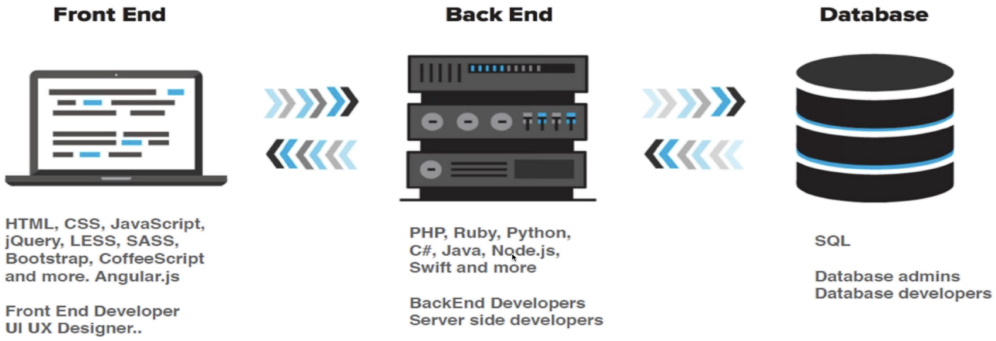
SQL

1. INTRODUCTION TO SQL

Web Application Architecture



- Manual Testing - Black Box Testing - Selenium - Protractor	- API Testing - API Automation	- Database Tester - Automate Database - Test Using JS - JDBC

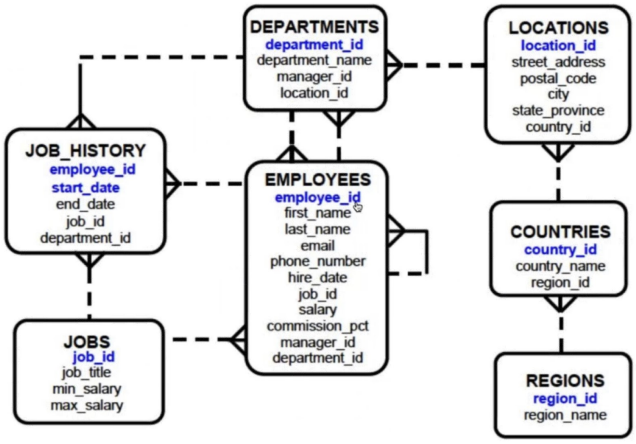
What is Data?

- Piece of information
- For ex. Bank account:
  - Account num
  - Account type
  - User firstname ...
- All above data needs to be stored somewhere, where **it is secure, easy to ready, fast to read, easy and fast to update**
- **In databases** we store data in an organized manner.

What is Database?

- Database is a systematic collection of data. Databases support storage and manipulation of data. Databases make data management easy.
- Data is stored into separate tables that are related to each other
- Database tables is similar to excel, webtable and consists of Columns and Rows.

What is Primary Key?	What is Foreign Key?
● It is unique column in every table in a database ● It can ONLY accept; ○ non-duplicate values ○ cannot be NULL	● It is a column that comes from a different table and using Foreign key tables are related each other ● It is the primary key of another table ● It can be duplicate or null for another table

Database Schema	

What is SQL?

- Structured Query Language
- It is a language that is used to work with Databases and manipulate data.

What is RDBMS?

- Relational Database Management System
- Relational Database → tables are related to each other using Primary and Foreign Keys
- All RDBMS are using SQL language.

2. SQL STATEMENT FUNDAMENTALS

- One of the most common tasks is to query data from tables by using the SELECT statement
- It has many clauses that you can combine to form a powerful query

SELECT STATEMENT

- Syntax → **SELECT** column1,column2...
  FROM table_name;
- First, we specify a list of columns in the table from which we want to query data in the **SELECT** statement. We use a **comma** between each column in case we want to query data from multiple columns.
- If we want to query data from **all column**, we can use an **asterisk (*)** as the shorthand for all columns.
- Second, we indicate the **table name** after the **FROM** keyword
- SQL language is NOT case-sensitive

DISTINCT STATEMENT

- Syntax → **SELECT DISTINCT** column1,column2...
  FROM table_name;
- We are trying to find that how many different type of value in the same column we have.

WHERE STATEMENT

- It is about what if we want to query (request) just particular rows from a table matching some sort of conditions.
- The **WHERE** clause appears right after the **FROM** clause of the **SELECT** statement.
- The conditions are used to ***filter the rows*** returned from the **SELECT** statement.
- PostgreSQL provides us with various standard operators to construct the conditions.
- Syntax → **SELECT** column1,column2...
  FROM table_name
  WHERE conditions;
- We can use JS operator in the condition part;
  - =, >, <, >=, <=, <> or !=, AND, OR

```
SELECT first_name,last_name, email
FROM customer
WHERE first_name = 'Tracy' AND last_name='Cole';
```

Data Output | Explain | Messages | Notifications | Query History

	first_name character varying (45)	last_name character varying (45)	email character varying (50)
1	Tracy	Cole	tracy.cole@sakilacusto...

dvdrental on postgres@PostgreSQL 9.5

```
SELECT email
FROM customer
WHERE first_name = 'Tracy' OR last_name='Cole';
```

Data Output | Explain | Messages | Notifications | Query History

	email character varying (50)
1	tracy.cole@sakilacustome...
2	tracy.herrmann@sakilacu...

If we want to know who paid the rental with amount is either less than $4 or greater than $8	**SELECT** * **FROM** payment **WHERE** amount<4 **OR** amount>8;
Different amount types greater than $5	**SELECT DISTINCT** amount **FROM** payment **WHERE** amount>5;
A customer forgot their wallet at our store. We need to track down their email to inform them. - What is the email for the customer with the name Jane Bennett?	**SELECT** email **FROM** customer **WHERE** first_name = 'Jane' **AND** last_name ='Bennett';
A customer wants to know what the movie "Angel's Life" is about. Could you give them the description for the movie "Angel's Life".	**SELECT** description **FROM** film **WHERE** title = 'Angels Life';
A customer is late on their movie return. I know their address is 604 Bern Place. I want to call them to let them know. Can you get me the phone number for the person who lives there.	**SELECT** phone **FROM** address **WHERE** address ='604 Bern Place';

COUNT STATEMENT

- The COUNT function returns the number of input rows that match a specific condition of a query.
- Similar to COUNT(*) function, the COUNT(column) function returns the number of rows returned by a SELECT clause.
- We can also use COUNT with DISTINCT.
    - However, it does not consider NULL values in the column.
- Syntax → **SELECT COUNT (*)**
  FROM table_name;

Please list how many different rental duration we have in our DVDRental Database	**SELECT COUNT(DISTINCT** rental_duration**)** **FROM** film**;**

ORDER BY STATEMENT

- The **ORDER BY** clause allows you to ***sort*** the rows returned from the SELECT statement in **ascending** or **descending** order based on criteria specified.
- If we sort the result set by multiple columns, use a **comma** to separate between two columns
- **ASC** → to sort the result set in ascending order (A-Z, 0-9)
- **DESC** → to sort the result set in descending order (Z-A, 9-0)
- If you leave it blank, the **ORDER BY** clause will use **ASC** by DEFAULT.
- Syntax → **SELECT COUNT (*)**
  FROM table_name;
  ORDER BY column_1 **ASC**/**DESC**;
-

Ex.	**SELECT** first_name, last_name **FROM** customer **ORDER BY** first_name **ASC,** last_name **DESC;**

LIMIT STATEMENT

- Allows you to limit the number of the rows you get back after a query.
- Useful when wanting to get all columns but not all rows.
- Goes at the end of a query.
- Syntax → **SELECT** column1,column2...
  FROM table_name;
  LIMIT number;

Get the customer ID numbers for the top 7 highest payment amounts	**SELECT** customer_id, amount **FROM** payment **ORDER BY** amount **DESC** **LIMIT** 7**;**

BETWEEN STATEMENT

- We use **BETWEEN** operator to match a value against a range of values.
- Syntax → value **BETWEEN** low **AND** high || value **NOT BETWEEN** low **AND** high
- If the value is greater than or equal to the low value and less than or equal to the high value, the expression returns true, or vice versa.
- We can rewrite the **BETWEEN** operator by using the greater than or **equal (>=)** or less than or **equal (<=)** operators as the following statement:
-

Provide me the list of first 5 movies where their replacement costs are between 15$ to $20 with title descending order	**SELECT** * **FROM** film **WHERE** replacement_cost **BETWEEN** 15 **AND** 20 **ORDER BY** title **DESC** **LIMIT** 5**;**

IN STATEMENT

- We use the IN operator with the WHERE clause to check if a value matches any value in a list of values.
    - Syntax → value **IN** (value1,value2…) || value **NOT IN** (value1,value2…)
    - The list of values is not limited to a list of numbers or strings but also a result of a SELECT statement as shown:
      value **IN** (**SELECT** value **FROM** table_name)
- **WHERE** customer_id = 5 **OR** customer_id=9 **OR** customer_id=13 === **WHERE** customer_id **IN**(5,9,13);

Display employee_id, first_name, last_name, salary for employees whose employee_id 101,105,117,123,125 order by salary high to low	**SELECT** employee_id, first_name, last_name, salary **FROM** employees **WHERE** employee_id **IN(**101,105,117,123,125**)** **ORDER BY** salary **DESC;**

LIKE

- Suppose the store manager asks you find a customer that he does not remember the name exactly
- He just remembers that customer's first name begins with something like Jen
- We may find the customer in the customer table by looking at the first name column to see if there is any value that begins with Jen
- Syntax → **SELECT** column1,column2...
  FROM table_name
  WHERE conditions **LIKE** 'Jen**%** '
-

	SELECT first_name, last_name **FROM** customer **WHERE** first_name **LIKE** 'Jen**%**'; **--ILIKE 'jen%';** **--> case INSENSITIVE** **--LIKE '%er'** **--> ends with er** **--NOT LIKE '%er'** **--> I don't want to see name which ends with er** **--LIKE '_er%'** **--> how many letter we expected before 'er'** **--LIKE '_ _ _ _ _'** **--> includes 5 characters**

3. FUNCTIONS in SQL

- **SINGLE ROW** FUNCTION**:** Function will run for each row and return a value for each row.
- **MULTIPLE ROW** FUNCTION**:** Function will run for many row and return a single value.

MATHEMATICAL FUNCTION

- SQL comes with a lot of math operators built-in that are very useful for numeric column types
- https://www.postgresql.org/docs/9.5/static/functions-math.htm

Operator	Description	Example	Result
+	addition	2 + 3	5
-	subtraction	2 - 3	-1
*	multiplication	2 * 3	6
/	division (integer division truncates the result)	4 / 2	2
%	modulo (remainder)	5 % 4	1
^	exponentiation (associates left to right)	2.0 ^ 3.0	8
|/	square root	|/ 25.0	5
||/	cube root	||/ 27.0	3
!	factorial	5 !	120
!!	factorial (prefix operator)	!! 5	120
@	absolute value	@ -5.0	5
&	bitwise AND	91 & 15	11
|	bitwise OR	32 | 3	35
#	bitwise XOR	17 # 5	20
~	bitwise NOT	~1	-2
<<	bitwise shift left	1 << 4	16
>>	bitwise shift right	8 >> 2	2

```
SELECT first_name, salary*12 AS Annual_Salary
FROM employees;
```

Data Output | Explain | Messages | Notifications | Query History

	first_name character varying (20)	annual_salary numeric
1	Steven	288000.00
2	Neena	204000.00
3	Lex	204000.00

- **SELECT** column_name **+,-,*,/** column_name **AS** new column **FROM** table

NOT: **SELECT** *
FROM employees
WHERE department_id **IS** NULL;

STRING FUNCTIONS

- https://www.postgresql.org/docs/9.5/static/functions-string.htm

  Popular ones;

string || string	text	String concatenation	'Post' || 'greSQL'	PostgreSQL
string || non-string or non-string || string	text	String concatenation with one non-string input	'Value: ' || 42	Value: 42

lower(string)	text	Convert string to lower case	lower('TOM')	tom

upper(string)	text	Convert string to upper case	upper('tom')	TOM

substring(string [from int] [for int])	text	Extract substring	substring('Thomas' from 2 for 3)	hom
substring(string from *pattern*)	text	Extract substring matching POSIX regular expression. See Section 9.7 for more information on pattern matching.	substring('Thomas' from '...$')	mas
substring(string from *pattern* for *escape*)	text	Extract substring matching SQL regular expression. See Section 9.7 for more information on pattern matching.	substring('Thomas' from '%#"o_a#"_' for '#')	oma

initcap(string)	text	Convert the first letter of each word to upper case and the rest to lower case. Words are sequences of alphanumeric characters separated by non-alphanumeric characters.	initcap('hi THOMAS')	Hi Thomas

length(string)	int	Number of characters in string	length('jose')	4
length(string bytea, encoding name)	int	Number of characters in string in the given encoding. The string must be valid in this encoding.	length('jose', 'UTF8')	4

-
```
SELECT first_name,last_name,first_name||' '||last_name AS fullname
FROM employees;
```

Data Output | Explain | Messages | Notifications | Query History

	first_name character varying (20)	last_name character varying (25)	fullname text
1	Steven	King	Steven King
2	Neena	Kochhar	Neena Kochhar

Display uppercase first name, lowercase last name, initcap email, length of phone number from employees table	**SELECT UPPER(**first_name**), LOWER(**last_name**), INITCAP(**email**), LENGTH(**phone_number**),** first_name **||'** **'||**last_name**||'** **'||**email**||'** **'||**phone_number **AS** full_info **FROM** employees**;**
Create a password for each employee that consists of first 3 letter of first and last name	**SELECT SUBSTRING (**first_name,1,3**) || SUBSTRING(**last_name,1,3**) AS** password **FROM** employees**;**

AGGREGATE FUNCTION

- **MIN (**Check all the rows and shows minimum one)
  - **SELECT MIN**(amount)
    FROM payment;

What is the lowest length of the film?	**SELECT MIN**(length) **FROM** film;	**SELECT** length **FROM** film **ORDER BY** length **ASC** **LIMIT** 1;

- **MAX (**Check all the rows and shows maximum one)
  - **SELECT MAX**(amount)
    FROM payment;
- **AVG** (Add all rows and get average)
  - **SELECT AVG**(amount)
    FROM payment;
- **SUM** (Add all rows and shows SUM)
  - **SELECT SUM**(amount)
    FROM payment;
- **ROUND** (The result with given decimal)
  - **SELECT ROUND(AVG**(amount)**, 2)** --2→ how many decimal we want to see
    FROM payment;

- **GROUP BY**
  - It divides the rows returned from the SELECT statement into groups
  - For each group, we can apply an aggregate function, for example:
    - calculating the sum of items
    - count the number of items in the group
  - Syntax → **SELECT** column_1, **aggregate_function(column_2)**
    FROM table_name
    GROUP BY column_1;

How many films we have for each rating type? Order by desc by the number	**SELECT** rating, **COUNT(*)** **FROM** film **GROUP BY** rating **ORDER BY** count **DESC;**

- **HAVING**
  - We often use the HAVING clause in conjunction with the GROUP BY clause to filter group rows that don't satisfy a specified condition.
  - Difference between HAVING and WHERE:
    - HAVING statement sets the condition for *group rows* created by the GROUP BY clause *after* the GROUP BY clause applies while
    - WHERE clause sets the condition for *individual rows* *before* GROUP BY clause applies.
  - It comes after GROUP BY and before ORDER BY!!!
  - Syntax → **SELECT** column_1, **aggregate_function(column_2)**
    FROM table_name
    GROUP BY column_1
    HAVING condition;

4. JOIN

- Suppose we want to get data from **Address** and **Customer** tables. The Customer table has the address_id field that relates to the **primary key** of the Address table.
- If we have same column name in two tables, we need to specify each of them like "**customer.first_name**".
- **FROM table_name → table_name must have only one column which is not in the other table**
- **JOIN table_name → BOTH tables has the same column_name which is the primary key of one table**
- **INNER JOIN === JOIN**

I want to see customer_id, first_name, last_name, email, phone, address in ONE TABLE. (in customer table, there is no address and phone info. we should get these infos from address table with **JOIN** and connection point is **ON** with address_id)	**SELECT** customer_id, first_name, last_name, email, phone, address **FROM** customer **JOIN address** **ON** customer.address_id = address.address_id; foreign key primary key **SELECT** customer_id, first_name, last_name, email, phone, address **FROM** customer, address **WHERE** customer.**address_id =** address.**address_id;** **--we can rename the table to make short** **SELECT c.**customer_id, first_name, last_name, email, phone, address **FROM** customer **AS c JOIN** address **ON c.address_id =** address.**address_id;**

CUSTOMER TABLE

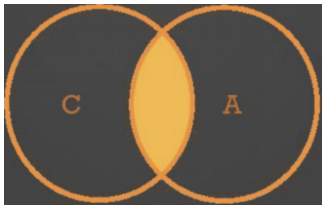
	customer_id integer	first_name character vary	last_name character varyi	address_id integer
1	1	Mary	Smith	5
2	2	Patricia	Johnson	[null]
3	3	Linda	Williams	7
4	4	Barbara	Jones	8
5	5	Elizabeth	Brown	[null]

ADDRESS TABLE

	address_id integer	address character varying (50)	phone integer
1	5	1913 Hanoi Way	28303384
2	7	692 Joliet Street	44847719
3	8	1566 Inegl Manor	70581400
4	10	1795 Santiago	86045262
5	11	900 Santiago	16571220

INNER JOIN

It produces only the set of records that match in both Table Customer and Table Address

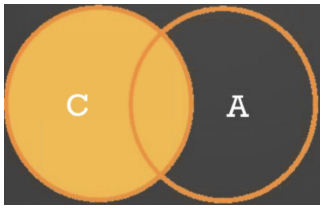


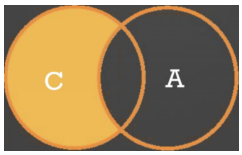

```
SELECT customer_id,first_name,last_name,address,phone
FROM customer INNER JOIN address
ON customer.address_id = address.address_id;
```

	customer_id integer	first_name character va	last_name character var	address character varying (5	phone integer
1	1	Mary	Smith	1913 Hanoi Way	28303384
2	3	Linda	Williams	692 Joliet Street	44847719
3	4	Barbara	Jones	1566 Inegl Manor	70581400

LEFT OUTER JOIN

It produces a complete set of records from Table Customer, with matching records (where available) in Table Address. If there is no match, the right side will contain null.





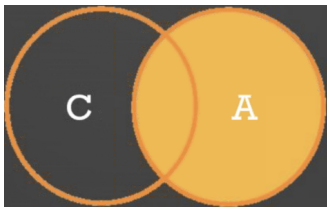

```
SELECT customer_id,first_name,last_name,address,phone
FROM customer LEFT OUTER JOIN address
ON customer.address_id = address.address_id;
```

	customer_id integer	first_name character var	last_name character var	address character varying (5	phone integer
1	1	Mary	Smith	1913 Hanoi Way	28303384
2	2	Patricia	Johnson	[null]	[null]
3	3	Linda	Williams	692 Joliet Street	44847719
4	4	Barbara	Jones	1566 Inegl Manor	70581400
5	5	Elizabeth	Brown	[null]	[null]

```
SELECT customer_id,first_name,last_name,address,phone
FROM customer LEFT OUTER JOIN address
ON customer.address_id = address.address_id
WHERE customer.address_id IS NULL;
```

RIGHT OUTER JOIN

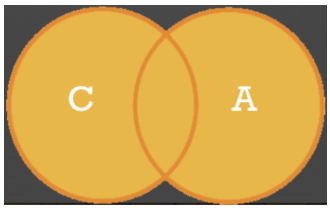
It produces a complete set of records from Table Address, with matching records (where available) in Table Customer. If there is no match, the right side will contain null.




```
SELECT customer_id,first_name,last_name,address,phone
FROM customer RIGHT OUTER JOIN address
ON customer.address_id = address.address_id;;
```

	customer_id integer	first_name character va	last_name character var	address character varying (5	phone integer
1	1	Mary	Smith	1913 Hanoi Way	28303384
2	3	Linda	Williams	692 Joliet Street	44847719
3	4	Barbara	Jones	1566 Inegl Manor	70581400
4	[null]	[null]	[null]	900 Santiago	16571220
5	[null]	[null]	[null]	1795 Santiago	86045262

FULL OUTER JOIN



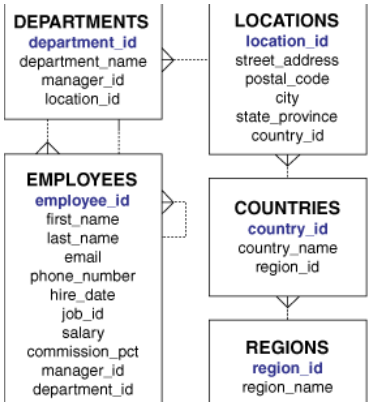

```
SELECT customer_id,first_name,last_name,address,phone
FROM customer FULL OUTER JOIN address
ON customer.address_id = address.address_id;
```

	customer_id integer	first_name character var	last_name character vary	address character varying (50	phone integer
1	1	Mary	Smith	1913 Hanoi Way	28303384
2	2	Patricia	Johnson	[null]	[null]
3	3	Linda	Williams	692 Joliet Street	44847719
4	4	Barbara	Jones	1566 Inegl Manor	70581400
5	5	Elizabeth	Brown	[null]	[null]
6	[null]	[null]	[null]	900 Santiago	16571220
7	[null]	[null]	[null]	1795 Santiago	86045262

```
SELECT customer.* --if I want to see just all customer table columns
FROM customer FULL OUTER JOIN address
ON customer.address_id = address.address_id;
```

	customer_id integer	first_name character var	last_name character var	address_id integer
1	1	Mary	Smith	5
2	2	Patricia	Johnson	[null]
3	3	Linda	Williams	7
4	4	Barbara	Jones	8
5	5	Elizabeth	Brown	[null]
6	[null]	[null]	[null]	[null]
7	[null]	[null]	[null]	[null]

THREE TABLE JOIN



TASK: Display each employees first_name, last_name, department_name and city

```
SELECT first_name, last_name, department_name,city
FROM employees AS e INNER JOIN departments AS d
ON e.department_id = d.department_id
INNER JOIN locations AS l
ON l.location_id = d.location_id;
```

	first_name character varying (20)	last_name character varying (25)	department_name character varying (30)	city character varying (30)
1	Steven	King	Executive	Seattle
2	Neena	Kochhar	Executive	Seattle
3	Lex	De Haan	Executive	Seattle
4	Alexander	Hunold	IT	Southlake
5	Bruce	Ernst	IT	Southlake

5. ADVANCED SQL COMMENTS

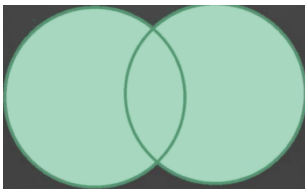
SET OPERATORS (UNION, UNION ALL, INTERSECT, EXCEPT**)**

- We need 2 independent queries
- SAME number of columns in Select statement and SAME data type in same order

- **UNION & UNION ALL**
  - We use UNION operator to combine data from similar tables that are not perfectly normalized.
  - It combines result set of two or more SELECT statements into a single result set.
  - It removes all DUPLICATE rows unless the UNION ALL used.

Syntax →

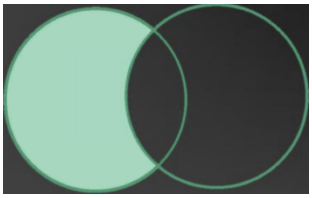
```
SELECT column1,column2...
FROM table_name;
UNION
SELECT column1,column2...
FROM table_name;
```



- **EXCEPT (Oracle → MINUS)**
  - It only returns records/values from first query that is not present in second query
  - Help us to find difference between two queries.

Syntax →

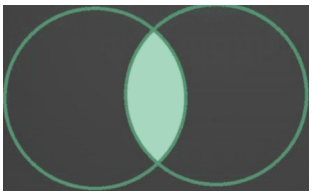
```
SELECT column1
FROM table_name1;
EXCEPT
SELECT column1
FROM table_name2;
```



- **INTERSECT**
  - It returns records that are present / common/ appear in both query results
  - It will sort and remove duplicates.

Syntax →

```
SELECT column1
FROM table_name1;
INTERSECT
SELECT column1
FROM table_name2;
```



SELF JOIN

- There is a special case that we join a table to itself, which is known as self join.
- Let's say we want to print out employee full name with their managers last together.
-

```
SELECT employee_id, first_name, last_name, manager_id
FROM employees
```

Data Output | Explain | Messages | Notifications | Query History

	employee_id integer	first_name character varying (20)	last_name character varying (25)	manager_id integer
1	100	Steven	King	[null]
2	101	Neena	Kochhar	100
3	102	Lex	De Haan	100
4	103	Alexander	Hunold	102

```
SELECT e1.employee_id, e1.first_name, e1.last_name, e1.manager_id, e2.first_name, e2.last_name
FROM employees AS e1 JOIN employees AS e2
ON e1.manager_id = e2.employee_id;
```

Data Output | Explain | Messages | Notifications | Query History

	employee_id integer	first_name character varying (20)	last_name character varying (25)	manager_id integer	first_name character varying (20)	last_name character varying (25)
1	101	Neena	Kochhar	100	Steven	King
2	102	Lex	De Haan	100	Steven	King
3	103	Alexander	Hunold	102	Lex	De Haan
4	104	Bruce	Ernst	103	Alexander	Hunold
5	105	David	Austin	103	Alexander	Hunold

SUBQUERY

- It allows us to use **multiple SELECT** statements, where we basically have a query within a query.
- Suppose we want to find the films whose rental rate is higher than the average rental rate.
  - 1st step → find the AVG rental_rate by using SELECT statement
  - 2nd step → use the result of the 1st query in the 2nd SELECT statement to find the films that we want
    - **SELECT** title
      FROM film
      WHERE rental_rate > (**SELECT AVG**(rental_rate) **FROM** film)
      2nd query

6. CREATING DATABASE and TABLES

DATA TYPES

- Boolean / bool
  - true → 1, yes, y, t, true
  - false → 0, no, n, f, false
  - NULL → space character
- Character
  - char → single character
  - char(n) → fixed-length character strings (if we insert a string that is shorter than the length of the column)
  - varchar(n) → variable-length character strings (store up to n character)
- Number
  - integers
    - Small integers (smallint) → 2 byte
    - Integer (int) → 4 byte
    - Big Integer (bigint) → 8 byte
    - Serial is the same as integer except that PostgreSQL populate value into column automatically
  - floating-point numbers
- Temporal (i.e. date and time-related data types)
- Special types

PRIMARY and FOREIGN KEY

- Primary: A table can have only one primary key. When we add a primary key to a table, PostgreSQL creates unique index.
- We define the primary keys through **primary key** constraints
  - Syntax → **CREATE TABLE** table_name**(**
    column_name **data_type primary key)**
- Foreign: it is defined in a table that refers to the primary key of the other table.

DDL & DML

- DDL: Data Definition Language
  It is used to define data structures
  CREATE, DROP, TRUNCATE, ALTER

  DML: Data Manipulation Language
  It is used to manipulate data itself
  SELECT, INSERT, UPDATE, DELETE

- **CREATE TABLE**
  - First, we specify the name of the new table alter the CREATE TABLE clause.
  - Next, we list the column name, its data type, and column constraint.
  - PostgreSQL column Constraints;
    - NOT NULL - the value of the column cannot be NULL
    - UNIQUE - the value of the column must be unique across the whole table
    - PRIMARY KEY - it is the combination of NOT NULL and UNIQUE constraints

Syntax → **CREATE TABLE** table name **(**column name **TYPE** column constraint**);**	**CREATE TABLE** students**(** student_id **serial primary key,** first_name **varchar(30) not null,** last_name **varchar(30) not null,** phone_number **bigint null);**

- **INSERT**
  - After creating a new table, we insert new rows into the table.

Syntax → **INSERT INTO** table(column1,column2) **VALUES** (value1,value2,..), (value1,value2,..);	**INSERT INTO** students(first_name, last_name, phone_number) **VALUES** ('Mike', 'Smith', 9739739739);

- **UPDATE**
  - To change the values of the columns

UPDATE table_name **SET** column1 = value1, column2 = value2 , … **WHERE** condition;	**UPDATE** students **SET** first_name = 'Jamal' **WHERE** student_id =1;

- **DELETE**
  - To delete rows in a table. (If you omit the WHERE clause, all rows in the table are deleted)
  - DELETE statement returns the number of rows deleted. If no rows are deleted, it returns zero.

DELETE FROM table_name **WHERE** condition;	**DELETE FROM** students **WHERE** student_id = 1;

- **ALTER**
  - To change existing table structure, you use ALTER TABLE statement.
  - PostgreSQL provides many actions that allow you to:
    - Add, remove, or rename column. (**ADD COLUMN, DROP COLUMN, RENAME COLUMN**)
    - Set default value for the column.
    - Add CHECK constraint to a column. (**ADD CONSTRAINT**)
    - Rename table (**RENAME TO**)

ALTER TABLE table_name **action**;	**ALTER TABLE** students **RENAME TO** st; **ALTER TABLE** st **RENAME COLUMN** phone_number **TO** phone; **ALTER TABLE** st **DROP COLUMN** phone;

- **DROP**
  - To **remove** existing table from the database, you use the DROP TABLE statement as shown following:

DROP TABLE table_name;	**DROP TABLE** st;

- **TRUNCATE**
  - Truncating will **remove** all data from the table but not delete the table. Lastly we can DROP TABLE.

TRUNCATE TABLE table_name;	**TRUNCATE TABLE** st;

7. DATABASE

- **How to get data from and how to pass to the website?**

POSTGRESQL CONNECTION

- We will use pg-promise modules to create connection between PostgreSQL server and NodeJS
- Installation→ to terminal → npm install pg-promise (for mac use sudo)
  - **ONE ROW**

create spec.js file (VISUAL STUDIO CODE)

```
var pgp = require('pg-promise')(/*options*/);

//then we will create our Connection String
var cn = {
   host: 'localhost',       //database host
   port: 5432,              //port number
   database: 'dvdrental',   //database name
   user: 'postgres',        //database username
   password: 'abc'          //database password
}

//then creating database connection
var db = pgp(cn);    //cn-->Connection String object

//then we will use db to query data from database
//RETRIEVE ONE ROW --> db.one method
db.one(`SELECT title FROM film WHERE film_id=133`)
   .then(result=>{
       console.log(result) //printing the result
   })
   .catch(error=>{
       console.log(error); //printing the error
   })

//when we run node spec.js on terminal we will see;
{ title: 'Chamber Italian' }
```

TO REACH SPECIFIC RESULTs

```
//to reach title directly → result.title
db.one(`SELECT title FROM film WHERE
film_id=133`)
   .then(result=>{
       console.log(result.title)
   })
   .catch(error=>{
       console.log(error);
   })

//TERMINAL → node spec.js
RESULT:
Chamber Italian
```

```
//to reach all infos with *
db.one(`SELECT * FROM film WHERE
film_id=133`)
   .then(result=>{
       console.log(result)
   })
   .catch(error=>{
       console.log(error);
   })

//TERMINAL → node spec.js
RESULT:
{ film_id: 133,
  title: 'Chamber Italian',
  description:
   'A Fateful Reflection of a Moose And a
Husband who must Overcome a Monkey in
Nigeria',
  release_year: 2006,
  language_id: 1,
  rental_duration: 7,
  rental_rate: '4.99',
  length: 117,
  replacement_cost: '14.99',
  rating: 'NC-17',
  last_update: 2013-05-26T18:50:58.951Z,
  special_features: [ 'Trailers' ],
  fulltext:
   '\'chamber\':1 \'fate\':4 \'husband\':11
\'italian\':2 \'monkey\':16 \'moos\':8
\'must\':13 \'nigeria\':18 \'overcom\':14
\'reflect\':5' }
```

TASK: Print first_name and last_name of who made highest total payment in dvdrental

```
var max = `SELECT first_name, last_name FROM customer WHERE customer_id = (SELECT
customer_id FROM payment GROUP BY customer_id ORDER BY SUM(amount) DESC LIMIT 1)`
db.one(max)
   .then(result=>{
       console.log(result.first_name +' '+ result.last_name);
   })
   .catch(error=>{
       console.log(error);
   })
```

- **MULTIPLE ROWS**

  TASK: Print first_name and last_name of whose customer_id is 3,4,5,6,7

```
for(var i=3;i<8;i++){
var max = `SELECT first_name,last_name
FROM customer WHERE customer_id
IN('${i}')`
db.one(max)
    .then(result=>{
        console.log(result.first_name +'
'+ result.last_name);
    })
    .catch(error=>{
        console.log(error);
    })
}
```

INSTEAD OF FOR LOOP → we use db.any → ARRAY

```
db.any(`SELECT first_name,last_name FROM customer
WHERE customer_id IN(3,4,5,6,7)`)
    .then(result=>{
        console.log(result);
    })
    .catch(error=>{
        console.log(error);
    })
}
RESULT:
[ { first_name: 'Linda', last_name: 'Williams' },
  { first_name: 'Barbara', last_name: 'Jones' },
  { first_name: 'Elizabeth', last_name: 'Brown' },
  { first_name: 'Jennifer', last_name: 'Davis' },
  { first_name: 'Maria', last_name: 'Miller' } ]
```

```
db.any(`SELECT first_name,last_name FROM customer
WHERE customer_id IN(3,4,5,6,7)`)
    .then(result=>{
        result.forEach(element => {
            console.log(element.first_name + ' ' +
element.last_name)
        });
    })
    .catch(error=>{
        console.log(error);
    })
RESULT:
Linda Williams
Barbara Jones
Elizabeth Brown
Jennifer Davis
Maria Miller
```

```
//to reach one information directly
db.any(`SELECT email FROM customer LIMIT 5`)
    .then(result=>{
        console.log(result[0].email);
        });
    })
    .catch(error=>{
        console.log(error);
    })
```

CONNECTING DATABASE WITH PROTRACTOR

- **AMAZON TASK**

  We want to search movie names in amazon.com where their titles start with Z.

conf.js file

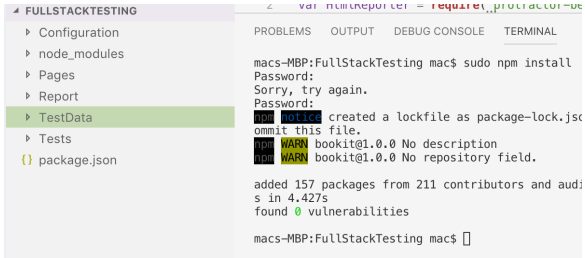
```
exports.config ={
   framework:'jasmine',
   directConnect:true,
   specs:['dbtest.js'],
   jasmineNodeOpts:{
      defaultTimeoutInterval:50000
   }
}
```

dbtest.js file

```
describe ('Amazon Database Testing', function(){
   var pgp = require('pg-promise')(/*options*/);
   var cn = {
       host: 'localhost',       //database host
       port: 5432,              //port number
       database: 'dvdrental',   //database name
       user: 'postgres',        //database username
       password: 'abc'          //database password
   }
   var db = pgp(cn);    //cn-->Connection String object

   var arr = [];

   it ('Should get the film names from database and search in amazon.com',()=>{
       browser.waitForAngularEnabled(false);
       browser.get('https://www.amazon.com');

       db.any(`SELECT title FROM film WHERE title LIKE 'Z%'`)
           .then(result=>{
               arr=result;
           })
           .catch(error=>{
               console.log(error);
           })
           .then(()=>{
               arr.forEach(function(i){
                   element(by.id(id="twotabsearchtextbox")).sendKeys(i.title);
                   browser.sleep(2000);
                element(by.css("#nav-search>form>div.nav-right>div>input")).click();
                   browser.sleep(2000);
                   browser.navigate().back();
               });
           })
   })
})
```

ROADMAP for FRAMEWORK CREATION with BACKEND TESTING

- Creating Folder
  - Desktop-folder (FullStackTesting)
  - Open it from Visual Studio Code (VSC)
    - Create new FOLDERS in the FullStackTesting from VSC
      - Configuration
      - Pages
      - Report
      - TestData
      - Tests
- Installing Dependencies
  - Use the package.json file

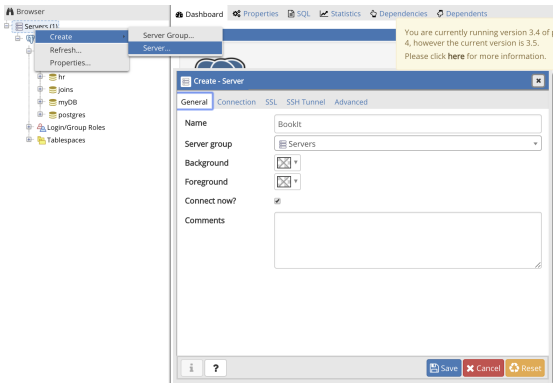


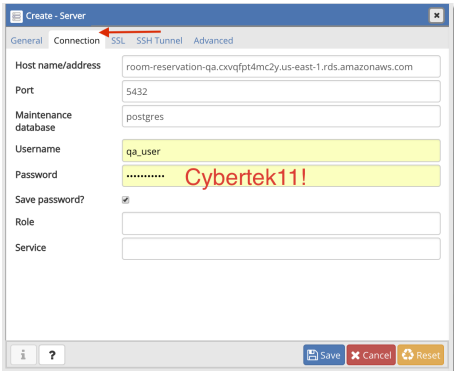
package.json

```
{
  "name": "bookit",
  "version": "1.0.0",
  "description": "",
  "main": "index.js",

  "author": "",
  "license": "ISC",
  "devDependencies": {
    "jasmine-data-provider": "^2.2.0",
    "jasmine-spec-reporter": "^4.2.1",
    "protractor": "^5.4.1",
    "protractor-beautiful-reporter": "^1.2.5"
  },
  "dependencies": {
    "pg-promise": "^8.5.0"
  }
}
```

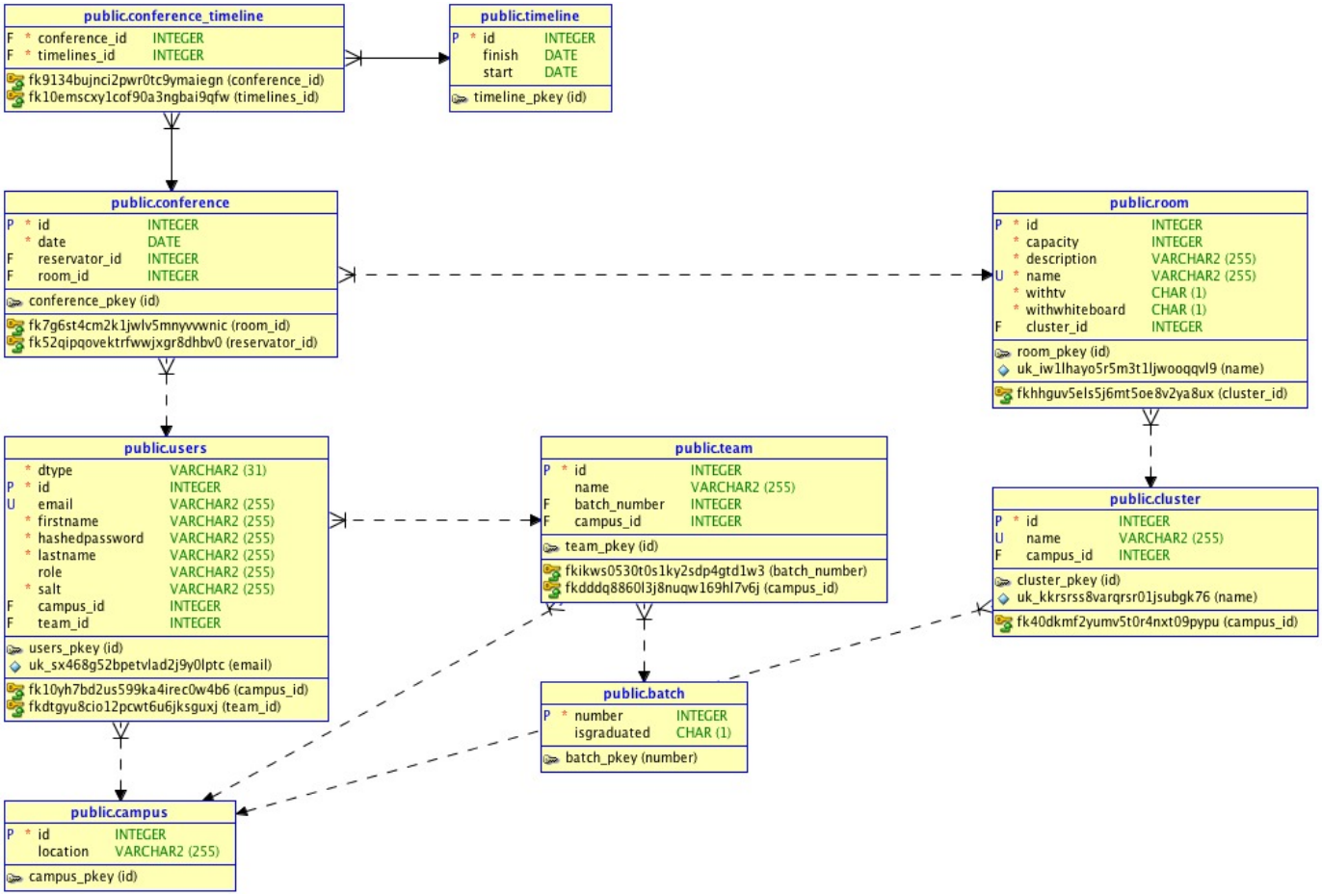
  - Reveal this file on finder and copy it to the FullStackTesting folder
  - Install the dependencies (packages to run our project) and Terminal → **sudo npm install**
- Create and Edit (or copy/paste it from previous projects) conf.js file in Configuration Folder
  - All the settings for the test
  - Reporters other tools etc.
- Create the server and database connection on pgAdmin
  - Open it from browser
  - Create Server and use these keys

Host	room-reservation-qa.cxvqfpt4mc2y.us-east-1.rds.amazonaws.com	← **This is our UI environment**
Port	5432	
Database	room_reservation_qa	
User	qa_user	
Password	Cybertek11!	

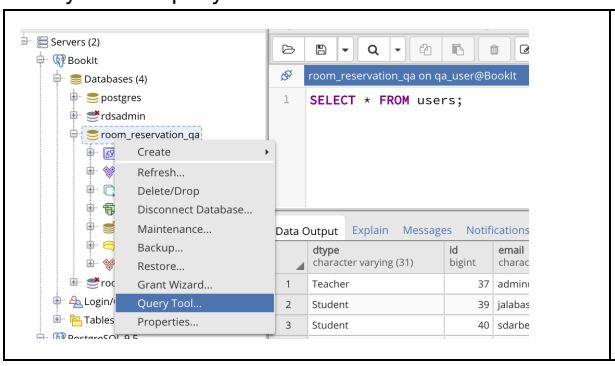




- Check your Schema

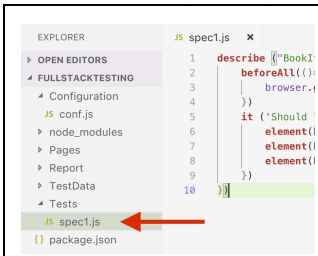


- Write your first query and confirm the records



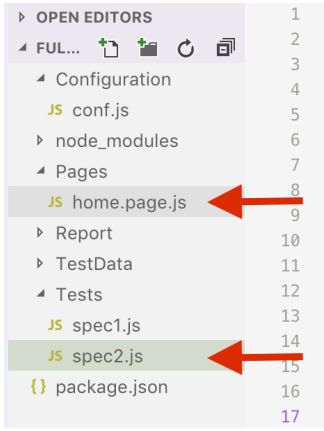
- Go to web address https://cybertek-reservation-qa.herokuapp.com/
- Create **spec1.js** file on VSC
- Login to the website below with credentials. No Page Object Model (POM). Verify you've signed successfully. Just plain protractor code.

Email address: efewtrell8c@craigslist.org
Password: jamesmay




```
describe ("BookIt Test Suite", ()=>{
   beforeAll(()=>{
       browser.get('https://cybertek-reservation-qa.herokuapp.com');
   })
   it ('Should login the webpage',()=>{
       $('[name="email"]').sendKeys("efewtrell8c@craigslist.org");
       $('[name="password"]').sendKeys("jamesmay");
       element(by.buttonText("sign in")).click();
       browser.sleep(2000);
       expect($(".title").getText()).toEqual("VA");
       browser.sleep(2000);
   })
})
```

- Create **spec2.js** - Login with the Website with POM and TestData
  - Create a file home.page.js under Pages folder
  - We are creating a constructor new HomePage = function(){};
  - module.exports = new homePage(); → use that file with require keyword
  - Finding the element and put inside HomePage object and change the hard-coded locators to page object locators like home.email



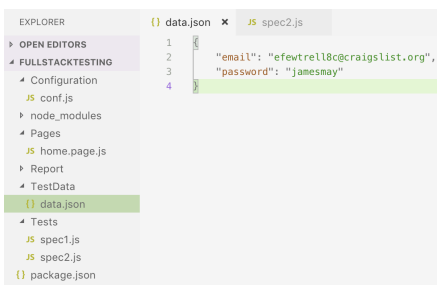
home.page.js

```
var HomePage = function(){
    this.email = $('[name="email"]');
    this.password = $('[name="password"]');
    this.signinButton = element(by.buttonText("sign in"));
    this.title = $(".title")
}
module.exports = new HomePage();
```

spec2.js

```
//Pages
var home = require("../Pages/home.page.js");

describe ("POM and TestData", ()=>{
   beforeAll(()=>{
       browser.get('https://cybertek-reservation-qa.herokuapp.com');
   })
   it ('Test Case 2 - Login to website with POM&TestData',()=>{
       home.email.sendKeys("efewtrell8c@craigslist.org");
       home.password.sendKeys("jamesmay");
       home.signinButton.click();
       browser.sleep(2000);
       expect(home.title.getText()).toEqual("VA");
       browser.sleep(2000);
   })
})
```

  - Create a data.json file under TestData folder
    - Put the credentials inside the file
    - On spec2.js file, use the require keyword to import the data from that json file
  - Use the data in data.json file via POM




```
//Pages
var home = require("../Pages/home.page.js");
var testData = require("../TestData/data.json")

describe ("POM and TestData", ()=>{
   beforeAll(()=>{
       browser.get('https://cybertek-reservation-qa.herokuapp.com');
   })
   it ('Test Case 2 - Login to website with POM&TestData',()=>{
       home.email.sendKeys(testData.email);
       home.password.sendKeys(testData.password);
       home.signinButton.click();
       browser.sleep(2000);
       expect(home.title.getText()).toEqual("VA");
       browser.sleep(2000);
   })
})
```

- Create **spec3.js** → Login with the DB connection. Basically we're going to get the data to login from DB

SELECT firstname, lastname, email FROM users WHERE email='efewtrell8c@craigslist.org'

	firstname character varying (255)	lastname character varying (255)	email character varying (255)
1	James	May	efewtrell8c@craigslist.org

Result Array = [{firstname: "James", lastname:"May", email: "efewtrell8c@craigslist.org"}] → **array[0]**

spec3.js

```
var home = require("../Pages/home.page.js");
var pgp = require('pg-promise')(/*options*/);
describe('Login with DB Connection', ()=>{
   var connectionString = {
       host: 'room-reservation-qa4.cxvqfpt4mc2y.us-east-1.rds.amazonaws.com',
       port: 5432,
       database: 'room_reservation_qa4',
       user: 'qa_user',
       password: 'Cybertek11!'
   }
   var db = pgp(connectionString);
   var arr = [];
   var username = '';
   var pass = '';
   it('Test Case 3- Login the website with DB Connection',()=>{
       db.any(`SELECT firstname, lastname, email FROM users WHERE email='efewtrell8c@craigslist.org'`)
           .then(function(result){
               //[{username: },{lastname: },{email: } ] --> array[0]
               username = result[0].email;
               //console.log(username)
               pass = result[0].firstname.toLowerCase()+result[0].lastname.toLowerCase();
               //console.log(pass);
           })
           .catch(function(error){
               console.log(error);
           })
           .then(function(){
               //all UI automation code
               browser.get('https://cybertek-reservation-qa.herokuapp.com');
               home.email.sendKeys(username);
               home.password.sendKeys(pass);
               home.signinButton.click();
               browser.sleep(2000);
               expect(home.title.getText()).toEqual("VA");
               browser.sleep(2000);
           })
   })
})
```

- Create **spec4.js** → create 3 files and follow the yellow signs

create 3 files

dbConnection.js

```
var dbConnection = function(){
   this.host = 'room-reservation-qa4.cxvqfpt4mc2y.us-east-1.rds.amazonaws.com';
   this.port = 5432;
   this.database = 'room_reservation_qa4';
   this.user = 'qa_user';
   this.password ='Cybertek11!';
}
module.exports = new dbConnection();
```

---

queries.js

```
var queries = function(){
   this.q1 = `SELECT firstname, lastname, email FROM users
              WHERE email='efewtrell8c@craigslist.org'`;
}
module.exports = new queries();
```

---

spec4.js

```
var home = require("../Pages/home.page.js");
var pgp = require('pg-promise')(/*options*/);
var connectionString = require("../TestData/dbConnection.js");
var queries = ("../TestData/queries.js");

describe('Login with DB Connection', ()=>{
   var db = pgp(connectionString);
   var arr = [];
   var username = '';
   var pass = '';
   it('Test Case 4- Connection String and Queries POM',()=>{
       db.any(queries.q1)
           .then(function(result){
               username = result[0].email;
               pass = result[0].firstname.toLowerCase()+result[0].lastname.toLowerCase();
           })
           .catch(function(error){
               console.log(error);
           })
           .then(function(){
               browser.get('https://cybertek-reservation-qa.herokuapp.com');
               home.email.sendKeys(username);
               home.password.sendKeys(pass);
               home.signinButton.click();
               browser.sleep(2000);
               expect(home.title.getText()).toEqual("VA");
               browser.sleep(2000);
           })
   })
})
```

- Create **spec5.js → Checking the data shown on 'me' page is correct**
  - **Expected Result:** database
  - **Actual Result:** whatever you see on the page
    1. Create page files → names topNavigation.js and self.js **(Follow the yellow sign)**
       a. create a constructor var … =function(){}; then module.export = new ...();
       b. on spec5.js var … =require(..address the file);
       c. Find the locators and put them under this page file
    2. Write your query to find the firstname, lastname, role... then check if it is working on pgAdmin

create 3 files

topNavigation.js

```
var topNav = function(){
   this.my = element(by.linkText("my"));//$$(".navbar-link");//
   this.self = element(by.linkText("self"));
   this.map = element(by.linkText("map"));
   this.schedule = element(by.linkText("schedule"));
   this.general = element(by.linkText("general"));
   this.signOut = element(by.linkText("sign out"));
   this.team = element(by.linkText("team"));
}
module.exports = new topNav();
```

self.js

```
var self = function(){
   // this.name = element(by.xpath("//*[@class='title is-6'][1]"));
   this.dataOnTable = $$("app-user-card .title");
   this.updatePass = $("app-update-password-card .card-content .title ");
   //this.role = element(by.xpath("//*[@class='title is-6'][2]"));
   //this.name = $$(".title.is-6").get(1);
   //this.role = $$
}
module.exports = new self();
```

spec5.js

```
var home = require("../Pages/home.page.js");
var pgp = require('pg-promise')(/*options*/);
var connectionString = require("../TestData/dbConnection.js");
var queries = ("../TestData/queries.js");
var topNav = ("../Pages/topNav.page.js");
var self = ("../Pages/self.page.js");

it('Test Case 5- Backend Testing Single Page', () => {

       db.any(queries.q2)
       .then(function(result){
           arr=result;
           username = result[0].email;
           pass = result[0].firstname.toLowerCase()+result[0].lastname.toLowerCase();
       }).catch(function(error){
           console.log(error);
       }).then(function(){
           //All UI automation Code
           browser.get("https://cybertek-reservation-qa5.herokuapp.com/");
           home.email.sendKeys(username);
           home.password.sendKeys(pass);
           home.signinButton.click();
           browser.sleep(2000);
           //expect(home.title.getText()).toEqual("VA");
           //browser.sleep(2000);
           browser.actions().mouseMove(topNav.my).perform();
           browser.sleep(2000);
           topNav.self.click();
           browser.sleep(2000);
           expect(self.dataOnTable.get(0).getText()).toEqual(arr[0].firstname + " "
+arr[0].lastname);
           expect(self.dataOnTable.get(1).getText()).toEqual(arr[0].role);
           //expect(self.dataOnTable.get(2).getText()).toEqual(arr[0].teamname);
       })
   });
});
```