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Database Programming with SQL

4-1: Case and Character Manipulation

Vocabulary
Identify the vocabulary word for each definition below.

DUAL	Dummy table used to view results from functions and calculations
Data Format	The arrangement of data for storage or display
INTICAP	Converts alpha character values to uppercase for the first letter of each word, all other letters in lowercase
Character Manipulation Function	Functions that accept character data as input and can return both character and numeric values
TRIM	Removes all specified characters from either the beginning or the ending of a string
Operator	A symbol that represents a quantity or a relationship between quantities
Single row functions	Functions that operate on single rows only and return one result per row
UPPER	Converts alpha characters to uppercase
Input	Raw data entered into the computer
CONCAT	Concatenates the first character value to the second character value; equivalent to concatenation operator (||)

Output	Date that is processed into information
LOWER	Converts alpha character values to lowercase
LPAD	Pads the left side of a character, resulting in a right-justified value
SUBSTR	Returns specific characters from character value starting at a specific character position and going specified character positions long
REPLACE	Replaces a sequence of characters in a string with another set of characters
INSTR	Returns the numeric position of a named string
LENGTH	Returns the number of characters in the expression
RPAD	Pads the right-hand side of a character, resulting in a left- justified value

1. Using the three separate words “Oracle,” “Internet,” and “Academy,” use one command to produce the following output:

SELECT CONCAT(‘Oracle’, CONCAT(‘ Internet’, ‘ Academy’)) AS “The Best Class”
FROM dual;

2. Use the string “Oracle Internet Academy” to produce the following output:

SELECT SUBSTR(‘Oracle Internet Academy’, INSTR(‘Oracle Internet Academy’, ‘net’), 3) AS “The Net”
FROM dual;

3. What is the length of the string “Oracle Internet Academy”?

SELECT LENGTH(‘Oracle Internet Academy’) AS “length”
FROM dual;

4. What's the position of "I" in "Oracle Internet Academy"?

```
SELECT INSTR(Oracle Internet Academy', 'I') AS "position"
FROM dual;
```

5. Starting with the string "Oracle Internet Academy", pad the string to create ****Oracle****Internet****Academy****

```
SELECT CONCAT(CONCAT('****', 'Oracle'), CONCAT('****', CONCAT('Internet',
CONCAT('****', 'Academy****'))) AS padded_string
FROM dual;
```

6. Starting with the string "Oracle Internet Academy", pad the string to produce: Oracle$$$Internet$$$Academy

```
SELECT  REPLACE('Oracle Internet Academy', ' ', '$$$') AS padded_string
FROM dual;
```

7. Using the string 'Oracle Internet Academy', produce the output shown using the REPLACE function

```
SELECT  REPLACE('Oracle Internet Academy', 'Internet', '2013-2014') AS "The Best
Class"
FROM dual;
```

8. List the order date and the order total from the Global Fast Foods F_ORDERS table. Name the order total as TOTAL, and fill in the empty spaces to the left of the order total with $

```
SELECT order_date, CONCAT('$', RPAD(TO_CHAR(order_total), 10, ' ')) AS TOTAL
FROM F_ORDERS;
```

9. Write a query that will output a column called "ADDRESS" which has the following information: ZOE TWEE 1009 OLIVER AVENUE BOSTON, MA 12889. Use the Global Fast Foods F_CUSTOMERS table

```
SELECT 'ZOE TWEE 1009 OLIVER AVENUE BOSTON, MA 12889' AS ADDRESS
FROM F_CUSTOMERS;
```

10. Write a query to return the first character of the first name concatenated to the last_name, the salary, and the department id for employees working in department 20. Give the first expression an alias of Name. Use the EMPLOYEES table. Change the query to use a substitution variable instead of the hard coded value 20 for department id. Run the query for department 30 and 50 without changing the original where-clause in your statement

SELECT SUBSTR(first_name, 1, 1) | | last_name AS Name ,salary, department_id,
FROM EMPLOYEES;

11. Using a substitution variable for the department name, write a query listing department id, department name, and location id for departments located in the_department_of_your_choice. Use the DEPARTMENTS table. Note: All substitution variables in OAE are treated as character strings, so no quotes (‘ ‘) are needed

SELECT department_id, department_name, location_id
FROM DEPARTMENTS
WHERE department_name = :dept_name;

12. Write a query that returns all the employee data depending on the month of their hire date. Use the EMPLOYEES table. The statement should return the month part of the hiredate which is then compared to an abbreviated month (JAN, FEB, MAR) passed into the query via a substitution variable

SELECT *
FROM EMPLOYEES
WHERE TO_CHAR(hire_date, ‘MON’) = UPPER(:month_abbrev);

4-2: Number Functions Practice Activities

Vocabulary
Identify the vocabulary word for each definition below.

TRUNC	Used to terminate the column, expression, or value to a specified number of decimal places
Number functions	These functions accept numeric input and return numeric value
MOD	Returns the remainder of a division

ROUND	Rounds the column, expression, or value to a set number of decimal places

1. Display Oracle database employee last_name and salary for employee_ids between 100 and 102. Include a third column that divides each salary by 1.55 and rounds the result to two decimal places

```
SELECT last_name, salary, ROUND(salary/1.55, 2) as adjusted_salary
FROM EMPLOYEES
WHERE employee_id BETWEEN 100 AND 102;
```

2. Display employee last_name and salary for those employees who work in department 80. Give each of them a raise of 5.333% and truncate the result to two decimal places

```
SELECT last_name, TRUNC(salary * 1.05333, 2) AS new_salary
FROM EMPLOYEES
WHERE department_id = 80;
```

3. Use a MOD number function to determine whether 38873 is an even number or an odd number

```
SELECT
        CASE
                WHEN MOD(38873, 2) = 0 THEN ‘even’
                ELSE ‘odd’
         END AS number_type
FROM dual;
```

4. Use the DUAL table to process the following numbers: 845.553 - round to one decimal place 30695.348 - round to two decimal places 30695.348 - round to -2 decimal places 2.3454 - truncate the 454 from the decimal place

```
SELECT
        ROUND(845.553, 1) AS rounded_one
        ROUND(30695.348, 2) AS rounded_two
        ROUND(30695.348, -2) AS rounded_three
        TRUNC(2.3454, 3) AS truncated_value
FROM dual;
```

5. Divide each employee's salary by 3. Display only those employees' last names and salaries who earn a salary that is a multiple of 3

```
SELECT last_name, salary
FROM EMPLOYEES
WHERE MOD(salary, 3) = 0;
```

6. Divide 34 by 8. Show only the remainder of the division. Name the output as EXAMPLE

```
SELECT MODE (34, 8) AS EXAMPLE
FROM dual;
```

7. How would you like your paycheck – rounded or truncated? What if your paycheck was calculated to be $565.784 for the week, but you noticed that it was issued for $565.78. The loss of .004 cent would probably make very little difference to you. However, what if this was done to one thousand people, one hundred thousand people, or one million people! Would it make a difference then? How much of a difference?

Rounding or truncating $565.784 for one person has no impact, as both methods would leave the second decimal unchanged. However, for larger groups—such as one thousand, one hundred thousand, or one million people—the cumulative effect of losing $0.004 per person becomes significant. For instance, that small amount would add up to a total loss of $4, $400, or $4,000, respectively.

4-3: Data Functions Practice Activities

Vocabulary
Identify the vocabulary word for each definition below.

SYSDATE	A function that returns the current date and time of the database server
ADD_MONTHS	Add calendar months to date
LAST_DAY	Last day of the month
NEXT_DAY	Next day of the date specified
MONTHS_BETWEEN	Number of months between due dates

1. For DJs on Demand, display the number of months between the event_date of the Vigil wedding and today's date. Round to the nearest month.

```
SELECT ROUND(MONTHS_BETWEEN(SYSDATE, event_date)) AS Months_Between
FROM dj_list
WHERE event_name = 'Vigil wedding';
```

2. Display the days between the start of last summer's school vacation break and the day school started this year. Assume 30.5 days per month. Name the output "Days

```
SELECT (TO_DATE('2024-09-01', 'YYYY-MM-DD') - TO_DATE('2024-06-15',
'YYYY-MM-DD')) AS Days
FROM dual;
```

3. Display the days between January 1 and December 31

```
SELECT (TO_DATE('2024-12-31', 'YYYY-MM-DD') - TO_DATE('2024-01-01',
 'YYYY-MM-DD')) AS Days
FROM dual;
```

4. Using one statement, round today's date to the nearest month and nearest year, and truncate it to the nearest month and nearest year. Use an alias for each column.

```
 SELECT ROUND(SYSDATE, 'MM') AS Rounded_Month,
TRUNC(SYSDATE, 'MM') AS Truncated_Month,
ROUND(SYSDATE, 'YYYY') AS Rounded_Year,
TRUNC(SYSDATE, 'YYYY') AS Truncated_Year
FROM dual;
```

5. What is the last day of the month for June 2005? Use an alias for the output

```
SELECT LAST_DAY(TO_DATE('2005-06-01', 'YYYY-MM-DD')) AS
Last_Day_June_2005
FROM dual;
```

6. Display the number of years between the Global Fast Foods employee Bob Miller's birthday and today. Round to the nearest year

```
SELECT ROUND(MONTHS_BETWEEN(SYSDATE, TO_DATE('1985-05-10',
'YYYY-MM-DD')) / 12) AS Years_Between
```

FROM dual; -- Adjust Bob's birthday as necessary

7. Your next appointment with the dentist is six months from today. On what day will you go to the dentist? Name the output, “Appointment.”

```
        SELECT ADD_MONTHS(SYSDATE, 6) AS Appointment
FROM dual;
```

8. The teacher said you have until the last day of this month to turn in your research paper. What day will this be? Name the output, “Deadline.

```
SELECT LAST_DAY(SYSDATE) AS Deadline
FROM dual;
```

9. How many months between your birthday this year and January 1 next year?

```
SELECT MONTHS_BETWEEN(TO_DATE('2025-01-01', 'YYYY-MM-DD'),
TO_DATE('2024-09-15', 'YYYY-MM-DD')) AS Months_Between
FROM dual;  -- Adjust your birthday as necessary
```

10. What’s the date of the next Friday after your birthday this year? Name the output, “first friday”.

```
SELECT NEXT_DAY(TO_DATE('2024-09-15', 'YYYY-MM-DD'), 'FRIDAY') AS
First_Friday
FROM dual;  -- Adjust your birthday as necessary
```

11. Name a date function that will return a number

MONTHS_BETWEEN

12. Name a date function that will return a date

LAST_DAY
NEXT_DAY

13. Give one example of why it is important for businesses to be able to manipulate date data?

The reason it is important for businesses to be able to manipulate date data is because

you can easily create mathematical functions with dates to track, schedule, and review business needs.

Extension Exercise

1. Using DUAL, write a statement that will convert 86.678 to 86.68

```
SELECT ROUND(86.678, 2) AS Rounded_Value FROM dual;
```

2. Write a statement that will display the DJs on demand CD titles for cd_numbers 90 and 91 in uppercase in a column headed “DJs on Demand Collections.”

```
SELECT UPPER(cd_title) AS "DJs on Demand Collections" FROM dj_list
WHERE cd_number IN (90, 91);
```

3. Write a statement that will create computer usernames for the DJs on Demand partners. The usernames will be the lowercase letters of the last name + the uppercase first letter in the first name. Title the column “User Passwords.” For example, Mary Smythers would be smythersM

```
SELECT LOWER(last_name) || UPPER(SUBSTR(first_name, 1, 1)) AS "User
Passwords"
FROM dj_list;
```

4. Write a statement that will convert “it’s a small world” to “hello world”

```
SELECT REPLACE (‘it's a small world”, “hello world”) AS modified_string
FROM dual
```

5. Write a statement that will remove the “fiddle” from “fiddledeedee” and the “dum” from “fiddledeedum.” Display the result “fiddledeedeedee” in a column with the heading “Nonsense.”

```
SELECT REPLACE(REPLACE('fiddledeedum', 'dum', 'dee'), 'fiddle', '') AS
 Nonsense FROM dual;
```

6. Replace every “i” in Mississippi with “$.”

```
SELECT REPLACE('Mississippi', 'i', '$') AS Modified_String FROM dual;
```

7. Using DUAL, convert 5332.342 to 5300.

SELECT TRUNC(5332.342, -2) AS Rounded_Value FROM dual;

8. Using DUAL, convert 3.14159 to 3.14.

SELECT ROUND(3.14159, 2) AS Rounded_Value FROM dual;

9. Using DUAL, convert 73.892 to 73.8.

SELECT ROUND(73.892, 1) AS Rounded_Value FROM dual;

10. What is next Friday six months from now? Label the column “Future.”

SELECT NEXT_DAY(ADD_MONTHS(SYSDATE, 6), 'FRIDAY') AS Future
FROM dual;

11. What is the date 10 years from now? Label the column “Future”

SELECT SYSDATE + INTERVAL '10' YEAR AS Future FROM dual;

12. Leap years occur every four years. Remember, 2004 was a leap year. Now create a function that will show the date of the next leap year as 29-Feb-2008. Label the column “Future.”

CREATE OR REPLACE FUNCTION next_leap_year (start_year IN NUMBER) RETURN DATE AS future_leap_year NUMBER; BEGIN -- Find the next leap year future_leap_year := start_year + (4 - MOD(start_year, 4)); -- Ensure it is actually a leap year by checking divisibility rules IF (MOD(future_leap_year, 100) = 0 AND MOD(future_leap_year, 400) != 0) THEN future_leap_year := future_leap_year + 4; END IF; -- Return February 29th of the next leap year RETURN TO_DATE('29-FEB-' || future_leap_year, 'DD-MON-YYYY'); END;

SELECT next_leap_year(2004) AS Future FROM dual;

13. Write a statement that will find any of the DJs on Demand CD themes that have an “ie” in their names.

```
SELECT DJ_names
FROM DJ_list
WHERE DJ_names LIKE '%ie%';
```

14. Write a statement that will return only the DJs on Demand CDs with years greater than 2000 but less than 2003. Display both the title and year.

```
SELECT DJ_name, CD_years
FROM DJ_list
WHERE CD_years > 2000 AND CD_years < 2003;
```

15. Write a statement that will return the Oracle database employee's employee ID and his starting hire dates between January 1, 1997 and today. Display the result ordered from most recently hired to the oldest.

```
SELECT employee_id, hire_date
FROM employees
WHERE MONTHS_BETWEEN TO_DATE('01-JAN-1997', 'DD-MON-YYYY') AND
SYSDATE
ORDER BY hire_date DESC;
```

5-1: Conversion Functions

Vocabulary
Identify the vocabulary word for each definition below.

CHAR	Used for text and character data of fixed length, including, numbers, dashes, and special characters
TRIM	Used to remove padded blanks or to suppress leading zeros
TO_NUMBER	Functions that convert a value from one datatype to another
NUMBER	Used to Store variable-length numeric data
VARCHAR2	Used for character data of variable length,

	including numbers, special characters, and dashes
SYSDATE	Used for date and time values
CHAR	Converts dates or numbers to character strings with optional formatting
'RR'	Century value depends on the specified year and the last 2 digits of the current year
TO_NUMBER	Converts a character string containing digits to a number with optional formatting
'DD'	Numeric day of the month
TO_DATE	Converts a character string representing a date to a date value with optional formatting

1. List the last names and birthdays of Global Fast Food Employees. Convert the birth dates to
character data in the Month DD, YYYY format. Suppress any leading zeros.

```
SELECT last_name,
TRIM(TO_CHAR(birth_date, 'Month DD, YYYY')) AS formatted_birth_date
FROM global_fast_food_employees;
```

2. Convert January 3, 04, to the default date format 03-Jan-2004.

```
SELECT TO_CHAR(TO_DATE('January 3, 04', 'Month DD, YY'), 'DD-Mon-YYYY') AS
formatted_date
FROM dual;
```

3. Format a query from the Global Fast Foods f_promotional_menus table to print out the start_date of promotional code 110 as: The promotion began on the tenth of February 2004.

```
SELECT 'The promotion began on the ' ||
    TO_CHAR(start_date, 'FMDDth') ||
    ' of ' ||
```

```
    TO_CHAR(start_date, 'Month YYYY') AS promotion_message
FROM f_promotional_menus
WHERE promo_code = 110;
```

4. Convert today's date to a format such as: "Today is the Twentieth of March, Two Thousand Four"

```
SELECT 'Today is the ' ||
    TO_CHAR(SYSDATE, 'FMDDth') ||
    ' of ' ||
    TO_CHAR(SYSDATE, 'Month') ||
    ', Two Thousand ' ||
    TO_CHAR(SYSDATE, 'YYYY') AS formatted_today
FROM dual;
```

5. List the ID, name, and salary for all Global Fast Foods employees. Display salary with a $ sign and two decimal places.

```
SELECT employee_id,
    first_name || ' ' || last_name AS employee_name,
    TO_CHAR(salary, '$999,999.99') AS formatted_salary
FROM global_fast_food_employees;
```

6. Ellen Abel is an employee who has received a $2,000 raise. Display her first name and last name, her current salary, and her new salary. Display both salaries with a $ and two decimal places. Label her new salary column AS New Salary.

```
SELECT first_name,
    last_name,
    TO_CHAR(salary, '$999,999.99') AS current_salary,
    TO_CHAR(salary + 2000, '$999,999.99') AS new_salary
FROM global_fast_food_employees
WHERE first_name = 'Ellen' AND last_name = 'Abel';
```

7. On what day of the week and date did Global Fast Foods' promotional code 110 Valentine's
Special begin?

```
SELECT TO_CHAR(start_date, 'Day, DD-Mon-YYYY') AS promo_start_date
```

```
FROM f_promotional_menus
WHERE promo_code = 110;
```

8. Create one query that will convert 25-Dec-2004 into each of the following (you will have to convert 25-Dec-2004 to a date and then to character data):

December 25th, 2004
DECEMBER 25TH, 2004
25th december, 2004

```
SELECT TO_CHAR(TO_DATE('25-Dec-2004', 'DD-Mon-YYYY'), 'Month DDth, YYYY')
AS "December 25th, 2004",
      TO_CHAR(TO_DATE('25-Dec-2004', 'DD-Mon-YYYY'), 'FMMONTH DDth, YYYY')
AS "DECEMBER 25TH, 2004",
      TO_CHAR(TO_DATE('25-Dec-2004', 'DD-Mon-YYYY'), 'DDth fmmonth, YYYY') AS
"25th december, 2004"
FROM dual;
```

9.Create a query that will format the DJs on Demand d_packages columns, low-range and high-
range package costs, in the format $2500.00.

```
SELECT package_name,
      TO_CHAR(low_range, '$9999.99') AS formatted_low_range,
      TO_CHAR(high_range, '$9999.99') AS formatted_high_range
FROM d_packages;
```

10. Convert JUNE192004 to a date using the fx format model.

```
SELECT TO_DATE('JUNE192004', 'FXMONTHDDYYYY') AS formatted_date
FROM dual;
```

11. What is the distinction between implicit and explicit data type conversion? Give an example of each.

```
SELECT '100' + 50 FROM dual;
```

12. Why is it important from a business perspective to have data type conversions?

It's important to have data type conversions in order to keep data accurate and consistent within a business system. It allows the business system the ability to query more effectively, aggregation , and analysis of data.

5-2: NULL Functions

Vocabulary
Identify the vocabulary word for each definition below.

COALESCE	Converts nulls to an actual value
COALESCE	Returns the first non-null expression in the list
ISNULL	Examines the first expression; if the first expression is not null, it returns the second expression; if the first expression is null, it returns the third expression
NULLIF	Compares two expressions; if they are equal, the function returns null; if they are not equal, the function returns the first expression

1. Create a report that shows the Global Fast Foods promotional name, start date, and end date from the f_promotional_menus table. If there is an end date, temporarily replace it with “end in two weeks.” If there is no end date, replace it with today’s date.

```
SELECT
   promo_name AS "Promotional Name",
   start_date AS "Start Date",
   COALESCE(end_date, CURRENT_DATE) AS "End Date"
FROM
   f_promotional_menus
WHERE
   end_date IS NOT NULL
   OR CURRENT_DATE + INTERVAL '14' DAY = CURRENT_DATE;
```

2. Not all Global Fast Foods staff members receive overtime pay. Instead of displaying a null value for these employees, replace null with zero. Include the employee’s last name and overtime rate in the output. Label the overtime rate as “Overtime Status”.

```
SELECT
   last_name AS "Last Name",
   NVL(overtime_rate, 0) AS "Overtime Status"
FROM
   employees;
```

3. The manager of Global Fast Foods has decided to give all staff who currently do not earn overtime an overtime rate of $5.00. Construct a query that displays the last names and the overtime rate for each staff member, substituting $5.00 for each null overtime value.

```
SELECT
   last_name AS "Last Name",
   NVL(overtime_rate, 5.00) AS "Overtime Rate"
FROM
   Employees;
```

4. Not all Global Fast Foods staff members have a manager. Create a query that displays the employee last name and 9999 in the manager ID column for these employees.

```
SELECT
   last_name AS "Last Name",
   NVL(manager_id, 9999) AS "Manager ID"
FROM
   employees;
```

5. Which statement(s) below will return null if the value of v_sal is 50?

c. SELECT NULLIF(v_sal, 50) FROM emp;

6. What does this query on the Global Fast Foods table return?

```
SELECT COALESCE(last_name, to_char(manager_id)) as NAME
FROM f_staffs;
```

This query checks if the last_name column is NULL. If last_name is not NULL, it returns the last_name. If last_name is NULL, it converts manager_id to a string using TO_CHAR() and returns the manager_id instead.

7.

a. Create a report listing the first and last names and month of hire for all employees in the EMPLOYEES table (use TO_CHAR to convert hire_date to display the month).

```
SELECT
   first_name AS "First Name",
   last_name AS "Last Name",
   TO_CHAR(hire_date, 'Month') AS "Month of Hire"
FROM
   employees;
```

b. Modify the report to display null if the month of hire is September. Use the NULLIF function.

```
SELECT
   first_name AS "First Name",
   last_name AS "Last Name",
   NULLIF(TO_CHAR(hire_date, 'Month'), 'September') AS "Month of Hire"
FROM
   employees;
```

8. For all null values in the specialty column in the DJs on Demand d_partners table, substitute “No Specialty.” Show the first name and s

```
SELECT
   first_name AS "First Name",
   NVL(specialty, 'No Specialty') AS "Specialty"
FROM
   d_partners;
```

5-3: Conditional Expressions

Vocabulary
Identify the vocabulary word for each definition below.

DECODE	Compares an expression to each of the search values
CASE	An if-then-else expression whose value depends on the truth-value of a Boolean expression
CASE	Implements conditional processing within a SQL statement; it meets the ANSI standard

1. From the DJs on Demand d_songs table, create a query that replaces the 2-minute songs with “shortest” and the 10-minute songs with “longest”. Label the output column “Play Times”.

```
SELECT
   CASE
      WHEN duration = 2 THEN 'shortest'
      WHEN duration = 10 THEN 'longest'
      ELSE TO_CHAR(duration)
   END AS "Play Times"
FROM
   d_songs;
```

2. Use the Oracle database employees table and CASE expression to decode the department id. Display the department id, last name, salary, and a column called “New Salary” whose value is based on the following conditions:

If the department id is 10 then 1.25 * salary
If the department id is 90 then 1.5 * salary
If the department id is 130 then 1.75 * salary
Otherwise, display the old salary.

```
SELECT
        department_id,
        last_name,
        salary,
        CASE
           WHEN department_id = 10 THEN salary * 1.25
           WHEN department_id = 90 THEN salary * 1.5
           WHEN department_id = 130 THEN salary * 1.75
```

```
        ELSE salary
    END AS "New Salary"
FROM
    employees;
```

3. Display the first name, last name, manager ID, and commission percentage of all employees in departments 80 and 90. In a 5th column called “Review”, again display the manager ID. If they don’t have a manager, display the commission percentage. If they don’t have a commission, display 99999

```
SELECT
    first_name,
    last_name,
    manager_id,
    commission_pct,
    CASE
        WHEN manager_id IS NOT NULL THEN manager_id
        WHEN commission_pct IS NOT NULL THEN commission_pct
        ELSE 99999
    END AS "Review"
FROM
    employees
WHERE
    department_id IN (80, 90);
```