Subqueries

DATA MANIPULATION IN SNOWFLAKE

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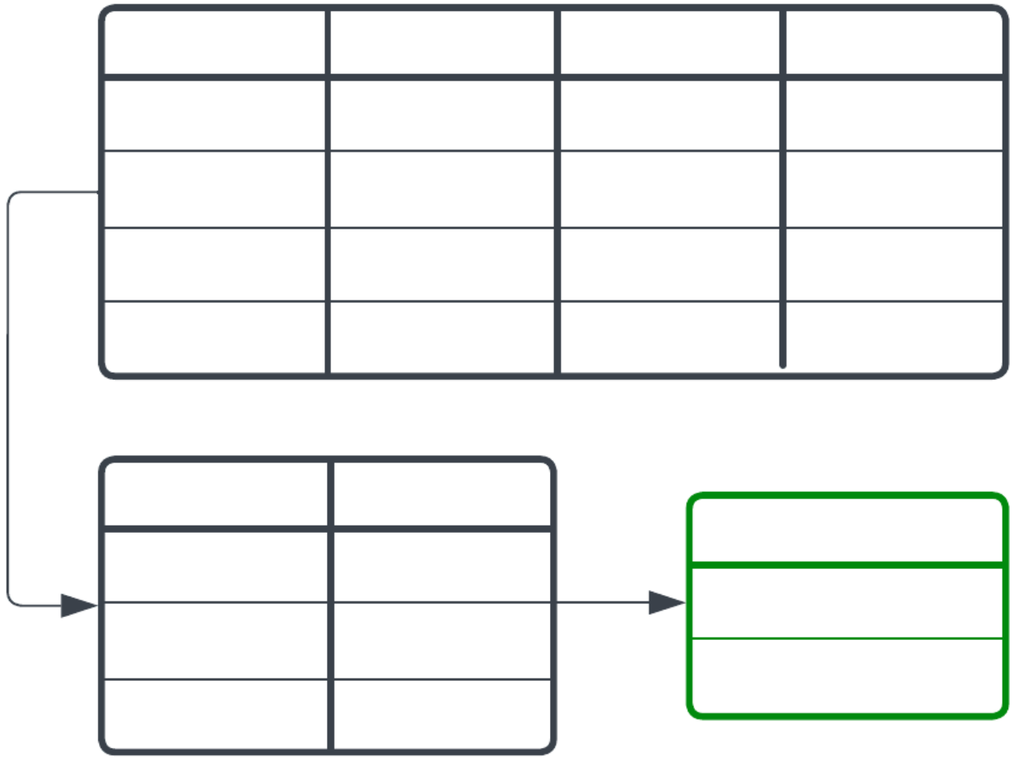
What are subqueries?

Subqueries are a tool that allow for the result of one query to be used by another query.



- Combine multiple queries
- Focus on readability
- Allow for modularity
- Make data manipulation easier!

`FROM ( ... )` or `WHERE ... IN ( ... )`

Subqueries and FROM

```
SELECT
    ...
-- Pull from query, not from a table
FROM (

    -- Create a result set that will
    -- be used by the main query
    SELECT
        <fields>
    FROM <table>
    WHERE ...

);
```

Retrieve data from the result of another query rather than pulling directly from a table.

- Decouple manipulation from analysis
- Makes queries easier to read, understand
- Allows for "portability" and easier changes
- `JOIN`, `WHERE`, etc.

Before a subquery

```
SELECT
    month_num,
    -- windchill - temperature has to be used twice here. What if this changes?
    AVG(windchill - temperature) AS avg_differential
    MIN(windchill - temperature) AS most_differential
FROM weather
WHERE
    -- Filtering is taking place in the same query as aggregation/analysis
    season = 'Winter' AND
    temperature < 32
GROUP BY month_num;
```

After a subquery

```
-- Start with the subquery, then aggregate
SELECT
    month_num,
    AVG(differential) AS avg_differential
    MIN(differential) AS most_differential
FROM (

    SELECT
        month_num,
        windchill - temperature AS differential
    FROM weather
    WHERE
        season = 'Winter' AND
        temperature < 32

)
GROUP BY month_num;
```

```
| month_num | differential |
| --------- | ------------ |
|     12    |      -12     |
|     1     |      -3      |
|     1     |       0      |
|     2     |      -7      |
```

```
| month_num | avg_differential | most_differential |
| --------- | ---------------- | ----------------- |
|     12    |       -5.77      |        -14        |
|     1     |       -1.91      |        -8         |
|     2     |       -8.13      |        -22        |
```

It's easy to understand and change the analysis once the data is cleaned.

WHERE ... IN (...)

```
...

-- Filter by records with a value in
-- the subquery result set
WHERE <field> IN (

    SELECT <other-field> FROM ...

);
```

Create a small result set to be used when transforming, filtering, or manipulating data.

- Filter for records `IN` a non-constant set of results
- Can be used in other places in a query
- `AVG`, `MAX`, `MIN`, etc.

WHERE ... IN(...)

```
SELECT
    todays_date,
    temperature,
    status
FROM weather
WHERE todays_date IN (  -- Filter by all days with home games that were won

    SELECT
        game_date
    FROM game_schedule
    WHERE stadium = 'Home' AND did_win = TRUE

);
```

WHERE ... IN (...)

todays_date	temperature	status
2025-04-01	51	Rainy, Windy
2025-05-14	67	Sunny
2025-06-13	74	Thunder Storms, Windy

Let's practice!

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Common Table Expressions

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Common Table Expressions

Common Table Expressions (CTE's) temporarily store the results of a query to eventually be used by another query

- CTE's are defined at the beginning of a query
- `WITH <cte-name> AS ( <query> )`
- Similar to subqueries

```
-- Pass the name of the CTE, followed
-- by the query in parenthesis
WITH <cte-name> AS (
    <query>
)

SELECT
    ...
FROM <cte-name>
... ;
```

Reporting on at-risk students

```
WITH at_risk AS (
    SELECT
        student_id
        course_name,
        teacher_name,
        grade
    FROM student_courses
    WHERE grade < 70 AND is_required
)

SELECT
    students.student_name,
    at_risk.*
FROM at_risk
JOIN students ON at_risk.student_id = students.id;
```

- Temporary results stored in `at_risk`
- Select a subset of records
- Query `at_risk` to generate a report

Reporting on at-risk students

student_id	course_name	teacher_name	grade
821930	Algebra	Mrs. Walker	61
636133	Biology	Mr. Casey	67
097165	History	Ms. Grimes	59

student_name	student_id	course_name	teacher_name	grade
L. Holt	821930	Algebra	Mrs. Walker	61
J. Barnes	636133	Biology	Mr. Casey	67
E. Yang	097165	History	Ms. Grimes	59

Comparing Subqueries and CTE's

```
SELECT
    month_num,
    AVG(differential) AS avg_differential
    MIN(differential) AS most_differential
FROM (

    SELECT
        month_num,
        windchill - temperature AS differential
    FROM weather
    WHERE
        season = 'Winter' AND
        temperature < 32

)
GROUP BY month_num;
```

```
WITH daily_temperature_differential AS (
    SELECT
        month_num,
        windchill - temperature AS differential
    FROM weather
    WHERE
        season = 'Winter' AND
        temperature < 32
)

SELECT
    month_num,
    AVG(differential) AS avg_differential
    MIN(differential) AS most_differential
FROM daily_temperature_differential
GROUP BY month_num;
```

Finding temperature differential

```
WITH daily_temperature_differential AS (
    SELECT
        month_num,
        windchill - temperature AS differential
    FROM weather
    WHERE
        season = 'Winter' AND
        temperature < 32
)

SELECT
    month_num,
    AVG(differential) AS avg_differential
    MIN(differential) AS most_differential
FROM daily_temperature_differential
GROUP BY month_num;
```

```
| month_num | differential |
| --------- | ------------ |
|     12    |      -12     |
|     1     |      -3      |
|     1     |       0      |
|     2     |      -7      |
```

The progression is more natural than subqueries.

```
| month_num | avg_differential | most_differential |
| --------- | ---------------- | ----------------- |
|     12    |       -5.77      |        -14        |
|     1     |       -1.91      |        -8         |
|     2     |       -8.13      |        -22        |
```

Let's practice!

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Advanced Common Table Expressions

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Defining multiple Common Table Expressions

More than one common table expression can be defined using a single `WITH` clause

- Arbitrary # of CTE's can be defined
- CTE's can be `JOIN` 'd together
- Can still perform complex operations in a CTE
- Could even use the results of one CTE in another

```
WITH <cte-name> AS (

    <query>

), <another-cte-name> (

    -- Add another query!
    <another-query>
)

-- These CTE's could be JOIN'd
SELECT ... ;
```

Top-performing courses

```
WITH active_courses AS (
    SELECT
        id,
        course_name,
        teacher_name
    FROM courses
    WHERE is_active
), course_avgs (
    SELECT
        course_id,
        AVG(grade) AS avg_grade
    FROM student_courses
    GROUP BY course_id
)
```

```
SELECT
    a.course_name,
    a.teacher_name,
    c.avg_grade
FROM active_courses AS a

-- JOIN these CTEs together
JOIN course_avgs AS c
    ON a.id = c.course_id

ORDER BY avg_grade DESC;
```

Query becomes easier to understand!

Top-performing courses

id	course_name	teacher_name
1145	Algebra	Mrs. Walker
1672	Biology	Mr. Casey
0985	History	Ms. Grimes

course_id	avg_grade
1145	87.77
1672	81.32
0985	91.56

course_name	teacher_name	avg_grade
Algebra	Mrs. Walker	87.77
Biology	Mr. Casey	81.32
History	Ms. Grimes	91.56

Tenured teachers

```
WITH active_courses AS (
    SELECT
        id,
        course_name,
        teacher_name,
        teacher_tenure
    FROM courses

    -- JOIN the teachers table to the courses
    -- table to get teacher_tenure
    JOIN teachers
        ON courses.teacher_id = teachers.id

    WHERE is_active
),
...
```

```
...
), course_avgs (
    SELECT
        course_id,
        AVG(grade) AS avg_grade
    FROM student_courses
    GROUP BY course_id
)

SELECT
    a.teacher_name,
    a.teacher_tenure
    MAX(c.avg_grade) AS highest_grade
FROM active_courses AS a
JOIN course_avgs AS c ON a.id = c.course_id
GROUP BY a.teacher_name, a.teacher_tenure;
```

Tenured teachers

teacher_name	teacher_tenure	highest_grade
Mrs. Walker	11 Years	92.89
Mr. Casey	27 Years	87.11
Ms. Grimes	2 Years	94.48

Let's practice!

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Wrapping up!

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