

Oracle Academy

Database Programming with SQL

Instructor Resource Guide

Notes For PowerPoint Slides:

SECTION 5 LESSON 1 – Review of Joins

Slide 1: Review of Joins

Lesson Preparation

This section reviews the join syntax covered in the previous lessons and allows time for classroom practice activity. Students should have completed the practice activities and study guides for these lessons.

Slide 2: What Will I Learn?

No instructor notes for this slide

Slide 3: Why Learn It?

No instructor notes for this slide

Slide 4: Try It / Solve It

No instructor notes for this slide

Slide 5: Try It / Solve It

No instructor notes for this slide

Slide 6: Try It / Solve It –

No instructor notes for this slide

Slide 7: Try It / Solve It -

No instructor notes for this slide

Slide 8: Try It / Solve It –

No instructor notes for this slide

Slide 9: Try It / Solve It –

No instructor notes for this slide

Slide 10: Try It / Solve It –

No instructor notes for this slide

Slide 11: Try It / Solve It –

No instructor notes for this slide

Slide 12: Summary – In this lesson you have learned to:
No instructor notes for this slide

Slide 13: Summary - Practice Guide
No instructor notes for this slide

SECTION 5 LESSON 2 – Group Functions

Slide 1: Group Functions

What to Watch For

Make sure students understand that a group function uses a group of rows to present one value. Reinforce the definition of NULL and that it is not equal to zero and will not be evaluated as a zero in a group function.

Connections

Relate group functions to their use in business. For each group function studied in the lesson, ask students to apply the function to a business use. Answers may include: being able to find the average salary, average monthly sales, sum of the year's orders, the last name in the employee list, how much a machined part's dimensions vary from the average size of all such parts manufactured, how many standard deviations the classes' test scores are from the national test-score average.

Many students will have learned group functions in their math class. Ask students for examples from their math book or class: maximum value, minimum value, average value, counting, adding, standard deviation, variance, and null.

Slide 2: What Will I Learn?

There are many new syntax terms in this lesson. Read "What Will I Learn" to the students. Ask them to guess what they think the function of each term is in a query.

Slide 3: Why Learn It?

Explain the term "aggregate." To be able to calculate the average age of all the students in the school would require finding the age of each student, adding all the ages together and then dividing by the number of students in the list. Explain that finding the AVG is an example of aggregating or grouping ages into one result.

Slide 4: Why Learn It? (continued)

No instructor notes for this slide

Slide 5: Tell Me / Show Me – GROUP FUNCTIONS

Use the words "aggregating data" when describing the process of gathering together data to produce a single output.

Slide 6: Tell Me / Show Me – MIN: Used with columns that store...

No instructor notes for this slide

Slide 7: Tell Me / Show Me – COUNT: Returns the number of rows.

Explain the group function graphic. Briefly explain standard deviation and variance as a measure of the spread of data around the mean or average. Draw a normal curve and relate it to the height of people -- some are very short, some are very tall, but most people are within a few inches of "average." If a group of people had lots of very tall people and lots of very short people, the group would have a large variance in heights.

Slide 8: Tell Me / Show Me – GROUP FUNCTIONS

No instructor notes for this slide

Slide 9: Tell Me / Show Me – There are a few important things you ...

No instructor notes for this slide

Slide 10: Tell Me / Show Me – Group functions ignore NULL values.

No instructor notes for this slide

Slide 11: Tell Me / Show Me – You can have more than one group ...

No instructor notes for this slide

Slide 12: Tell Me / Show Me – Two group functions, MIN and MAX...

Review the use of MIN and MAX with all data types. Students may have difficulty thinking of a minimum date -- is minimum yesterday or is the minimum 10 years ago? Write the query below from the Global Fast Foods database on the board. Ask students what date will be returned if the database has the following three dates: 01-JUL-80, 19-MAR-79, 30-MAR-69.

```
SELECT MIN(birthdate)
FROM f_staffs;
```

Slide 13: Tell Me / Show Me – Rules for Group Function

For each of the points stated, explain why the rule is important. For example, because group functions ignore nulls, you may want to substitute zeros for nulls if you're trying to find the average of something. It may be significant to know about null values. Or you may want to ignore the null values and no modification is necessary. If a column such as student_volunteer_hours has nulls in it, and you are finding the average number of hours students have volunteered in the community at your school, nulls are important! A null would mean that the student hasn't completed any volunteer hours! This would affect your average. So you would need to replace the nulls with zeros before using the AVG group function.

Slide 14: Tell Me /Show Me - Terminology

AVG-Calculates average value excluding nulls

COUNT>Returns the number of rows with non-null values for the expression

STDDEV-For two sets of data with approximately the same mean, the greater the spread, the greater the standard deviation.

Group functions-Operate on sets of rows to give one result per group.

MIN>Returns minimum value ignoring nulls

VARIANCE-Used with columns that store numeric data to calculate the spread of data around the mean

SUM-Calculates the sum ignoring null values

MAX>Returns the maximum value ignoring nulls

Aggregate -To gather into a sum or whole

Slide 15: Summary – In this lesson you have learned to:
No instructor notes for this slide

Slide 16: Summary - Practice Guide
No instructor notes for this slide

SECTION 5 LESSON 3 – COUNT, DISTINCT, NVL

Slide 1: COUNT, DISTINCT, NVL

Connections

Choose two sample tables (use two that could be queried using a join) from any one of the three databases used in this course. Without referring to notes, ask pairs of students to do the following:

Query the database using a `SELECT *` for each table.

- Copy the table structure into MSWord.

- Based on the table results set returned for each table, ask students to list all the SQL commands they know that could be used on the data. Students must name the query and give an example. Make it a game with prizes!

Possible table combinations for this activity are:

Oracle database: employees and departments; job_history and employees; departments and job_history

DJs on Demand: d_songs and d_types; d_clients and d_events; d_cds and d_track_listings

Global Fast Foods: f_staffs and f_shift_assignments; f_food_items and f_promotional_menus; f_food_items and f_order_lines

Slide 2: What Will I Learn?

Explain that NVL is an abbreviation for null value.

The three functions COUNT, DISTINCT, and NVL should be straightforward and easy for students to learn and use.

Slide 3: Why Learn It?

Before beginning this lesson, ask students to list all the ways the people in their town could be counted. List their responses on the board.

Possible answers include:

Go door to door asking each resident for the number of people living at that residence; use a mail-in form that asks for the number of people in their household; count all the names in the phone book; go to the tax records and count the number of taxpayers, etc. If there were millions of rows of names on a list, how easily could they be counted? How accurate would the final count be?

SQL uses the COUNT function to accomplish this task.

Slide 4: Tell Me / Show Me – COUNT

COUNT(expression) returns the number...

No instructor notes for this slide

Slide 5: Tell Me / Show Me – COUNT

Why are null values returned in the query...

Discuss with students, "Why is it important, from a business perspective, to be able to handle null values when aggregating data?"

Use the example of calculating the class average for an exam. If there are 30 students in the class, but only 28 were present who took the exam, how would the class average be affected if the total of all the scores were divided by 30 rather than 28? How does the null value test score for the two absent students affect the class average?

Answer: In SQL, null values are not included in an AVG function. However, if you want the null values to be part of the class average, the NVL function could be used to replace each null value with a zero.

Slide 6: Tell Me / Show Me – COUNT

COUNT(*) returns the number of rows...

Students may ask: Why do we need (*) ? Why can't we just write COUNT ? Answer: because the syntax rules require that every function has at least one input argument, enclosed in parentheses.

Slide 7: Tell Me / Show Me - DISTINCT

This and the next two slides review the use of DISTINCT without combining it with group functions.

Slide 8: Tell Me / Show Me – To eliminate duplicate rows, use the...

No instructor notes for this slide

Slide 9: Tell Me / Show Me – The keyword DISTINCT, when used...

No instructor notes for this slide

Slide 10: Tell Me / Show Me – Using DISTINCT

Now we learn that DISTINCT is very useful with group functions, especially COUNT.

Slide 11: Tell Me / Show Me – When using DISTINCT with a group function...

No instructor notes for this slide

Slide 12: Tell Me / Show Me – NVL

NVL was introduced in an earlier lesson.

Ask students how the restaurant customer average would change if the owner did not use null values in the average.

Answer: The average number of customers per day would be higher if nulls were eliminated.

Slide 13: Tell Me /Show Me - Terminology

COUNT(expression)-Returns the number of non-null values in the expression column

DISTINCT-The keyword used to return only nonduplicate values or combinations of nonduplicate values in a query.

COUNT(DISTINCT expression)-Returns the number of unique non-null values in the expression column.

Slide 14: Summary – In this lesson you have learned to:

No instructor notes for this slide

Slide 15: Summary - Practice Guide

No instructor notes for this slide

Notes For Practice Activities:

Review of Joins S05 L01

Try It / Solve It

1a. EQUIJOIN

```
SELECT s.name, c.name  
FROM students s, course c, enrolled e  
WHERE (s.sid = e.sid) AND (e.cid = c.cid);
```

1b. FROM students NATURAL JOIN enrolled or
FROM courses NATURAL JOIN enrolled;

1c. SELF JOIN

```
SELECT s.name, m.name  
FROM students s, students m  
WHERE s.mid=m.sid;
```

1d. SELECT s.name, m.name
FROM students s, students m
WHERE s.mid=m.sid(+);

```
SELECT s.name, m.name  
FROM students s LEFT OUTER JOIN students m  
ON (s.mid=m.sid);
```

2a. Equijoin, NATURAL JOIN, JOIN .. USING, JOIN .. ON

2b. OuterJoin:

```
SELECT l.city, c.country_name  
FROM locations l, countries c  
WHERE l.country_id = c.country_id (+) ;
```

```
SELECT l.city, c.country_name  
FROM locations l LEFT OUTER JOIN countries c  
ON (l.country_id = c.country_id) ;
```

```
SELECT l.city, c.country_name  
FROM countries c RIGHT OUTER JOIN locations l  
ON (l.country_id = c.country_id) ;
```

2c. Equijoin, NATURAL JOIN, JOIN .. USING, JOIN .. ON

2d. Equijoin, NATURAL JOIN, JOIN ... USING, JOIN ... ON between locations and departments table

Equijoin, JOIN ... USING, JOIN ... ON between employees and departments table
(NATURAL JOIN is not an option here due to the presence of two foreign keys in departments from employees)

2e. NATURAL JOIN, JOIN ... USING, JOIN ... ON between locations and departments table

FULL OUTER JOIN between employees and departments table

not possible using Oracle specific Join syntax

```
SELECT l.city, d.department_name, e.last_name
FROM locations l NATURAL JOIN departments d
FULL OUTER JOIN employees e
ON(d.department_id = e.department_id);
```

```
SELECT l.city, d.department_name, e.last_name
FROM locations l JOIN departments d
USING (location_id)
FULL OUTER JOIN employees e
ON(d.department_id = e.department_id) ;
```

```
SELECT l.city, d.department_name, e.last_name
FROM locations l JOIN departments d
ON (l.location_id = d.location_id)
FULL OUTER JOIN employees e
ON(d.department_id = e.department_id);
```

Group Functions S05 L02

Vocabulary

| | |
|------------------------|--|
| <u>AVG</u> | Calculates average value excluding nulls |
| <u>COUNT</u> | Returns the number of rows with non-null values for the expression |
| <u>STDDEV</u> | For two sets of data with approximately the same mean, the greater the spread, the greater the standard deviation. |
| <u>Group functions</u> | Operate on sets of rows to give one result per group. |
| <u>MIN</u> | Returns minimum value ignoring nulls |
| <u>VARIANCE</u> | Used with columns that store numeric data to calculate the spread of data around the mean |
| <u>SUM</u> | Calculates the sum ignoring null values |
| <u>MAX</u> | Returns the maximum value ignoring nulls |
| <u>Aggregate</u> | To gather into a sum or whole |

Try It / Solve It

1. AVG – calculates average for numeric columns
COUNT – returns number of rows
MAX – returns maximum value
MIN – returns minimum value
STDDEV – returns spread about mean numeric columns
SUM – returns the sum on numeric columns
VARIANCE – returns spread for numeric columns
Examples may vary.

2. SELECT ROUND(AVG(cost), 2)
FROM d_events;

3. SELECT AVG(salary)
FROM f_staffs
WHERE manager_id = 19 ;

4. SELECT SUM(salary)
FROM f_staffs

WHERE id IN(12, 9);

5. SELECT MIN(salary), MAX(hire_date), MIN(last_name), MAX(last_name)
FROM employees
WHERE department_id IN (50 , 60);

6. Answer: 1

Group functions return one result.

7. Group functions such as AVG ignore null values. For hourly employees, the salary field was null. These were not used to calculate the average, thus making the average salary very high.

8. March 30, 1969

9. SELECT AVG(order_total)
FROM f_orders
WHERE order_date BETWEEN '01-JAN-02' AND '21-DEC-02';

10. SELECT MAX(hire_date)
FROM employees;

11. SUM(operating_cost)

12. Valid statements are: b, d, g

Count, Distinct, NVL S05 L03

Vocabulary

| | |
|-----------------------------------|--|
| <u>COUNT(expression)</u> | Returns the number of non-null values in the expression column |
| <u>DISTINCT</u> | The keyword used to return only nonduplicate values or combinations of nonduplicate values in a query. |
| <u>COUNT(DISTINCT expression)</u> | Returns the number of unique non-null values in the expression column. |

Try It / Solve It

1. SELECT COUNT(*)
FROM d_songs;
2. SELECT COUNT(DISTINCT loc_type)
FROM d_venues;
3. SELECT COUNT(song_id), COUNT(DISTINCT cd_number)
FROM d_track_listings;
4. SELECT COUNT(email)
FROM d_clients;
5. SELECT COUNT(auth_expense_amt)
FROM d_partners;
6. COUNT = 4 DISTINCT = 3
7. SELECT ROUND(AVG(NVL(auth_expense_amt, 100000)),2)
FROM d_partners;
8. b and c are True
9. c is True.