SEMtech!
Student Engagement & Mentoring in Technology

Study Guide: Database Concepts

Objective: Explain Database Concepts and the Purpose of a Database

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1. Introduction to Databases

- **Purpose:** Centralized storage of data, accessible by multiple users while protecting data from unauthorized access and damage.
- **Popular Database Platforms:**
  - **Microsoft SQL Server**
  - **Oracle**
  - **MySQL**

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2. Usage of a Database

- **Ideal for scenarios requiring:**
  - Multiple concurrent users
  - Scalability
  - Speed in data retrieval
  - Organization of diverse data types

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3. Database vs. Flat Files

Database	Flat File
Allows multiple concurrent users	Suitable for single-user or small datasets
Highly scalable to accommodate data growth	Limited scalability
Speed advantage for quick data retrieval	Slower due to lack of indexing and data organization
Supports a variety of data types and structures	Typically stores unstructured or sequential data, often in text format
Ideal for organized data (tables and relationships)	Suitable for simple, standalone lists or sequences (e.g., log files)

Key Insight:
Use a **database** when data needs to be accessed by multiple users or when it requires organization into tables. Use a **flat file** for linear, simple, and one-person data handling.

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4. Structuring Data into Tables

- **Tables:** Organize data into rows and columns.
- **Example Structure (University Courses):**

Department	CourseNumber	CourseName	Semester	Credits	Professor
CHEM	101	Introduction to Chemistry	Fall 2022	3.0	Smith
ECON	220	Macroeconomics	Spring 2023	4.0	Hutchinson
PHIL	220	Modern Philosophy	Spring 2023	3.0	Kolessar

Tip: Use tables for structured data (like course lists). For unstructured or sequential data (like driving directions), use flat files.

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5. Using a Database: Four Major Stages

1. **Database Creation:**
   - Setting up the database server and persistent data storage.
2. **Data Entry:**
   - Importing existing datasets (e.g., CSV files) or manually inputting data.
3. **Data Retrieval and Queries:**
   - Running SQL queries to fetch, update, or manipulate data.
4. **Reporting:**
   - Automating recurring data summaries (e.g., daily sales reports).

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6. Exam Tips and Best Practices

- **When to Use a Database:**
  - If data requires **multiple concurrent access, scalability, high speed**, or **diverse data formats** (text, numeric, multimedia).
  - **Example:** Customer contact information in a restaurant chain.
- **When Not to Use a Database:**

- For data that is **sequential or textual in nature** and does not fit well in a tabular format.
- **Example:** Recipe instructions (better suited for flat files).

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7. Practice Questions and Answers

1. **Question:**
   An IT manager needs software for customer contact management, allowing multiple users to update information simultaneously.
   - **Best Software:** Database software.
2. **Question:**
   A restaurant chain needs a data management strategy. Which type of data is least suited for a database?
   - **Correct Answer:** Recipes used in the kitchen (sequential and non-tabular).

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8. Exam Essentials

- **Databases:** Centralize and organize data into tables, offering concurrent access and efficient querying.
- **Flat Files:** Suitable for simpler, unstructured data used by a single user.
- **Use Cases:**
  - Database for **customer contact information, inventory, and location data**.
  - Flat file for **recipe instructions and procedural steps**.

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9. Tips for Exam Success

- Focus on the **advantages of databases** over flat files: concurrency, scalability, speed, and diversity of data.
- Practice differentiating **structured (tables) vs. unstructured data (sequences)**.
- Familiarize yourself with **basic SQL concepts** like queries and reports.
- Understand **data persistence** and the role of databases in maintaining long-term data integrity.