

Tutorial 2

Building a Database and Defining Relationships

Opening a Database

- Two ways to open an existing database
 - File | Open
 - File | Recent Documents list
- Access first saves any open database
 - can have only 1 accdb open using the Access User Interface
 - can have >1 accdb open using VBA code
- When a database file is opened, Access also creates in the same folder an .LACCDB file with same name
 - this file contains user and record locking information

2

Guidelines for Designing Databases

- Identify all **fields** needed to produce required information
 - what do reports need to show? what queries will be run?
- Organize each piece of data into its smallest useful part
- Group related fields into tables
 - **entities** frequently get their own tables
 - place each field in an appropriate table (normalization, RD appendix)
- Determine each table's **primary key**
 - to uniquely identify each record in a table (no duplicates)
 - composite primary key
- Include a **common field** in related tables
 - include **foreign key** as common field to join related tables

3

Guidelines for Designing Databases (continued)

- Avoid **data redundancy** (pg. AC 53)
 - 3 main reasons data redundancy is a problem:
 -
 -
 -
- Determine the **properties** of each field
 - properties determine an object's **appearance** and **behavior**
 - Name, Data Type, Field Size, Description, many others

4

Naming Fields and Objects

- Assign each object a descriptive name
- Object names
 - ≤ 64 characters
 - letters, digits
 - no periods, exclamation point, accent grave, brackets
 - avoid spaces
 - although Access allows, many other DBMS don't
 - objects of the same type cannot have the same name

5

Assigning Field Data Types

- Text
 - for storing text entries (no calculations)
 - defaults to 255 bytes
 - stored as a variable-length string
- Memo
 - longer, free-form text entries, typically sentences or paragraphs
 - ≤ 1GB, of which you can display 65,535 characters in a control on a form or report
- Number
 - for storing numeric values that are non-monetary
 - can be used for calculations
 - several varieties...

6

Assigning Field Data Types

- Date/Time
 - important in many business applications
 - can be used for date/time calculations
 - requires 8 bytes
- Currency
 - for monetary values
 - can be used for calculations
- AutoNumber (Tutorial 12)
 - a field containing values that Access automatically **increments** as each new record is added to table
 - guarantees a **unique** field value for each record... for a PK
 - we can't control its values

7

Assigning Field Data Types

- Yes/No (logical)
 - presence/absence of an attribute
- OLE Object
 - objects such as pictures, sound, data files from other applications
 - not directly modifiable in Access
- Hyperlink
 - a path to an object, document, web page, or other destination
- Attachment (new Access 2007, Tut. 12)
 - attach a file (image, spreadsheet, document) to a record in your database
 - can view and edit attached files, depending on field properties
 - provide greater flexibility than OLE; compressed to store more efficiently
- Lookup Wizard (Tutorial 5)
 - not actually a data type
 - used to help set properties for a **foreign key** field to make it easy to link a record in one table to a related record in another

8

Creating Table in Design View

- Table
 - an object that **stores data** in rows (records) & columns (fields)
 - each record in a table has the same field **structure**
 - created **Invoice** table in Design View
 - creating a table involves
 - specifying each field and its properties
 - declaring a primary key
 - naming the table object
 - Create tab | Table Design
 - Table Design grid on top and Field Properties beneath
 - hints for currently selected property
 - press [F1] to enter Help System

9

Assigning Field Sizes

- Field Size
 - a property that controls the **maximum** number of characters that can be entered into a Text field, or the range and kind of values that can be entered into a Number or AutoNumber field
 - is predefined for other data types (eg Date/Time, Currency)
- Practice Time
 - use Help to learn about the Field Size property
 - press [F1] to get context-sensitive help
 - special focus: Number field size options
 - balance field storage needs vs. resources consumed

10

Creating Table in Design View

- Specifications for the new **Payment** table
 - Fields:
 - TransactionID – PK and Text(48)
 - DateIssued - Date
 - PayeeWriterID – Text(4)
 - Amount - Currency
 - Purpose – Text(30)
 - AuthorizedBy – Text(25)
 - TaxDeductible- Yes/No
- Practice Time
 - Create this **Payment** table in your issue 25.accdb
 - Enter 2 records for payments made to yourself, using your WriterID value for the PayeeWriterID



11

Specifying the Primary Key

- Advantages of having a primary key for each table:
 - each record can be uniquely identified
 - makes it possible for a table to participate in relationships
 - Access automatically prevents duplicates
 - Access requires the primary key be provided (not be left null)
 - Access **displays** rows in primary key sequence (by default)
 - Access **stores** records in order they were entered (until you compact)
- How do you designate a table's primary key?
- How is a table's primary key identified?
- Practice Time
 - Payment table: try to duplicate a TransactionID & try to omit it

12

Modifying the Structure of an Access Table

- Moving a Field
 - click the field selector | drag to desired location | drop
- Adding a Field
 - Design tab | Insert Row
 - new field is inserted below the current field
- Deleting a Field
 - right-click field selector | Delete Rows | Yes
 - be careful, an entire column of field values at risk!
- Changing Field Properties
 - select the field | modify properties in lower pane

13

Practice Time

- Make the following changes to the Writer table:
 - Add new field named Gender to store 1-byte codes (M or F)
 - Add new field named Homepage to store the URL of the writer's web page
 - Switch to Datasheet view and enter your Gender into your writer record
 - Also enter a valid URL in for your homepage
 - Test that the Homepage hyperlink works

14

Selected Field Properties

- Field Size property
- Description property
 - text displayed in Status Bar when insertion point is in field
 - up to 255 characters
- Decimal Places property
 - specifies number of digits to display to right of decimal point
- Format property
 - to customize how numbers, dates/times, text are displayed/printed
 - can use a predefined format or create a custom format
 - eg: mm/dd/yyyy
- Default Value property (nib)
 - specifies a value that Access provides when a new row is inserted
- Caption
 - used as column heading in a Datasheet (Field Name used when no Caption)

15

Practice Time

- Make the following changes to the Writer table:
 - Increase Field Size for LastName to 30
- Make the following changes to the Payment table:
 - Specify =Date() as the Default Value for DateIssued
 - Switch to Datasheet View and notice that the new record row now shows today's date
 - Use a Caption to have the AuthorizedBy field's column heading display as Authorized By (two separate words)
- Make the following changes to the Article table:
 - Remove the Default Value for Length

16

Importing

- Copy and Paste
 - Tutorial 1: copied 55 rows from Agreement table in Oren.accdb, pasted into Contract table in Belmont.accdb
- Import
 - Access opens the specified source file, copies its data, places into the database either creating new table or appending to an existing table
 - External Data tab has several buttons for data sources
 - Excel - rows/columns from a spreadsheet becomes table data
 - Access- another accdb has a table whose structure/data is to be cloned in the current accdb
 - Text File
 - Import Text Wizard imported 38 new Customer rows
 - Delimited vs Fixed Width text file
 - and other data sources

17

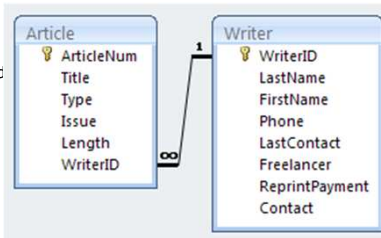
Defining Table Relationships

- We'll cover these topics more thoroughly in the Relational Design Appendix
- Review:
 - primary key
 - foreign key
- Join
 - using a **common field** to link two tables that contain related data
 - storing data in separate, joinable tables avoids **data redundancy**

18

One-to-Many Relationship

- Each record in Table A can have **many** (zero or more) matching records in Table B but each record in Table B has **only one** matching record in Table A.
 - eg: each Writer can have **many** Articles but each Article is written by **one** Writer
- Implementation:
 - include the primary key of the **one** table as a foreign key in the **many** table
- Example:
 - Payment table should relate to _____ table



19

Referential Integrity Concepts

- Each foreign key value provided must match a primary key value in the related table
 - example: each Article record's WriterID must match the WriterID of an actual Writer
- If a row in one table references a row in another table, the referenced row must exist
- Rules that ensure that records stored in related tables are **in synch** with each other
- Prevents **orphaned** records in a related table
- Bottom line: no unmatched foreign keys

20

Referential Integrity

- Cannot **delete** a row from the **One table** when matching rows exist in the **Many table**
 - e.g.: try to delete a Writer who has matching Articles
 - by default, Access denies deletion of a row in the primary table when it has matching row(s) in a related table
 - Cascade Delete option
 - Access also deletes the matching row(s) in the related table
 - business rules will determine whether it is appropriate to use this option

21

Referential Integrity

- Cannot **change** a primary key value in the **One table** when matching rows exist in the Many table
 - e.g.: you need to change a witer's WriterID
 - by default, Access denies changes to primary key value of a row in the One table that has any matching rows in the Many table
 - Cascade Update option
 - Access changes foreign key values in matching rows in the related table too
 - business rules will determine whether it is appropriate to use this option

22

Referential Integrity

- When you **add** or **change** a row in a **Many table**, the foreign key value must match a primary key for a row in the One table
 - e.g.: when you add a new Article, the WriterID you enter must match that of an existing Writer
 - e.g.: when you change WriterID for an Article, the WriterID must match that of an existing Writer
 - if a foreign key value doesn't match the primary key of a row in the One table Access will display an error message
 - what if you have a new writer and need to enter their two articles?
- When no foreign key value is entered, Access has no value to check and referential integrity is not at issue
 - whether to allow a Null in a foreign key depends on business rules
 - can use field properties to prevent Null in a foreign key (Tut 5)

23

Defining a Relationship Between Two Tables



- Relationships Window
 - used to create/modify/delete inter-table relationships
 - drag PK from the One table & drop on FK in the Many table
 - option to Enforce Referential Integrity
 - Cascade Deletes option , Cascade Updates option
- Practice Time
 - create relationship between the Writer and Payment tables, enforcing referential integrity and cascade updates but not deletes
 - open Payment table and try to change a PayeeWriterID to a value that is not present as a WriterID in the Writer table
- Relationship Report (Tutorial 6)
 - Access creates a report that shows tables & relationships

24

Special Focus: Date/Time Data Type

- Background
 - Date() function
 - Now() function
- Date/Times are stored as 8-byte floating point **serial number** in **date.time** format
 - eg: 37145.375 corresponds to 9/11/2001 at 9:00 am
 - eg: 37146.500 corresponds to _____
 - eg: 1.0 corresponds to 12/31/1899 12:00 AM
 - eg: 1.5 corresponds to 12/31/1899 12:00 PM
 - eg: 2.25 corresponds to 1/1/1900 6:00 AM
- Date/Time values stored this way to enable date/time **calculations**
 - eg: #12/25/2008# - Date()
 - eg: Date() - [HireDate]
 - eg: DateDiff("n", #Aug 12, 2008 2:00 pm#, #Aug 12, 2008 2:45 pm#)

25

Dates

- Access can **store** dates in the range January 1, 100 to December 31, 9999
- By default, Access displays dates using General Date format in Control Panel's Regional Settings
 - can use a field's Format property to control how Date values are displayed/printed independent of the machine's settings
 - eg: display all 4 digits **mm/dd/yyyy**
- If a user is allowed to enter only 2-digit year, Access uses the following rule to **guess** the century intended
 - years 00 through 29 are assumed **2000-2029**
 - years 30 through 99 are assumed **1930-1999**
 - how would Access interpret 3/3/**33**? 8/8/**08**?

26

Times

- Access can **store** times in the range 0:00:00 to 23:59:59
 - clock time is simply a **fraction of a day**
 - midnight is 0, lunchtime is .50, 6 pm is .75
- When no time is entered, Access stores a default time of midnight
- By default, Access displays time according to the Long Time format specified in Control Panel's Regional Settings
 - can use Format property to control how time values are displayed/printed, independent of the machine's settings

27