

SQL - Standard Query Language

Tutorial 7

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SQL Introduction-

- (1) SQL stands for Standard Query Language
- (2) In order to understand the importance and significance of SQL, it is necessary to have some understanding of the concept of databases.
- (3) Now, to put databases into context, most/all serious organisations use databases. These include commercial organisations such as Amazon, Google, , Twitter, Yahoo; public organisations such as the NHS, the Electoral Commission, schools; banks such as HSBC, the Bank of America, etc.
- (4) So databases are used for a multitude of purposes. These include:-
 - (1) When to buy something online - related to e-commerce (eg Amazon, EBay)
 - (2) Search engines store data about websites such as name, web address and their content; users can quickly search for and find the information they are looking for.
 - (3) Storing information about students in a school.
 - (4) Storing information about books in a library
 - (5) Storing information about patients medical records which are used by doctors and nurses to treat patients.
- (5) And the databases contain data.
- (6) Data is growing at a huge rate in the world and we need a way of storing all this data.
- (7) So, we store the data in databases.
- (8) What is a database?
 - (1) One way of defining a database is that "a database is a persistent and structured/organised store of data.
 - (1) Persistent means the data is stored permanently
 - (2) And a way in which the data can be stored in an organised fashion is that it is stored in related tables. We shall look at this a bit later.
- (9) Now, when data is stored in tables - we say we are using a Relational Database.
- (10) The Relational Database was proposed in 1970 by an Englishman called E.F.Codd, who moved to the USA, whilst he was working for IBM.
- (11) IBM stands for International Business Machines and is one of the most foremost technology companies in the world.
- (12) And then Codd proposed a language which could retrieve information from the database - "retrieve" means extract information.
- (13) In 1980, IBM brought SQL to the world.
- (14) The database market worldwide in 2018 was worth \$46billion, so we can see that we are studying a serious topic!!

(15) Now, in order to understand SQL, the next “thing” you have to understand is the “structure of the tables” in the database. We said that a Relational Database is made up of related tables so let us look at the structure of these tables.

Title_ID	Title	Price	Sold_by_Foyles	Author
1	The Wizard of Oz	12=99	1	Smith
2	The Guide to Mars	15=00	0	Musk
3	Becoming a Billionaire	99=00	1	Nandi
4	The Guide to Spain	10=00	1	Jones

(16) **Terminology**

- (I) The table above is called **BOOKS**
- (II) **Table** - A structure in which data is stored in a database
- (III) **Record** -
 - (I) a collection of data about a single item in a database -
 - (II) You can think of a records as a row of information in a table,
 - (III) There are 4 Records in the above table called **BOOKS**

(IV) **Field**

- (I) One piece of data about an item in a database
- (II) You can think of a field as a column.
- (III) There are 5 fields in the table above
- (IV) The fields are called Title_ID, Title, Price, Sold_by_Foyles, Author

(V) **Datatypes** - This is defined as ‘the format of the data in a field eg String, Boolean, Integer, Real/Float, Date/Time, Number which can be Integer or Real/Float. The fields in the table above have the following datatypes associated with them. These are:-

- (I) Title_ID - Integer
- (II) Title - String
- (III) Price - Real or it can be called Float or Decimal
- (IV) Sold_by_Foyles - Boolean
- (V) Author - String

(VI) **Validation** - Fields can also be validated. This means when an user is entering the data for a particular field, there can be a programmatic check to ensure only data of the correct data type is entered.

Commented [1]:

Commented [LN2]:

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(VII) Now, some fields are special and known as 'key fields'. One type of 'key field' is the **PRIMARY KEY**.

The PRIMARY KEY is the UNIQUE IDENTIFIER in a table. This uniquely identifies a row in a table.

In the above table, the PRIMARY KEY is TITLE_ID and is an unique identifier.

So, a PRIMARY KEY is a field which is different for every record.

(17) Using the SELECT statement to retrieve information from the table BOOKS

Title_ID	Title	Price	Sold_by_Foyles	Author
1	The Wizard of Oz	12=99	1	Smith
2	The Guide to Mars	15=00	0	Musk
3	Becoming a Billionaire	99=00	1	Nandi
4	The Guide to Spain	10=00	1	Jones

We will look at the following SQL statements:-

- (1) SELECT
- (2) FROM
- (3) WHERE
- (4) ORDER BY
- (5) OR
- (6) AND
- (7) LIKE
- (8) The wildcard '*'
- (9) The wildcard '%'

And you should also be familiar with the following Relational Operators

- (10) < Which means less than
- (11) > which means greater than
- (12) <= which means less than or equal to
- (13) >= which means greater than or equal to
- (14) = means equal to
- (15) != means not equal to
- (16) <> means not equal to

(18) A SELECT statement which retrieves all of the rows in the table BOOKS.

SELECT * FROM BOOKS

Output

Title_ID	Title	Price	Sold_by_Foyle s	Author
1	The Wizard of Oz	12=99	1	Smith
2	The Guide to Mars	15=00	0	Musk
3	Becoming a Billionaire	99=00	1	Nandi
4	The Guide to Spain	10=00	1	Jones

Please note that the symbol '*' is known as a WILDCARD.

(19) A SELECT statement which returns specified fields/columns

SELECT Title, Author FROM BOOKS

Output

Title	Author
The Wizard of Oz	Smith
The Guide to Mars	Musk
Becoming a Billionaire	Nandi
The Guide to Spain	Jones

(20) A SELECT statement which ORDERS the DATA in ASCENDING ORDER

SELECT Author FROM TABLE ORDER BY ASC

Output

Author
Jones
Musk
Nandi
Smith

Commented [6]:

Commented [7]:

(21) A SELECT statement which ORDERS the DATA in DESCENDING ORDER
SELECT Author FROM TABLE ORDER BY DESC

Output

Author

Smith

Nandi

Musk

Jones

Commented [LN8]:

(22) Now, let us look at statements which FILTER the DATA.

A SELECT statement which outputs books which cost more than £12=00 or more.

SELECT Title FROM BOOKS WHERE Price >= 12

Output

Title

The Wizard of Oz

Becoming a Billionaire

The Guide to Spain

(23) Filtering data using an AND clause - A SELECT statement which outputs books which are both sold by Foyles and authored by Jones.

SELECT Title FROM BOOKS WHERE Sold_by_Foyles= TRUE AND author="Jones"

Output

Title

The Guide to Spain

(24) Filtering data using an OR clause - A SELECT statement which outputs books which have either been authored by Jones or Nandi.

SELECT Title FROM BOOKS WHERE author= "Jones" OR author="Nandi"

Output

Title

Becoming a Billionaire

The Guide to Spain

(25) Filtering data using the LIKE clause - the LIKE operator allows you to search for simple string patterns or otherwise known as masks.

The symbol '%' matches any string of zero or more characters.

So use LIKE to output books which have the word "THE" somewhere in the title

SELECT title from BOOKS WHERE title like "%THE%"

OUTPUT

Title

The Wizard of Oz

The Guide to Mars

The Guide to Spain

(26) Now to practise learning about SQL statements go to

<https://www.w3schools.com/sql/exercise.asp>

And do the exercises on SELECT, WHERE and LIKE clauses

SQL – Standard Query Language – Tutorial 7 – CLNandi (Dr)

