Access 2007 - Beginning

103-133

Unit 2 - Building Databases

Notes	Activity

Quick Links

Database Design Concepts

- This course only provides a brief overview of database design concepts
  - The book authors provide the design and in this unit you'll learn to build the database
  - Database design is course of its own.
  - Access – Intermediate covers database design in greater detail.

- Database Design Goals -- Database that is:
  - Adaptable
    - Fields and tables can be added (removed) easily
  - Flexible
    - Data can be retrieved in an unlimited number of ways
  - Accurate
    - No data redundancy
    - Validation on fields
      - Default values
      - Look ups

Notes	Activity

- Database Design Steps
  - ➢ Make a list of required fields
    - − Break fields like *name* or *phone* into smallest useful parts (first name, last name; area code, phone number, extension)
  - ➢ Group related fields into tables.
    - − Fields should only appear in one table
  - ➢ Determine the primary key for each table.
  - ➢ Link related tables using the primary keys
  - ➢ Determine the properties of each field
    - − Size, default value, format,

Creating a Table

New Database:
My First Database

- Before you can enter data into a database table, you must define its **structure**—the fields the table contains and the types of data the fields store.
- As you learned in the previous unit, you can create tables using datasheet view. However, using datasheet view doesn't provide access to all the data table build features
- To gain access to all table build features, you need to use table *design view*.
  - ➢ You could use the two views in combination if you wish.
- To create a table in design view, click the Table Design button in the Tables group of the Create tab.
  - ➢ If you are already in datasheet view, click the View button to switch to design view.

Defining Fields

Partially rebuild
tblCustomers and tblOrders

CustomerNum	Text
FirstName	Text
LastName	Text
Address	Text
City	Text
State	Text
ZipCode	Text
AreaCode	Text
Phone	Text
Email	Hyperlink

- For each field in a table, you must provide two pieces of information: the field name and its data type.
- Field name guidelines
  - ➢ Use names that describe the contents of the field
  - ➢ Stick to letters and numbers
  - ➢ Avoid spaces
    - − Cause problems for programmers and when creating calculated query values
  - ➢ Capitalize first letter of each word to improve readability
  - ➢ Use standard abbreviations when necessary such as *Num, Qty, Avg, Amt*

Notes	Activity

- Data Types
  - ➢ After entering the field name, press the Tab key to move to the Data Type column. Press the first letter of the data type to make it appear (or drop down the list).
  - ➢ Text
    - – Most common field type
    - – Use whenever field will not be used in numeric calculations
    - – Maximum size: 255 characters
    - – <u>Never</u> accept the default text field size of 255
      - ▪ Estimate the number of characters of the largest field value you expect to enter. If you're not sure, estimate on the low side. You can easily expand the field size later.
      - ▪ <mark>Tip</mark>: you can change the default field sizing using Access Options ‣ Object Designers (Office button). But, you should **still** verify the field size is appropriate.
  - ➢ Memo
    - – Used when Text type maximum (255) is not large enough.
    - – Max size: 65,535 characters.

Field	Type
OrderNum	AutoNumber
CustomerNum	Text
Product	Number
Quantity	Number
PricePaid	Currency
BackOrdered	Yes/No
PurchaseDate	Date/Time

Notes	Activity

➤ Number
  – Used for all fields whose values **may** be used in a numeric calculation **except** for currency values
  – Numeric type sizes
    ▪ The numeric type is broken down to 6 different *sizes*
    ▪ Byte: Values 0-255, bytes: 1
    ▪ Integer: Values -32768 to 32767, bytes: 2
    ▪ Long Integer: Values ± 2 billion, bytes: 4
    ▪ Single: numbers with decimal places (accurate to 7 digits after decimal) bytes: 4
    ▪ Double: numbers with decimal places (accurate to 15 digits after decimal) bytes: 8
    ▪ Decimal: numbers with decimal places (accurate to 28 digits after decimal) bytes:12
    ▪ Select the appropriate size for the field's expected values. Using the larger sizes requires more memory.

➤ Currency
  – Preferred type for numbers representing dollar amount
  – Less susceptible to rounding errors than Number type

Notes	Activity

➢ Date/Time
  – Used to store dates and/or times between 1/1/100 and 12/31/9999
  – You can enter dates (in datasheet view) in just about any format. Access converts the date you entered into the format you specify (see below)
  – <mark>Tip</mark>: If you enter a date and leave off the year, Access automatically uses the current year.
➢ Yes/No
  – Used to represent data that can only contain true/false, yes/no values
➢ AutoNumber
  – Long integer type. Access automatically assigns a unique number to this field (usually sequentially) for every new record.
  – Often used for primary keys
➢ Hyperlink
  – Used to store web or Email addresses
  – Once entered, convert to a hyperlink that can be clicked to open the web site or a new Email
➢ Attachment
  – Allows you to *attach* pictures, sound clips etc. to the record.
➢ OLE Object: not used in this course
➢ Lookup Wizard: provides a range of values based on a field in another, related table. Discussed in Access Intermediate.

● Field descriptions
  ➢ Access allows you to enter a more detailed description of the field's purpose
    – This helps others (or you) who may need to update the table's *structure* in the future.
  ➢ <mark>Tip</mark>: A more practical use of the field description is to provide tips on how or what type of data to enter in the field.
    – The text entered in the field description displays in the status bar whenever the insertion point is in the field.
    – The book's suggestion to enter *Primary Key* or *Foreign Key* is pretty much useless. These terms don't mean much to the average person entering data into the table.

Add descriptions (help) for each field below.

Notes	Activity

Designating the Primary Key

ProductID is key

- All tables should have a primary key field (value is required and must be unique for each record)
- In design view, you designate the primary key field by
  - ➢ clicking anywhere in the field's row
  - ➢ clicking the Primary Key 🔑 button in the Tools group of the Table Tools Design tab.
    - – Alternatively, you can right-click in the field's *row selector* (the blue box to the left of the field) and choose Primary Key from the popup menu.
- Don't forget you can also designate the primary key in datasheet view by placing your cursor in the field and checking the **Unique** box in the Data Type & Formatting group of the Table Tools Datasheet tab.
- Tip: To designate more than one field as the primary keys (*combination keys*) in design view, select all the fields (best if they're next to each other) and click the Primary Key 🔑 button.
- Tip: If more than two fields are required to create a unique *combination key*, consider adding an AutoNumber field to serve as the only primary key.

Field properties

tblProduct:
 ProductID (auto)
 ProductName (T25)
 Price (Currency)
 QuantityOnHand
 (Integer)

- Most field types allow you to specify field properties which include the ability to set the field's size, caption, format, default value, validation rules and text alignment.
- Tip: To move from the Table Design Grid to Field Properties pane, press the F6 key.
  - ➢ Unfortunately, there's no easy way to move back to the Table Design Grid from the Field Properties pane. You can press F6 **four** times, but that seems a little ridiculous.
- Field size
  - ➢ For text fields, the maximum number of characters allowed in the field.
  - ➢ For numeric fields, the number type *size* (see above)
- Caption
  - ➢ Used to display a different value than the field's name in datasheet view, forms and reports.
  - ➢ Better place to add spaces between words
  - ➢ Can also be used to display a shortened version of the field name.

ProductID	AutoNumber
ProductName	Text
Color	Text
Price	Currency
QOH	Number
ReOrderDate	Date/Time

Notes	Activity

<table>
<tr><td>

- Format
  - ➢ Note: formats change the way values appear but do NOT change how they are stored. *Behind the scenes*, values are still stored with all decimal places, thousandths of seconds of accuracy, etc.
  - ➢ I don't recommend using formats with Text fields.
  - ➢ For numeric and currency field types, designates how the value should be displayed ($, commas)
    - – Single, Double and Currency fields include the Decimal Places property which allows you to designate how many decimal places should be displayed
      - ▪ Auto designates that only the number of decimal places required (up to 6) are displayed (varying number of decimal places)
    - – Standard format includes commas
    - – Fixed format doesn't include commas
    - – Percent format, displays the value multiplied by 100 with a trailing %
  - ➢ For date fields, the Format property allows you to designate how the date (or time) will appear
    - – Long Date: Sunday, September 6, 2007
    - – Medium Date: 6-Sep-07
    - – Short Date: 9/6/2007
    - – Custom dates. If the predefined date formats don't meet your needs, you can define your own, custom formats using these special codes
      - ▪ **d** day of month, no leading zero
      - ▪ **dd** day of month, leading zero
      - ▪ **ddd** abbreviated day of week
      - ▪ **dddd** full day of week
      - ▪ **m** month number, no leading zero
      - ▪ **mm** month number, leading zero
      - ▪ **mmm** 3-letter abbreviated month name
      - ▪ **mmmm** full month name
      - ▪ **yy** 2-digit year
      - ▪ **yyyy** 4-digit year

      - ▪ <mark>Tip</mark>: The Short Date format is the same as the custom date format: m/d/yyyy

      - ▪ See the Access help system to learn about custom **time** formats

</td><td>

Price, Currency
   Format standard

ReorderDate, Date
   Format Long Date
   Custom Format

</td></tr>
</table>

Notes	Activity
- Default Value - The default value property allows you to tell Access to automatically enter a value in the field **for new records** - Select default values carefully. Select values that will occur most often in this field. - If no value occurs most often, leave the default value property blank. - Access makes it easy for users to replace this value by highlighting the value whenever the user moves to the field - Tip: Use **Date( )** including the parenthesis, to automatically enter the current date in a date field. Use **Now( )** to enter the current date and current time. - Validation rules allow you designate the acceptable range of values that can be entered in a cell. - Validation rules will be covered in Access Intermediate. - Text Align - The Text Align property allows you to control how the data is aligned in the field box - General (the default) aligns text and memo values to the left and all other data types to the right. - Left, Center, Right (self explanatory) - Distribute adds spaces between the characters of the value to stretch the value to fill the provided area.	Default Date() (Now ( ))
## Saving the Table Structure - If you switch from design view to datasheet view and haven't saved your changes to the design, Access will prompt you to save the changes. - Actually, you probably shouldn't wait until you're done entering the entire table structure definition before saving. At any time, you can click the Save button on the Quick Access toolbar to save the changes to your table structure.	Save table

Notes	Activity

Modifying Table Structure

Change format of Price to Currency (from standard)

- Caution: modifying a table's structure may cause problems if the table already has data in it.
- Modifying using datasheet view.
  - ➢ You can modify some field properties using datasheet view.
  - ➢ Open the table in datasheet view
  - ➢ Click the Datasheet tab
  - ➢ Select the field to modify (click anywhere in the field's column)
  - ➢ Use the options in the Data Type & Formatting group to change the field's properties.
    - – $\boxed{\$ \ \% \ ,}$ Change the field's format to Currency, Percent or Standard
    - – $\boxed{\substack{\leftarrow .0 \ \ .00 \\ .00 \ \rightarrow .0}}$ Increase or decrease the number of decimal places displayed
- Modifying using design view
  - ➢ Design view provides access to all table structure properties and allows you to change the field order
  - ➢ Open the table in design view.
    Tip: Right-click the table in the Navigation pane and choose Design View in the popup menu.
  - ➢ Select the field to modify.
  - ➢ Change field name, data type, description or properties as required.

(Default values)
tblOrders:
PurchaseDate = Date()
Quantity = 1

tblCustomers:
State = "WI"
Area Code = "715"

Notes	Activity
➢ Moving a field	Move fields and restore original order
– Having the fields in the correct order can simplify data entry	
– Select the field to move by clicking its *row selector*	
– Drag the row selector to move the field to the appropriate position	
➢ Adding a field	
– You could add a new field to the end of the field list and then move it to the correct position	
– To insert the field in the correct position to start with	Add Color (T15) after ProductName
▪ Right-click anywhere in the field that the new field should be inserted <u>before</u> (Windows products generally insert *before*)	
▪ Choose Insert Rows from the popup menu that appears	
▪ Alternatively, (left) click anywhere in the field to insert before, then click the Insert Rows ⥂ icon in the Tools group of the Table Tools Design tab.	
– ==Tip==: To make room for more than one new field, use the row selector to select multiple rows (drag), then click the Insert Rows ⥂ icon.	
➢ Deleting a field	Delete ReorderDate
– Caution: when you delete a field, the data in all the table rows for that field is also deleted.	Undo
– ==Tip==: Undo is available if you accidentally delete a field, but only until you Save the table structure. Once you save, the field (and its data) is gone for good.	Review Undo rules
– Right-click anywhere in the field to delete, then choose Delete Rows from the popup menu.	
– Alternatively, select (click) the field and click the Delete Rows ⥅ button in the Tools group of the Table Tools Design tab.	
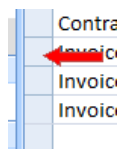
Notes	Activity

Entering Record Data

- To enter data, you must be in datasheet view
  - Later, we'll use queries and forms to enter and modify data.
- After entering data in one field, press Tab or Enter to move to the next field.
  - Press Shift-Tab to move to the previous field
- To save the changes to record data, simply move to a different record. The record is saved automatically.
  - Pressing the Save 💾 button has no effect

- Text and Memos
  - Type the text exactly as you want it to appear in the database
  - Capitalize and space appropriately
- Numbers and Currency
  - Enter the numbers as efficiently as possible.
  - Skip dollar signs, percent signs and commas.
  - Use formatting to control how values appear
  - Access will apply the formatting after you move to the next field.
- Dates
  - You can enter dates in just about any format you can dream of
    - Sep 19, 2007
    - 9/19/2007
    - September 19 (current year added automatically)
    - 9-19-2007
    - 2007-9-19
  - If you leave off the year, Access will use the current year automatically.
  - You can also select a date using the calendar button that appears when the insertion point is in a date field

    SigningDate ▾
       2/9/2010 ▦ ⬅

    - Click the blue arrows to change the month
    - Click Today to jump to the current date.
    - For dates more than a couple of months in the past or future, it's usually more efficient to type the date.
  - If you have set a format for the date field, Access will apply the format after you leave the field.

Activity column:

Enter a test record or two into each table

Try various kinds of dates

Return to design mode: note there's a property to turn on/off the little calendar

Notes	Activity

• Yes/No
    ➢ Access displays a check box in datasheet view for Yes/No fields
    ➢ Click the check box to change its state
    ➢ Alternatively, you can press the spacebar to change the check box state.
• AutoNumber
    ➢ Do not enter values in AutoNumber fields
    ➢ Simply press Tab or Enter to skip over the field
    ➢ Access will insert the appropriate number when you start typing values in the next field.
 	
• Editing Record Data
    ➢ Click the record and field with the incorrect data
    ➢ Use standard editing techniques (arrows, Home, End, Delete, Backspace, etc) to change the data.
    ➢ Click in a different record to save the changes.
• Deleting Data
    ➢ Highlight all the data in the field and press Delete
• Deleting records
    ➢ Select the record using the record selection box (left edge of the record)
    ➢ Right-click and choose Delete Rows from the popup menu
	Delete the sample records entered for testing.

Notes	Activity

Defining Table Relationships

- Most databases contain more than one table (sometimes hundreds or thousands)
- All of the tables are typically *related* to at least one other table in the database, sometimes more.
- Most relationships are *one-to-many* relationships which means that one record in the *parent table* is related to many records in the *child table*.
  - ➤ One student takes many classes (student is parent, class is child)
  - ➤ One customer places many orders (customer is parent, order is child)
  - ➤ One order contains many line items (order is parent, line item is child)
    - – Note a table can be a parent in one relationship and a child in another (order)
- In order for two tables to be related they must share one field.
  - ➤ Normally, that field is the primary key field from the parent table.
  - ➤ The fields must be of exactly the same type, though they could have different names.
    - – Normally, the *linking field* (aka *foreign key*) is named the same in both the parent and child table for clarity.

Notes	Activity

• Access can figure some relationships out by itself, but it is best to define the table relationships yourself.
• To designate the relationship between two tables
 	
  ➢ Click the Relationships ⬛ button in the Show/Hide group of the Database Tools tab
  ➢ The Show Table dialog box will appear. Select the tables to relate (probably all of them)
    – Double-click the table name to quickly include the table in the Relationships window.
    – Close the Show Table dialog box.
    – Tip: If you forget a table, you can open the Show Table dialog box again by selecting the Show Table ⬛ button in the Relationships group of the Relationship Tools Design tab.
  ➢ For each pair of tables that are related, drag the common field in the first table to the second table.
    – It doesn't matter if you drag from the parent to the child or child to the parent.
    – Note that Access figures out which table is the parent table (1) and which is the child (∞)
	Link tblCustomers to tblOrders
	
	Link tblOrders to tblProducts

Notes	Activity

➢ The Edit Relationships dialog box appears.
   – We want to make sure that every record in the child table has a corresponding record in the parent table (no *orphan records*)
   – Check the Enforce Referential Integrity option (that's what *referential integrity* means—no *orphan* records)
   – We also want to make sure if we change the linking field value in the parent table, all the child record's linking field values are automatically updated.
   – Click the Cascade Update Related Fields check box
   – Finally, we DO NOT want child records to be **automatically** deleted when we delete the parent record.
     ▪ Automatically deleting records is generally a bad idea. <u>You</u> should take steps to ensure the child records don't become orphaned.
     ▪ Do NOT check the Cascade Delete Related Records check box
       ♦ If you delete a parent record, the child records will be orphaned.
       ♦ To prevent this, manually delete (or modify) all child records linked to the parent to be deleted **before** deleting the parent record.
	Attempt to enter a record in tblOrders with a non-existent product number