

Discovering Computers 2007

Chapter 10 Database Management



Chapter 10 Objectives

Define the term, database

Differentiate between a file processing system approach and the database approach

Identify the qualities of valuable information

Discuss the functions common to most DBMSs

Explain why data is important to an organization

Describe characteristics of relational, object-oriented, and multidimensional databases

Discuss the terms character, field, record, and file

Explain how to interact with Web databases

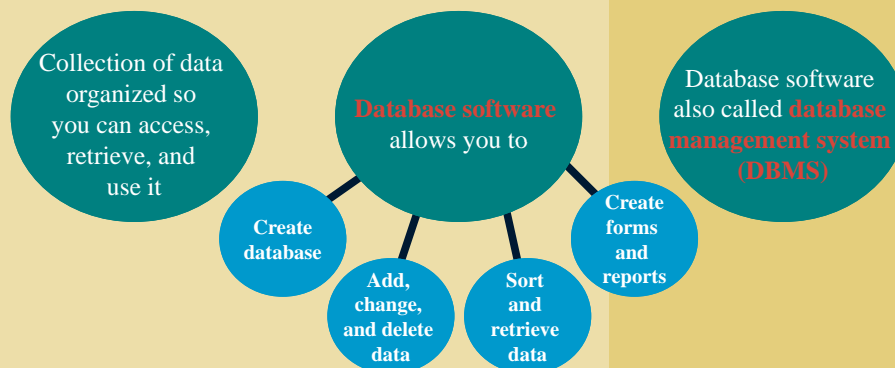
Identify file maintenance techniques

Discuss the responsibilities of database analysts and administrators

Next

Data and Information

What is a **database**?



Data and Information

How are **data** and **information** related?

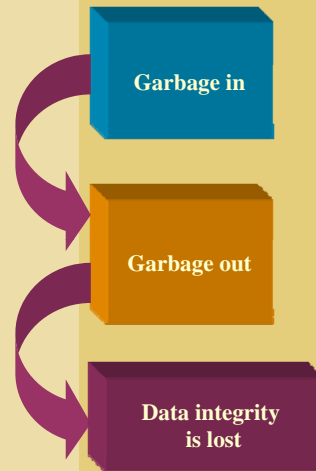
- **Data** is raw facts
- **Information** is data that is organized and meaningful
- **Computers process data into information**



Data and Information

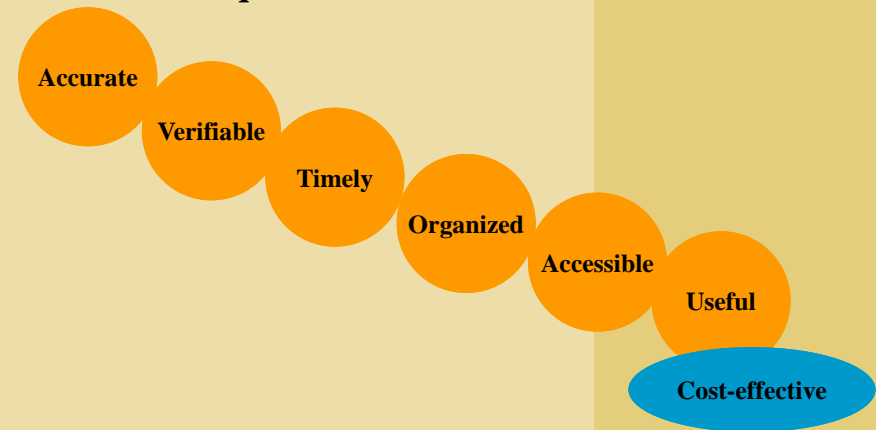
What is data integrity?

- Degree to which data is correct
 - **Garbage in, garbage out (GIGO)**—computer phrase that means you cannot create correct information from incorrect data



Data and Information

What are the qualities of valuable information?



The Hierarchy of Data

What is a hierarchy?

- Database contains files, file contains records, record contains fields, field contains characters



The Hierarchy of Data

What is a **field**?

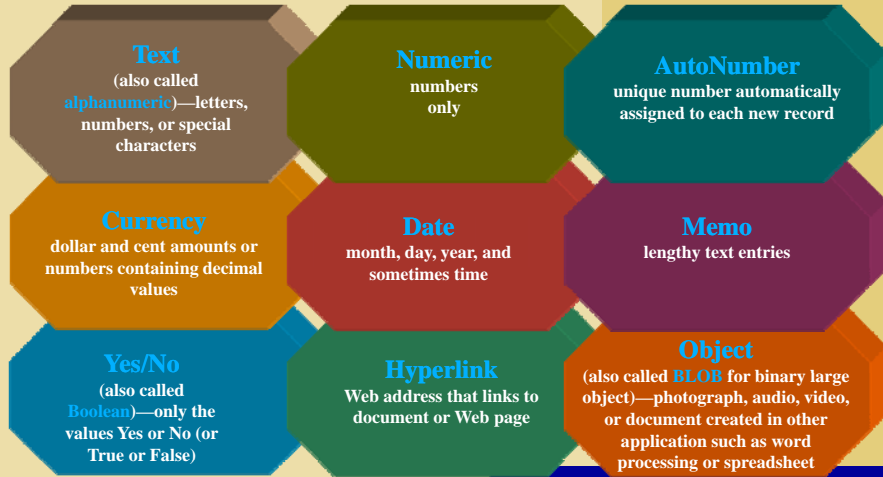
- Combination of one or more characters
- Smallest unit of data user accesses
 - **Field name** uniquely identifies each field
 - **Field size** defines the maximum number of characters a field can contain
 - **Data type** specifies kind of data field contains

Membership Code	Text
Membership Name	Text
Annual Fee	Currency

Member ID	AutoNumber
First Name	Text
Last Name	Text
Address	Text
City	Text
State	Text
Postal Code	Text
E-mail Address	Hyperlink
Date Joined	Date/Time
Membership Code	Text
Photograph	Object

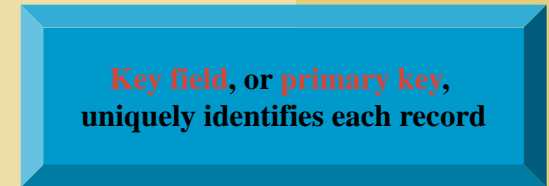
The Hierarchy of Data

What are common data types?



The Hierarchy of Data

What is a **record**?



The Hierarchy of Data

What is a **data file**?

- Collection of related records stored on disk

Member ID	First Name	Last Name	Address	City	State
2295	Milton	Brewer	54 Lucy Court	Shelbyville	IN
2928	Shannon	Murray	33099 Clark Street	Montgomery	AL
3876	Louella	Drake	33 Timmons Place	Cincinnati	OH
3928	Adelbert	Ruiz	99 Tenth Street	Carmel	IN
4872	Elena	Gupta	2 East Penn Drive	Pittsboro	IN

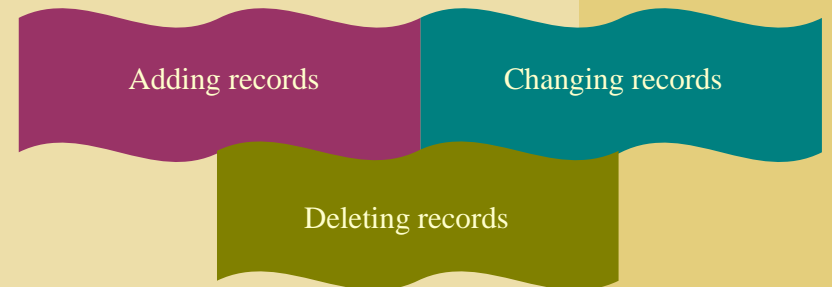
Labels: records (pointing to rows), key field (pointing to Member ID), fields (pointing to column headers).



Maintaining Data

What is **file maintenance**?

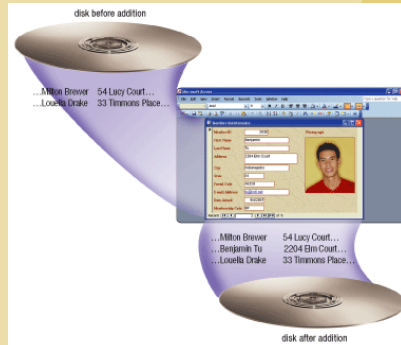
- Procedures that keep data current



Maintaining Data

Why do you add records?

- Add new record when you obtain new data



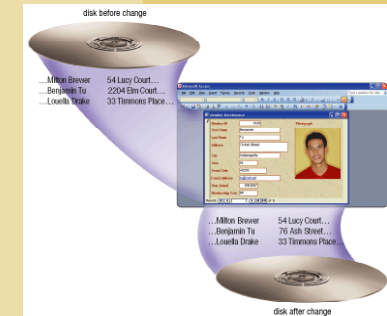
p. 520 Fig. 10-5



Maintaining Data

Why do you change records?

- Correct inaccurate data
- Update old data



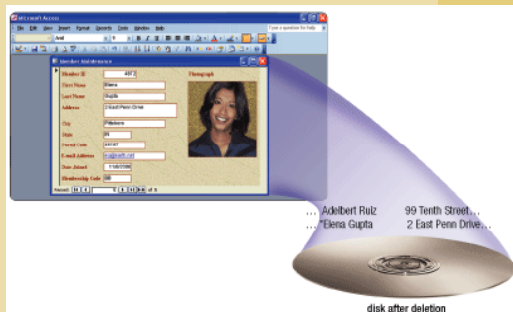
p. 521 Fig. 10-6



Maintaining Data

Why do you delete records?

- When record no longer is needed
- Some programs remove record immediately, others flag record



p. 522 Fig. 10-7



Maintaining Data

What is **validation**?

- Process of comparing data with a set of rules to find out if data is correct
- Reduce data entry errors and enhance data integrity before program writes data on disk

SAMPLE VALID AND INVALID DATA

Validity Check	Field Being Checked	Valid Data	Invalid Data
Alphabetic Check	First Name	Karen	Ka24n
Numeric Check	Postal Code	46322	4tr22
Range Check	Annual Fee	\$30.00	\$120.00
Consistency Check	Date Joined Birth Date	9/20/2006 8/27/1983	9/20/2006 8/27/2007
Completeness Check	Last Name	Tu	

p. 522 - 523 Fig. 10-8



Maintaining Data

What are the types of validity checks?

Check Digit
number(s) or character(s) appended to or inserted into a primary key value to confirm accuracy of primary key value

**Alphabetic/
Numeric Check**
ensures correct type of data entered

**Completeness
Check**
verifies that a required field contains data

Range Check
determines whether number is within specified range

**Consistency
Check**
tests for logical relationship between two or more fields



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File Processing Versus Databases

What is a **file processing system**?



File Processing Versus Databases

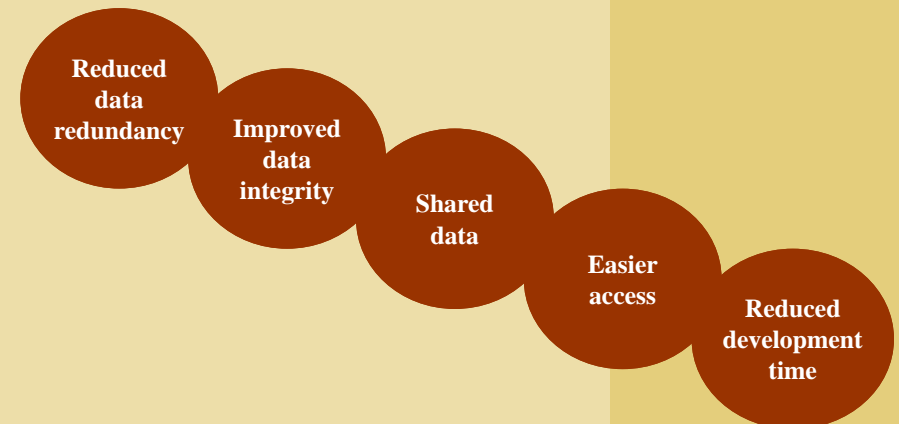
What is the **database approach**?

- Many programs and users can share data in database
- Secures data so only authorized users can access certain data



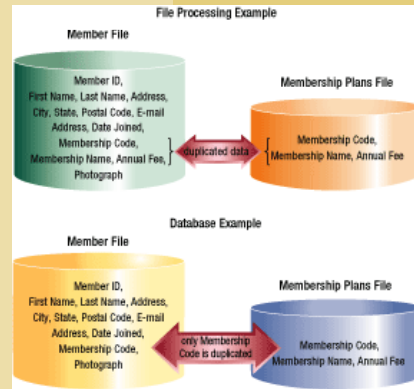
File Processing Versus Databases

What are the strengths of the database approach?



File Processing Versus Databases

How do a database application and a file processing application differ in the way they store data?



p. 525 Fig. 10-10



Database Management Systems

What are popular database management systems (DBMSs)?

POPULAR DATABASE MANAGEMENT SYSTEMS		
Database	Manufacturer	Computer Type
Access	Microsoft Corporation	Personal computer, server, mobile devices
Adabas	Software AG	Server, mainframe
D²	Raining Data	Personal computer, server
DB2	IBM Corporation	Personal computer, server, mainframe
Essbase	Hyperion Solutions Corporation	Personal computer, server
FastObjects	Versant Corporation	Personal computer, server
GemFire	GemStone Systems, Inc.	Server
Informix	IBM Corporation	Personal computer, server, mainframe
Ingres	Computer Associates International, Inc.	Personal computer, server, mainframe
InterBase	Borland Software Corporation	Personal computer, server
JDataStore	Borland Software Corporation	Personal computer, server
KE Textpress	KE Software, Inc.	Personal computer, server
MySQL	MySQL AB	Personal computer, server
ObjectStore	Progress Software Corporation	Personal computer, server
Oracle Database	Oracle Corporation	Personal computer, server, mainframe, mobile devices
SQL Server	Microsoft Corporation	Server, personal computer, PDA
Sybase	Sybase Inc.	Personal computer, server, mobile devices
Versant	Versant Corporation	Personal computer, server
Visual FoxPro	Microsoft Corporation	Personal computer, server



Click to view Web Link, click Chapter 10, Click Web Link from left navigation, then click Database Management System below Chapter 10

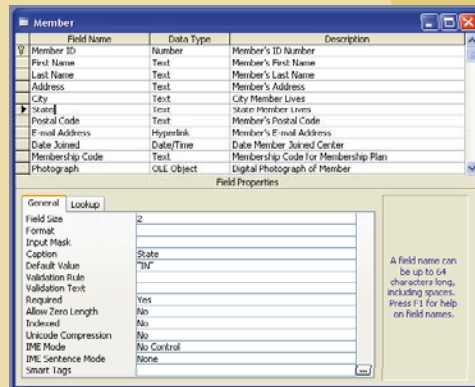
p. 526 Fig. 10-11



Database Management Systems

What is a **data dictionary**?

- Contains data about each file in database and each field within those files



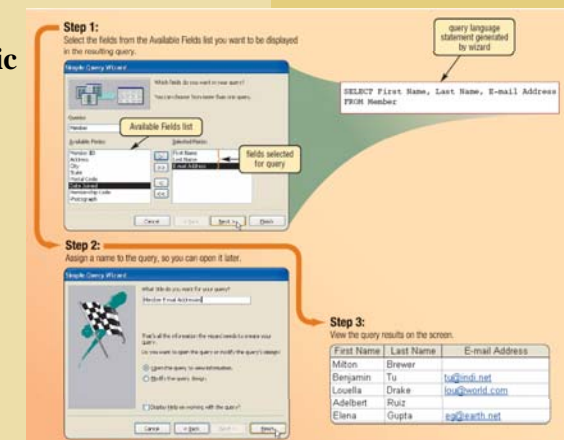
p. 527 Fig. 10-12



Database Management Systems

What is a **query**?

- Request for specific data from a database
- **Query language** consists of simple, English-like statements that allow users to specify data to display, print, or store



Click to view Web Link, click Chapter 10, Click Web Link from left navigation, then click Query below Chapter 10 p. 528 Fig. 10-13



Database Management Systems

What is a **query by example (QBE)**?

- Program retrieves records that match criteria entered in form fields
- Has a graphical user interface that assists users with retrieving data

Query by example screen

Member: Filter by Form

Last Name	Address	City	State	Postal Code	E-mail Address	Date Joined	Membership Code
▶ Tu	76 Ash Street	Indianapolis	IN	46259	tu@indi.net	9/4/2007	BP
▶ Ruiz	99 Tenth Street	Carmel	IN	46033		10/8/2006	BP

Look for: Or [BP]

Query results

Member

Last Name	Address	City	State	Postal Code	E-mail Address	Date Joined	Membership Code
▶ Tu	76 Ash Street	Indianapolis	IN	46259	tu@indi.net	9/4/2007	BP
▶ Ruiz	99 Tenth Street	Carmel	IN	46033		10/8/2006	BP

Record: 14 of 2 (Filtered)

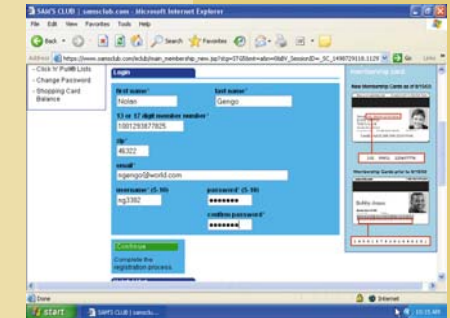
criteria



Database Management Systems

What is a **form**?

- Window on screen that provides areas for entering or changing data in database
- Used to retrieve and maintain data in a database
- Form that sends data across network or Internet is called **e-form**, short for electronic form



Database Management Systems

What is a **report generator**?

- Allows user to design a report on screen, retrieve data into report design, then display or print reports
- Also called report writer

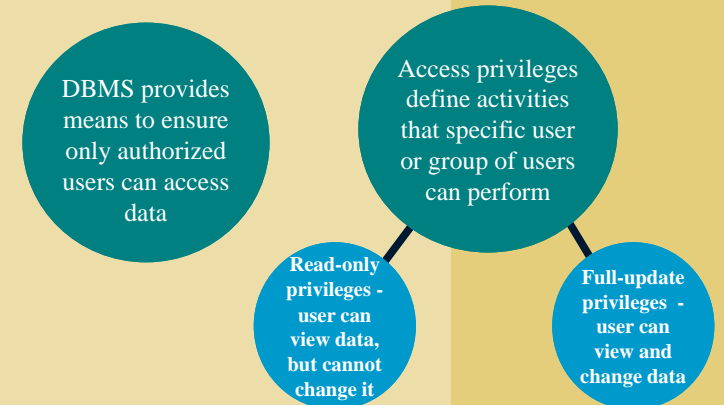
Member List by Membership Plan

Membership Name	Last Name	First Name	Address	City	State	Date Joined
Subjunctive System	Berens	Melba	34 Lory Court	Ellettsville	IN	6/10/2006
Subjunctive System	Chick	Carole	107 Terrace Park	Claremont	IN	9/10/2006
Subjunctive System	Orpha	Elva	2 East Park Drive	Franklin	IN	1/10/2006
Subjunctive System	Rus	Adrian	99 Tenth Street	Carmel	IN	10/8/2006
Subjunctive System	Tu	Brenda	76 Ash Street	Indianapolis	IN	9/4/2007



Database Management Systems

What is data security?



Database Management Systems

What are **backup** and **log**?

- **Backup** is a copy of the entire database
- **Log** is a listing of activities that change database contents
 - DBMS places three items in log: before image, actual change, and after image

before image

Membership ID: 2929
 First Name: Benjamin
 Last Name: To
 Address: 2204 Elm Court
 City: Indianapolis
 State: IN
 Postal Code: 46259
 E-mail Address: bto@ind.com
 Date Joined: 9/4/2007
 Membership Code: 00P

change

Address: 78 Ash Street

after image

Membership ID: 2929
 First Name: Benjamin
 Last Name: To
 Address: 78 Ash Street
 City: Indianapolis
 State: IN
 Postal Code: 46259
 E-mail Address: bto@ind.com
 Date Joined: 9/4/2007
 Membership Code: 00P



Database Management Systems

What is a **recovery utility**?

Uses logs and/or backups to restore database when it is damaged or destroyed

Rollforward—DBMS uses log to re-enter changes made to database since last save or backup
 ▪ Also called **forward recovery**

Rollback—DBMS uses log to undo any changes made to database during a certain period of time
 ▪ Also called **backward recovery**



Click to view Web Link, click Chapter 10, Click Web Link from left navigation, then click Continuous Backup below Chapter 10



Relational, Object-Oriented, and Multidimensional Databases

What is a **data model**?

- Rules and standards that define how database organizes data
- Defines how users view organization of data
- Four popular data models
 - Relational
 - Object-oriented
 - Object-relational
 - Multidimensional

Data Model	Popular DBMSs
Relational	Access Adabas Informix Ingres InterBase MySQL SQL Server Sybase
Object-oriented	FastObjects GemFire KE Texpress ObjectStore Versant
Object-relational	DB2 JDataStore Oracle Polyhedra PostgreSQL Visual FoxPro
Multidimensional	D ³ Essbase Oracle Express



Relational, Object-Oriented, and Multidimensional Databases

What is a **relational database**?

- Stores data in tables that consist of **rows** and **columns**
 - Each row has primary key
 - Each column has unique name
- Stores data relationships
- Uses specialized terminology

DATA TERMINOLOGY

File Processing Environment	Relational Database Developer	Relational Database User
File	Relation	Table
Record	Tuple	Row
Field	Attribute	Column

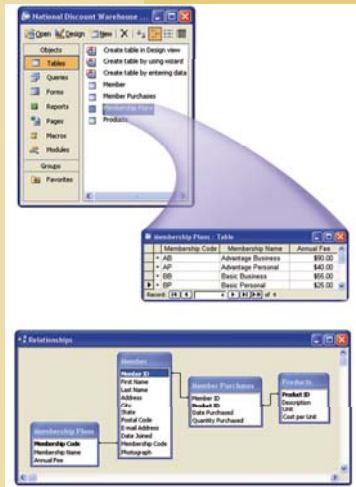


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What is a **relationship**?

- Connection within data



p. 533 Fig. 10-20



What is **Structured Query Language (SQL)**?

- Allows you to manage, update, and retrieve data
- Has special keywords and rules included in SQL statements

SQL statement

```
SELECT FIRST NAME, LAST NAME, ANNUAL FEE
FROM MEMBR, MEMBERSHIP PLANS
WHERE MEMBR.MEMBERSHIP CODE =
MEMBERSHIP PLANS.MEMBERSHIP CODE
ORDER BY LAST NAME
```

SQL statement results

First Name	Last Name	Annual Fee
Milton	Brewer	\$90.00
Louella	Drake	\$40.00
Elena	Gupta	\$55.00
Adelbert	Ruiz	\$25.00
Benjamin	Tu	\$25.00



Click to view Web Link, click Chapter 10, Click Web Link from left navigation, then click SQL below Chapter 10

p. 534 Fig. 10-21



What is an **object-oriented database (OODB)**?

Stores data in objects

Object is item that contains data, as well as actions that read or process data

Advantages

- Can store more types of data
- Can access data faster

Often uses **object query language (OQL)**



Click to view Web Link, click Chapter 10, Click Web Link from left navigation, then click Object-Oriented Databases below Chapter 10

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What are examples of applications appropriate for an **object-oriented database**?

Multimedia databases

Store images, audio clips, and/or video clips

Computer-aided design (CAD) databases

Store data about engineering, architectural, and scientific designs

Hypermedia databases

Contain text, graphics, video, and sound

Groupware databases

Store documents such as schedules, calendars, manuals, memos, and reports

Hypertext databases

Contain text links to other documents

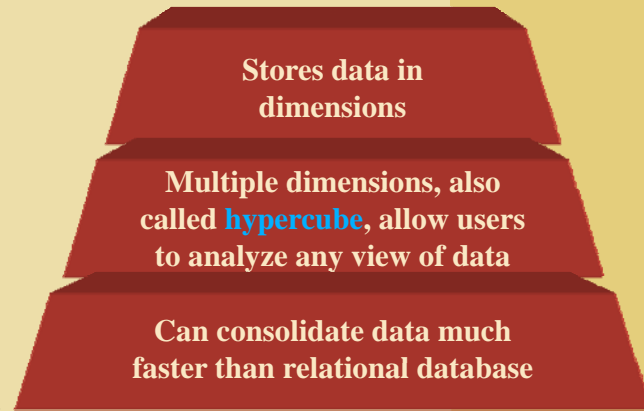
Web databases

Link to e-form on Web page

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What is a **multidimensional database**?



Click to view Web Link, click Chapter 10, Click Web Link from left navigation, then click Multidimensional Databases below Chapter 10



What is a **data warehouse**?

Huge database system that stores and manages data required to analyze historical and current transactions	
Quick and efficient way to access large amounts of data	Often uses a process called data mining to find patterns and relationships among data
Uses multidimensional databases	Data mart is smaller version of data warehouse



Web Databases

What is a Web database?

- Database you access through the Web by filling in a form on a Web page
- Usually resides on a database server, a computer that stores and provides access to a database



Click to view Web Link, click Chapter 10, Click Web Link from left navigation, then click Web Databases below Chapter 10



Database Administration

What are guidelines for developing a database?

- Determine the purpose of the database**
- Design the tables**
 - Design tables on paper first
 - Each table should contain data about one subject
- Design the records and fields for each table**
 - Be sure every record has a unique primary key
 - Use separate fields for logically distinct items
 - Do not create fields for information that can be derived from entries in other fields
 - Allow enough space for each field
 - Set default values for frequently entered data
- Determine the relationships among the tables**



Database Administration

What is the role of the database analyst and administrator?

Database analyst (DA)

- Focuses on meaning and usage of data
- Decides proper placement of fields, defines relationships, and identifies users' access privileges

Database administrator (DBA)

- Creates and maintains data dictionary, manages database security, monitors database performance, and checks backup and recovery procedures



Click to view Web Link, click Chapter 10, Click Web Link from left navigation, then click Database Administrators below Chapter 10

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Next

Summary of Database Management

How data and information are valuable assets to an organization

Methods for maintaining high-quality data

Assessing the quality of valuable information

Advantages of organizing data in a database

Various types of databases

Role of the database analysts and administrators

Chapter 10 Complete