Concepts of Database Management 10th edition Friedrichsen Solutions Manual

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Module 1

Introduction to Database Management

Solutions

REVIEW QUESTIONS

1. _____ is the duplication of data or the storing of the same data in more than one place.

   a. Data security

   b. Data inconsistency

   c. Data independence

   d. Data redundancy

2. Which of the following is *not* a problem associated with redundancy?

   a. prevents orphan records

   b. makes updating data more cumbersome and time-consuming

   c. can lead to inconsistencies

   d. results in more frequent data errors

3. A(n) _____ is a person, place, object, event, or idea for which you want to store and process data.

   a. attribute

   b. entity

   c. relationship

   d. flat file

4. A(n) _____ is a characteristic or property of an entity.

   a. metadata

   b. database

c. flat file

d. attribute

5. A(n) _____ is an association between entities. A(n) _____ exists between two entities when each row in the first entity matches many rows in the second entity, and each row in the second entity matches only one row in the first entity.

   a. record

   b. one-to-many relationship (for second blank)

   c. relationship (for first blank)

   d. attribute

6. A(n) _____ is a structure that contains data about many categories of information as well as the relationships between those categories.

   a. table

   b. data file

   c. relational database

   d. software stack

7. Which of the following describes how to create a one-to-many relationship in a database system?

   a. Insert a new table between two existing tables.

   b. Use a common field in the two tables to tie the related records from each table together.

   c. Create an entity-relationship (E-R) diagram.

   d. Include multiple entries in a single field.

8. In a(n) _____, rectangles represent entities and display their attributes; lines represent relationships between connected entities.

   a. entity-relationship (E-R) diagram

   b. unstructured data file

c. spreadsheet

d. software stack

9. Which of the following defines a DBMS?

a. a collection of data that corresponds to one record

b. a file used to store data about a single entity

c. the person or group in charge of a database

d. a program through which users interact with the data stored in a database

10. Which of the following describes database design?

a. collecting the large volume of data produced by digital processes and devices

b. creating a file used to store data about a single entity

c. creating the entities, attributes, and relationships between tables of data

d. Converting the data in a database to a format indecipherable to normal programs

11. Which of the following allows you to get more information from the same amount of data?

a. creating a healthy relational database

b. entering the same information more than once

c. using a flat file system

d. encrypting the data

e. designing professional forms

12. A(n) _____ is the person in charge of an organization's database.

a. database management server (DBMS)

b. database administrator (DBA)

c. organization administrator (OBA)

d. big data administrator (BDA)

CRITICAL THINKING

1. Explain how redundant data often leads to poorer decision making.

   If a student's name was repeated for each course he/she took, any data entry errors at input could potentially create a second student rather than give the same student credit for all of the courses he or she took. Even if the name change was intentional which commonly follows a marriage, a second person would be created if that person's name was entered into the system for every class he or she took. Redundancy in class names would create inconsistencies between students and confusion about the specific class that was taken.

2. An attribute is a characteristic or property of an entity. If *person* is an entity, would the same attributes be used to describe a person in different databases that store medical, student, and fitness club data? Why or why not?

   Perhaps. It depends on what information is needed. Some attributes about a person would be the same regardless of what type of application was being used, such as first and last name, address, and other contact information. Other attributes are specific to the application and would require new entities. A medical database would have entities with attributes to describe appointments, lab results, and medications to name a few. A student database would have entities and attributes to describe courses taken, credits, grades, and academic major. A fitness database would have entities and attributes to describe membership level, athletic ability, fitness classes, fees, and liability waivers.

JC CONSULTING EXERCISES

Answer each of the following questions using the JCC data shown in Figure 1-5. No computer work is required.

1. Which employee has a salary value of $8,100?

   a. Nathan Geller

   b. Nigel Horvat

   c. Hector Garcia

d. Nada Prohm

2. What client is *not* a government entity?

   a. Project Lead The Way

   b. Aspire Associates

   c. The HELPCard

   d. All are government entities

3. Which projects had an estimated start date prior to 1/1/2020?

   a. ProjectIDs 1, 2, 3, and 7

   b. ProjectIDs 8, 16, and 24

   c. ProjectIDs 8–30

   d. ProjectID 1, 9, and 17

4. List ProjectLineItemID values that are related to ProjectID 3.

   a. ProjectLineItemIDs 1 and 2

   b. ProjectLineItemIDs 8 and 9

   c. ProjectLineItemIDs 39, 40, and 41

   d. ProjectLineItemID 4

5. List the name of the client related to ProjectID 3.

   a. SecureCom Wireless

   b. Loren Group

c. Midstates Auto Auction

d. Project Lead The Way

6. Which of the following tasks is *not* priced by the project?

a. TaskID DB01 Design relational database

b. Task ID DB04 Install SQL Server database

c. Task ID MEET00 Initial customer meeting

d. Task ID CODE04 Code SQL

7. For the record with a ProjectLineItemID value of 7, why does the Quantity field contain 20?

a. It represents an estimate of 20 hours.

b. It represents an estimate of 20 minutes.

c. It represents an estimate of 20 projects.

d. It represents the project ID.

8. For the record with a ProjectLineItemID value of 7, why does the Factor field contain 1.3?

a. It represents an estimated increase of 1.3% due to risk or complexity for that task.

b. It represents an estimated increase of 30% due to risk or complexity for that task.

c. It represents an estimate of 1.3 hours for that task.

d. It represents an additional 1.3 hours to add to the task.

9. What is the cost for an initial meeting with a client, TaskID MEET00?

a. $100

b. $150

c. $0 (no charge)

d. $1

10. What is the cost for creating a shopping cart, TaskID CODE15?

a. $150/hour

b. $125/project

c. $100/month

d. $125/hour

Critical Thinking

1. JCC needs to be able to contact clients when problems arise concerning an estimate. What other attributes could JCC include in the Clients table to assist in contacting clients?

   Potential Answer: JCC may want to store other contact information such as email addresses or phone numbers for various contacts at each company.

2. JCC wants the database to include data on all its employees, not just those who may be involved in projects. What additional entities would the DBA need to include in the database to store this data? What attributes?

   Potential Answer: JCC may want to store employee titles, departments, supervisor names, telephone numbers, email addresses or other contact information for each employee.

3. What kinds of unstructured data or big data might JCC want to gather in the future?

Potential Answer: JCC may want to store information on blog postings, web site analytics, photos, or social media posts.

PITT FITNESS CASE

Answer each of the following questions using the Pitt Fitness data shown in Figures 1-15 through 1-19. No computer work is required.

1. Which instructor lives on Webster Avenue?
    a. Vicki Pegues
    b. Neda Tahan
    c. Memo Said
    d. Luke Lane
2. Who is the oldest customer?
    a. Glenn Spencer
    b. Jess Hill
    c. Gene Shaffer
    d. Nour Aboud
3. What class did Terrance Feldman reserve?
    a. Barre
    b. Barbell Power
    c. Yoga Balance
    d. Yogalates
4. In what location and room is ClassID 9, Barre, held?
    a. Shadyside, 159B
    b. Oakland, Main
    c. Shadyside, Main

d. Oakland, 159B

5. What time does ClassID 24, Intense Cycle, begin?

   a. 2 pm

   b. 1 pm

   c. 12 pm

   d. 10 am

6. How long is the ClassID 15, Bootcamp?

   a. 60 minutes

   b. 45 minutes

   c. 30 minutes

   d. 90 minutes

7. Who teaches ClassID 21, Combination?

   a. Maria D'Angelo

   b. Robert Sisto

   c. Michael Nguyen

   d. Megan Kobinski

8. What customer has reservation 2100014?

   a. Debbie Thorn

   b. Tamara Lara

   c. Sylvia Devito

   d. Margo Patterson

9. When was customer Ramiro Sanchez born?

   a. 10/21/2000

   b. 4/20/1984

c. 2/16/1957

d. 4/1/1953

10. How many classes are offered on Mondays?

    a. 2

    b. 3

    c. 0

    d. 5

11. Which facility does *not* have the three senior classes: Maturity, Endurance, and Strength, Maturity Classics, and Agility for Seniors?

    a. Shadyside

    b. Downtown

    c. Oakland

    d. All of the facilities have the three senior classes.

12. How many classes are offered at the Downtown location at 6:00 pm?

    a. 1

    b. 2

    c. 3

    d. 4

13. What two classes did Charles Hatcher sign up for?

    a. Aquasize, Aqua Strength and Cardio

    b. Barre, Barre Limited

    c. Cycle, Cycle and Strength

    d. HIIT, Bootcamp

14. Where does Juan Varlano teach his classes?

a. Oakland and Downtown

b. Oakland only

c. Oakland and Shadyside

d. Shadyside and Downtown

15. Which class holds the largest number of participants?

a. Yoga

b. Cycle

c. Barbell Power

d. Combination

Critical Thinking

1. A few of the classes have data in a field called "OtherFees." These are rentals of bicycle shoes for the cycle classes. Should that fee be combined with the ClassPrice field? What if a participant has their own bike shoes?

   Answer: The OtherFees should not be included in the ClassPrice field because someone who does a lot of cycling might have his or her own bike shoes. Yet those who are new to the class or don't want to bother, might like to rent them.

2. Currently, the class price and other fees reside in the Registration table. If Pitt Fitness practices dynamic pricing (the management changes the prices as the classes fill up like the airlines do), should they put the class price in the Classes table? Why or why not?

   Answer: Pitt Fitness should leave the class price in the Registration table. That gives them maximum flexibility in terms of changing prices of classes as they fill up. If they put the class price in the Classes table, it would remain a constant price and not be changing as the class enrollment changes.

SPORTS PHYSICAL THERAPY CASE

Answer each of the following questions using the Sports Physical Therapy data shown in Figures 1-21 through 1-24. No computer work is required.

1. What therapist lives in Palm Rivers?
    a. Steven Wilder
    b. Bridgette McClain
    c. Saritha Nair
    d. Jonathan Risk
2. What patient lives in Palm Rivers?
    a. Tierra Falls
    b. Ben Odepaul
    c. Susan Houghland
    d. Andre Marino
3. Which patient has the highest balance?
    a. Joseph King
    b. Robbie Koehler
    c. Latisha Culling
    d. Tammy Wilson
4. Which therapy takes the longest time?
    a. Massage
    b. Education and training for patient self-management
    c. Ultrasound
    d. Electrical stimulation
5. What treatment is Ben Odepaul having?
    a. Paraffin bath

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b. Knee strapping

c. Electrical stimulation

d. Hot or cold pack application

6. Who is having self-care/home management therapy?

a. Tammy Wilson

b. Tobey Short

c. Brianna Waggoner

d. Isaiah Venable

7. What therapist is performing unlisted modality on 10/17/2021?

a. Steven Wilder

b. Bridgette McClain

c. Saritha Nair

d. No therapist has that session

8. Which patient is undergoing aquatic therapy with therapeutic exercises? What is the length of the session? Who is the therapist in charge?

a. Tierra Falls, 15 minutes, Bridgette McClain

b. Tierra Falls, 30 minutes, Jonathan Risk

c. Tierra Falls, 30 minutes, Bridgette McClain

d. Robbie Koehler, 30 minutes, Steven Wilder

9. What patient is therapist Saritha Nair seeing on 10/18/2021?

a. Susan Houghland

b. Isaiah Venable

c. Tierra Falls

d. Latisha Culling

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Critical Thinking

1. The Sports Physical Therapy database does not include a field for the hours that the therapist is working. For example, doing any sort of treatment requires set up and break down of equipment, reading patients' charts, etc. In which table would you put the hours worked? What might be a better way to record when therapists begin their work and end their work?

   Answer: There should be an additional table that records each therapist's ID, the date, when he or she clocked in and when he or she clocked out.

2. What table might the database need to help determine the balance field in the Patient table? Would you want to record when a bill is paid and the amount? How would the insurance part of the bill be recorded?

   Answer: You should have an additional table that records each Patient Number, the date and the amount paid for the outstanding bill. That amount would then be subtracted from the Patient's balance. When the Patient's bill is generated, and that most likely would be in an additional table, the portion that the insurance company is billed should be included as a field.

Concepts of Database Management, Tenth Edition

Module One: Introduction to Database Management

A Guide to this Instructor's Manual:
We have designed this Instructor's Manual to supplement and enhance your teaching experience through classroom activities and a cohesive module summary.

This document is organized chronologically, using the same heading in **red** that you see in the textbook. Under each heading, you will find (in order): Lecture Notes that summarize the section, Figures and Boxes found in the section, if any, Teacher Tips, Classroom Activities, and Lab Activities. Teacher Tips and activities are geared toward quizzing your students, enhancing their critical thinking skills, and encouraging experimentation within the software.

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Module Objectives

The learning objectives for Module 1 are:

- Examine JC Consulting (JCC), the company used for many of the examples throughout the text
- Define basic database terminology
- Describe database management systems (DBMSs)
- Explain the advantages and key factors for a healthy relational database system
- Prepare for a career in database administration
- Review Pitt Fitness, a company used in a case that appears at the end of each module
- Review Sports Physical Therapy, a company used in another case that appears at the end of each module

JC Consulting Company Background

LECTURE NOTES

- Describe the JC Consulting (JCC)
- Use Figure 1-1 to illustrate the problems associated with using spreadsheets to maintain this data
    - Data redundancy
    - Difficulty accessing related data
    - Limited security features
    - Multiple updates
    - Size limitations
- Define redundancy
    - Duplication of data or the storing of the same data in more than one place
- Discuss the problems redundancy causes
    - Wastes space
    - Makes changes more cumbersome
    - Leads to inconsistencies and inaccuracies
    - Leads to lower quality information which leads to poorer decision making
- Use Figure 1-2 to introduce the type of data that JCC must be able to store and retrieve
    - Point out that the amounts in the Estimate column in Figure 1-2 are not stored in the database but are calculated. The total for the project estimate is also calculated.

FIGURES: 1-1, 1-2

TEACHER TIPS

Students will work with JCC in every module. They should become familiar with this fictitious company and the type of data it needs to maintain to develop project estimates. The same type of data needs to be stored by other consulting companies or service providers.

If you want to personalize the database, you can have students add their name as a client or employee or you can have them rename the database using their own name rather than JCConsulting.

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CLASSROOM ACTIVITIES
1. Group Activities: Place students in groups and distribute order forms found on the web. Ask the groups to determine the data the company must store and the data that is calculated.

2. Class Discussion: Ask students what other type of data a service provider such as JCC might need to maintain.

3. Critical Thinking: JCC needs to maintain data on employee benefits. Should JCC store this data in a spreadsheet? Why or why not?

Selecting a Database Solution

LECTURE NOTES

- Define entity
    - Person, place, object, event, or transaction for which you want to store and process data
- Define attribute
    - Characteristic or property of an entity
    - Also called a field or column in many database systems
- Define relational database
    - A structure that can store information about multiple types of entities, the attributes of those entities, and the relationships among the entities
- Use Figure 1-3 to discuss the Clients and Projects entities and the attributes for each entity
- Define relationship
    - An association between entities
- Define one-to-many relationship
    - Each client is associated with many projects, but each project is associated with only one client
- Use Figure 1-4 to explain the one-to-many relationship between clients and projects

FIGURES: 1-3, 1-4

TEACHER TIPS
Database concepts such as entity, attribute, and relationship are key terms. Use examples that students can relate to, for example, a school database or a database maintained to access driver's license data. The data needed for an employment application form supports a good discussion of attributes and entities.

CLASSROOM ACTIVITIES
1. Class Discussion: Ask students to list the attributes to describe common entities such as students, classes, and instructors.

2. Quick Quiz
   What is an entity? (Answer: A person, place, object, event, or transaction for which you want to store and process data)

Storing Data

LECTURE NOTES

- Define data file and flat file
    - A file used to store data as a list, such as a spreadsheet
- Point out the differences between a flat file and a relational database
- Use Figure 1-5 to review the tables (entities) that make up the JCC relational database
    - Employees, Clients, Projects, ProjectLineItems, TaskMasterList
- Use Figure 1-6 to illustrate the problems with storing project estimates in the alternative table structure
- Review the Q & As in this section

- Define entity-relationship (E-R) diagram
    - Visual way to represent a database
- Use Figure 1-7 to illustrate an E-R diagram and review the entities, attributes, and relationships in the JCCC database

FIGURES: 1-5, 1-6, 1-7

TEACHER TIPS
Figure 1-5 lists the five tables that make up the JCC database. Each table represents an entity. The data in the tables are related through common fields. It is these relationships that allow the user to access data from more than one table and produce reports, queries, and forms. Encourage students to use the embedded Q & As to test their understanding of the concepts as well as the design of the JCC database.

CLASSROOM ACTIVITIES
1. Class Discussion: Ask students to list the attributes to describe common entities such as students, classes, and instructors.

2. Critical Thinking: What happens when the relationship between two entities is "many-to-many"? (Answer: a third table needs to be created that is positioned on the "many" side of a one-to-many relationship with each of the first two entities.)

3. Quick Quiz
1) In the database environment, what is a one-to-many relationship? (Answer: An association between two entities where one record in one entity relates to zero, one, or many records in the second entity.)
2) What is a relational database? (A structure that that contains data about many categories of information as well as the relationships between those categories)

Identifying Database Management Systems

LECTURE NOTES
- Define database management system (DBMS)
    - A program or collection of programs, through which users interact with a database
- Use Figure 1-8 to discuss common popular relational database management programs
- Use Figure 1-9 to discuss popular software stacks. These are constantly changing and the term "stack" is not consistent across different types of stacks.
- Discuss the typical environment where these relational database systems are used
    - Access, Oracle, Db2, MySQL, SQL Server, PostgreSQL, SQLite
- Define database design
    - Determining the structure of a desired database, the entities, attributes, and relationships
- Define forms
    - Screen objects used to maintain, view, and print data from a database
- Use Figures 1-10 and 1-11 to illustrate forms used in an Access database
- Use Figure 1-12 to illustrate a report created from an Access database

FIGURES: 1-8, 1-9, 1-10, 1-11, 1-12

TEACHER TIPS
Discuss the problems students have encountered with redundant data. They may have experienced these frustrations at doctor's appointments, with government requirements, or with the college itself.

Microsoft Access currently is the most popular DBMS for use with personal computers. There are versions of Oracle, DB2, MySQL, and SQL Server that run under several different operating systems. MySQL is

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open-source software that is available at no cost. Both Oracle and SQL Server provide Express versions that can be downloaded at no cost. These Express versions are subsets of the complete versions. PostgreSQL and SQLite are both open source, freeware.

CLASSROOM ACTIVITIES
1. Class Discussion: Ask students how they have managed their own data. Have any used Access or any other relational database management software?

2. Group Activities: Divide the class into small groups. Ask each group to determine the fields that could be used to describe a student in one of the following situations:

(1) A database that stores information about students in a student organization
(2) A database that stores information about students in a course
(3) A database that stores information about students on an athletic team
(4) A database that stores information about student health records

Advantages of a Properly Designed Relational Database

LECTURE NOTES

- Use Figure 1-13 to discuss the advantages of database processing
  - Better information is provided
  - Data and information are shared
  - Multiple business information requirements are addressed
  - Data redundancy is minimized
  - Data consistency is applied
  - Referential integrity is enforced
  - Security is increased
  - Productivity is increased
  - Data is freed from individual applications
- Define database administrator or database administration (DBA)
  - Person or group in charge of the database
- Define referential integrity
  - A relational database concept stating that table relationships must be consistent and follow integrity constraints
- Define integrity constraint
  - Rule that a relationship must follow to prevent the creation of orphan records.
  - Orphan records are records in an entity (table) on the "many" side of a relationship that do not have a matching record with the entity (table) on the "one" side of a relationship.
- Define data security
  - Protection of data from threats including the prevention of unauthorized access to the database, encryption of data as it travels through a network, protection against data corruption, and protection against all other electronic and physical attacks to the data
- Define data independence
  - A quality that allows you to change the structure of a database without requiring you to change the programs that access the database

FIGURE: 1-13

CLASSROOM ACTIVITIES
1. Group Activities: Divide the class into nine small groups. Assign each group a different advantage. Ask them to give a practical example of the advantage using a university database.

2. Class Discussion: Ask each student to list one place (for example, doctor's office, dentist's office, employer, school) where data about them is stored. Write the list on the board. Ask students what happens when data that is stored about them is incorrect.

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3. Critical Thinking: If a database is not maintained or if incorrect data is entered into the database, serious problems can occur. What problems could occur if a student database is not maintained? What problems could occur if a database that maintains medical records data (such as a hospital database) has incorrect data?

4. Critical Thinking: One of the advantages of database processing is: getting more information for the same amount of data. Using a medical records database, provide some specific examples of this advantage.

Key Factors for a Healthy Relational Database

LECTURE NOTES

- Use Figure 1-14 to discuss the key factors for a healthy relational database and how that might be important to their career
    - Design
    - Security
    - Talent

FIGURE: 1-14

CLASSROOM ACTIVITIES

1. Group Activities: Divide the class into three groups. Assign each group a different key factor. Ask them to give a practical example of the disadvantage using a university database.

2. Critical Thinking: Ask students to research data-intensive job opportunities. List the job titles on the board.

3. Critical Thinking: One of the disadvantages of database processing is the greater impact of failure. If the student database or the learning management system (for example, *Blackboard* or *Canvas*) at your university is unavailable, how does that affect you? How does it affect your instructors?

Big Data

LECTURE NOTES

- Define big data
    - the large volume of data produced by every digital process, system, sensor, mobile device, and social media exchange
- Define structured data
    - traditional in its retrieval and storage
- Define unstructured data
    - data that is not organized or easily interpreted by traditional relational database models
- Define metadata
    - descriptive data stored with input sources
- Point out that big data is a source for ongoing discovery and analysis. The demand for information from big data will require new approaches to database management, architecture, tools, and practices.

CLASSROOM ACTIVITIES

1. Classroom Discussion: Big data is often seen as a controversial issue today. Everyone seems to be collecting it, analyzing it, making money from it, and praising it. Have students discuss whether they feel there are potential problems with collecting, storing, and distributing big data.

Preparing for a Career in Database Administration and Data Analysis

LECTURE NOTES

- Describe the role of a database administrator

    - managing the physical aspects of the database such as installing, maintaining, and testing hardware and software to designing and improving the database to provide efficient and effective access to the information.
- Describe the role of a data analyst
    - use tools and algorithms to mine a database for answers, information, trends, and insights
- Explain the requirements of a database administrator and data analyst
    - for DBAs, college degrees and certifications from software vendors
    - for data analysts, college degrees
- Point out that both roles are valuable to organizations and command salaries that reflect this value.

CLASSROOM ACTIVITIES
1. Classroom Discussion: Have students discuss the types of careers they are seeking that involve using or managing databases.

Introduction to the Pitt Fitness Database Case

- Use Figures 1-15 through 1-19 to describe the Pitt Fitness database case
- Use Figure 1-20 to illustrate the E-R diagram for Pitt Fitness
- Use Q & A 1-9 and other questions in the "Introduction to the Pitt Fitness Database Case" section to test students' understanding of Pitt Fitness

FIGURES: 1-15, 1-16, 1-17, 1-18, 1-19, 1-20

TEACHER TIPS
The Pitt Fitness database has five entities: Instructors, Classes, Customers, Reservations, and ClassInstructors. There is a one-to-many relationship (one customer can have many reservations) between the Customers table and the Reservations table. The common field between the two tables is CustomerID. There is a one to many relationship (one class can have many reservations) between the Classes table and the Reservations table. The common field between the two tables is the ClassID field. Because one instructor can teach many classes and one class can be taught by many instrutors, there is a many-to-many relationship between instructors and classes. The ClassInstructors table relates instructors and classes by including the InstructorID field and the ClassID field. The InstructorID field is the common field between the ClassInstructors and Instructors tables. The ClassID field is the common field between the ClassInstructors and Classes tables.

CLASSROOM ACTIVITIES
1. Class Discussion: Ask students if there are any other attributes they would add to the Iinstructors table and to the Customers table.

2. Critical Thinking: What other attributes could you use to uniquely identify each class?

3. Critical Thinking: Why is the price of a class in the Reservations table and not in the Classes table?

Introduction to the Sports Physical Therapy Database Case

- Use Figures 1-21 through 1-24 to describe the Sports Physical Therapy database case
- Use Figure 1-25 to illustrate the E-R diagram for Sports Physical Therapy database
- Use Q & A 1-10 and the questions in the "Introduction to the Sports Physical Therapy Database Case" section to test students' understanding of Sports Physical Therapy

FIGURES: 1-21, 1-22, 1-23, 1-24, 1-25

CLASSROOM ACTIVITIES
1. Class Discussion: Ask students if there are any other attributes they would add to the Owner table.

2. Assign a Project: Have students visit a local business to find out how the business uses a database.

End of Module Material

- Review questions require students to recall and apply the important material in the module.

- The JC Consulting, Pitt Fitness, and Sports Physical Therapy exercises test students' knowledge of the module material.

Key Terms

- algorithm
- attribute
- big data
- column
- data analyst
- data file
- data independence
- data redundancy
- data security
- database
- database administration (DBA)
- database administrator (DBA)
- database design
- database management system (DBMS)
- encryption
- entity
- entity-relationship (E-R) diagram
- field
- flat file
- form
- integrity
- integrity constraint
- many-to-many relationship
- metadata
- NoSQL
- one-to-many relationship
- orphan record
- record
- redundancy
- referential integrity
- relational database
- relationship
- report
- row
- software stack
- structured data
- table
- unstructured data

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