
Volkwagen	1
Toyota	1
Honda	2
Mercedes Benz	1
Jeep	1
Mini	1

Aggregate Functions and Group By

- *CAR table: grouping by Make with combination of getting only the record groups that contain the count value greater than 1 is as follows*

```
SELECT make, COUNT(DISTINCT model)
FROM car
GROUP BY make
HAVING COUNT(DISTINCT model)>1;
```

```
MAKE                 COUNT(DISTINCTMODEL)
-------------------- --------------------
Holden                                  2
Honda                                   2
```

Aggregate Functions and Group By

- *multiple tables: selecting the number of sold cars for each colour*

```
SELECT colour, COUNT(DINSTINCT customerId)
FROM car c, carsales cs
WHERE c.carid=cs.carid
GROUP BY colour;
```

```
COLOUR      COUNT(DISTINCTCUSTOMERID)
----------- -------------------------
White                               2
Grey                                4
Blue                                1
Black                               2
Red                                 1
```

Aggregate Functions

- **Count vs. Sum**
  - COUNT - count number of records in the input table
  - SUM - calculate the sum of a numerical attribute

SELECT <attribute1, attribute2>, ***COUNT(*)***
FROM <table_name>
GROUP BY <attribute1, attribute2>;

SELECT <attribute1, attribute2>, ***SUM (attribute3)***
FROM <table_name>
GROUP BY <attribute1, attribute2>;

Aggregate Functions

- **Sum without Group By**
  - **Example**: calculate the sum of purchasedPrice

```
SELECT SUM(purchasedPrice) AS totalsales
FROM carsales;
```

```
TOTALSALES
----------
    402983
```

Aggregate Functions

- **Sum with Group By**
  - **Example**: calculate the sum of purchasedPrice for each make in carsales table

```
SELECT c.make, SUM(cs.purchasedPrice) AS totalsales
FROM carsales cs, car c
WHERE c.CARID=cs.CARID
GROUP BY c.make;
```

MAKE	TOTALSALES
Holden	38430
BMW	197600
Mazda	13999
Audi	68200

Simple Query Retrieval

- **SUM with Calculations**
  - **Example:** list all Cname, SalesDate and calculate the TotalPrice for each customer (TotalPrice = PurchasedPrice+StampDuty)

```
SELECT ct.cname, cs.salesdate, SUM(purchasedPrice+StampDuty) as TotalPrice
FROM carSales cs, customer ct
WHERE cs.customerid=ct.customerid
GROUP BY ct.cname, cs.salesdate;
```

CNAME	SALESDATE	TOTALPRICE
Jone	14-JUN-2016	14027.52
Rex	12-DEC-2015	14558.96
Lily	13-JUL-2016	13156

I. Alter Tables – Add New Fields

- **Syntax:**

  ALTER TABLE <table_name>

  ADD (attribute_name data_type_declare constraints_declare);

  - ***attribute name***: referring to the new attribute that you want to add into the existing table
  - ***data type***: defines the data type and the size of the new attribute
  - ***constraint***: defines the constraints that the new attribute might be enforced by certain constraints

- **Example:** *add a transmission attribute to the CAR table*

  ALTER TABLE *car*
  ADD *(transmission VARCHAR2(10));*

Alter Tables – Modify Fields

- **Syntax:**

  ALTER TABLE <table_name>

  MODIFY (attribute_name new_data_type);

  - ***attribute name:*** refers to the attribute that you want to modify
  - ***new data:*** defines the new data type that you want to use replacing the old one

- **Example:** *change the data type of the transmission to CHAR with a size of 30*

  ALTER TABLE *car*

  MODIFY *(transmission CHAR(30));*

Alter Tables – Drop Columns

- **Syntax:**

  ALTER TABLE <table_name>

  DROP COLUMN attribute_name;

- **Example:** *delete the attribute transmission from the CAR table*

  ALTER TABLE *car*

  DROP COLUMN *transmission ;*