Tutorial 3
Maintaining and Querying a Database

Microsoft® Access® 2013
Objectives

• Session 3.1
  – Find, modify, and delete records in a table
  – Hide and unhide fields in a datasheet
  – Work in the Query window in Design view
  – Create, run, and save queries
  – Update data using a query datasheet
  – Create a query based on multiple tables
  – Sort data in a query
  – Filter data in a query
Objectives (Cont.)

• Session 3.2
  – Specify an exact match condition in a query
  – Use a comparison operator in a query to match a range of values
  – Use the And and Or logical operators in queries
  – Change the font size and alternate row color in a datasheet
  – Create and format a calculated field in a query
  – Perform calculations in a query using aggregate functions and record group calculations
  – Change the display of database objects in the Navigation Pane
Maintaining and Querying a Database

• Case - *Chatham Community Health Services*

  *Updating and Retrieving Information About Patients, Visits, and Invoices*

  – User wants to make sure she has up-to-date contact information
  – The office staff also must monitor billing activity to ensure that invoices are paid on time and in full
  – Develop new strategies for promoting services provided by the clinic
  – Analyze other aspects of the business related to patient visits and finances
Maintaining and Querying a Database

(Cont.)

STARTING DATA FILES

- Access1
  - Tutorial: Chatham.accdb (cont.)
  - Case2: O'Brien.accdb (cont.)
- Review: Vendor.accdb (cont.)
- Case1: Gopher.accdb (cont.)
- Case3: Shelter.accdb (cont.)
- Case4: Stanley.accdb (cont.)
  - Tour.accdb
Maintaining and Querying a Database

(Cont.)

When you are constructing a query, you can see the results at any time by clicking the View button or the Run button. In response, Access displays the query datasheet, which contains the set of fields and records that result from answering, or running, the query.

The top portion of the Query window in Design view contains the field list (or list) for the table(s) used in the query.

The default query name, Query1, is displayed on the tab for the query. You change the default query name to a more meaningful one when you save the query.

The bottom portion of the Query window in Design view contains the design grid. In the design grid, you include the fields and record selection criteria for the information you want to see.

In the Query Type group, the active Select button indicates that you are creating a select query, which is the default type of query. A select query is one in which you specify the fields and records you want Access to select.

Each field list contains the fields for the table(s) you are querying. The table name appears at the top of the field list, and the fields are listed in the order in which they appear in the table. Notice that the primary key for the table is identified by the key symbol.

You can scroll the field list to see more fields, or you can expand the field list box by dragging its borders to display all the fields and the complete field names. When all the field names are displayed, the scroll bar disappears.

The view buttons on the status bar allow you to change to different views; for example, you can click the Datasheet View button to run the query and display the results in Datasheet view.

The ribbon displays the QUERY TOOLS DESIGN tab with options for creating and running queries. Note: you can click on the DESIGN tab; it provides buttons you can click to create various types of queries.

In Design view, you specify the data you want to view by constructing a query by example. When you use query by example (QBE), you give Access an example of the information you are requesting. Access then retrieves the information that precisely matches your example.

Each column in the design grid contains specifications about a field you will use in the query. You can choose a single field for your query by double-clicking its name in the field list to place the field in the next available design grid column.
Updating a Database

- **Updating**, or **maintaining**, a database is the process of adding, modifying, and deleting records in database tables to keep them current and accurate.

- **Modifying Records**
  - To make minor changes, or select the field value to replace it entirely.
    - The **F2 key** is a toggle that you use to switch between navigation mode and editing mode.
  - In **navigation mode**, Access selects an entire field value. If you type while you are in navigation mode, your typed entry replaces the highlighted field value.
  - In **editing mode**, you can insert or delete characters in a field value based on the location of the insertion point.
### Updating a Database (Cont.)

#### Figure 3-1  Navigation mode and editing mode keyboard shortcuts

<table>
<thead>
<tr>
<th>Press</th>
<th>To Move the Selection in Navigation Mode</th>
<th>To Move the Insertion Point in Editing Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>←</td>
<td>Left one field value at a time</td>
<td>Left one character at a time</td>
</tr>
<tr>
<td>→</td>
<td>Right one field value at a time</td>
<td>Right one character at a time</td>
</tr>
<tr>
<td>Home</td>
<td>Left to the first field value in the record</td>
<td>To the left of the first character in the field value</td>
</tr>
<tr>
<td>End</td>
<td>Right to the last field value in the record</td>
<td>To the right of the last character in the field value</td>
</tr>
<tr>
<td>↑ or ↓</td>
<td>Up or down one record at a time</td>
<td>Up or down one record at a time and switch to navigation mode</td>
</tr>
<tr>
<td>Tab or Enter</td>
<td>Right one field value at a time</td>
<td>Right one field value at a time and switch to navigation mode</td>
</tr>
<tr>
<td>Ctrl + Home</td>
<td>To the first field value in the first record</td>
<td>To the left of the first character in the field value</td>
</tr>
<tr>
<td>Ctrl + End</td>
<td>To the last field value in the last record</td>
<td>To the right of the last character in the field value</td>
</tr>
</tbody>
</table>

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• Hiding and Unhiding Fields
  – When you are viewing a table or query datasheet in Datasheet view, you might want to temporarily remove certain fields from the displayed datasheet, making it easier to focus on the data you’re interested in viewing.
  – The **Hide Fields** command removes the display of one or more fields.
    • Can be especially useful in a table with many fields.
  – The **Unhide Fields** command redisplay any hidden fields.
Updating a Database (Cont.)

• Finding Data in a Table
  – Access provides options you can use to locate specific field values in a table
  • The **Find command** searches a table or query datasheet, or a form, to locate a specific field value or part of a field value

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**Figure 3-4**  Find and Replace dialog box

- Specifies that the current field will be searched
- Specifies that Access will search for a match to the entire field value
- Specifies that the value selected in the table datasheet will be searched
- Specifies that all records in the table will be searched
Updating a Database  (Cont.)

• Deleting Records
  – To delete a record, you need to select the record in Datasheet view, and then delete it using the Delete button in the Records group on the HOME tab or the Delete Record option on the shortcut menu.

Figure 3-5  Related record from the Billing table in the subdatasheet

- minus sign appears when related records are displayed
- subdatasheet with related record from the Billing table
- plus signs indicate records have related records in another table
Introduction to Queries

• Access provides powerful query capabilities that allow you to do the following:
  – Display selected fields and records from a table
  – Sort records
  – Perform calculations
  – Generate data for forms, reports, and other queries
  – Update data in the tables in a database
  – Find and display data from two or more tables

• The answer to a select query is returned in the form of a datasheet
  – The result of a query is also referred to as a recordset because the query produces a set of records that answers your question
Introduction to Queries (Cont.)

Designing Queries vs. Using a Query Wizard

More specialized, technical queries, such as finding duplicate records in a table, are best formulated using a Query Wizard. A **Query Wizard** prompts you for information by asking a series of questions and then creates the appropriate query based on your answers. In Tutorial 1, you used the Simple Query Wizard to display only some of the fields in the Visit table; Access provides other Query Wizards for more complex queries. For common, informational queries, designing your own query is more efficient than using a Query Wizard.

**Figure 3-6** Show Table dialog box

- List of tables in the database
- Tabs for selecting the source of the query
Creating and Running a Query

Figure 3-7  Field added to the design grid

- Field list resized to display all the fields in the table
- Field added from field list to the first column in the design grid
- Indicates that the field will appear in the query datasheet
- Specifies the field is in the Patient table
Creating and Running a Query (Cont.)

Figure 3-8  Datasheet displayed after running the query

selected fields displayed
A query datasheet is temporary and its contents are based on the criteria in the query design grid.

- You can still update the data in a table using a query datasheet.

- Instead of making the changes in the table datasheet, you can make them in the PatientEmail query datasheet because the query is based on the Patient table.

- The underlying Patient table will be updated with the changes you make.
Creating a Multitable Query

• A multitable query is a query based on more than one table
• If you want to create a query that retrieves data from multiple tables, the tables must have a common field
Sorting Data in a Query

- **Sorting** is the process of rearranging records in a specified order or sequence
  - Sometimes you might need to sort data before displaying or printing it to meet a specific request
- To sort records, you must select the **sort field**, which is the field used to determine the order of records in the datasheet

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Ascending Sort Results</th>
<th>Descending Sort Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Text</td>
<td>A to Z (alphabetical)</td>
<td>Z to A (reverse alphabetical)</td>
</tr>
<tr>
<td>Number</td>
<td>lowest to highest numeric value</td>
<td>highest to lowest numeric value</td>
</tr>
<tr>
<td>Date/Time</td>
<td>oldest to most recent date</td>
<td>most recent to oldest date</td>
</tr>
<tr>
<td>Currency</td>
<td>lowest to highest numeric value</td>
<td>highest to lowest numeric value</td>
</tr>
<tr>
<td>AutoNumber</td>
<td>lowest to highest numeric value</td>
<td>highest to lowest numeric value</td>
</tr>
<tr>
<td>Yes/No</td>
<td>yes (checkmark in check box) then no values</td>
<td>no then yes values</td>
</tr>
</tbody>
</table>
Sorting Data in a Query (Cont.)

- When working in Datasheet view for a table or query, each column heading has an arrow to the right of the field name
  - Arrow gives you access to the **AutoFilter** feature, which enables you to quickly sort and display field values in various ways
Sorting Data in a Query (Cont.)

- Sorting on Multiple Fields in Design View
  - Sort fields can be unique or nonunique
    - A sort field is **unique** if the value in the sort field for each record is different
    - A sort field is **nonunique** if more than one record can have the same value for the sort field
      - When the sort field is nonunique, records with the same sort field value are grouped together, but they are not sorted in a specific order within the group
      - To arrange these grouped records in a specific order, you can specify a **secondary sort field**, which is a second field that determines the order of records that are already sorted by the **primary sort field** (the first sort field specified)
Sorting Data in a Query (Cont.)

Figure 3-12  Selecting two sort fields in Design view

Figure 3-13  Datasheet sorted on two fields

- primary sort field
- secondary sort field
- sort order for the primary sort field
- sort order for the secondary sort field
- records grouped by City are shown in descending order by VisitDate

New Perspectives on Microsoft Access 2013
Filtering Data

• A **filter** is a set of restrictions you place on the records to *temporarily* isolate a subset of the records
  – Lets you view different subsets of displayed records so that you can focus on only the data you need
  – An applied filter is not available the next time you run the query or open the form (unless it has been saved)

• The simplest technique for filtering records is **Filter By Selection**
  – Lets you select all or part of a field value in a datasheet or form, and then display only those records that contain the selected value in the field
  – Another technique for filtering records is to use Filter By Form, which changes your datasheet to display blank fields
Filtering Data (Cont.)
Selection Criteria in Queries

When creating queries in Design view, you can enter criteria so that Access will display only selected records in the query results.

To define a condition for a field, you place the condition in the field's Criteria box in the design grid.

To tell Access which records you want to select, you must specify a condition as part of the query. A condition is a criterion, or rule, that determines which records are selected.

The results of a query containing selection criteria include only the records that meet the specified criteria.

The results of this query show only patients from Bloomfield because the condition "Bloomfield" in the City field's Criteria box specifies that Access should select records only with City field values of Bloomfield. This type of condition is called an exact match because the value in the specified field must match the condition exactly in order for the record to be included in the query results.

A condition usually consists of an operator, often a comparison operator, and a value. A comparison operator sets Access to compare the value in a field to the condition value and to select all the records for which the condition is true.

The results of this query show only those invoices with amounts greater than $250 because the condition is $250, which uses the greater than comparison operator, and specifies that Access should select records only with InvoiceAmt field values over $250.

Most comparison operators (such as Between, And, ...) ask Access to select records that match a range of values for the condition—in this case, all records with dates that fall within the range shown.

The results of this query show only those patient visits that took place in December 2015 because the condition in the VisitDate's Criteria box specifies that Access should select records only with a visit date between 12/1/2015 and 12/31/2015.
Defining Record Selection Criteria for Queries

• To tell Access which records you want to select, you must specify a condition as part of the query
  – A condition usually includes one of the comparison operators

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### Access comparison operators

<table>
<thead>
<tr>
<th>Operator</th>
<th>Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>=</td>
<td>equal to (optional; default operator)</td>
<td>=&quot;Hall&quot;</td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>not equal to</td>
<td>&lt;&gt;&quot;Hall&quot;</td>
</tr>
<tr>
<td>&lt;</td>
<td>less than</td>
<td>&lt;#1/1/99#</td>
</tr>
<tr>
<td>&lt;=</td>
<td>less than or equal to</td>
<td>&lt;=100</td>
</tr>
<tr>
<td>&gt;</td>
<td>greater than</td>
<td>&gt;&quot;C400&quot;</td>
</tr>
<tr>
<td>&gt;=</td>
<td>greater than or equal to</td>
<td>&gt;=18.75</td>
</tr>
<tr>
<td>Between ... And ...</td>
<td>between two values (inclusive)</td>
<td>Between 50 And 325</td>
</tr>
<tr>
<td>In 0</td>
<td>in a list of values</td>
<td>In (&quot;Hall&quot;, &quot;Seeger&quot;)</td>
</tr>
<tr>
<td>Like</td>
<td>matches a pattern that includes wildcards</td>
<td>Like &quot;706*&quot;</td>
</tr>
</tbody>
</table>

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Defining Record Selection Criteria for Queries  (Cont.)

• Specifying an Exact Match
  – Create a query that will display specific records
  • This type of condition is an exact match because the value in the specified field must match the condition exactly in order for the record to be included in the query results.
Defining Record Selection Criteria for Queries

(Cont.)

• **Modifying a Query**
  
  – After you create a query and view the results, you might need to make changes to the query if the results are not what you expected or require.
Defining Record Selection Criteria for Queries (Cont.)
• Using a Comparison Operator to Match a Range of Values
  – After you create and save a query, you can double-click the query name in the Navigation Pane to run the query again
  – Click the View button to change its design
  – You can also use an existing query as the basis for creating another query
Defining Record Selection Criteria for Queries (Cont.)

![Running the modified query](image)

- Only records with a VisitDate field value less than 1/1/2016 are selected.
- 18 records are selected.
Defining Multiple Selection Criteria for Queries

- Multiple conditions require you to use **logical operators** to combine two or more conditions
  - Need to use the **And logical operator**
  - If you place conditions in separate fields in the *same* Criteria row of the design grid, all conditions in that row must be met in order for a record to be included in the query results
  - If you place conditions in *different* Criteria rows, a record will be selected if at least one of the conditions is met
  - If none of the conditions are met, no records are selected
  - When you place conditions in different Criteria rows, you are using the **Or logical operator**
Defining Multiple Selection Criteria for Queries (Cont.)

**Figure 3-26** Logical operators And and Or for multiple selection criteria

Design grid using the And logical operator

Criteria: condition condition

or:

Conditions are placed in the same row

Are both conditions satisfied?

Yes: select record

No: do not select record

Design grid using the Or logical operator

Criteria: condition

or: condition

Conditions are placed in different rows

Are one or more conditions satisfied?

Yes: select record

No: do not select record

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Defining Multiple Selection Criteria for Queries (Cont.)

- The And Logical Operator
  - In the query design, both conditions you specify will appear in the same Criteria row; therefore, the query will select records only if both conditions are met.

![Query to find older patients who have had influenza](image1)

And logical operator with conditions entered in the same row

![Results of query using the And logical operator](image2)
The Or Logical Operator

In the query design, either one of two conditions is satisfied or when both conditions are satisfied.
Changing a Datasheet’s Appearance

- You can make many formatting changes to a datasheet to improve its appearance or readability
  - Font type, size, color, alignment of text, apply different colors to the rows and columns

- Modifying the Font Size
  - Depending on the size of the monitor you are using or the screen resolution, you might need to increase or decrease the size of the font to view more or fewer columns of data
Changing a Datasheet’s Appearance (Cont.)

• Changing the Alternate Row Color in a Datasheet
  – Access uses themes to format the objects in a database. A **theme** is a predefined set of formats including colors, fonts, and other effects that enhance an object’s appearance and usability
    • The Office theme, which formats every other row in a datasheet with a gray background color to distinguish one row from another, is the default
Changing a Datasheet’s Appearance (Cont.)

**Figure 3-31** Gallery of color choices for alternate row color

**Figure 3-32** Datasheet formatted with alternate row color

- Modified Font Size setting
- Select this color
- Gallery with color choices (yours might differ)

- Orange color applied to every other row
- First row is active, so it appears selected (highlighted in blue)
Creating a Calculated Field

• Queries can perform calculations
  – Must define an expression containing a combination of database fields, constants, and operators
  – A calculated field is a field that displays the results of an expression but it does not exist in a database
  – The Zoom box is a dialog box that you can use to enter text, expressions, or other values
  – Expression Builder is an Access tool that makes it easy for you to create an expression
    • It contains a box for entering the expression, an option for displaying and choosing common operators, and one or more lists of expression elements, such as table and field names
Creating a Calculated Field (Cont.)

Figure 3-33  Completed expression for the calculated field

Expression Builder

- Field name within brackets
- Expression
- Selected field used in the expression
- Expression Elements
- Expression Categories
- Expression Values

Expression:

```
[InvoiceAmt] * .02
```

Examples of expressions include `[Field1] + [Field2]` and `[Field1] < 5`
Creating a Calculated Field (Cont.)

Formatting a Calculated Field
You can specify a particular format for a calculated field, just as you can for any field, by modifying its properties.

Figure 3-34  Property Sheet for the calculated field

Figure 3-35  Datasheet displaying the calculated field
Using Aggregate Functions

- You can calculate statistical information, such as totals and averages, on the records displayed in a table datasheet or selected by a query
  - Use the Access **Aggregate functions** which perform arithmetic operations on selected records in a database

<table>
<thead>
<tr>
<th>Aggregate Function</th>
<th>Determines</th>
<th>Data Types Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>Average of the field values for the selected records</td>
<td>AutoNumber, Currency, Date/Time, Number</td>
</tr>
<tr>
<td>Count</td>
<td>Number of records selected</td>
<td>AutoNumber, Currency, Date/Time, Long Text, Number, OLE Object, Short Text, Yes/No</td>
</tr>
<tr>
<td>Maximum</td>
<td>Highest field value for the selected records</td>
<td>AutoNumber, Currency, Date/Time, Number, Short Text</td>
</tr>
<tr>
<td>Minimum</td>
<td>Lowest field value for the selected records</td>
<td>AutoNumber, Currency, Date/Time, Number, Short Text</td>
</tr>
<tr>
<td>Sum</td>
<td>Total of the field values for the selected records</td>
<td>AutoNumber, Currency, Date/Time, Number</td>
</tr>
</tbody>
</table>
Using Aggregate Functions (Cont.)

- **Working with Aggregate Functions Using the Total Row**
  - To quickly perform a calculation using an aggregate function in a table or query datasheet, you can use the Totals button in the Records group on the HOME tab.

- When you click this button, a row labeled “Total” appears at the bottom of the datasheet.
- Choose one of the aggregate functions.
Using Aggregate Functions (Cont.)

- **Creating Queries with Aggregate Functions**
  - Aggregate functions operate on the records that meet a query’s selection criteria
  - You specify an aggregate function for a specific field, and the appropriate operation applies to that field’s values for the selected records

![Figure 3-38: Total row inserted in the design grid](image)
Using Aggregate Functions (Cont.)

Figure 3-39  Query with aggregate functions entered

Figure 3-40  Result of the query using aggregate functions
• **Using Record Group Calculations**
  – In addition to calculating statistical information on all or selected records, you can calculate statistics for groups of records
  – The **Group By operator** divides the selected records into groups based on the values in the specified field
  • Those records with the same value for the field are grouped together, and the datasheet displays one record for each group
  • Aggregate functions, which appear in the other columns of the design grid, provide statistical information for each group
Working with the Navigation Pane

• The Navigation Pane is the main area for working with the objects in a database.
  – Provides options for grouping database objects in various ways to suit your needs.
  – Divides database objects into categories, and each category contains groups.
  – The default category is **Object Type**, which arranges objects by type—tables, queries, forms, and reports.
  – The default group is **All Access Objects**, which appears at the top of the Navigation Pane.
Working with the Navigation Pane (Cont.)

Figure 3-43  Database objects grouped by table in the Navigation Pane

- Each table name appears as a heading.
- An object based on more than one table appears in the group of objects for each table.
- All Tables group selected.