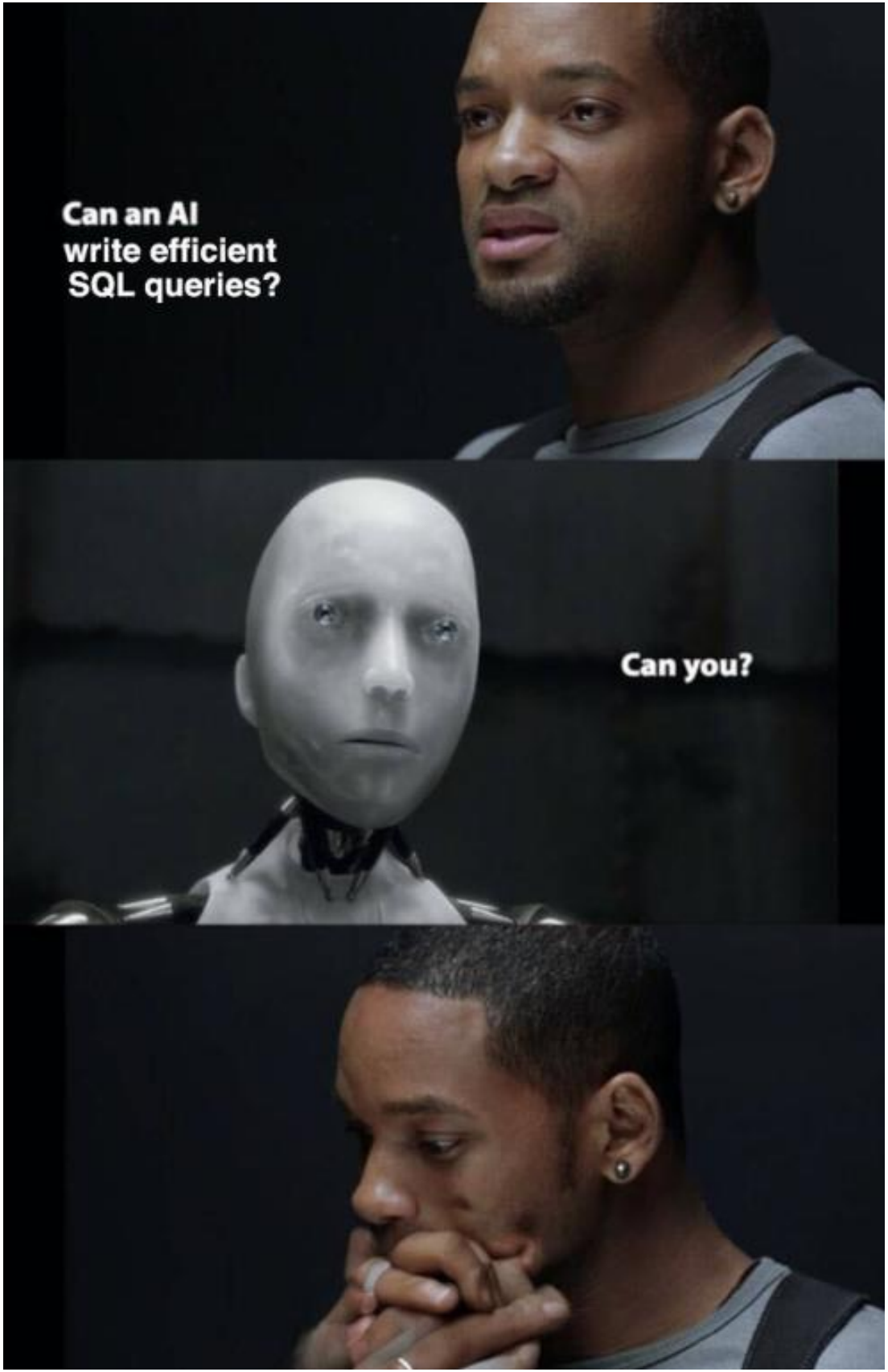
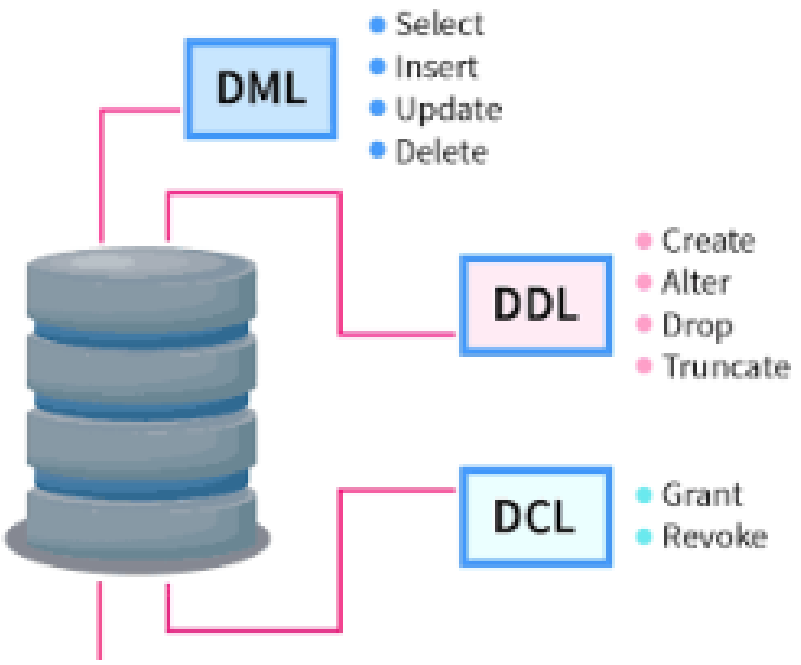
ROSETTA SQL


Can an AI
write efficient
SQL queries?
Can you?



DML - Data Manipulation Language:

Command	Description
SELECT	Retrieves certain records from one or more tables
INSERT	Creates a record
UPDATE	Modifies records
DELETE	Deletes records

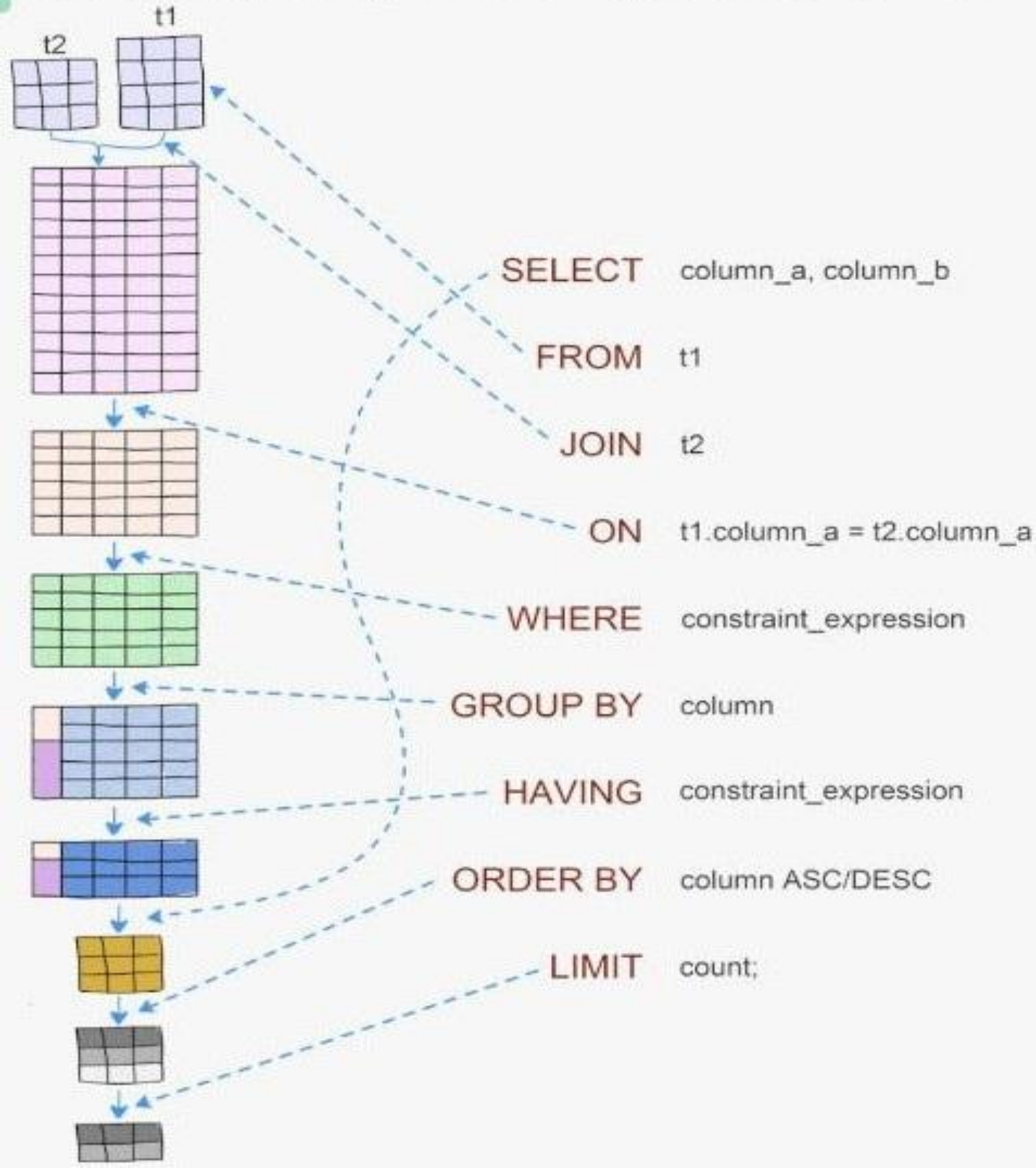
DDL - Data Definition Language:

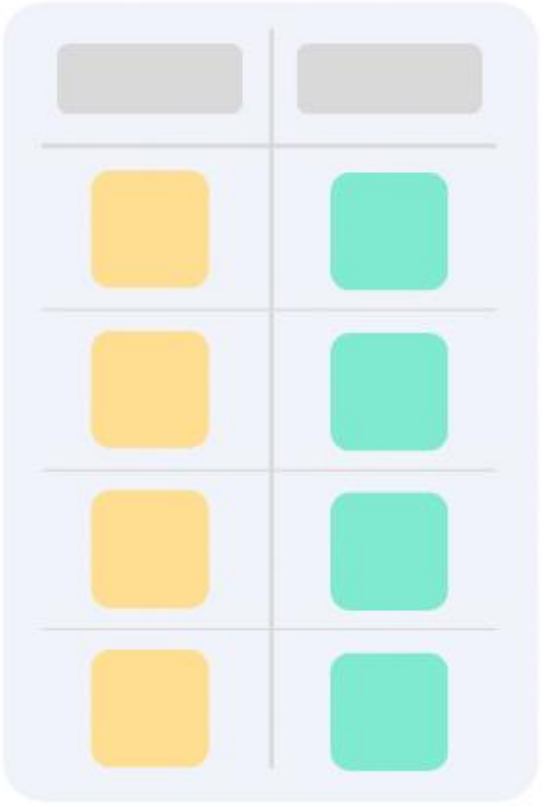
Command	Description
CREATE	Creates a new table, a view of a table, or other object in database
ALTER	Modifies an existing database object, such as a table.
DROP	Deletes an entire table, a view of a table or other object in the database.

DCL - Data Control Language:

Command	Description
GRANT	Gives a privilege to user
REVOKE	Takes back privileges granted from user

SQL Query Execution Order





SQLite

```
#Check table in SQLite
pd.read_sql_query ('select * from employees', con)
```

	index	empid	firstname	lastname
0	0	12985	Michael	Scott
1	1	12986	Dwight	Schrute
2	2	12987	Jim	Halpert
3	3	12988	Pam	Beesly
4	4	12989	Andy	Bernard
5	5	12990	Kevin	Malone
6	6	12991	Toby	Flenderson
7	7	12992	Angela	Martin

Select

Selecting data with Pandas vs SQL

`df`	**SELECT * FROM tab;**	query data from all columns
`df[['col_1', 'col_2']]`	**SELECT col_1, col_2 FROM tab;**	select subset of columns and get all rows
`df.assign(new_col = df['col_1'] / df['col_2'])`	**SELECT *, col_1/col_2 as new_col FROM tab;**	Aliases - add a calculated column based on other columns
`df[['col 1']]`	**SELECT `col 1` FROM tab;**	Column name with space - `col 1`
`df.sort_values(by='col_1', ascending=True)`	**SELECT * FROM tab ORDER BY col_1 ASC;**	Sort values by col_1 in ascending or descending (DESC) order

Where

Filtering in SQL vs Pandas

`df[df['col_1'] == '11']`	**SELECT * FROM tab WHERE col_1 = '11';**	Filtering on single condition
`df[(df['col_1'] == 11) & (df['col_2'] > 5)]`	**SELECT * FROM tab WHERE col_1 = 11 AND col_2 > 5;**	Filtering on multiple conditions
`df[df['col_2'].isna()]`	**SELECT * FROM tab WHERE col_2 IS NULL;**	NULL checking is done using the isna()
`df[df['col_1'].notna()]`	**SELECT * FROM tab WHERE col_1 IS NOT NULL;**	NOT NULL checking is done using the notna()
`df[df.col_1 > df.col_2]`	**SELECT * FROM tab WHERE col_1 > col_2;**	Where clause with 2 SQL columns
`df.query('col_1 == col_2')`	**SELECT * FROM tab WHERE col_1 = col_2;**	Filter with Pandas Query
`df.query('col_1 == `col 2`')`	**SELECT * FROM tab WHERE col_1 = `col 2`;**	Column name with space - `col 2` in where clause

Like, and, or

Operators(Text, Logical) in Pandas vs SQL

`df[df['col_1'].str.contains('i', na=False)]`	**WHERE col_1 LIKE '%i%'**	Finds values which contain `i`. Column need to be string - .astype(str)
`df[df['col_1'].str.contains('sh|rd', regex=True, na=True)]`	**WHERE col_1 LIKE '%sh%' OR col_1 LIKE '%rd%'**	Finds any values which contain `sh` or `rd`
`df[df['col_1'].str.startswith('h', na=False)]`	**WHERE col_1 LIKE 'h%'**	Finds any values that start with `h`
`df[df['col_1'].astype(str).str.endswith ('k', na=False)]`	**WHERE col_1 LIKE '%k'**	Finds any values that ends with `k`
`(df['col_1'] == '11') & (df['col_2'] > 5)`	**WHERE col_1 = '11' AND col_2 > 5;**	AND = SQL - `and`, Pandas - `&`
`(df['col_1'] == '11') | (df['col_2'] > 5)`	**WHERE col_1 = '11' OR col_2 > 5;**	OR = SQL - `or`, Pandas - `|`
`df[df['col_1'].isin([1,2,3])]`	**SELECT * FROM tab WHERE col_1 in (1,2,3);**	IN operator - find values from list of values
`df[df['col_1'].between(1, 5)]`	**SELECT * FROM tab WHERE col_1 BETWEEN 1 AND 5;**	BETWEEN operator - find values in a range

Group by

Group by operations in SQL vs Pandas

`df.groupby('col_1').size()`
`df.groupby('col_1')['col_2'].count()`
`df.col_1.value_counts()`
	SELECT col_1, count(*)
	FROM tab
	GROUP BY col_1;
		count records in each group(3 versions in Pandas)

`import numpy as np` `df.groupby('col_1').agg({'col_2': np.mean, 'col_1': np.size})`	**SELECT col_1, AVG(col_2), COUNT(*)** **FROM tab** **GROUP BY col_1;**	Apply multiple statistical functions
`df.groupby(['col_1', 'col_2']).agg({'col_3': [np.size, np.mean]})`	**SELECT col_1, col_2, COUNT(*), AVG(col_3)** **FROM tab** **GROUP BY col_1, col_2;**	Grouping by multiple columns, multiple functions

`# group by`
`g = df.groupby('col_1')`
`# having count(*) > 10`
`g.filter(lambda x: len(x) > 10)['col_1']`
	SELECT col_1, count(*)
	FROM tab
	GROUP BY col_1
	HAVING count(*) > 10;
		HAVING - Group by column and filtering contidion on the groups

`df.groupby('col_1').col_2.nunique()`	**SELECT count(distinct col_2)** **FROM tab** **GROUP BY col_1;**	count(distinct) - count unique elements in group

Join

Join in SQL and Pandas

`pd.merge(df1, df2, on='key')`	**SELECT *** **FROM t1** **INNER JOIN t2** **ON t1.key = t2.key;**	Inner join of 2 table/dataframes(1)
`pd.merge(df1, df2, on='key', how='left')`	**SELECT *** **FROM t1** **LEFT OUTER JOIN t2** **ON t1.key = t2.key;**	Left Outer join
`pd.merge(df1, df2, on='key', how='right')`	**SELECT *** **FROM t1** **RIGHT OUTER JOIN t2** **ON t1.key = t2.key;**	Right Join
`pd.merge(df1, df2, on='key', how='outer')`	**SELECT *** **FROM t1** **FULL OUTER JOIN t2** **ON t1.key = t2.key;**	Full Join (not working on MySQL)
`pd.merge(df1, df2, left_on= ['col_1', 'col_2'], right_on= ['col_3', 'col_4'], how = 'right')`	**SELECT *** **FROM t1** **INNER JOIN t2** **ON t1.col_1 = t2.col_3** **AND t1.col_2 = t2.col_4;**	Join on columns with different names
`m = pd.merge(df1, df2, how='left', on= ['col_1', 'col_2'])` `pd.merge(m, df3[['col_1', 'col_2', 'col_3']], how='left', on=['col_1', 'col_3'])`	**SELECT t1.col_a, t2.col_b, t3.col_c** **FROM t1** **LEFT OUTER JOIN t2** **ON t1.col_1 = t2.col_1** **AND t1.col_2 = t2.col_2** **LEFT OUTER JOIN t3** **ON t1.col_1 = t3.col_1** **AND t1.col_3 = t3.col_3**	join multiple dataframes on multiple columns

Union

Union in SQL and Pandas

`pd.concat([df1, df2])`	**SELECT * FROM df1 UNION ALL SELECT * FROM df2;**	Unioun All(columns must have same number of columns)
`cols= ['col_1', 'col_2']` `pd.concat([df1[cols], df2[cols]])`	**SELECT col_1, col_2 FROM t1 UNION ALL SELECT col_1, col_2 FROM t2;**	Unioun All
`pd.concat([df1, df2]).drop_duplicates()`	**SELECT col_1, col_2 FROM t1 UNION SELECT col_1, col_2 FROM t1;**	Unioun All (remove duplicate rows)

Limit

Limit in SQL and Pandas

`df.head(10)`	**SELECT * FROM tab LIMIT 10;**	Get top rows
`df.tail(10)`	**SELECT * FROM tab ORDER BY id DESC LIMIT 10;**	Get last N rows
`lim = 2 offset = 5 df.sort_values('col_1', ascending=False).iloc[offset:lim+offset]`	**SELECT * FROM tab ORDER BY col_1 DESC LIMIT 2 OFFSET 5;**	return only top 2 records, start on record 6 (OFFSET 5)

Update

Update in SQL vs Pandas

`df.loc[df['col_1'] < 2, 'col_1'] *= 2`	**UPDATE tab SET col_1 = col_1*2 WHERE col_1 < 2;**	Update all rows for 1 column with condition
`df1['name'] = np.where(df2['id']==1,df2['name'],df1['name'])`	**UPDATE t1, (SELECT * FROM t2 WHERE id = 1) AS temp SET t1.name = temp.name WHERE t1.id = 1;**	Update based on select from another table / dataframe

Delete

Delete in SQL vs Pandas

`df = df.loc[df['col_1'] > 9]`	**DELETE FROM tab** **WHERE col_1 > 9;**	Delete rows with condition
`df1.drop(df1[(df1.id.isin(df2.id) & (df1.id==1))].index)`	**DELETE t1** **FROM df1 as t1** **JOIN df2 as t2 ON t1.id = t2.id** **WHERE t2.id = 1;**	Delete rows with condition based on another table / dataframe

Insert

Insert in SQL vs Pandas

`data = {'col_1': 1, 'col_2': '11'}` `df = df.append(data, ignore_index = True)`	**INSERT INTO tab(col_1, col_2)** **VALUES (1, '11');**	Add new data/rows to a table/dataframe

Operation	Pandas	SQL
Read CSV	pd.read_csv(file)	LOAD DATA INFILE 'data.csv' INTO TABLE table FIELDS TERMINATED BY ',' LINES TERMINATED BY '\n' IGNORE 1 ROWS;
Print first 10 (or k) rows	df.head(10)	SELECT * FROM table LIMIT 10;
Dimensions	df.shape	SELECT count(*) FROM table;
Datatype	df.dtyes	DESCRIBE table;
Filter Data	df[df.column>10]	SELECT * FROM table where column>10;
Select column(s)	df.column	SELECT column FROM table;
Sort	df.sort_values("column")	SELECT * FROM table ORDER BY column;
Fill NaN	df.column.fillna(0)	UPDATE table SET column=0 WHERE column IS NULL;
Join	pd.merge(df1, df2, on ="col", how = "inner")	SELECT * FROM table1 JOIN table2 ON (table1.col = table2.col);
Concatenate	pd.concat((df1, df2))	SELECT * FROM table1 UNION ALL table2;
Group	df.groupby("column"). agg_col.mean()	SELECT column, avg(agg_col) FROM table GROUP BY column;
Unique values	df.column.unique()	SELECT DISTINCT column FROM table;
Rename column	df.rename(columns = {"old_name": "new_name"})	ALTER TABLE table RENAME COLUMN old_name TO new_name;
Delete column	df.drop(columns = ["column"])	ALTER TABLE table DROP COLUMN column;

Pandas equivalent of SQL

Table below shows the most used equivalents between SQL and Pandas:

CATEGORY	PANDAS	SQL
Data Structure	DataFrames, Series	Tables, Row, Column
Querying	.loc , .iloc , boolean indexing	SELECT, WHERE
Filtering	.query() , boolean indexing	WHERE
Sorting	.sort_values() , .sort_index()	ORDER BY
Grouping	.groupby() , .agg()	GROUP BY, AGGREGATE
Joins	.merge() , .join(), .concat()	JOIN, UNION
Aggregations	.agg() , .apply()	AGGREGATE
Data Transformation	.apply() , .map() , .replace()	replace(`column` , 'old', 'new')
Count Unique	.nunique(), .agg(['count', 'nunique'])	count(distinct)
Data Cleaning	.dropna() , .fillna()	IS NULL; IS NOT NULL;
Data Type Conversion	.astype()	CAST


EXIT 12
Precise Data Queries
SELECT * FROM everything
Me, an SQL “expert”