9. Adjust the datasheet column widths so that you can see the contents of the datasheet in one screen. The final result is shown in Figure AW-1-29.
10. We are adding only the data for Jessica Christman at this point, and we will add the remaining CUSTOMER data later in this section of "The Access Workbench." Click the **Close** button in the upper-right corner of the document window to close the CUSTOMER datasheet. A dialog box appears that asks if you want to save the changes you made to the layout (column widths). Click the **Yes** button.
11. Click the **Shutter Bar Open/Close** button to expand the Navigation Pane. This makes the objects in the Navigation Pane visible.

Modifying Data in Tables: The Datasheet View

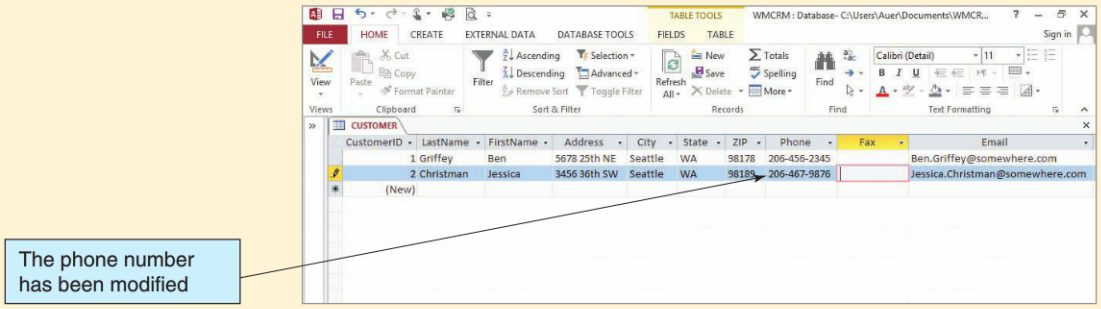
After entering data into a table, you can modify or change the data by editing the data values in the Datasheet view. To illustrate this, we will temporarily change Jessica Christman's phone number to 206-467-9876.

Modifying Data in the CUSTOMER Table in Datasheet View

1. In the Navigation Pane, double-click the **CUSTOMER** table object. The CUSTOMER table window appears in a tabbed document window in Datasheet view.
2. Click the **Shutter Bar Open/Close** button to collapse the Navigation Pane.
3. Click the **cell** that contains Jessica Christman's phone number to select it. Microsoft Access automatically puts the cell into Edit mode.
   - **NOTE:** If you instead use the **Tab** key (or **Shift-Tab** to move to the left in the datasheet) to select the cell, press the **F2** key to edit the contents of the cell.
4. Change the phone number to **206-467-9876**.
   - **NOTE:** Remember that Phone has a field size of 12 characters. You have to delete characters before you can enter new ones.
5. Press the **Enter** key or otherwise move to another cell to complete the edit. The CUSTOMER datasheet appears as shown in Figure AW-1-30.
6. Because we really do not want to change Jessica Christman's phone number, edit the Phone value back to its original value of **206-467-3456**. Complete the edit and click the **Save** button on the Quick Access Toolbar to save the changes.
7. Click the **Close** button in the upper-right corner of the document window to close the CUSTOMER datasheet.
8. Click the **Shutter Bar Open/Close** button to expand the Navigation Pane.

FIGURE AW-1-30

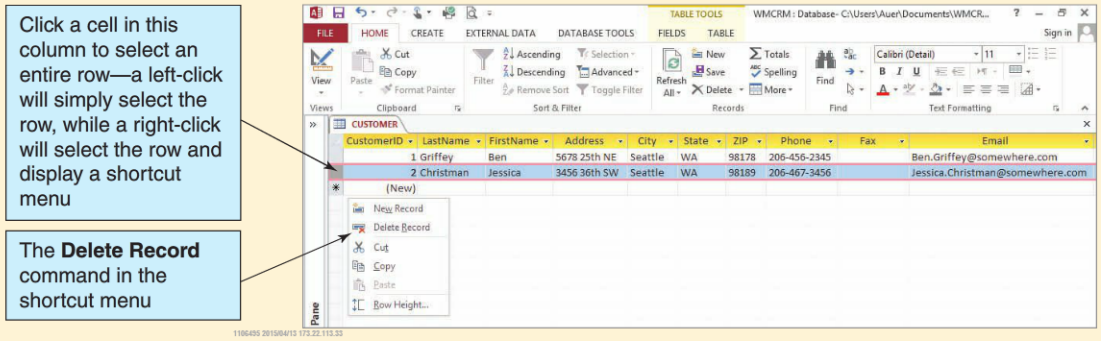
The Modified CUSTOMER Datasheet



(Continued)

FIGURE AW-1-31

Deleting a Row in the CUSTOMER Datasheet



Deleting Rows in Tables: The Datasheet View

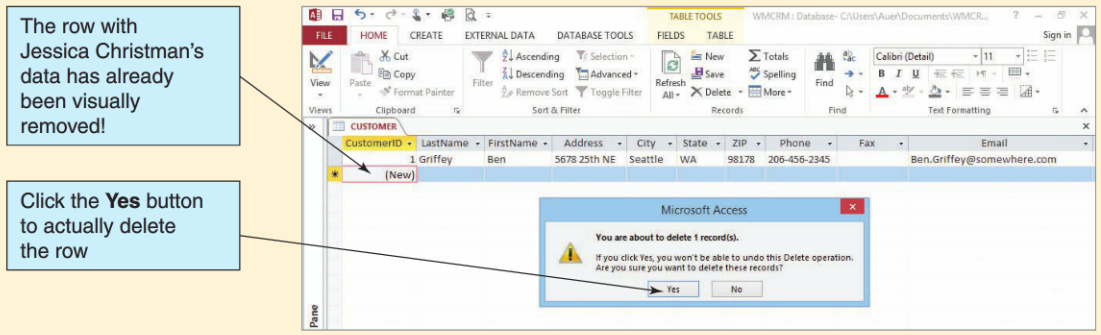
After the data have been entered into a table, you can delete an entire row in Datasheet view. To illustrate this, we will temporarily delete Jessica Christman's data.

Deleting a Row in the CUSTOMER Table in Datasheet View

1. In the Navigation Pane, double-click the **CUSTOMER** table object. The CUSTOMER table window appears in a tabbed document window in Datasheet view.
2. Click the **Shutter Bar Open/Close** button to collapse the Navigation Pane.
3. Right-click the **row selector cell** on the left side of the CUSTOMER datasheet for the row that contains Jessica Christman's data. This selects the entire row and displays a shortcut menu, as shown in Figure AW-1-31.
   - **NOTE:** The terms *row* and *record* are synonymous in database usage.
4. Click the Delete Record command in the shortcut menu. As shown in Figure AW-1-32, a Microsoft Access dialog box appears, warning you that you are about to permanently delete the record.
   - **NOTE:** As also shown in Figure AW-1-32, Microsoft Access 2013 with default settings performs the visual trick of actually removing the row! However, the row is not permanently deleted until you click the **Yes** button in the Microsoft Access dialog box. If you click the **No** button, the row reappears.

FIGURE AW-1-32

The Microsoft Access Deletion Warning Dialog Box



5. Click the **Yes** button to complete the deletion of the row.
   - **NOTE:** Alternatively, you can delete the row by clicking the **row selector cell** and then pressing the **Delete** key. The same Microsoft Access dialog box shown in Figure AW-1-32 then appears.
6. Because we do not want to really lose Jessica Christman's data at this point, add a new row to the CUSTOMER datasheet that contains Jessica's data. As shown in Figure AW-1-33, the CustomerID number for Jessica Christman is now 3 instead of 2. In an autonumbered column, each number is used only once.
7. Click the **Close** button in the upper-right corner of the document window to close the CUSTOMER datasheet.
8. Click the **Shutter Bar Open/Close** button to expand the Navigation Pane.

Inserting Data into Tables: Using a Form

Now, we will create and use a **form** to insert data into a table. A form provides a visual reference for entering data into the various data columns, and Microsoft Access has a form generator as part of its application generator functions. We could build a form manually in Form Design view, but instead we can take the easy route and use the **Form Wizard**, which will take us through a step-by-step process to create the form we want.

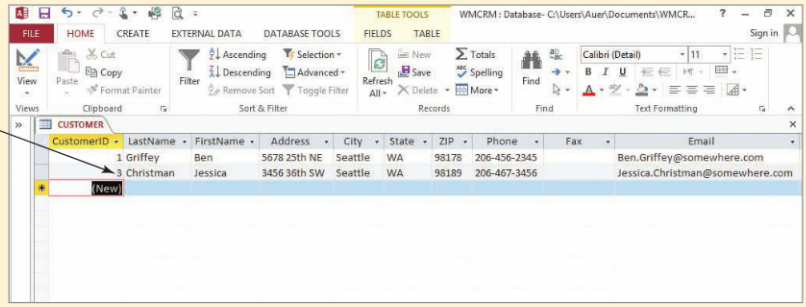
Creating a Data Entry Form for the CUSTOMER Table

1. Click the **Create** command tab to display the Create command tab and its command groups, as shown in Figure AW-1-34.
2. Click the **Form Wizard** button shown in Figure AW-1-34. The Form Wizard appears, as shown in Figure AW-1-35.
3. The CUSTOMER table is already selected as the basis for the form, so we only have to select which columns we want to include on the form. We can choose columns one at a time by highlighting a column name and clicking the right-facing single-chevron button. Or we can choose all the columns at once by clicking the right-facing double-chevron button. We want to add all the columns in this case, so click the **right-facing double-chevron** button to add all the columns and then click the **Next** button.
   - **NOTE:** In a real-world situation, we might not want to display the CustomerID value. In that case, we would deselect it by highlighting it and clicking the left-facing single-chevron button.

FIGURE AW-1-33

The New CustomerID Number

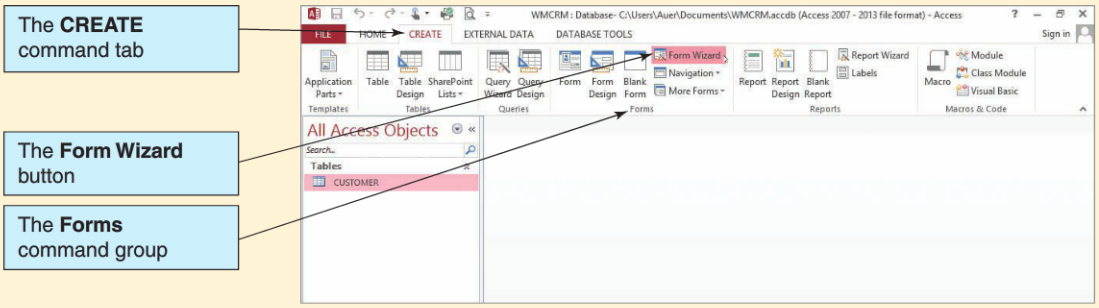
The row with the reentered Jessica Christman data now has a CustomerID of 3—AutoNumber numbers are sequential and are used only once!



(Continued)

FIGURE AW-1-34

The Create Command Tab and Form Wizard Button



4. When asked, "What layout would you like for your form?" click the **Next** button to select the default **Columnar** layout.
5. When asked, "What title do you want for your form?" type the form title **WMCRM Customer Data Form** into the text box and then click the **Finish** button. As shown in Figure AW-1-36, the completed form appears in a tabbed document window and a WMCRM Customer Data Form object is added to the Navigation Pane.
   - **NOTE:** The WMCRM Customer Data Form is properly constructed and sized for our needs. Sometimes, however, we might need to make adjustments to the form design. We can make form design changes by switching to form Design view. To switch to form Design view, click the **Design View** button in the View gallery.

Now that we have the form we need, we can use the form to add some data to the CUSTOMER table.

FIGURE AW-1-35

The Form Wizard

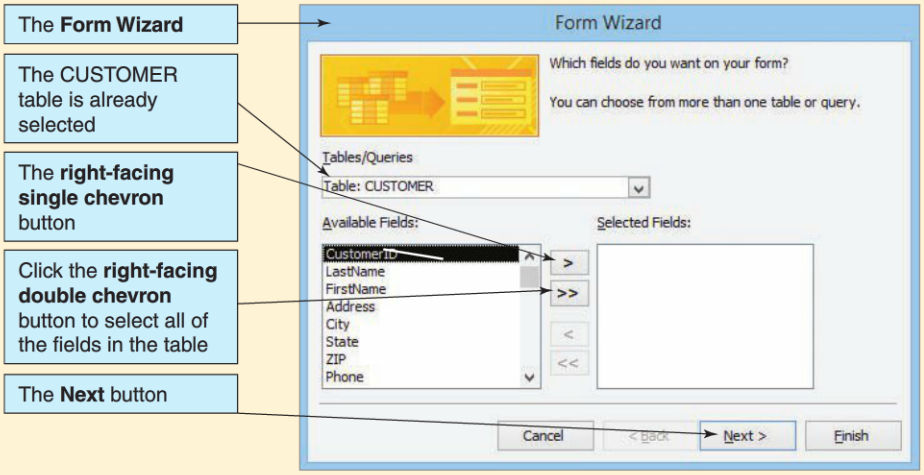
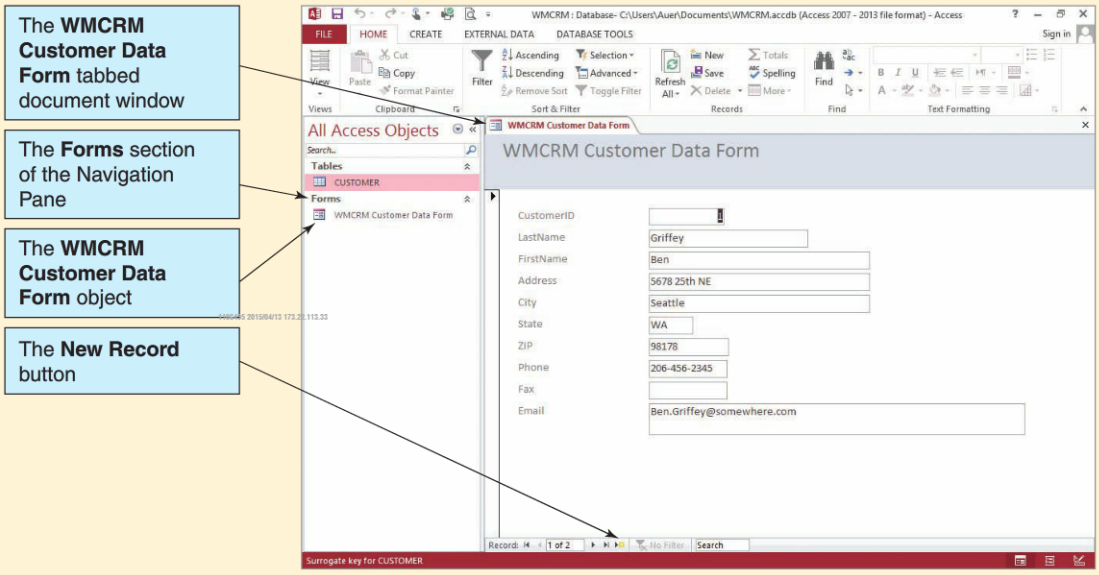


FIGURE AW-1-36

The Completed WMCRM Customer Data Form



Inserting Data into the CUSTOMER Table Using a Form

1. Click the **New Record** button. A blank form appears.
2. Click the **LastName** text box to select it. Enter the data for Rob Christman shown in Figure AW-1-24. You can either use the **Tab** key to move from text box to text box or you can click the text box you want to edit.
3. When you are done entering the data for Rob Christman, enter the data for Judy Hayes shown in Figure AW-1-24. After you have entered the data for Judy Hayes, your form will look as shown in Figure AW-1-37.
4. Click the **Close** button in the upper-right corner of the document window to close the WMCRM Customer Data Form.

Modifying Data and Deleting Records: Using a Form

Just as we can modify data and delete rows in Datasheet view, we can edit data and delete records by using a form. Editing data is simple: Move to the record you want to edit by using the **record navigation buttons** (First Record, Previous Record, etc.) shown in Figure AW-1-37, click the appropriate field text box, and then edit the contents. Deleting a record is also simple: Move to the record you want to edit by using the record navigation buttons and then click the *Delete Record* button in the Delete drop-down list of the Records group of the Home command tab, as shown in Figure AW-1-38. However, you will not use these capabilities at this time.

Creating Single-Table Microsoft Access Reports

One common function of an application is to generate printed reports. Microsoft Access 2013 has a report generator as part of its application generator functions. Just as with forms, we could build a form manually, or we can take the easy route and use the **Report Wizard**.

(Continued)

FIGURE AW-1-37

The WMCRM Customer Data Form for Customer Judy Hayes

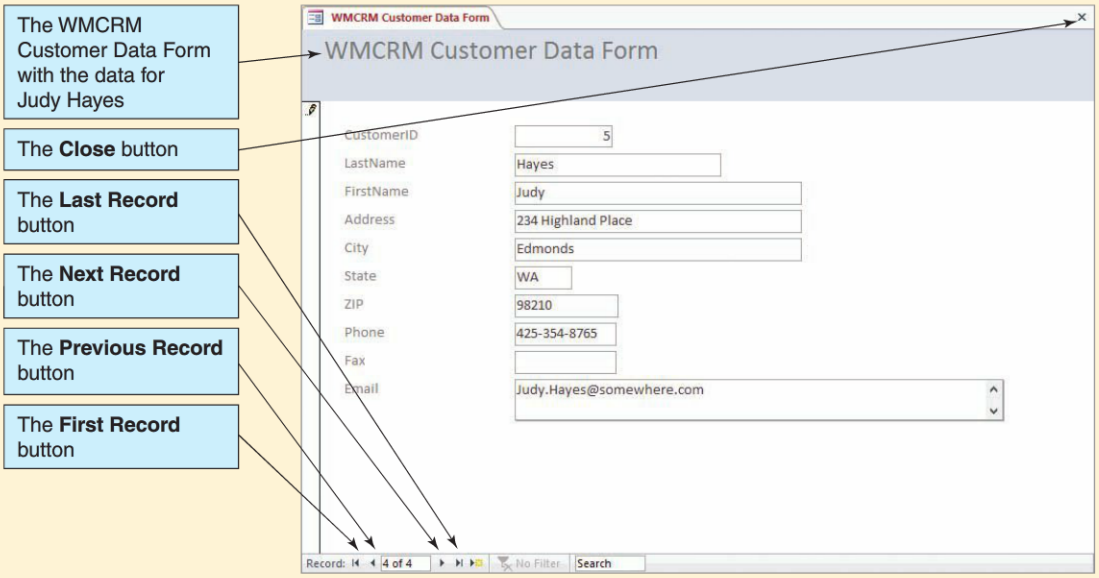


FIGURE AW-1-38

The Delete Record Button

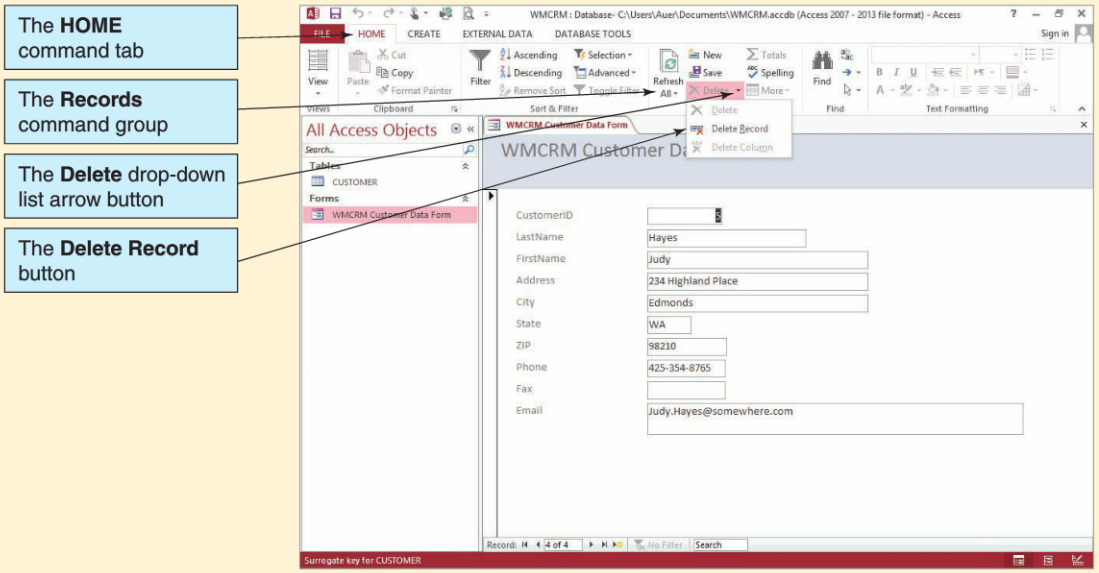
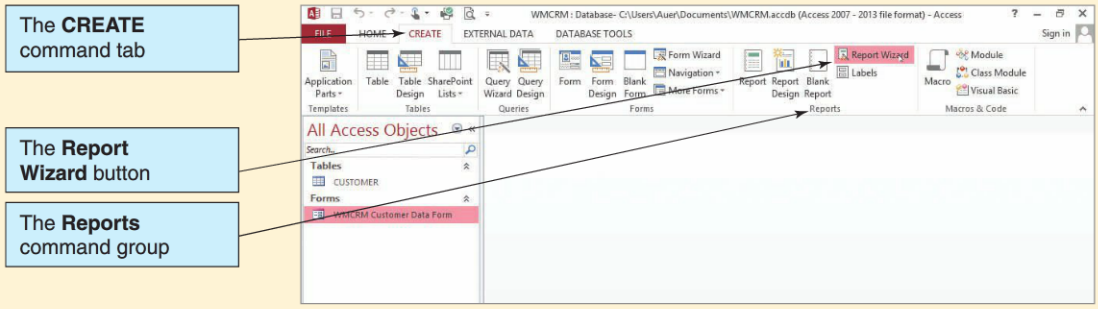


FIGURE AW-1-39

The Create Command Tab and Report Wizard Button

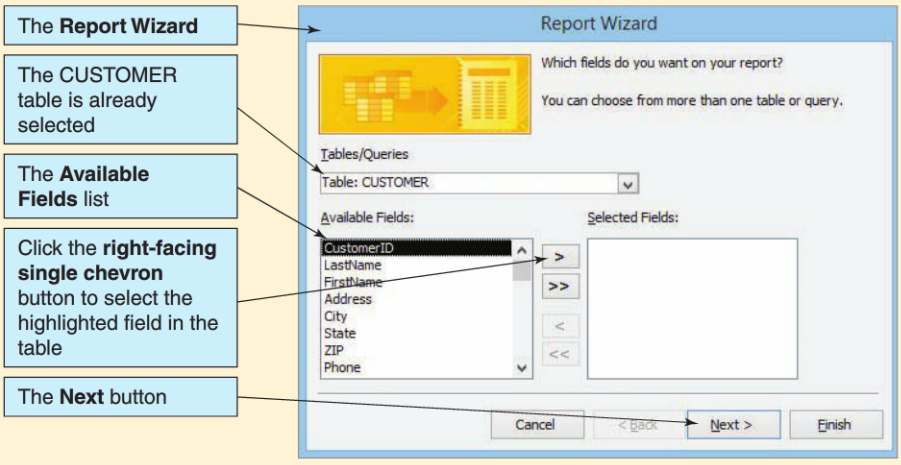


Creating a Report for the CUSTOMER Table

1. Click the **Create** command tab to display the Create command groups, as shown in Figure AW-1-39.
2. Click the **Report Wizard** button shown in Figure AW-1-39. The Report Wizard appears, as shown in Figure AW-1-40.
3. The CUSTOMER table is already selected as the basis for the report, so we only have to select which columns we want on the form. Just as with the Form Wizard, we can choose columns one at a time by highlighting the column name and clicking the right-facing single-chevron button. We can also choose all the columns at once by clicking the right-facing double-chevron button. In this case, we want to use only the columns **LastName**, **FirstName**, **Phone**, **Fax**, and **Email**. Click each column name in the Available Fields list

FIGURE AW-1-40

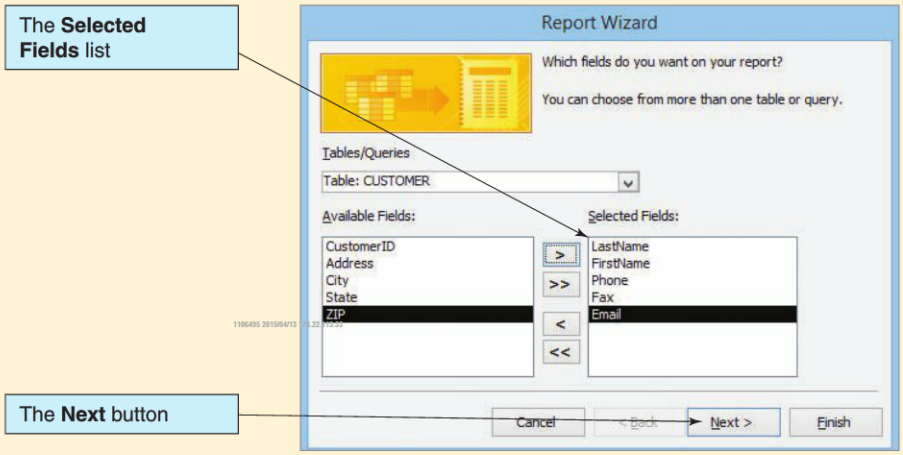
The Report Wizard



(Continued)

FIGURE AW-1-41

The Completed Column Selection



to select it and then click the **right-facing single-chevron** button to move each column to Selected Fields. The completed selection looks as shown in Figure AW-1-41.

- **NOTE:** You can select only one column at a time. The usual technique of selecting more than one column name at a time by pressing and holding the **Ctrl** key while clicking each additional column name does *not* work in this case.

4. Click the **Next** button.
5. Microsoft Access now asks, "Do you want to add any grouping levels?" Grouping can be useful in complex reports, but we do not need any groupings for this simple report that lists customers. Instead, we can use the default nongrouped column listing, so click the **Next** button.
6. As shown in Figure AW-1-42, we are now asked, "What sort order do you want for your records?" The most useful sorting order in this case is by last name, with sorting by first name

FIGURE AW-1-42

Choosing the Sort Order

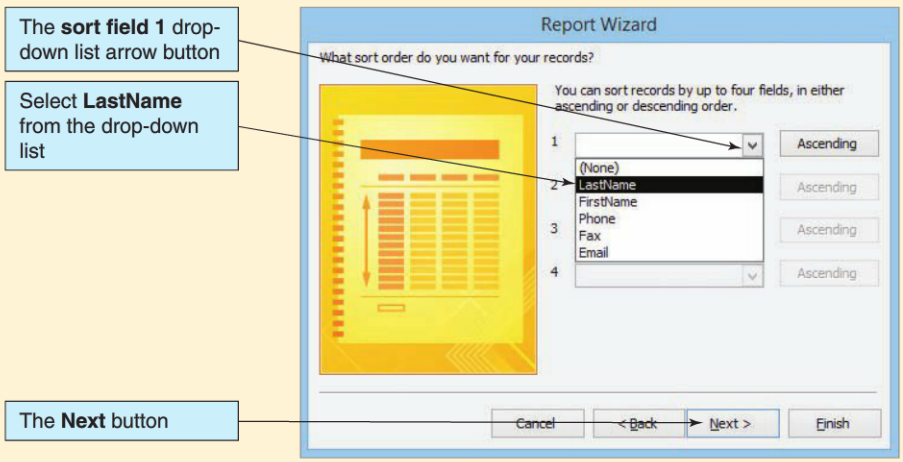
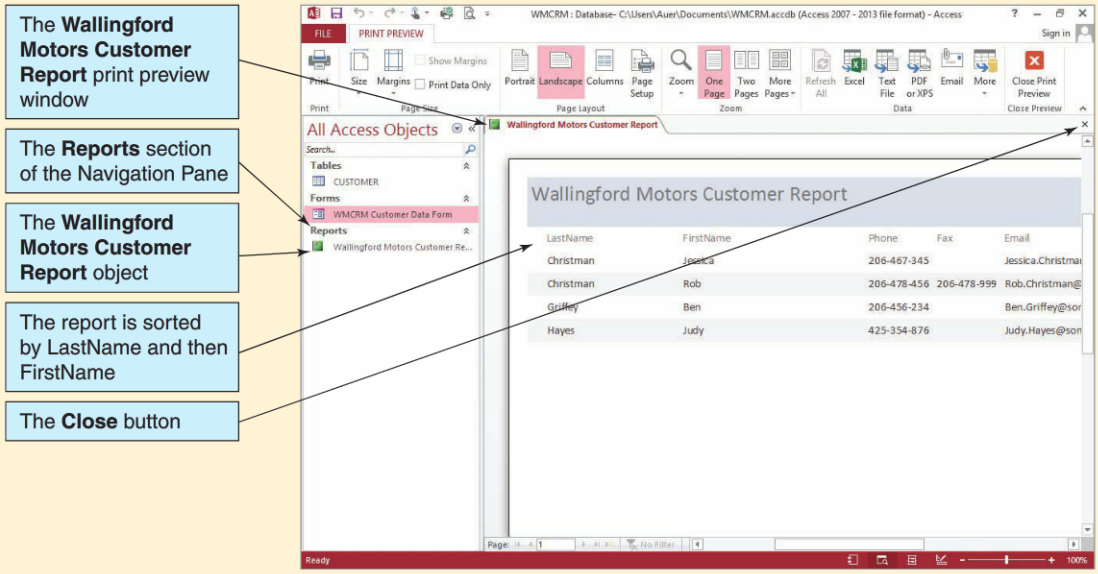


FIGURE AW-1-43

The Finished Report



for identical last names. For both sorts, we want an *ascending* sort (from A to Z). Click the **sort field 1** drop-down list arrow and select **LastName**. Leave the sort order button set to **Ascending**.

7. Click the **sort field 2** drop-down list arrow and select **FirstName**, leave the sort order button set to **Ascending**, and click the **Next** button.
8. We are now asked, "How would you like to lay out your report?" We will use the default setting of **Tabular Layout**, but click the **Landscape Orientation** radio button to change the report orientation to landscape. Click the **Next** button.
9. Finally, when we are asked, "What title do you want for your report?" we edit the report title to read **Wallingford Motors Customer Report**. Leave the **Preview the report** radio button selected. Click the **Finish** button. As shown in Figure AW-1-43, the completed report appears in a tabbed document window, a Reports section has been added to the Navigation Pane, and the Wallingford Motors Customer Report object appears in this section.
10. Click the **Close** button in the upper-right corner of the document window.

Closing a Database and Exiting Microsoft Access 2013

We have finished all the work we need to do in this chapter's "The Access Workbench." We have learned how to create a database; how to build database tables, forms, and reports; and how to populate a table with data by using Datasheet view and a form. We finish by closing the database and Microsoft Access.

Closing the WMCRM Database and Exiting Microsoft Access 2013

1. To close WMCRM: Database and exit Microsoft Access 2013, click the **Close** button in the upper-right corner of the Microsoft Access 2013 window.

(Continued)

SUMMARY

The importance of database processing increases every day because databases are used in information systems everywhere—and increasingly so. The purpose of this book is to teach you essential database concepts and to help you get started using and learning database technology.

The purpose of a database is to help people keep track of things. Lists can be used for this purpose, but if a list involves more than one theme modification problems will occur when data are inserted, updated, or deleted.

Relational databases store data in the form of tables. Almost always, the tables are designed so that each table stores data about a single theme. Lists that involve multiple themes need to be broken up and stored in multiple tables, one for each theme. When this is done, a column needs to be added to link the tables to each other so that the relationship from a row in one table to a row in another table can be shown.

Structured Query Language (SQL) is an international language for processing tables in relational databases. You can use SQL to join together and display data stored in separate tables, create new tables, and query data from tables in many ways. You can also use SQL to insert, update, and delete data.

The components of a database system are the database, the database management system (DBMS), one or more database applications, and users. A database is a self-describing collection of related records. A relational database is a self-describing collection of related tables. A database is self-describing because it contains a description of its contents within itself, which is known as metadata. Tables are related by storing linking values of a common column. The contents of a database are user data; metadata; supporting structures, such as indexes; and sometimes application metadata.

A database management system (DBMS) is a large, complicated program used to create, process, and administer a database. DBMS products are almost always licensed from software vendors. Specific functions of a DBMS are summarized in Figure 1-18.

The functions of database applications are to create and process forms, to process user queries, and to create and process reports. Application programs also execute specific application logic and control the application. Users provide data and data changes and read data in forms, queries, and reports.

DBMS products for personal database systems provide functionality for application development and database management. They hide considerable complexity, but at a cost: Requirements unanticipated by DBMS features cannot be readily implemented. Enterprise-class database systems include multiple applications that might be written in multiple languages. These systems may support hundreds or thousands of users.

An example of a personal database system is Microsoft Access 2013, which is discussed in this book in chapter sections titled "The Access Workbench." These sections cover all the basic knowledge that you need to create and use databases in Microsoft Access 2013.

Examples of enterprise-class DBMS products include Microsoft SQL Server 2014, Oracle MySQL 5.6, and Oracle Database Express Edition 11*g* Release 2. Information about these DBMS products is provided in Appendix A, "Getting Started with Microsoft SQL Server 2014 Express Edition"; Appendix B, "Getting Started with Oracle Database Express Edition 11*g* Release 2"; and Appendix C, "Getting Started with Oracle MySQL 5.6 Community Server."

NoSQL refers to nonrelational databases used in Web 2.0 applications such as Facebook and Twitter. NoSQL databases are discussed in Chapter 8 and Appendix K, "Big Data."