Extract

R

DBI

OUTLINE

- Motivation
- SQL Basics
  - Constructing a query
  - Functions
- Where should I write SQL queries?
- Building Connections

“I ~~rob banks~~ use databases because its where the ~~money~~ data is.”

–Willie Sutton

SQL

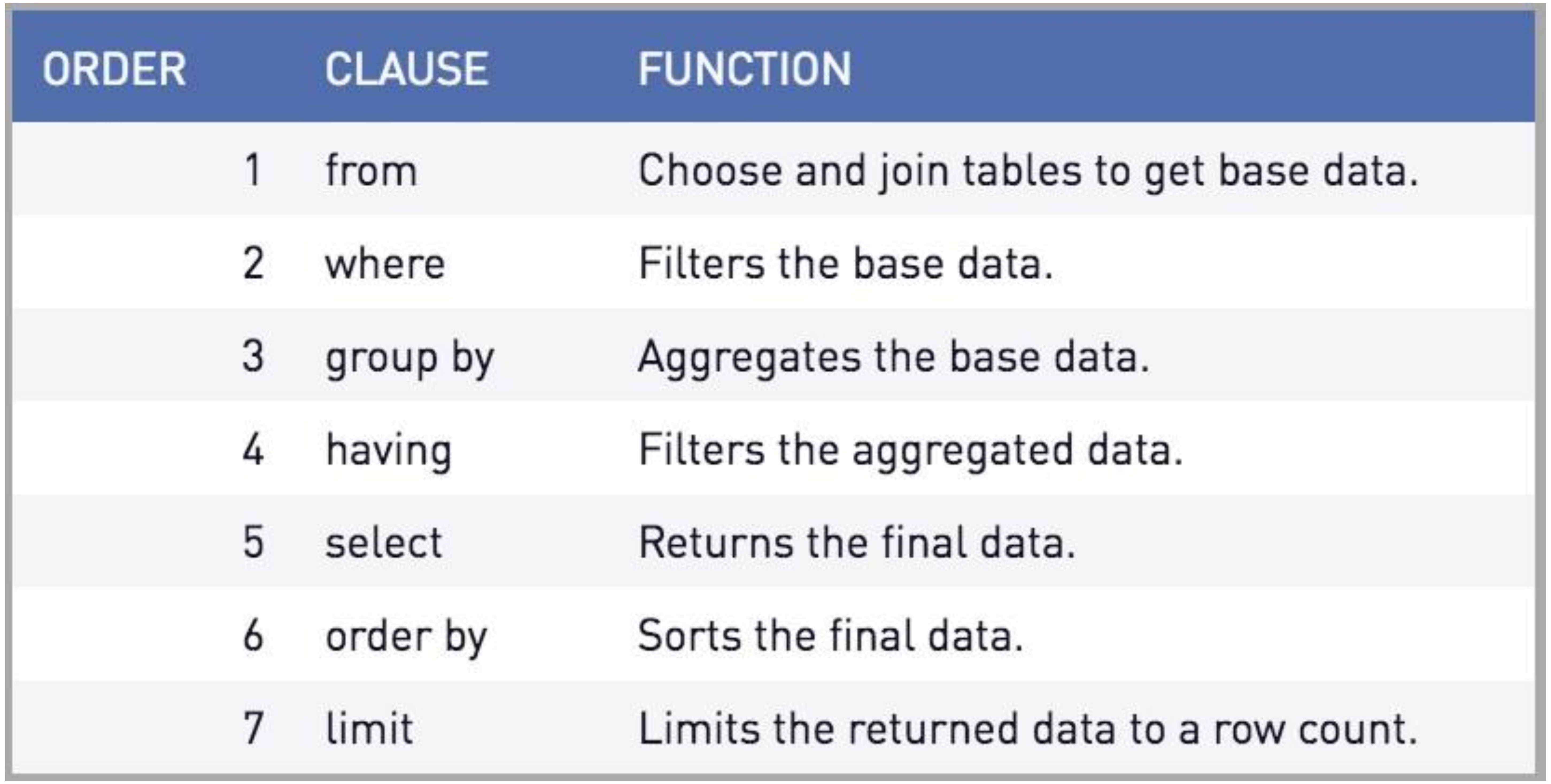
the structured language

“SQL is a domain specific language used in programming and … data held in a relational database management system”

–Wikipedia

Structuring a query

QUERIES



ORDER	CLAUSE	FUNCTION
1	from	Choose and join tables to get base data.
2	where	Filters the base data.
3	group by	Aggregates the base data.
4	having	Filters the aggregated data.
5	select	Returns the final data.
6	order by	Sorts the final data.
7	limit	Limits the returned data to a row count.

Source: periscope data

EXERCISE

- Run apps/wprdc_sql.R
- Build a query that selects all of the crimes by neighborhood from the City of Pittsburgh Police Blotter
  - Hint 1: FROM would be the resource ID (1797ead8-8262-41cc-9099-cbc8a161924b)
  - Hint 2: The WPRDC uses a Postgresql backend
    - This means that anything that contains number or capital letters have to be wrapped in quotes

2:00

SOLUTION

```
SELECT * FROM "1797ead8-8262-41cc-9099-cbc8a161924b"
```

WHERE

BETWEEN … AND

- BETWEEN
  - *Grab Values between two other values, like IN but for numeric values*
  - *Works like < and >*

```
SELECT column_name(s)
FROM table_name
WHERE column_name BETWEEN value1
      AND value2;
```

IN STATEMENTS

- Useful for when you have an input that returns multiple
- This works the same way %in% does in R
- Checks to see if the value in the column matches *any* of the values in your list

```
SELECT column_name(s)
FROM table_name
WHERE column_name IN (value1, value2, ...)
```

EXERCISE

- Run apps/wprdc_sql.R
- This time let’s target 311 requests (resource ID:76fda9d0-69be-4dd5-8108-0de7907fc5a4)
- Use the BETWEEN function as a WHERE filter to get 311 requests from from the last week.
  - Stretch goal: Use the IN Filter to only get requests of the Potholes, Weeds/Debris and Overgrowth call types.

SOLUTION

```
SELECT * FROM"76fda9d0-69be-4dd5-8108-0de7907fc5a4"
WHERE "CREATED_ON" BETWEEN '2019-09-30' AND '2019-
10-06'
```

```
SELECT * FROM "76fda9d0-69be-4dd5-8108-0de7907fc5a4"
WHERE "CREATED_ON" BETWEEN '2019-09-30' AND '2019-10-06'
AND "REQUEST_TYPE " IN (‘Potholes’, 'Weeds/Debris',
'Overgrowth')
```

SELECT Functions and GROUP BY

SQL FUNCTIONS

- Sometimes you don’t just want the raw data
- You want to aggregate the data in SQL before you load it into R
  - Use another server to do the heavy lifting so you don’t have to!
- This is where

DISTINCT

- DISTINCT()
  - Every unique value of a column.
  - Placing TWO columns inside will return unique instances of both columns:

```
DISTINCT(“REQUEST_TYPE”,  “DEPARTMENT”)
```

MATH FUNCTIONS

- MIN()
  - Returns minimum value in a column(s)
- MAX()
  - Return max value in a column(s)
- COUNT()
  - Return

COUNT, AVERAGE, SUM

- COUNT() - returns the number of rows that your query returns

  -
    ```
    SELECT COUNT(column_name)
    FROM table_name
    ```
- AVG() - returns the average value of a numeric column.

  -
    ```
    SELECT AVG(column_name)
    FROM table_name
    ```
- SUM() - function returns the total sum - numeric columns only

  -
    ```
    SELECT SUM(column_name)
    FROM table_name
    ```

GROUP BY

- This is helpful for when you are doing any of the summary functions mentioned in the previous slides. (COUNT, SUM, MAX etc)

- Any column that isn't handled with a function should be included in your GROUP BY

```
SELECT column_name(s), max(column_name)
FROM table_name
WHERE condition
GROUP BY column_name(s)
```

EXERCISE

- Run apps/wprdc_sql.R
  - Build a query that counts the number crimes by neighborhood from the City of Pittsburgh Police Blotter

5m 00s

SOLUTION

```
SELECT
"INCIDENTNEIGHBORHOOD",
COUNT("CCR")
FROM "1797ead8-8262-41cc-9099-cbc8a161924b"
GROUP BY "INCIDENTNEIGHBORHOOD"
```

Where should I…

write my DB queries

SQL IDE’S

- There are a bunch of SQL IDE’s each database provider has their own
- If you’re in a workplace like mine with no standard then I suggest something like DBeaver because it connects to pretty much everything
- If not, then use whatever comes standard with the platform

DB connections in R

Not always easy

CONNECTING

- Database connectors require that your computer has the necessary software.
  - This will depend on what database type you are trying to connect to

PostgreSQL

MySQL®

Microsoft® SQL Server®

ALLOWING HANDSHAKES

- To setup database connections you will need to install the proper drivers.
  - The steps for this can be found here: https://db.rstudio.com/best-practices/drivers/
  - In general setup on Windows is a little bit easier since ODBC Data Source Administrator can be used
- Your machine may already have drives installed if you've already installed SQL IDE's such as: pgAdmin, DBeaver, or the MySQL Workbench

Storing credentials

FILE OR ENVIRONMENTAL VARIABLE

- You should never "hard code" your credentials into an app.
- Instead you should store them as environmental variables, or in a hidden file that you ignore in the Git Repository
  - Why?

If something requires that you to login, we can assume that not just anybody should be able to access it.
Think of your credentials like your debit card and pin number

ESTABLISHING CONNECTIONS

- Each data base type has a different connection string and list of requirements.

```
conn <- dbConnect(odbc::odbc(), driver  ="FreeTDS", server ="IP_or_HOST_ADDRESS",  port
     = 1433, database  = "DBName", uid = un, pwd = pw, TDS_Version = "8.0")
```

- More on connection strings: https://db.rstudio.com/best-practices/drivers/#connecting-to-a-database-in-r