

1 What Is a Database, and How Does a Database Interact with Data and Information?

A database is a collection of data organized in a manner that allows access, retrieval, and use of that data. Database software, often called a database management system (DBMS), allows users to create a computerized database; add, modify, and delete the data; sort and retrieve the data; and create forms and reports from the data. Data is a collection of unprocessed items, which can include text, numbers, images, audio, and video. Computers process data into information. Information is processed data; that is, it is organized, meaningful, and useful. In addition to documents, information can be in the form of audio, images, and video.

2 What Is Data Integrity, and What Are the Qualities of Valuable Information?

Because data is used to generate information, many organizations realize that data is one of their more valuable assets. Data integrity identifies the quality of data. Data integrity is important because computers and people use information to make decisions and take actions. For a computer to produce correct information, the data that is entered in a database must have integrity. For information to be valuable, it should be accurate, verifiable, timely, organized, accessible, useful, and cost-effective. Accurate information is error free. Verifiable information can be proven as correct or incorrect. Timely information has an age suited to its use. Organized information is arranged to suit the needs and requirements of the decision maker. Accessible information is available when the decision maker needs it. Useful information has meaning to the person who receives it. Cost-effective information should give more value than it costs to produce.

3 What Is Meant by Character, Field, Record, and File?

Data is classified in a hierarchy, with each level of data consisting of one or more items from the lower level. A bit is the smallest unit of data a computer can process. Eight bits grouped together in a unit form a byte, and each byte represents a single character, which can be a number, letter, space, punctuation mark, or other symbol. A field is a combination of one or more related characters or bytes and is the smallest unit of data a user accesses. A record is a group of related fields. A data file is a collection of related records stored on a storage medium such as a hard disk or optical disc.

4 What Are File Maintenance Techniques and Validation Techniques?

File maintenance refers to the procedures that keep data current. File maintenance procedures include adding records when new data is obtained, modifying records to correct inaccurate data or to update old data with new data, and deleting records when they no longer are needed. Validation is the process of comparing data with a set of rules or values to find out if the data is correct. Many programs perform a validity check that analyzes data, either as you enter it or after you enter it, to help ensure that it is correct. Types of validity checks include an alphabetic check, a numeric check, a range check, a consistency check, a completeness check, and a check digit.

5 How Is a File Processing Approach Different from the Database Approach?

In a file processing system, each department or area within an organization has its own set of data files. The records in one file may not relate to the records in any other file. Two major weaknesses of file processing systems are redundant data (duplicated data) and isolated data. With a database approach, many programs and users share the data in a database. The database approach reduces data redundancy, improves data integrity, shares data, permits easier access, and reduces development time. A database, however, can be more complex than a file processing system, requiring special training and more computer memory, storage, and processing power than file processing systems. Data in a database also can be more vulnerable than data in file processing systems.

6 What Functions Are Common to Most Database Management Systems?

Database management systems (DBMSs) are available for many sizes and types of computers. Whether designed for a small or large computer, most DBMSs perform common functions. A data dictionary, sometimes called a repository, contains data about each file in the database and each field in those files. A DBMS offers several methods to retrieve and maintain data in the database, such as query languages, query by example, forms, and report generators. A query language consists of simple, English-like statements that allow users to specify the data to display, print, or store. Query by example (QBE) has a graphical user interface that assists users with retrieving data. A form, sometimes called a data entry form, is a window on the screen that provides areas for entering or modifying data in a database. A report generator, also called a report writer, allows users to design a report on the screen, retrieve data into the report design, and then display or print the report. To supply security, most DBMSs can identify different levels of access

privileges that define the actions a specific user or group of users can perform for each field in a database. If a database is damaged or destroyed, a DBMS provides techniques to return the database to a usable form. A backup is a copy of the database. A log is a listing of activities that modify the contents of the database. A recovery utility uses the logs and/or backups to restore the database using rollforward or rollback techniques. In a rollforward, also called forward recovery, the DBMS uses the log to reenter changes made to the database since the last save or backup. In a rollback, also called backward recovery, the DBMS uses the log to undo any changes made to the database during a certain period. Continuous backup is a backup plan in which all data is backed up whenever a change is made.

7 What Are Characteristics of Relational, Object-Oriented, and Multidimensional Databases?

A data model consists of rules and standards that define how the database organizes data. Three popular data models are relational, object-oriented, and multidimensional. A relational database stores data in tables that consist of rows and columns. A relational database developer refers to a file as a relation, a record as a tuple, and a field as an attribute. A relational database user refers to a file as a table, a record as a row, and a field as a column. A relationship is a link within the data in a relational database. Structured Query Language (SQL) allows users to manage, update, and retrieve data in a relational database. An object-oriented database (OODB) stores data in objects. An object is an item that contains data, as well as the actions that read or process the data. Applications appropriate for an object-oriented database include a multimedia database, a groupware database, a computer-aided design (CAD) database, a hypertext database, and a hypermedia database. Object-oriented databases often use an object query language (OQL) to manipulate and retrieve data. A multidimensional database stores data in dimensions. These multiple dimensions, sometimes known as a hypercube, allow users to access and analyze any view of the database data. No standard query language exists for multidimensional databases. One application that uses multi dimensional databases is a data warehouse, which is a huge database that stores and manages the data required to analyze historical and current transactions. A smaller version of a data warehouse is the data mart, which contains a database that helps a specific group or department make decisions.

8 How Are Web Databases Accessed?

To access data in a Web database, you fill in a form or enter search text on a Web page, which is the front end to the database. A Web database usually resides on a database server, which is a computer that stores and provides access to a database. One type of program that manages the sending and receiving of data between the front end and the database server is a CGI (Common Gateway Interface) script.

9 What Are the Responsibilities of Database Analysts and Administrators?

A database analyst (DA), or data modeler, focuses on the meaning and usage of data. The DA decides on the placement of fields, defines data relationships, and identifies users' access privileges. A database administrator (DBA) requires a more technical inside view of the data. The DBA creates and maintains the data dictionary, manages database security, monitors database performance, and checks backup and recovery procedures. In small companies, one person often is both the DA and DBA. In larger companies, the responsibilities of the DA and DBA are split among two or more people.