Introduction to the World of SQL

LEARN

1. What is Data?

Data refers to raw, unorganized facts that are collected from various sources. These facts could be numbers, characters, symbols, or even multimedia like images and videos. Data on its own has no meaning until it is processed and interpreted.

Types of Data:

- **Textual Data**: e.g., Names, addresses
- **Numerical Data**: e.g., Prices, scores, temperatures
- **Multimedia Data**: e.g., Images from a CCTV, sound recordings
- **Sensor Data**: e.g., Temperature, humidity, GPS location

Example:

- If a sensor reads 37.5, it is just a data point unless we know it's temperature in °C.

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2. Data → Information → Knowledge

Transformation Process:

Stage	Description	Example
Data	Raw values or facts	"John", 98, "Blue", 2025
Information	Organized and contextualized data	"John scored 98 in Mathematics"

Stage	Description	Example
Knowledge	Insight or decision derived from information	“John is strong in mathematics and is a topper”

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3. Vitality of Data

Data is often called the "new oil" because of how important it is for running digital businesses. Every interaction, transaction, or observation generates data.

Importance:

- **Business Optimization**: Amazon uses customer data to improve product recommendations.
- **Personalization**: Netflix personalizes your homepage using your viewing history.
- **Automation**: Google uses traffic data to suggest optimal routes in Maps.
- **AI and ML**: Data is the foundation for training intelligent systems.

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4. Why Data is Required?

- **To Draw Conclusions**:
  - E.g., Sales increased by 25% after launching a new ad campaign.
- **To Gain Insights**:
  - E.g., Most customers abandon their cart during the payment phase.
- **To Make Predictions**:
  - E.g., Based on rainfall data, there is an 80% chance of floods.

Without data, decisions would be purely based on guesswork.

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5. Data Symphony – How is Data Collected?

Modern systems use various tools to continuously collect data:

Source	Description	Example
Sensors	Hardware that detects and responds to inputs like light or heat	Thermometers, motion detectors
Trackers	Software that monitors activities	Web analytics tools track clicks, time on page
Mobile Phones	Devices that collect location, app usage, and more	Google tracks real-time traffic from Android phones

Other Sources Include:

- Social media platforms
- POS (Point of Sale) systems
- Cameras and smart home devices
- IoT-enabled devices

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6. How is Data Stored?

Data needs to be stored in such a way that it is:

- **Easily retrievable**
- **Organized for analysis**
- **Secure and backed up**

Common Storage Types:

- **Flat Files**: Simple files like .csv, .txt. Good for small amounts of data. No relationships between data.
    - Example: Employee attendance stored in Excel.

- **Databases**: Systems to store structured data using tables with relationships.
    - Example: Banking system maintaining customer and transaction details.
- **Data Warehouses**: Central repositories of integrated data from one or more sources.
    - Example: E-commerce platforms storing years of user behavior for trend analysis.

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7. Central Data Tank – Types of Databases

What is a Database?

A database is an organized collection of data, generally stored and accessed electronically.

What is RDBMS?

A Relational Database Management System stores data in a tabular form and enforces relationships between them using keys.

Features of RDBMS:

Concept	Description
Tables	Data stored in rows and columns
Primary Key	Uniquely identifies each row in a table
Foreign Key	A field that creates a relationship between two tables
SQL	Language used to manage and query data in an RDBMS

Concept	Description
Data Integrity	Ensures accuracy and consistency of data

Examples of RDBMS Tools:

- MySQL
- Oracle Database
- Microsoft SQL Server
- PostgreSQL

Real-World Example:

In a school database:

- Students table: student_id, name, class
- Marks table: student_id, subject, marks

  The two tables are linked using the student_id as a foreign key in the Marks table.

PRACTISE

Task 1: Identify Types of Information

Classify each as Data, Information, or Knowledge:

1. "72 kg" – _____

   2. "Average weight of 10 people is 70 kg" – _____

   3. "People in this region tend to be heavier than national average" – _____

Task 2: Match Data Collection Source

Device	Data Type Collected
FitBit Smartwatch	_____ ____
Google Maps App	_____ ____
Smart Thermostat	_____ ____
Amazon Website	_____ ____

Task 3: Choose the Right Storage Method

Choose: Flat File / Database / Data Warehouse

1. Small cafe's daily transactions stored in Excel – _____
2. Indian Railways reservation system – _____
3. Amazon's customer data and purchase history – _____

Task 4: Relational Database Structure

Tables:

- Students: student_id, name, age
- Marks: student_id, subject, marks

Questions:

1. What is the Primary Key in Students table? _____
2. How are these two tables related? _____
3. Write a SQL query to fetch name and marks:

```
SELECT name, marks
FROM Students
JOIN Marks ON Students.student_id = Marks.student_id;
```

FAQ

Q1: Why should I use a database instead of Excel?

A: Excel is good for small-scale tasks. Databases:

- Handle millions of records efficiently
- Support multiple users
- Maintain relationships between different types of data
- Provide security, indexing, and backup

Q2: What's the difference between SQL and RDBMS?

- **SQL**: A language used to manage data in a relational database.
- **RDBMS**: A software that uses SQL and enforces data relationships.

Q3: Can I store images in a database?

A: Yes, but usually only a reference or link is stored in the database. Actual files are stored in separate media storage.

Q4: What are some real-life applications of RDBMS?

- Banking systems
- School Management Systems
- E-commerce platforms

- Healthcare patient records

Q5: Is SQL difficult to learn?

A: SQL is one of the easiest programming languages to learn. It has simple English-like commands:

```
SELECT name FROM Students WHERE age > 18;
```

Even beginners can become proficient within a few weeks.