SQL Workshop (Dec):
Introduction to SQL – Day 1

WHY LEARN SQL?

Most-Requested Tech Skills, Feb 18 - March 18, 2020

SQL	26,441
Java	22,842
Software Development	17,405
JavaScript	17,218
Software Engineering	16,115
Project Management	13,621
Python	13,053
Linux	10,925
Git	10,291
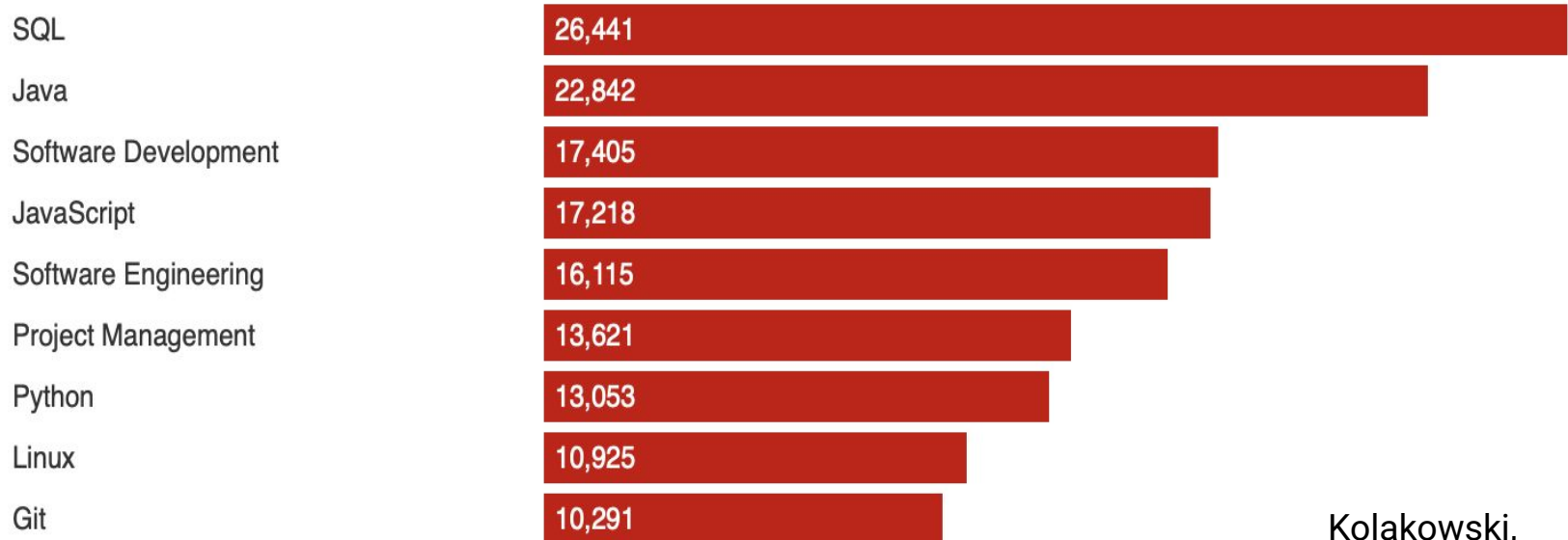
Kolakowski, 2020

WHAT'S A DATABASE?

It's any collection of related information

- Customer's Information
- Product listing
- Your classmate's names
- Clicks on websites and actions done

So where is a database stored?

- SQL server (or PostgreSQL server) on physical infrastructure
- Or on personal computer
- Cloud Platforms
- even… **EXCEL**

Excel: Why using Microsoft's tool caused Covid-19 results to be lost

By Leo Kelion
Technology desk editor

🕒 5 October

☆ **Coronavirus pandemic**

The badly thought-out use of Microsoft's Excel software was the reason nearly 16,000 coronavirus cases went unreported in England.

And it appears that Public Health England (PHE) was to blame, rather than a third-party contractor.

Here's one reason why database is crucial!

TYPES OF DATABASES

Non-Relational Databases (NoSQL)

- Organises data into anything but a traditional table
  - Key-value store
  - Graphs
  - Documents
  - Big data, real time web apps

Relational Databases (SQL)

- Organises data into one or more tables
  - Each table has columns and rows
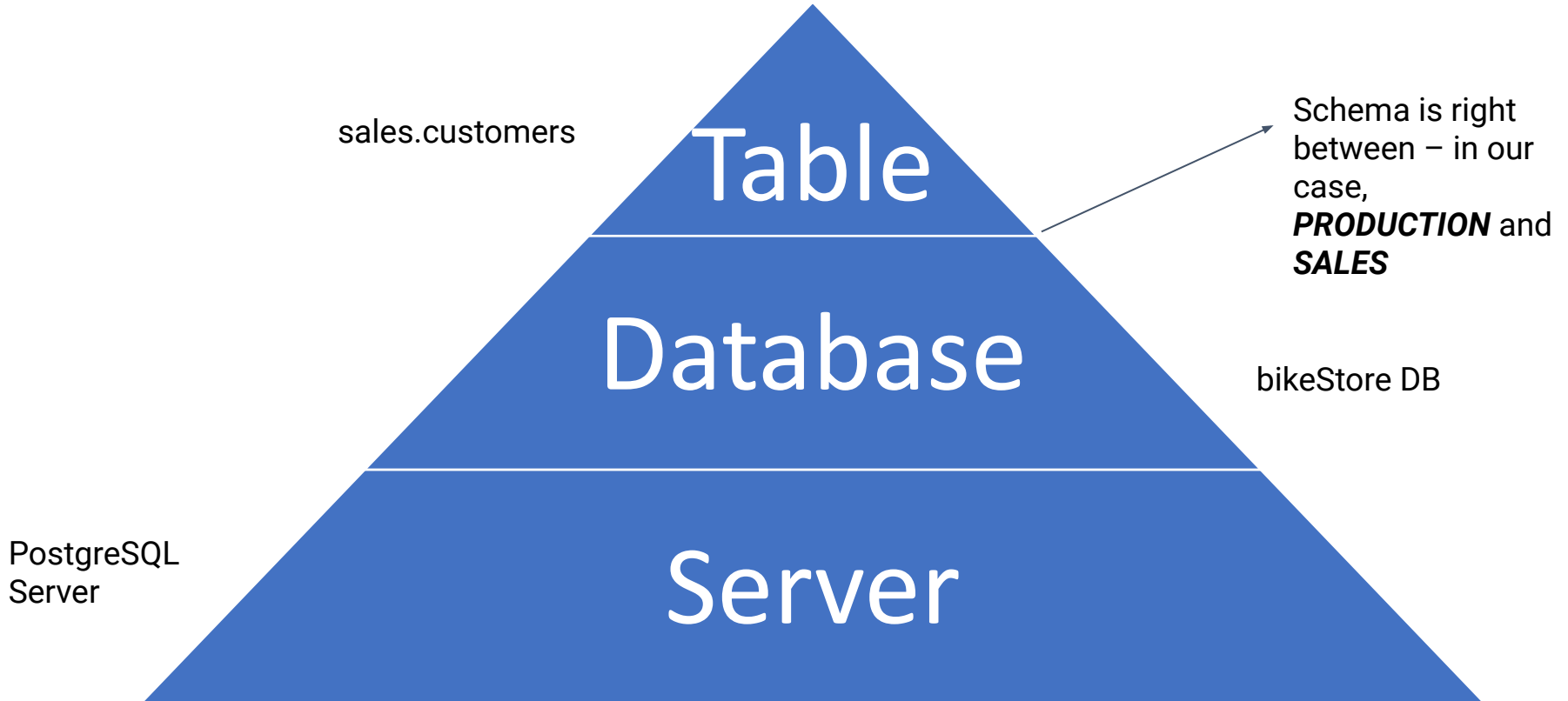 - A unique key identifies each row

RELATIONAL DATABASES

- **Relational Database Management system (RDBMS)**
  - Help users create and maintain a relational database

- **Standard Query Language (SQL)**
  - Standardised language for interacting with RDBMS
  - Used to define tables and structures
  - Used to execute create, read, update and delete (CRUD) operations.
  - Able to handle administrative tasks like user management, security and backup.

SQL BREAKDOWN

- **Data Definition Language (DDL)**
  - Use of SQL to define database(s) – CREATE

- **Data Manipulation Language (DML)**
  - Use of SQL to manipulate existing data in the database(s) – UPDATE/DELETE

- **Data Query Language (DQL)**
  - Use of SQL to query data from the database(s) – READ
  - Allows for meaningful analysis and reporting
  - Focus of this workshop

SQL Structure

sales.customers

Table

Schema is right between – in our case, **PRODUCTION** and **SALES**

Database

bikeStore DB

PostgreSQL Server

Server

Tables

Column

Row

brand_id [PK] integer	brand_name character varying (255)
1	1 Electra
2	2 Haro
3	3 Heller
4	4 Pure Cycles
5	5 Ritchey
6	6 Strider
7	7 Sun Bicycles
8	8 Surly
9	9 Trek

staff_id [PK] integer	first_nam... character...
1	1 Fabiola
2	2 Mireya
3	3 Genna
4	4 Virgie
5	5 Jannette
6	6 Marcelen
7	7 Venita
8	8 Kali
9	9 Layla
10	

store_id [PK] integer	product_id [PK] integer	quantity integer
1	1	27
1	2	5
		10 15

phone character varying (25)	active integer	store_id integer	manager_id integer
(831) 555-5554	1	1	[null]
(831) 555-5555	1	1	1
(831) 555-5556	1	1	2
(831) 555-5557	1	1	2
(516) 379-4444	1	2	1
(516) 379-4445	1	2	5
(516) 379-4446	1	2	5
(972) 530-5555	1	3	1
(972) 530-5556	1	3	7
	1	3	7

store_id [PK] integer	store_name character varying (255)	phone character varying (25)	email character varying (255)	street character varying (255)	city character varying (255)	state character varying (1
1	1 Santa Cruz Bikes	(831) 476-4321	santacruz@bikes.shop	3700 Portola Drive	Santa Cruz	CA
2	2 Baldwin Bikes	(516) 379-8888	baldwin@bikes.shop	4200 Chestnut Lane	Baldwin	NY
3	3 Rowlett Bikes	(972) 530-5555	rowlett@bikes.shop	8000 Fairway Avenue	Rowlett	TX

SQL Data Types

Imported as	Stored as	With these rules
String	VARCHAR(1024)	Any characters, with a maximum field length of 1024 characters.
Date/Time	TIMESTAMP	Stores year, month, day, hour, minute and second values as YYYY-MM-DD hh:mm:ss.
Number	DOUBLE PRECISION	Numerical, with up to 17 significant digits decimal precision.
Boolean	BOOLEAN	Only TRUE or FALSE values.

SQL - Syntax

Syntax	Returns:
SELECT	Results
*	All
DISTINCT	Unique values, one of each
WHERE	Filter results
IN	Results in these list
BETWEEN	Results within these values
LIKE	A pattern to the results
IS NULL	Empty results

Syntax	Returns:
NOT	When you are finding the opposites
AND	"All" that are listed
OR	Either one that is listed
ORDER BY	Results in ascending or descending order
LIMIT	Selected number of rows
GROUP BY	Set(s) of results
JOIN - ON	Combined tables
HAVING	Similar to WHERE

SELECT Statement

- Order of the SELECT statement is **IMPORTANT**

- Basic statement only consist of "SELECT" and "FROM"
  - Others are like **add-ons**; optional and only if needed

- If you want to get the quantity of all the products
  - SELECT quantity FROM products

- But if you only want to get the quantity of apples
  - SELECT quantity FROM products WHERE product_name = 'apples'

*

- "*" works like a wildcard, returning all the columns

SELECT * FROM production.brands

SELECT brand_name FROM production.brands

	brand_id [PK] integer	brand_name character varying (255)
1	1	Electra
2	2	Haro
3	3	Heller
4	4	Pure Cycles
5	5	Ritchey
6	6	Strider
7	7	Sun Bicycles
8	8	Surly
9	9	Trek

	brand_name character varying (255)
1	Electra
2	Haro
3	Heller
4	Pure Cycles
5	Ritchey
6	Strider
7	Sun Bicycles
8	Surly
9	Trek

Think of * as selecting
EVERYTHING

DISTINCT

- Return non-duplicate values

SELECT store_id FROM production.stocks

SELECT DISTINCT store_id FROM production.stocks

HANDS-ON (SELECT, DISTINCT)

1. How many different store(s) are there?

2. How many different staff(s) are there?

3. How many distinct product_id(s) are there?

4. Which table gives you the product information?

WHERE - Filters / Conditions

- Filter the return values
- Used with comparison and logical operators

Comparison Operators	
Equals to	=
Not Equals to	<> or !=
Greater than	>
Less than	<
Greater than or equals to	>=
Less than or equals to	<=

Logical Operators	
IN	Specify a list of conditions for the returned values
BETWEEN	Return values within the specified range
LIKE	Specify patterns for the returned values
IS NULL	Return values that have no value
AND	Returned values must fulfil both conditions
OR	Returned values to fulfil at least one condition
NOT	Return values that do not match the condition

WHERE - Filters / Conditions

SELECT * FROM production.products

SELECT * FROM production.products WHERE brand_id = 9

	product_id [PK] integer	product_name character varying (255)	brand_id integer	category_id integer	model_year smallint	list_price numeric (10,2)
1	1	Trek 820 - 2016	9	6	2016	379.99
2	4	Trek Fuel EX 8 29 - 2016	9	6	2016	2899.99
3	7	Trek Slash 8 27.5 - 2016	9	6	2016	3999.99
4	8	Trek Remedy 29 Carbon Fram...	9	6	2016	1799.99
5	9	Trek Conduit+ - 2016	9	5	2016	2999.99
6	29	Trek X-Caliber 8 - 2017	9	6	2017	999.99
7	32	Trek Farley Alloy Frameset - 2...	9	6	2017	469.99
8	34	Trek Session DH 27.5 Carbon ...	9	6	2017	469.99
9	39	Trek Stache 5 - 2017	9	6	2017	1499.99

	product_id [PK] integer	product_name character varying (255)	brand_id integer	category_id integer	model_year smallint	list_price numeric (10,2)
1	1	Trek 820 - 2016	9	6	2016	379.99
2	2	Ritchey Timberwolf Frameset ...	5	6	2016	749.99
3	3	Surly Wednesday Frameset - 2...	8	6	2016	999.99
4	4	Trek Fuel EX 8 29 - 2016	9	6	2016	2899.99
5	5	Heller Shagamaw Frame - 2016	3	6	2016	1320.99
6	6	Surly Ice Cream Truck Frames...	8	6	2016	469.99
7	7	Trek Slash 8 27.5 - 2016	9	6	2016	3999.99
8	8	Trek Remedy 29 Carbon Fram...	9	6	2016	1799.99
9	9	Trek Conduit+ - 2016	9	5	2016	2999.99

* What if you change the brand id to 5?
* What if you change the brand it to 1000

WHERE - Filters / Conditions

SELECT * FROM production.products WHERE brand_id <> 9

SELECT * FROM production.products WHERE brand_id != 9

	product_id [PK] integer	product_name character varying (255)	brand_id integer	category_id integer	model_year smallint	list_price numeric (10,2)
1	2	Ritchey Timberwolf Frameset ...	5	6	2016	749.99
2	3	Surly Wednesday Frameset - 2...	8	6	2016	999.99
3	5	Heller Shagamaw Frame - 2016	3	6	2016	1320.99
4	6	Surly Ice Cream Truck Frames...	8	6	2016	469.99
5	10	Surly Straggler - 2016	8	4	2016	1549.00
6	11	Surly Straggler 650b - 2016	8	4	2016	1680.99
7	12	Electra Townie Original 21D - ...	1	3	2016	549.99
8	13	Electra Cruiser 1 (24-Inch) - 20...	1	3	2016	269.99
9	14	Electra Girl's Hawaii 1 (16-inch...	1	3	2016	269.99

WHERE - Filters / Conditions

SELECT * FROM production.products WHERE brand_id < 5

SELECT * FROM production.products WHERE brand_id > 5

	product_id [PK] integer	product_name character varying (255)	brand_id integer	category_id integer	model_year smallint	list_price numeric (10,2)
1	1	Trek 820 - 2016	9	6	2016	379.99
2	3	Surly Wednesday Frameset - 2...	8	6	2016	999.99
3	4	Trek Fuel EX 8 29 - 2016	9	6	2016	2899.99
4	6	Surly Ice Cream Truck Frames...	8	6	2016	469.99
5	7	Trek Slash 8 27.5 - 2016	9	6	2016	3999.99
6	8	Trek Remedy 29 Carbon Fram...	9	6	2016	1799.99
7	9	Trek Conduit+ - 2016	9	5	2016	2999.99
8	10	Surly Straggler - 2016	8	4	2016	1549.00
9	11	Surly Straggler 650b - 2016	8	4	2016	1680.99

	product_id [PK] integer	product_name character varying (255)	brand_id integer	category_id integer	model_year smallint	list_price numeric (10,2)
1	5	Heller Shagamaw Frame - 2016	3	6	2016	1320.99
2	12	Electra Townie Original 21D - ...	1	3	2016	549.99
3	13	Electra Cruiser 1 (24-Inch) - 20...	1	3	2016	269.99
4	14	Electra Girl's Hawaii 1 (16-inch...	1	3	2016	269.99
5	15	Electra Moto 1 - 2016	1	3	2016	529.99
6	16	Electra Townie Original 7D EQ ...	1	3	2016	599.99
7	17	Pure Cycles Vine 8-Speed - 20...	4	3	2016	429.00
8	18	Pure Cycles Western 3-Speed ...	4	3	2016	449.00
9	19	Pure Cycles William 3-Speed - ...	4	3	2016	449.00

WHERE - Filters / Conditions

SELECT * FROM production.products WHERE brand_id <= 5

SELECT * FROM production.products WHERE brand_id >= 5

	product_id [PK] integer	product_name character varying (255)	brand_id integer	category_id integer	model_year smallint	list_price numeric (10,2)
1	1	Trek 820 - 2016	9	6	2016	379.99
2	2	Ritchey Timberwolf Frameset …	5	6	2016	749.99
3	3	Surly Wednesday Frameset - 2…	8	6	2016	999.99
4	4	Trek Fuel EX 8 29 - 2016	9	6	2016	2899.99
5	6	Surly Ice Cream Truck Frames…	8	6	2016	469.99
6	7	Trek Slash 8 27.5 - 2016	9	6	2016	3999.99
7	8	Trek Remedy 29 Carbon Fram…	9	6	2016	1799.99
8	9	Trek Conduit+ - 2016	9	5	2016	2999.99
9	10	Surly Straggler - 2016	8	4	2016	1549.00

	product_id [PK] integer	product_name character varying (255)	brand_id integer	category_id integer	model_year smallint	list_price numeric (10,2)
1	2	Ritchey Timberwolf Frameset …	5	6	2016	749.99
2	5	Heller Shagamaw Frame - 2016	3	6	2016	1320.99
3	12	Electra Townie Original 21D - …	1	3	2016	549.99
4	13	Electra Cruiser 1 (24-Inch) - 20…	1	3	2016	269.99
5	14	Electra Girl's Hawaii 1 (16-inch…	1	3	2016	269.99
6	15	Electra Moto 1 - 2016	1	3	2016	529.99
7	16	Electra Townie Original 7D EQ …	1	3	2016	599.99
8	17	Pure Cycles Vine 8-Speed - 20…	4	3	2016	429.00
9	18	Pure Cycles Western 3-Speed …	4	3	2016	449.00

AND / OR - All conditions / Choice conditions

Inputs		Outputs	
X	**Y**	**And**	**Or**
1	1	1	1
1	0	0	1
0	1	0	1
0	0	0	0

AND / OR - All conditions / Choice conditions

SELECT * FROM production.stocks WHERE store_id = 1 AND quantity < 5

SELECT * FROM production.stocks WHERE (store_id = 1 OR store_id = 2) AND quantity = 0

	store_id [PK] integer	product_id [PK] integer	quantity integer
1	1	6	0
2	1	8	0
3	1	15	3
4	1	16	4
5	1	17	2
6	1	19	4
7	1	31	2
8	1	32	0
9	1	34	2
10	1	39	2
11	1	42	0
12	1	43	2
13	1	44	1
14	1	51	2

	store_id [PK] integer	product_id [PK] integer	quantity integer
1	1	6	0
2	1	8	0
3	1	32	0
4	1	42	0
5	1	92	0
6	1	160	0
7	1	163	0
8	1	168	0
9	1	246	0
10	1	302	0
11	2	22	0
12	2	47	0
13	2	91	0
14	2	158	0

IN - Specify list of conditions

SELECT * FROM production.products WHERE brand_id IN (1,3,5)

	product_id [PK] integer	product_name character varying (255)	brand_id integer	category_id integer	model_year smallint	list_price numeric (10,2)
1	2	Ritchey Timberwolf Frameset ...	5	6	2016	749.99
2	5	Heller Shagamaw Frame - 2016	3	6	2016	1320.99
3	12	Electra Townie Original 21D - ...	1	3	2016	549.99
4	13	Electra Cruiser 1 (24-Inch) - 20...	1	3	2016	269.99
5	14	Electra Girl's Hawaii 1 (16-inch...	1	3	2016	269.99
6	15	Electra Moto 1 - 2016	1	3	2016	529.99
7	16	Electra Townie Original 7D EQ ...	1	3	2016	599.99
8	20	Electra Townie Original 7D EQ ...	1	3	2016	599.99
9	21	Electra Cruiser 1 (24-Inch) - 20...	1	1	2016	269.99

BETWEEN - Specify Range

SELECT * FROM production.products WHERE brand_id BETWEEN 2 AND 5

	product_id [PK] integer	product_name character varying (255)	brand_id integer	category_id integer	model_year smallint	list_price numeric (10,2)
1	2	Ritchey Timberwolf Frameset …	5	6	2016	749.99
2	5	Heller Shagamaw Frame - 2016	3	6	2016	1320.99
3	17	Pure Cycles Vine 8-Speed - 20…	4	3	2016	429.00
4	18	Pure Cycles Western 3-Speed …	4	3	2016	449.00
5	19	Pure Cycles William 3-Speed - …	4	3	2016	449.00
6	37	Haro Flightline One ST - 2017	2	6	2017	379.99
7	38	Haro Flightline Two 26 Plus - …	2	6	2017	549.99
8	41	Haro Shift R3 - 2017	2	6	2017	1469.99
9	44	Haro SR 1.1 - 2017	2	6	2017	539.99

HANDS-ON (WHERE, AND/OR, IN, BETWEEN)

1. Using an appropriate SQL statement, find the email of Staff called Jannette David.

2. Using an appropriate SQL statement, find the number of stock quantity for product_id between 1 and 10 (inclusive) and such products are from store_id = 2.

3. Using an appropriate SQL statement, find the brand_id of the brand_name = Sun Bicycles.

4. Using an appropriate SQL statement, find the address of the customer called Addie Hahn.

TO RECAP

1. You learn about what is SQL and what is a database.

2. How to conduct basic retrieval of data from database.

3. Filtering data based on certain conditions based on both numerical and categorical values

END OF DAY 1!

Any questions? Feel free to clarify now.

Or you can reach us at:

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