Advanced SQL Topics

PIERIAN DATA

SQL

- Section Overview
  - Timestamps and EXTRACT
  - Math Functions
  - String Functions
  - Sub-query
  - Self-Join

Timestamps and Extract

PART ONE
DISPLAYING CURRENT TIME INFORMATION

PIERIAN DATA

SQL

- In Part One, we will go over a few commands that report back time and date information.
- These will be more useful when creating our own tables and databases, rather than when querying a database.

SQL

- We've already seen that PostgreSQL can hold date and time information:
  - **TIME** - Contains only time
  - **DATE** - Contains only date
  - **TIMESTAMP** - Contains date and time
  - **TIMESTAMPTZ** - Contains date,time, and timezone

SQL

- Careful considerations should be made when designing a table and database and choosing a time data type.
- Depending on the situation you may or may not need the full level of TIMESTAMPTZ
- Remember, you can always remove historical information, but you can’t add it!

SQL

- Let’s explore functions and operations related to these specific data types:
  - TIMEZONE
  - NOW
  - TIMEOFDAY
  - CURRENT_TIME
  - CURRENT_DATE

Timestamps and Extract

PART TWO
EXTRACTING TIME AND DATE INFORMATION

PIERIAN DATA

SQL

- Let’s explore extracting information from a time based data type using:
  - EXTRACT()
  - AGE()
  - TO_CHAR()

SQL

- EXTRACT()
  - Allows you to “extract” or obtain a sub-component of a date value
    - YEAR
    - MONTH
    - DAY
    - WEEK
    - QUARTER

SQL

- EXTRACT()
  - Allows you to “extract” or obtain a sub-component of a date value
    - EXTRACT(YEAR FROM date_col)

SQL

- AGE()
  - Calculates and returns the current age given a timestamp
  - Useage:
    - AGE(date_col)
  - Returns
    - 13 years 1 mon 5 days 01:34:13.003423

SQL

- TO_CHAR()
  - General function to convert data types to text
  - Useful for timestamp formatting
  - Usage
    - TO_CHAR(date_col, ‘mm-dd-yyyy’)

SQL

- All of these functions are best understood through example, so let’s jump to pgadmin and work with these functions!

Timestamps and Extract

CHALLENGE TASKS

SQL

- During which months did payments occur?
- Format your answer to return back the full month name.

SQL

- Expected Result

1	MARCH
2	MAY
3	FEBRUARY
4	APRIL

SQL

- Hints
  - You do not need to use EXTRACT for this query.

SQL

- Solution
- SELECT DISTINCT(TO_CHAR(payment_date,'MONTH')) FROM payment

SQL

- How many payments occurred on a Monday?
- *NOTE: We didn't show you exactly how to do this, but use the documentation or Google to figure this out!*

SQL

- Expected Result
  - 2948

SQL

- Hints
  - Use EXTRACT
  - Review the **dow** keyword
  - PostgreSQL considers Sunday the start of a week (indexed at 0)

SQL

- Solution
- SELECT COUNT(*)
  FROM payment
  WHERE EXTRACT(dow FROM payment_date) = 1

Mathematical Functions

SQL

- Let’s quickly explore some mathematical operations we can perform with SQL!
- This is best shown through examples and the documentation, so we’ll jump straight to pgAdmin.

String Functions and Operations

SQL

- PostgreSQL also provides a variety of string functions and operators that allow us to edit, combine, and alter text data columns.
- Let’s explore the documentation to see what is available for us!

String Functions and Operations

QUICK CHALLENGE TASK

PIERIAN DATA

SubQuery

SQL

- In this lecture we will we discuss how to perform a subquery as well as the EXISTS function.

SQL

- A sub query allows you to construct complex queries, essentially performing a query on the results of another query.
- The syntax is straightforward and involves two SELECT statements.

SQL

- Let’s imagine a table consisting of student names and their test scores

SQL

- Standard Query
  - SELECT student,grade
    FROM test_scores

SQL

- Standard Query to return average grade
  - SELECT AVG(grade)
    FROM test_scores

SQL

- *How can we get a list of students who scored better than the average grade?*
  - SELECT AVG(grade)
    FROM test_scores

SQL

- *It looks like we need two steps, first get the average grade, then compare the rest of the table against it.*
  - SELECT AVG(grade)
    FROM test_scores

SQL

- *This is where a subquery can help us get the result in a “single” query request*
  - SELECT student,grade
    FROM test_scores
    WHERE grade > (SELECT AVG(grade)
    FROM test_scores)

SQL

- *This is where a subquery can help us get the result in a “single” query request*
  - SELECT student,grade
    FROM test_scores
    WHERE grade > (SELECT AVG(grade)
    FROM test_scores)

SQL

- *This is where a subquery can help us get the result in a “single” query request*
  - SELECT student,grade
    FROM test_scores
    WHERE grade > (70)

SQL

- *This is where a subquery can help us get the result in a “single” query request*
  - SELECT student,grade
    FROM test_scores
    WHERE grade > (SELECT AVG(grade)
    FROM test_scores)

SQL

- The subquery is performed first since it is inside the parenthesis.
- We can also use the IN operator in conjunction with a subquery to check against multiple results returned.

SQL

- *A subquery can operate on a separate table:*
  - SELECT student,grade
    FROM test_scores
    WHERE student IN
    (SELECT student
    FROM honor_roll_table)

SQL

- *A subquery can operate on a separate table:*
  - SELECT student,grade
    FROM test_scores
    WHERE student IN
    (('Zach' , 'Chris' , 'Karissa'))

SQL

- *A subquery can operate on a separate table:*
  - SELECT student,grade
    FROM test_scores
    WHERE student IN
    (SELECT student
    FROM honor_roll_table)

SQL

- The EXISTS operator is used to test for existence of rows in a subquery.
- Typically a subquery is passed in the EXISTS() function to check if any rows are returned with the subquery.

SQL

- Typical Syntax

```
SELECT column_name
FROM table_name
WHERE EXISTS
(SELECT column_name FROM
table_name WHERE condition);
```

SQL

- Subqueries and EXISTS are best learned through example, so let’s jump to pgAdmin!

Self-Join

SQL

- A self-join is a query in which a table is joined to itself.
- Self-joins are useful for comparing values in a column of rows within the same table.

SQL

- The self join can be viewed as a join of two copies of the same table.
- The table is not actually copied, but SQL performs the command as though it were.
- There is no special keyword for a self join, its simply standard JOIN syntax with the same table in both parts.

SQL

- However, when using a self join it is necessary to use an alias for the table, otherwise the table names would be ambiguous.
- Let’s see a syntax example of this.

SQL

- Syntax
  - SELECT tableA.col, tableB.col
    FROM table AS tableA
    JOIN table AS tableB ON
    tableA.some_col = tableB.other_col

SQL

- Syntax
  - SELECT tableA.col, tableB.col
    FROM table AS tableA
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SQL

- Let’s explore a more realistic situation of when you would use this.

SQL

- Let’s explore a more realistic situation of when you would use this.

EMPLOYEES		
emp_id	name	report
1	Andrew	3
2	Bob	3
3	Charlie	4
4	David	1

SQL

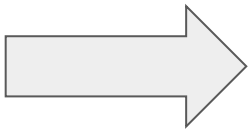
- Each employee sends reports to another employee.

EMPLOYEES		
emp_id	name	report_id
1	Andrew	3
2	Bob	3
3	Charlie	4
4	David	1

SQL

- We want results showing the employee name and their reports recipient name

EMPLOYEES		
emp_id	name	report_id
1	Andrew	3
2	Bob	3
3	Charlie	4
4	David	1



name	rep
Andrew	Charlie
Bob	Charlie
Charlie	David
David	Andrew

SQL

- Syntax
  - SELECT tableA.col, tableB.col
    FROM table AS tableA
    JOIN table AS tableB ON
    tableA.some_col = tableB.other_col

SQL

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- Syntax
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EMPLOYEES		
emp_id	name	report_id
1	Andrew	3
...	...	...

SQL

- Syntax
  - SELECT tableA.col, tableB.col
    FROM employees AS tableA
    JOIN employees AS tableB ON
    tableA.some_col = tableB.other_col

SQL

- Syntax
  - SELECT tableA.col, tableB.col
    FROM employees AS tableA
    JOIN employees AS tableB ON
    tableA.some_col = tableB.other_col

SQL

- Syntax
  - SELECT tableA.col, tableB.col
    FROM employees AS tableA
    JOIN employees AS tableB ON
    tableA.some_col = tableB.other_col

EMPLOYEES		
emp_id	name	report_id
1	Andrew	3
...	...	...

SQL

- Syntax
  - SELECT emp.col, tableB.col
    FROM employees AS emp
    JOIN employees AS tableB ON
    emp.some_col = tableB.other_col

SQL

- Syntax
  - SELECT emp.col, tableB.col
    FROM employees AS emp
    JOIN employees AS tableB ON
    emp.some_col = tableB.other_col

SQL

- Syntax
  - SELECT emp.col, tableB.col
    FROM employees AS emp
    JOIN employees AS tableB ON
    emp.some_col = tableB.other_col

EMPLOYEES		
emp_id	name	report_id
1	Andrew	3
...	...	...

PIERIAN DATA

SQL

- Syntax
  - SELECT emp.col, report.col
    FROM employees AS emp
    JOIN employees AS report ON
    emp.some_col = report.other_col

SQL

- Syntax
  - SELECT emp.col, report.col
    FROM employees AS emp
    JOIN employees AS report ON
    emp.some_col = report.other_col

SQL

- Syntax
  - SELECT emp.col, report.col
    FROM employees AS emp
    JOIN employees AS report ON
    emp.emp_id = report.report_id

SQL

- Syntax
  - SELECT emp.col, report.col
    FROM employees AS emp
    JOIN employees AS report ON
    emp.emp_id = report.report_id

SQL

- Syntax
  - SELECT emp.name, report.name
    FROM employees AS emp
    JOIN employees AS report ON
    emp.emp_id = report.report_id

SQL

- Syntax
  - **SELECT** emp.name, report.name
    FROM employees **AS** emp
    JOIN employees **AS** report **ON**
    emp.emp_id = report.report_id

SQL

- Syntax
  - **SELECT** emp.name, report.name **AS** rep
    FROM employees **AS** emp
    JOIN employees **AS** report **ON**
    emp.emp_id = report.report_id

SQL

- We want results showing the employee name and their reports recipient name

name	rep
Andrew	Charlie
Bob	Charlie
Charlie	David
David	Andrew

SQL

- Let’s explore an example on our dvdrental database in pgAdmin!