

SQL

Syntactical and Execution Order

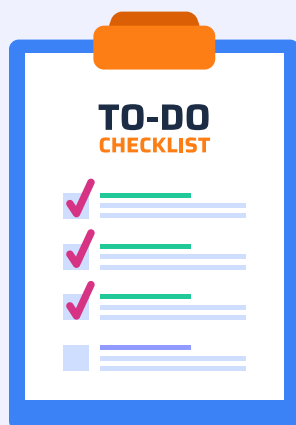


SQL(Structured Query Language), is a powerful tool for managing and manipulating databases.

A critical aspect of writing effective SQL queries involves understanding the **syntactical order of the query** and the **logical order** in which the database engine executes these commands.

This article will guide you through these concepts using a simple analogy, followed by a detailed technical explanation and practical examples.

Syntactical Order



Logical Execution Order

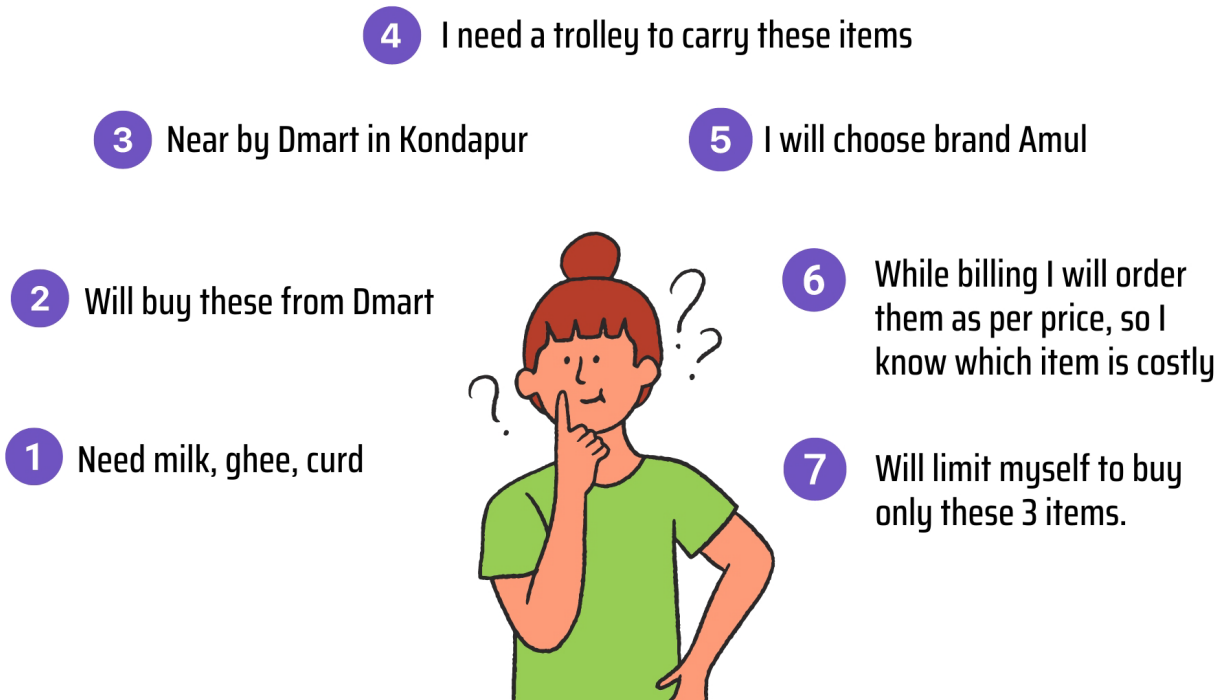


What is Syntactical Order and Logical Execution Order?

Imagine you are planning a grocery shopping trip. Initially, you create a list of what you need to buy, which is called the **syntactical order**. Then, you perform the actual shopping, which is called the **execution order**.

Note:

We will be using an analogy that focuses on explaining the syntactical and logical execution order in SQL by concentrating on the English meaning of the functions rather than their actual functions, making the order easier to memorize.



Creating List: Syntactical Order

- **Select:** What to Buy: List items you need, like **milk, curd, ghee**.
- **From:** Which Store: Decide where to buy, such as **D-mart**.
- **Where:** Choose the area where the store is located, let's say **Kondapur**.
- **Group By:** To carry these items together, you need a **trolley**.
- **Having Brand:** Let's say you want to buy products from a particular brand, such as **Amul**.
- **Order By:** Let's say you want to order them by **ascending order of price** at the billing counter.
- **Limit:** You want to limit yourself not to buy any products apart from these **3**.



Shopping: Logical Execution Order

- **From:** First you will visit the Dmart.
- **Where:** Where: In the Kondapur location.
- **Group By:** You will pick a trolley to pick up these items.
- **Having:** Then you will go to the section where Amul products are displayed.
- **Select:** Next, you will pick up the items you listed: milk, curd, and ghee.
- **Order By:** At the billing counter, you will order them by ascending price.
- **Limit:** As you have limited yourself to buying only these three products, you will exit the market without purchasing any other items.

Let's explore how SQL queries are written and executed in actual database environments.

Syntactical Order: This is the order in which we write SQL commands.

- **Select:** Specifies the columns to be returned.
- **From:** Specifies the table from which to retrieve data.
- **Where:** Applies filtering conditions.
- **Group By:** Groups rows that have the same values in specified columns into summary rows.
- **Having:** Applies conditions to groups defined by the GROUP BY clause.
- **Order By:** Specifies the sort order of the rows returned.
- **Limit:** Specifies the maximum number of rows to return.

Logical Execution Order: This is the order in which the SQL engine processes the query.

- **From:** Identifies the table(s).
- **Where:** Filters rows before grouping.
- **Group By:** Groups rows after WHERE filters have been applied.
- **Having:** Filters after groups have been formed.
- **Select:** Selects data from the result set.
- **Order By:** Orders the results in the specified order.
- **Limit:** Limits the results to a specified number of rows.

Example:

Consider the below table: Books

This dataset will be a bookstore inventory which lists various books, their genres, prices, and sales data.

BookID	Title	Genre	Price	StoreLocation	UnitsSold
1	The Final Empire	Fantasy	8.99	Kondapur	150
2	The Hero of Ages	Fantasy	7.99	Kondapur	120
3	The Way of Kings	Fantasy	9.99	Kondapur	180
4	Elantris	Fantasy	6.99	Kondapur	90
5	Mistborn	Fantasy	8.50	Kondapur	200
6	Prodigal Son	Thriller	5.99	Kondapur	60
7	Deception Point	Thriller	7.99	Kondapur	140
8	Digital Fortress	Thriller	6.99	Kondapur	70
9	The Lost Symbol	Thriller	5.99	Kondapur	150
10	Origin	Thriller	9.99	Kondapur	130
11	Persuasion	Romance	4.99	Kondapur	80
12	Emma	Romance	5.50	Kondapur	110
13	Pride and Prejudice	Romance	6.99	Kondapur	160
14	Sense and Sensi...	Romance	5.99	Kondapur	90
15	The Gathering St...	Fantasy	9.50	Kondapur	110
16	Towers of Midnight	Fantasy	9.75	Kondapur	130
17	A Memory of Light	Fantasy	10.00	Kondapur	140
18	Warbreaker	Fantasy	8.25	Kondapur	95
19	Words of Radiance	Fantasy	10.50	Kondapur	85
20	Skyward	Science...	11.99	Kondapur	150
21	Dune	Science...	9.99	Kondapur	120
22	Foundation	Science...	8.99	Kondapur	130
23	The Alloy of Law	Fantasy	7.50	Hitech City	120
24	Shadows of Self	Fantasy	7.75	Hitech City	100
25	The Bands of Mo...	Fantasy	8.20	Hitech City	110
26	Calamity	Science...	9.45	Hitech City	130
27	Firefight	Science...	9.35	Hitech City	140
28	Steelheart	Science...	9.25	Hitech City	150
29	Inferno	Thriller	8.99	Hitech City	165
30	Angels & Demons	Thriller	7.99	Hitech City	175
31	The Da Vinci Code	Thriller	8.50	Hitech City	160
32	Northanger Abbey	Romance	4.99	Hitech City	90
33	Lady Susan	Romance	5.20	Hitech City	80

SQL Query:

Let's formulate an SQL query to find the top 2 genres by their average price where at least 100 units were sold in Kondapur, ensuring that the average price is greater than \$7.00 and ordering them by descending order.

Syntactical Order:

```
SELECT Genre, AVG(Price) AS AveragePrice
FROM Books
WHERE StoreLocation = 'Kondapur' AND UnitsSold > 100
GROUP BY Genre
HAVING AVG(Price) > 7.00
ORDER BY AveragePrice DESC
LIMIT 2;
```

Step-by-Step Execution (Logical Execution Order):

From Clause:

BookID	Title	Genre	Price	StoreLocation	UnitsSold
1	The Final Empire	Fantasy	8.99	Kondapur	150
2	The Hero of Ages	Fantasy	7.99	Kondapur	120
3	The Way of Kings	Fantasy	9.99	Kondapur	180
4	Elantris	Fantasy	5.99	Kondapur	90
5	Mistborn	Fantasy	8.50	Kondapur	200
6	Prodigal Son	Thriller	5.99	Kondapur	60
7	Deception Point	Thriller	7.99	Kondapur	140
8	Digital Fortress	Thriller	6.99	Kondapur	70
9	The Last Symbol	Thriller	5.99	Kondapur	150
10	Origin	Thriller	9.99	Kondapur	130
11	Persuasion	Romance	6.99	Kondapur	80
12	Etema	Romance	5.50	Kondapur	110
13	Pride and Prejudice	Romance	6.99	Kondapur	160
14	Sense and Sensibility	Romance	5.99	Kondapur	90
15	The Gathering Storm	Fantasy	9.50	Kondapur	110
16	Towers of Midnight	Fantasy	9.75	Kondapur	130
17	A Memory of Light	Fantasy	10.00	Kondapur	140
18	Watership Down	Fantasy	8.25	Kondapur	95
19	Words of Radiance	Fantasy	10.50	Kondapur	85
20	Skyward	Science...	11.99	Kondapur	150
21	Dune	Science...	9.99	Kondapur	120
22	Foundation	Science...	8.99	Kondapur	130
23	The Way of Law	Fantasy	7.50	Hitech City	120
24	Shadows of Self	Fantasy	7.75	Hitech City	100
25	The Bands of Heaven	Fantasy	8.20	Hitech City	110
26	Calamity	Science...	9.45	Hitech City	130
27	Firefight	Science...	9.35	Hitech City	140
28	Steelheart	Science...	8.25	Hitech City	150
29	Inferno	Thriller	8.99	Hitech City	160
30	Angels & Demons	Thriller	7.99	Hitech City	175
31	The Da Vinci Code	Thriller	8.50	Hitech City	160

Where Clause:

BookID	Title	Genre	Price	StoreLocation	UnitsSold
1	The Final Empire	Fantasy	8.99	Kondapur	150
2	The Hero of Ages	Fantasy	7.99	Kondapur	120
3	The Way of Kings	Fantasy	9.99	Kondapur	180
4	Elantris	Fantasy	5.99	Kondapur	90
5	Mistborn	Fantasy	8.50	Kondapur	200
6	Prodigal Son	Thriller	5.99	Kondapur	60
7	Deception Point	Thriller	7.99	Kondapur	140
8	Digital Fortress	Thriller	6.99	Kondapur	70
9	The Last Symbol	Thriller	5.99	Kondapur	150
10	Origin	Thriller	9.99	Kondapur	130
11	Persuasion	Romance	6.99	Kondapur	80
12	Etema	Romance	5.50	Kondapur	110
13	Pride and Prejudice	Romance	6.99	Kondapur	160
14	Sense and Sensibility	Romance	5.99	Kondapur	90
15	The Gathering Storm	Fantasy	9.50	Kondapur	110
16	Towers of Midnight	Fantasy	9.75	Kondapur	130
17	A Memory of Light	Fantasy	10.00	Kondapur	140
18	Watership Down	Fantasy	8.25	Kondapur	95
19	Words of Radiance	Fantasy	10.50	Kondapur	85
20	Skyward	Science...	11.99	Kondapur	150
21	Dune	Science...	9.99	Kondapur	120
22	Foundation	Science...	8.99	Kondapur	130

Group By Clause:

Genre	avg(Price)
Fantasy	9.245714
Thriller	7.990000
Romance	6.245000
Science Fiction	10.323333

Having Clause:

Genre	avg(Price)
Fantasy	9.245714
Thriller	7.990000
Science Fiction	10.323333

Select Clause:

Genre	AveragePrice
Fantasy	9.245714
Thriller	7.990000
Science Fiction	10.323333

Order By Clause:

Genre	AveragePrice
Science Fiction	10.323333
Fantasy	9.245714
Thriller	7.990000

Limit Clause:

Genre	AveragePrice
Science Fiction	10.323333
Fantasy	9.245714

From Clause:

All entries from the Books table are considered.

BookID	Title	Genre	Price	StoreLocation	UnitsSold
1	The Final Empire	Fantasy	8.99	Kondapur	150
2	The Hero of Ages	Fantasy	7.99	Kondapur	120
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9	The Lost Symbol	Thriller	5.99	Kondapur	150
10	Origin	Thriller	9.99	Kondapur	130
11	Persuasion	Romance	4.99	Kondapur	80
12	Emma	Romance	5.50	Kondapur	110
13	Pride and Prejudice	Romance	6.99	Kondapur	160
14	Sense and Sensi...	Romance	5.99	Kondapur	90
15	The Gathering St...	Fantasy	9.50	Kondapur	110
16	Towers of Midnight	Fantasy	9.75	Kondapur	130
17	A Memory of Light	Fantasy	10.00	Kondapur	140
18	Warbreaker	Fantasy	8.25	Kondapur	95
19	Words of Radiance	Fantasy	10.50	Kondapur	85
20	Skyward	Science...	11.99	Kondapur	150
21	Dune	Science...	9.99	Kondapur	120
22	Foundation	Science...	8.99	Kondapur	130
23	The Alloy of Law	Fantasy	7.50	Hitech City	120
24	Shadows of Self	Fantasy	7.75	Hitech City	100
25	The Bands of Mo...	Fantasy	8.20	Hitech City	110
26	Calamity	Science...	9.45	Hitech City	130
27	Firefight	Science...	9.35	Hitech City	140
28	Steelheart	Science...	9.25	Hitech City	150
29	Inferno	Thriller	8.99	Hitech City	165
30	Angels & Demons	Thriller	7.99	Hitech City	175
31	The Da Vinci Code	Thriller	8.50	Hitech City	160
32	Northanger Abbey	Romance	4.99	Hitech City	90
33	Lady Susan	Romance	5.20	Hitech City	80

Where Clause:

Filters for 'Kondapur' and UnitsSold greater than 100.

BookID	Title	Genre	Price	StoreLocation	UnitsSold
1	The Final Empire	Fantasy	8.99	Kondapur	150
2	The Hero of Ages	Fantasy	7.99	Kondapur	120
3	The Way of Kings	Fantasy	9.99	Kondapur	180
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17	A Memory of Light	Fantasy	10.00	Kondapur	140
20	Skyward	Science ...	11.99	Kondapur	150
21	Dune	Science ...	9.99	Kondapur	120
22	Foundation	Science ...	8.99	Kondapur	130

Group By Clause:

Group by Genre.

Here we want to find top genres by their average price. Grouping is necessary to calculate aggregate functions like AVG(Price) for each genre.

Genre	avg(Price)
Fantasy	9.245714
Thriller	7.990000
Romance	6.245000
Science Fiction	10.323333

Having Clause:

Filters groups where the average price is greater than \$7.00:

Genre	avg(Price)
Fantasy	9.245714
Thriller	7.990000
Science Fiction	10.323333

Select Clause:

Selects Genre and the computed AVG(Price) (aliased as AveragePrice) for the final output.

Genre	AveragePrice
Fantasy	9.245714
Thriller	7.990000
Science Fiction	10.323333

Order By Clause:

Orders the groups by AVG(Price) in descending order.

Genre	AveragePrice
Science Fiction	10.323333
Fantasy	9.245714
Thriller	7.990000

Limit Clause:

Limits the result to the top 2 genres that meet the criteria.

Genre	AveragePrice
Science Fiction	10.323333
Fantasy	9.245714



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