



SQL Learning Program

Version 1.0

KPMG India Lighthouse



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Revision History

Version	Updated By	Remarks	Date	Reviewed By
1.0	Priya Ranjan	Initial version	2023-01-03	Puneet Sachdeva
2.0	Priya Ranjan	Final version	2023-01-08	Puneet Sachdeva

Approval History

Version	Approved By	Date
2.0	Amit Kumar	2023-01-08



1. Objective

The objective of this SQL learning program is to provide participants with the knowledge and skills necessary to effectively use SQL for data analysis and data engineering tasks, including ability to work with databases for queries and manipulations.

By the end of this program, the participants will be able to utilize SQL to effectively analyze and manipulate large data from one or more tables. Participants would be able to understand the relationships between tables and how it affects SQL. Participants would be able to write complex SQLs to analyze data and provide optimized queries for use cases.



2. Pre-requisites

Suggested pre-requisites for this program:

- 1 Basic knowledge of databases and table structures.
- 2 Basic understanding of table relationships.
- 3 Basic understanding of data aggregation concepts.
- 4 Register at <https://www.db4free.net/> to have free public MYSQL database

2.1 Suggested resources for pre-requisites and Learning

Below Udemy courses give good understanding of concepts

[SQL for Data Analysis: Beginner MySQL Business Intelligence | Udemy](#)

[Advanced SQL: MySQL Data Analysis & Business Intelligence | Udemy](#)

Below videos are good learning material

✂ SQL Fundamentals, CRUD Operations & Setting Environment -
<https://lnkd.in/ekBxGU2c>

✂ Primary Key vs Unique Key, Auto Increment Values -
<https://lnkd.in/eXSugBVX>

✂ DDL vs DML, Truncate vs Delete -
<https://lnkd.in/eCEj6NHc>

✂ Foreign Key Constraint -
<https://lnkd.in/ebfYyM2b>

✂ Distinct, Order By, Limit, Like Keyword -
<https://lnkd.in/ec-McKnC>



✂ Order of execution in SQL -

<https://lnkd.in/eShPzDCJ>

✂ Aggregate Functions in SQL -

<https://lnkd.in/e2HQQZj3>

✂ Datatypes in SQL -

<https://lnkd.in/eJ7prXMR>

✂ Logical Operators in SQL -

<https://lnkd.in/eubjUHeD>

✂ Joins in SQL -

<https://lnkd.in/e63jvjec>

✂ Difference between where and having in mysql -

<https://lnkd.in/eTwb9pcJ>

✂ Over Clause & Partition By Clause -

<https://lnkd.in/ewspqCVS>

✂ Row Number Function in MySQL -

<https://lnkd.in/eK9-Ef4P>

✂ Rank & Dense Rank -

<https://lnkd.in/en83Pr5VSQL> Advanced (2 videos)

✂ CTE in SQL -

<https://lnkd.in/e-cksd89>



More Learning Materials with some practice:

<https://www.mygreatlearning.com/blog/sql-interview-questions/#sql-practice-questions>

3 Expectation and required commitment

It's a self-paced SQL learning plan with pre-planned milestones. Some general expectations and required commitments include:

- 1 Setting aside dedicated time for learning and practice
- 2 Completing assigned reading and exercises
- 3 Engage in discussions and forums
- 4 Seek additional resources or help when needed
- 5 Take assessments as per the schedule
- 6 Keep record of all required exercises



4 Learning Plan

4.1 Checklist

By the end of this program, participant must know the following:

- 1 Basic database concepts – Relational, NoSQL Database.
- 2 Database and Table Creation Concepts.
- 3 DDL, DML concepts.
- 4 Primary Key, Foreign Key and Constraints.
- 5 Single Table Selects.
- 6 Using keywords and in-built functions in Select.
- 7 Multi Table Selects – Good understanding of Joins.
- 8 Aggregate Functions.
- 9 Scalar and String manipulation functions.
- 10 Advanced Functions.
- 11 Sub-queries and CTEs.
- 12 Advanced Functions and operators.
- 13 Query Optimization and Indexing

4.2 Module: Basic Database Concepts

- 1 Database Basics – Relational, Non-Relational
- 2 Database, Tables, Table Schema
- 3 Datatypes – Column Definitions, Difference between various similar data types
- 4 DDL (CREATE, ALTER, DROP, TRUNCATE, RENAME)
- 5 DML (SELECT, INSERT, UPDATE, DELETE, MERGE)
- 6 DCL (GRANT, REVOKE)
- 7 TCL (ROLLBACK, COMMIT)
- 8 NULL vs NOT NULL
- 9 DEFAULT VALUES
- 10 Combinations of NOT NULL and DEFAULT
- 11 DEFAULT Constraint



- 12 CHECK Constraint
- 13 Primary Key
- 14 Unique Keys
- 15 Primary Key vs Unique Keys
- 16 Combination of Columns for Primary Key/Unique Key
- 17 Auto Increment of Keys

4.3 Module: Single Table Selects

- 1. Select *
- 2. Select Col1, Col2
- 3. Column aliasing - Select Col1 as ""
- 4. Filter using where
- 5. Case sensitive where clause
- 6. Concepts of AND, OR in where clause
- 7. Using Operators: =, <>, >=, <=, >, <, !=, LIKE, BETWEEN, IN, NOT IN, EXISTS, NOT EXISTS

4.4 Module: Data Manipulation Concepts

- 1 Update table
- 2 Conditional Updates
- 3 Basic Delete from Concepts
- 4 Add Column
- 5 Drop Column
- 6 Modify Column
- 7 Drop Primary Key
- 8 Add Primary Key



4.5 Module: Foreign Key Concepts

- 1 Defining Relationship between tables based on keys
- 2 Foreign Key Constraints – REFERENCES
- 3 Impact of Foreign Key Constraints on Insert, Delete

4.6 Module: Multi Table Selects - Joins

- 1 Inner Join
- 2 Left Outer Join
- 3 Right Outer Join
- 4 Full Join
- 5 Self Join

4.7 Module: Aggregate and Scalar Functions

Using aggregate functions

Using functions to clean data – string manipulations, date formatting, etc.

Below list of functions, but not limited to these

Aggregate Functions: AVG(), COUNT(), FIRST(), LAST(), MAX(), MIN(), SUM()
Usages of GROUP BY, HAVING

Scalar Functions: UPPER(), LOWER(), UCASE(), LCASE(), MID(), LEN(), ROUND(),
NOW(), FORMAT(), TRIM(), LTRIM(), RTRIM(), INSTR(), LPAD(),
REGEXP_INSTR(), REGEXP_LIKE(), REGEXP_REPLACE(),
REGEXP_SUBSTR(), NVL(), CONCAT()
DATE Functions

Advanced Operators: UNION, UNION ALL, MINUS, INTERSECT



4.8 Module: Sub Query and CTE

```
WITH TAB_XXXX(col1,col2) as  
(Select .....)  
Select * from TAB_XXXX
```

Using sub-queries to aggregate in multiple stages

Sub-queries in conditional logic

Joining sub-queries/CTE

Sub-queries with advanced operators: UNION, MINUS, etc.

4.9 Module: Advanced Concepts: Window, Pivot

Window function – difference between Windowing and Group By

- 1 Over and Partition By clause
- 2 Use of Sub-Query vs Over Partition By
- 3 Row_Number(), row_number with Partition By
- 4 rank() and dense_rank()
- 5 Where to use row_number() vs rank() vs dense_rank()
- 6 Concepts of LAG, LEAD
- 7 Pivoting – rows to column, column to rows

4.10 Module: Query Optimization and Indexes

- 1 Order of execution in SQL
- 2 The theory behind a query run time
- 3 Use of indexes in query execution
- 4 Checking Execution Plans
- 5 Different scan methods in execution plans – Full Table Scan, Rowid Lookup, Range Index Scan, Hash Index Scan, etc.
- 6 Different Types of Indexes – Clustered, Non-Clustered, Filtered, Column Store, Hash, Unique
- 7 Query Optimization techniques: Adding Indexes, Do not over index, Correct use of OR/AND in where clause, Optimized joins



5. Evaluation & Exit Criteria

There will be Hacker Rank Test after 2 weeks. Candidates need to score >70% to successfully complete this learning plan.

Candidates will get 2 attempts at Hacker Rank to complete the Learning Plan.