Database Management

A **database** is a collection of an organised logically related data.

Data refers to the raw facts that can be recorded and stored on computer media, such facts could be in any format; for example, text, graphics, and images.

Information is processed data that could be used for further information processing.

A **database application** is a **software** package that lets us create, access, manipulate and manage data in a database; i.e. sort, edit, index, update, filter, etc.

Relational Database Management Systems (RDBMS) – is a database collection of tables that are interrelated or interlinked to be treated as a sing unit or entity.

Advantages of data in DBMS

- Data is **shared** among different users and applications.
- Data exist **permanently** and it can live beyond the scope of the process that created it.
- **Valid** and correctness since data can be validated before it is saved to the tables.
- Data is **secure** and **protected** from un authorized access using passwords and access codes.

- Non-redundancy - Eliminates or decreases duplication of data in the same container.

- Files are saved automatically as they are adjusted.

Disadvantages of DBMS

- They are complex, costly and take much time to develop.
- Organization security may be compromised since a database is used by many people.
- They are difficult to thoroughly test and audit errors.
- Initial expense is high.

- Requires special skills to handle.
- Vulnerability - data in the database may be exposed to software and hardware failure, sabotage, theft, destruction, etc.
- Requires Routine Backup which at times is very time consuming.

Examples of database applications

- Microsoft Access,
- FoxPro,
- Paradox,
- Oracle,
- Structured Query Language (SQL),
- Crystal Reports,
- Claris FileMaker Pro,
- Lotus Approach

Application/Uses of databases

- Storage of data.
- Ensure easy and efficient retrieval of data.
- To keep the data secure.
- To protect data from wear and tear.
- To sort records.
- To generate reports.

Forms of databases

Databases generally can be classified in four forms or types:

1. Manual databases,
2. Electronic databases
3. Flat-file (single-file) databases
4. Relational databases.

Features of database software

- Create a database structure to accommodate data.
- Enter data easily, quickly and organize records in different ways i.e. sorted and indexed order.
- Locate specific records i.e. search and find.
- Eliminate duplicate data say by editing e.g. deleting and retyping.

- Create relationships between tables.
- Ask questions about your data and get answers using queries.
- Create data entry forms.
- Create professional good-looking reports.
- Change appearance of information, i.e. perform some formatting etc.

Manual databases

- Manual systems are the traditional filing systems where individuals manually record information and file them in physical paper records, folders and filing cabinets; a filing cabinet is where all related information on a particular subject is kept.

- Examples of manual databases include the post office directory books where information such as subscribers' names and addresses are recorded, contact lists, library cards etc.

Disadvantages of manual databases

- Finding records can be a time-consuming process.
- Files and folders can be easily misplaced if they are not filed properly.
- These databases require large amounts of physical storage space.
- Cross-referencing information between files is difficult.
- Accessing information from another location (e.g. another office) is difficult.
- There is unnecessary duplication of data.

Flat-file Database Systems

- A flat-file system is a computerised filing system where all the data is stored at the same level (root) on a storage medium such as a hard disk or floppy disk.

- It is relatively static and the data is not structurally related; that means the data in the flat file is not linked to any other files, so there is little that can be accomplished with the information other than editing, reading, and storing data.

Disadvantages of flat-file database

- Unnecessary duplicate data since Flat-file systems cannot relate one file to another.
- Flat-file systems offer limited user access.
- It is not possible to request and retrieve data from various files at the same time.
- Retrieving data is slow because users needs to read it line by line to obtain needed information.

Relational Database

- A relationship is the situation that exists between two or more relational database tables when one table has a field (**foreign key**) that references the primary key of the other table.

- A relational database has more than one table and the tables are linked using keyfields. i.e. each tables shares atleast one field with another table in a “one to one” relationship, or with other tables in a “one to many” or “many to many” relationship.

Advantages of Relational Database

- The relational database is easier to edit, modify and query than other models.
- Use queries in an optimum manner means faster data retrieval and efficient reporting.
- They support different platforms such as Linux, Windows, and Apple Mac.
- Less storage space is required to store large amount of data compared to manual systems.

- Relational databases have excellent security which allows database administrators to implement data access permissions.
- Data being entered can be easily validated, thereby preventing mistakes on entry.
- Searching for specific data is quick and easier than using paper records.
- It ensures data security through access controls.

DISADVANTAGES OF DATABASE MANAGEMENT SYSTEMS

- Computer breakdown can cause files to become inaccessible or corrupted.
- It is easy to copy or steal files unless the files are stored and protected carefully.
- Database administration requires training, which may take some time.
- Searching the database can be time consuming in the case of very big databases.

DATABASE CONCEPTS.

- A database management system (DBMS) is a specialised computer software program that manages databases.

- It controls the organisation, storage, management, and retrieval of data in a database.

- a **database file** is the entire database.

- a **table** is a basic/primary unit of a database and contains data on a specific topic, e.g. all the personal information about all the members of a video club. **tables** are made up of Columns that contain Fields, and Rows that contain Records.

- A **field** is an area within a record reserved for one specific piece of data, e.g. the address of one video club member. Tables therefore have multiple fields.

- A **field name** describes the nature of the contents of the field, for example *name* or *Date of birth*.

A **primary key** is a field, or a collection of fields, whose values uniquely identify each record in a table.

- **Data type** specifies the way the data is represented on the disk and in RAM. The different data types are described later in the chapter.

- A **foreign key** is a column in one table referring to a primary key in another.
- **Data** is the information that is held in the table fields.
- A **record** is a group of related fields containing information for an individual record. e.g. student and exam marks.

- A **field definition/property** is the set of attributes that describe a field.

- **Query** is a database tool used to locate and retrieve information from a database using a set of commands or expressions.

- A **form** is a graphical representation of a table. It allows you to create a more visually pleasing display for data entry.

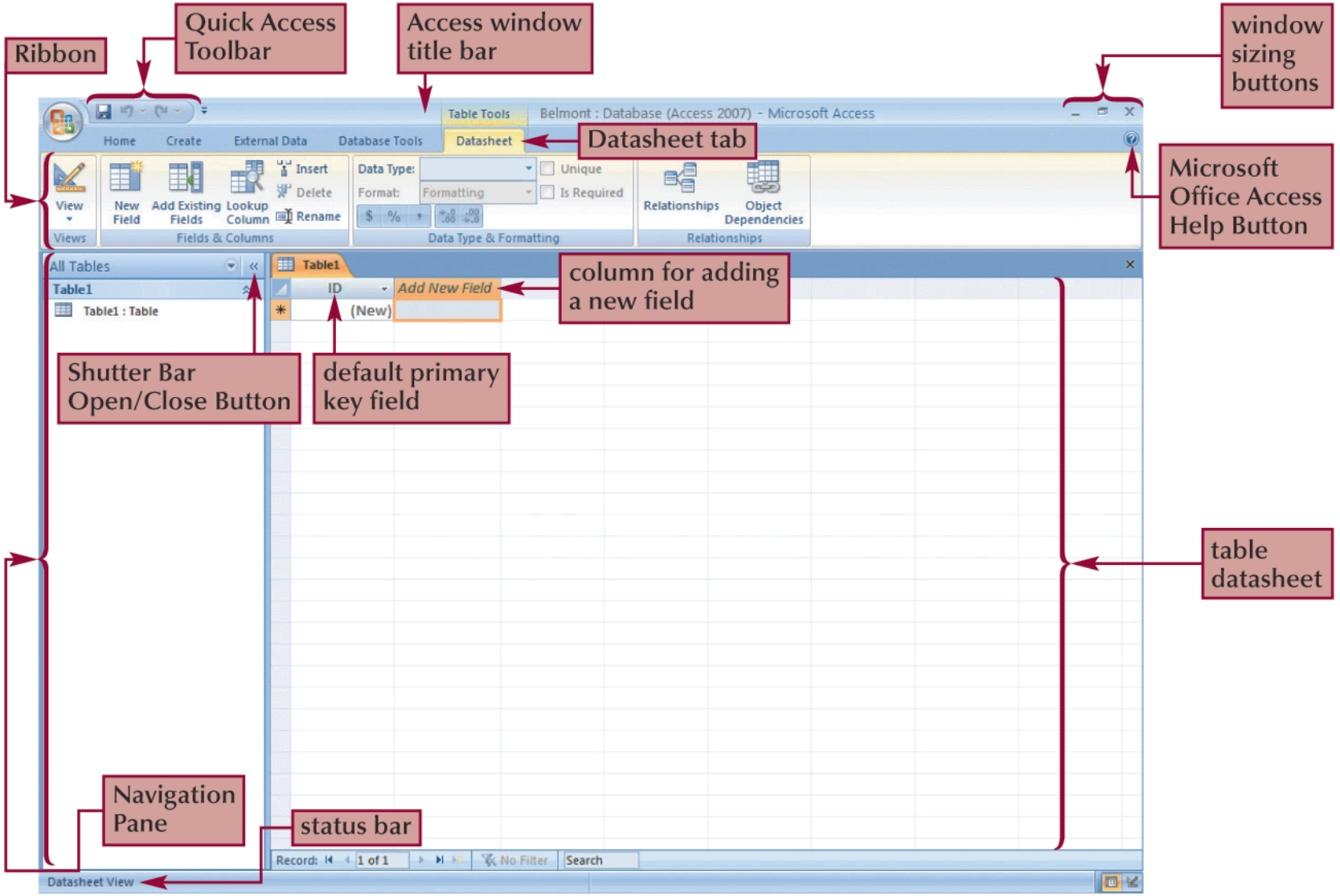
- **Report** a tool used to present a selected set of contents from the database in a format that is easy to mentally interpret.

CREATING A DATABASE

Creating and Saving a Database

- Click Start
- All Programs
- Microsoft Office
- Select Microsoft Office Access
- Choose blank database.
- Browse for save location by clicking folder icon
- Choose location to save database.
- Enter filename of the database
- Click Create button.

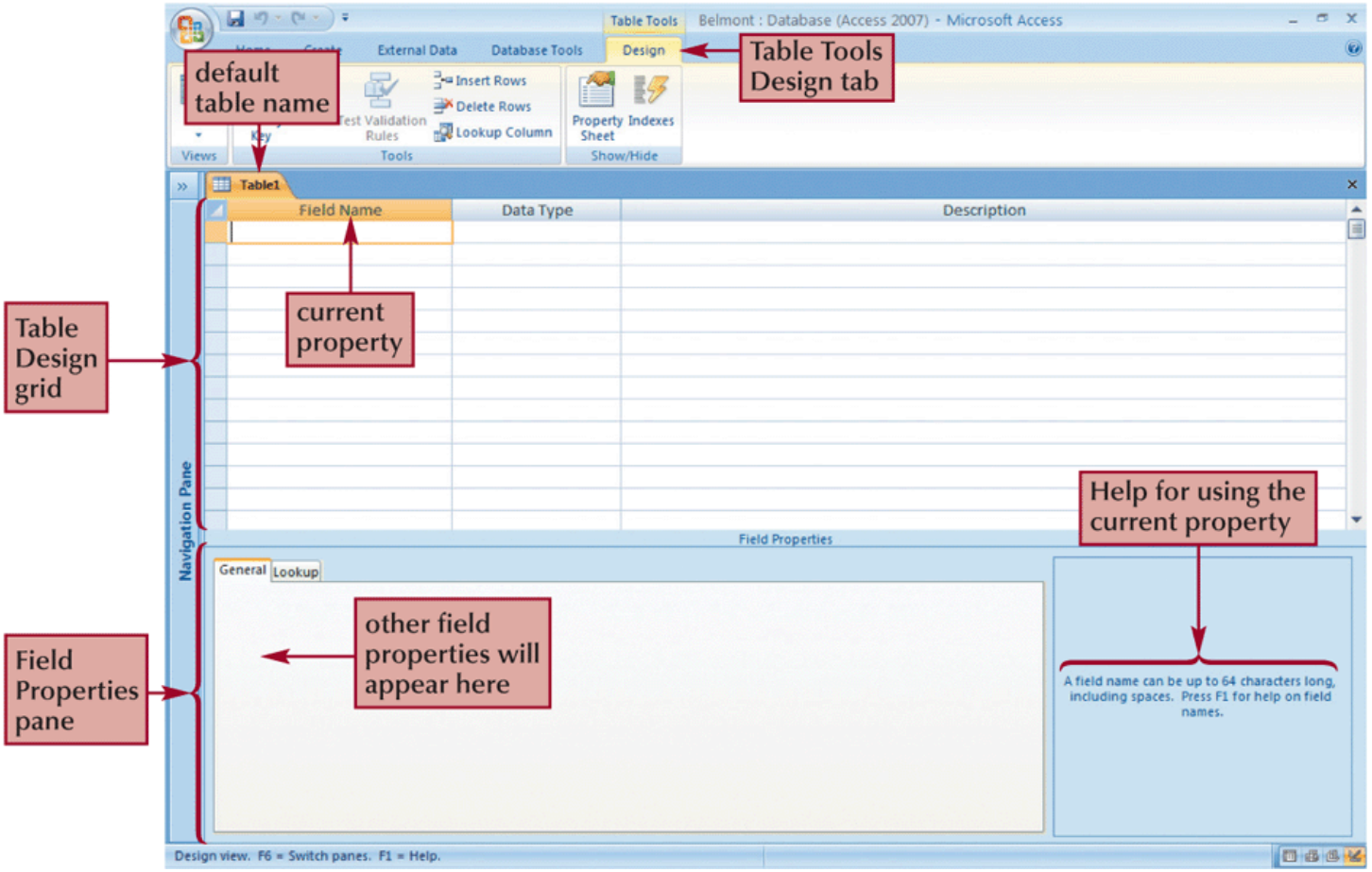
Microsoft Access window Figure 1-5



WORKING WITH TABLES

Creating a Table in Design View

Table window in Design view — Figure 2-11

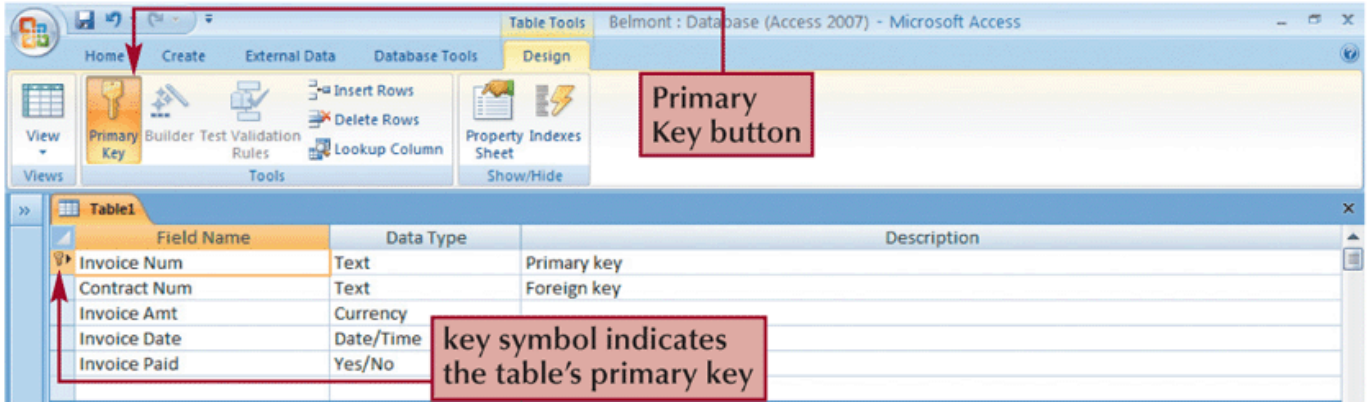


Setting the Primary Key in Design View

- In the Table window in Design view, click in the row for the field you've chosen to be the primary key.

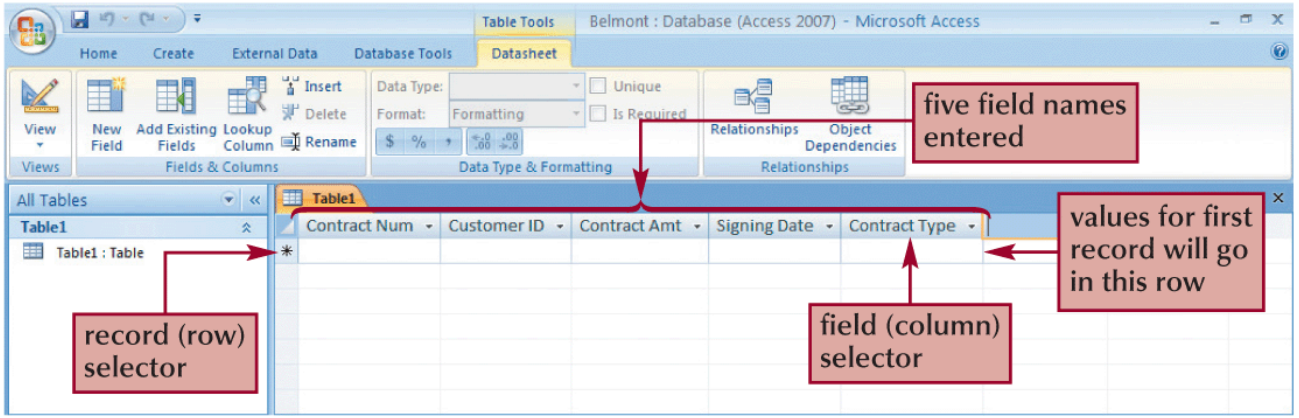
- In the Tools group on the Table Tools Design tab, click the Primary Key button/Icon.

Figure 2-18 Invoice Num field selected as the primary key



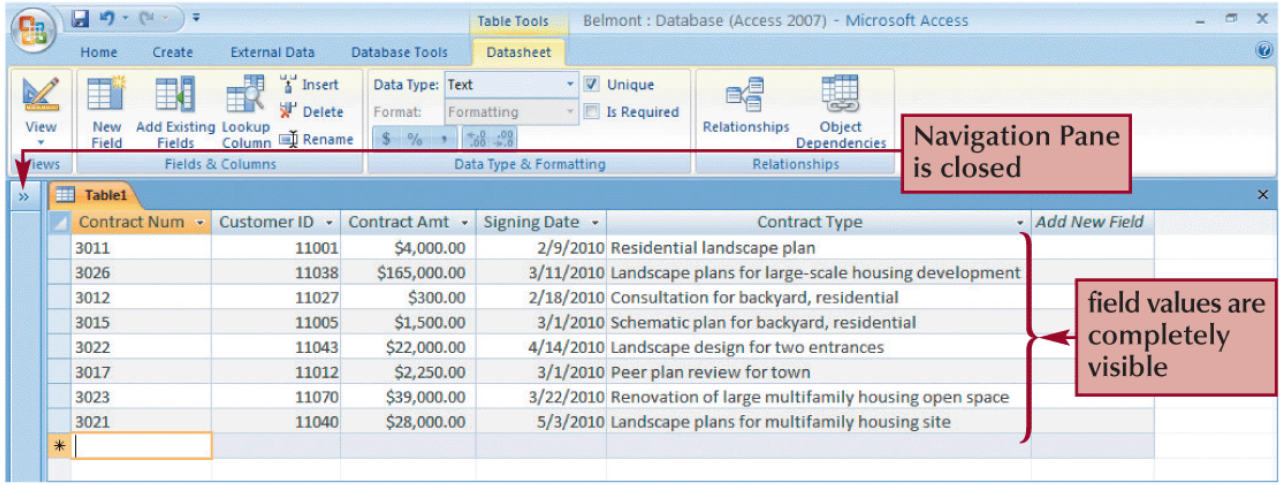
Creating a Table in Datasheet View

Figure 1-11 Table with field names entered



Entering Records

Datasheet with eight records entered — Figure 1-14



Saving a Table

- Click the Save button on the Quick Access Toolbar. The Save As dialog box opens.

- In the Table Name text box, type the name for the table.

- Click the OK button

DATA TYPES

- Text - Text or combinations of text and numbers that don't require calculations, such as phone numbers. – Can contain upto 255 characters.

- Memo - Lengthy text or combinations of text and numbers - Up to 65,535 characters.

- Number – Integers, decimals data that can be used in mathematical calculations.

- Date/Time - Date and time values for the dates, years 100 through 9999

- Currency – Monetary values. e.g Salary, Fees
- AutoNumber - A unique sequential number or random number assigned by Microsoft Access whenever a new record is added to a table.
- Yes/No - Yes and No values and fields that contain only one of two values (Yes/No, True/False, or On/Off).

- OLE Object – Allows user to embed objects like Spreadsheet, Video, Sound, documents and other binary data to a Microsoft Access table.
- Hyperlink – Links like web addresses and emails.
- Attachment – Allows user to store files in the data base
- Lookup- Allows user to lookup values from another table.

FIELD PROPERTIES

Field Size**:** Specifies maximum number of characters to be stored in that field. When used the extra characters will be rejected,

Format**:** Specifies how data is displayed which may be default or custom. e.g long/short date, scientific, standard number and currency fields.

Input mask. Specifies the pattern or predefined format for data to be entered in that field e.g. (--/--/--) ie dd/mm/yy.

Caption. This is a default label in a form or report e.g. DOB for date of birth, L/name for lastname etc.

Default Value**.** A value that appears in the field automatically even before you enter anything i.e. it works as a placeholder e.g. MSMN/ _ e.t.c.

Validation rule. Expression that limits the values to be entered in the field. e.g. "F" or "M" for sex, >=10 for age, "married" or "Single" for marital status.

Validation Text. Error message that appears when a value prohibited by the validation rule is entered in a field. e.g. Enter M or F for sex.“

Required - Specifies whether or not an entry must be entered in that field i.e. if **yes** you must type an entry but if No, you may proceed without entering anything.

Indexed - It specifies whether or not duplicates should be allowed in a field.

Importing Data from an Excel Worksheet

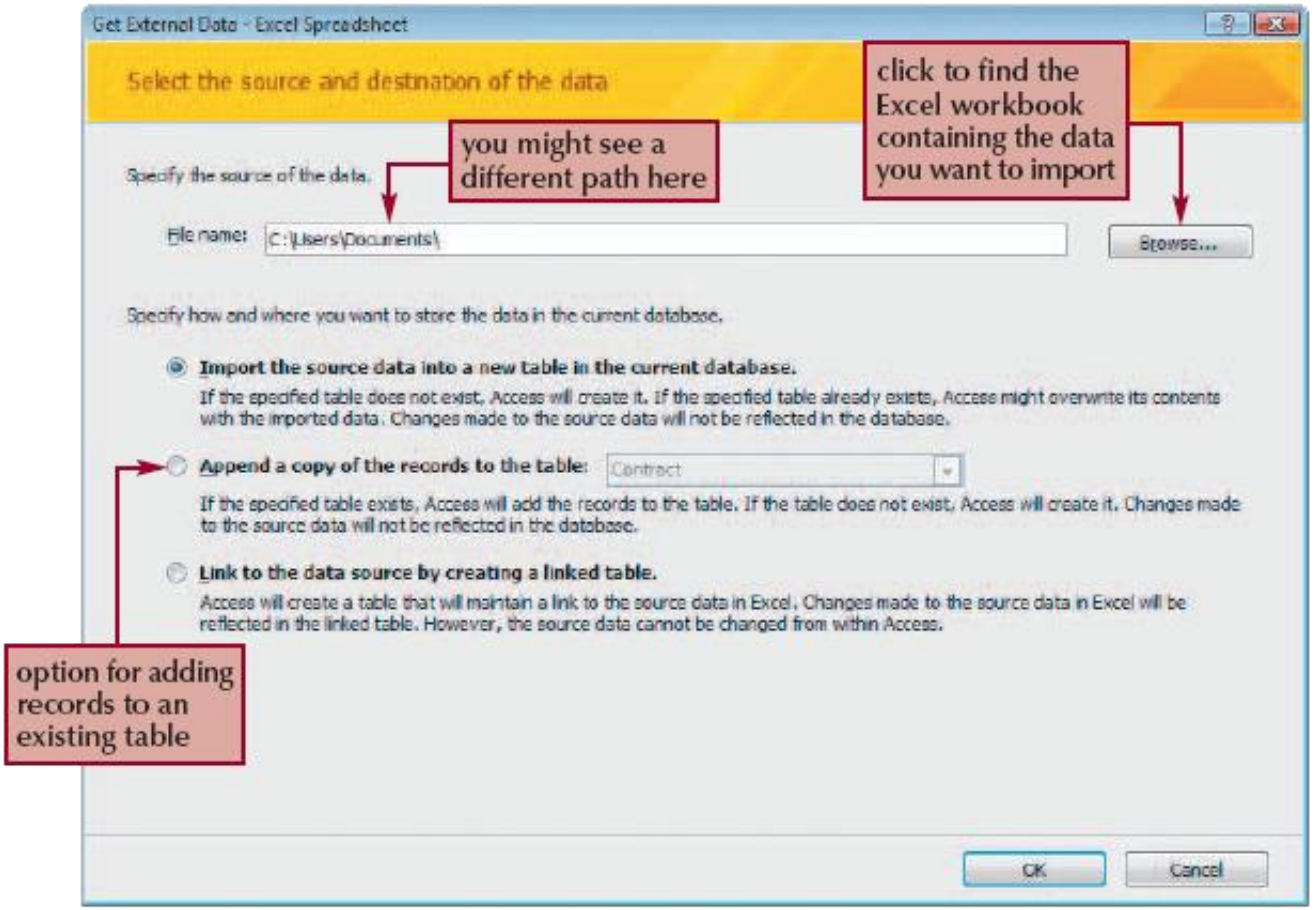
- The **import** process allows you to copy the data from a source without having to open the source file.

- Click **External Data** on the Ribbon.

- Click the **Excel** button in the Import group to start the wizard

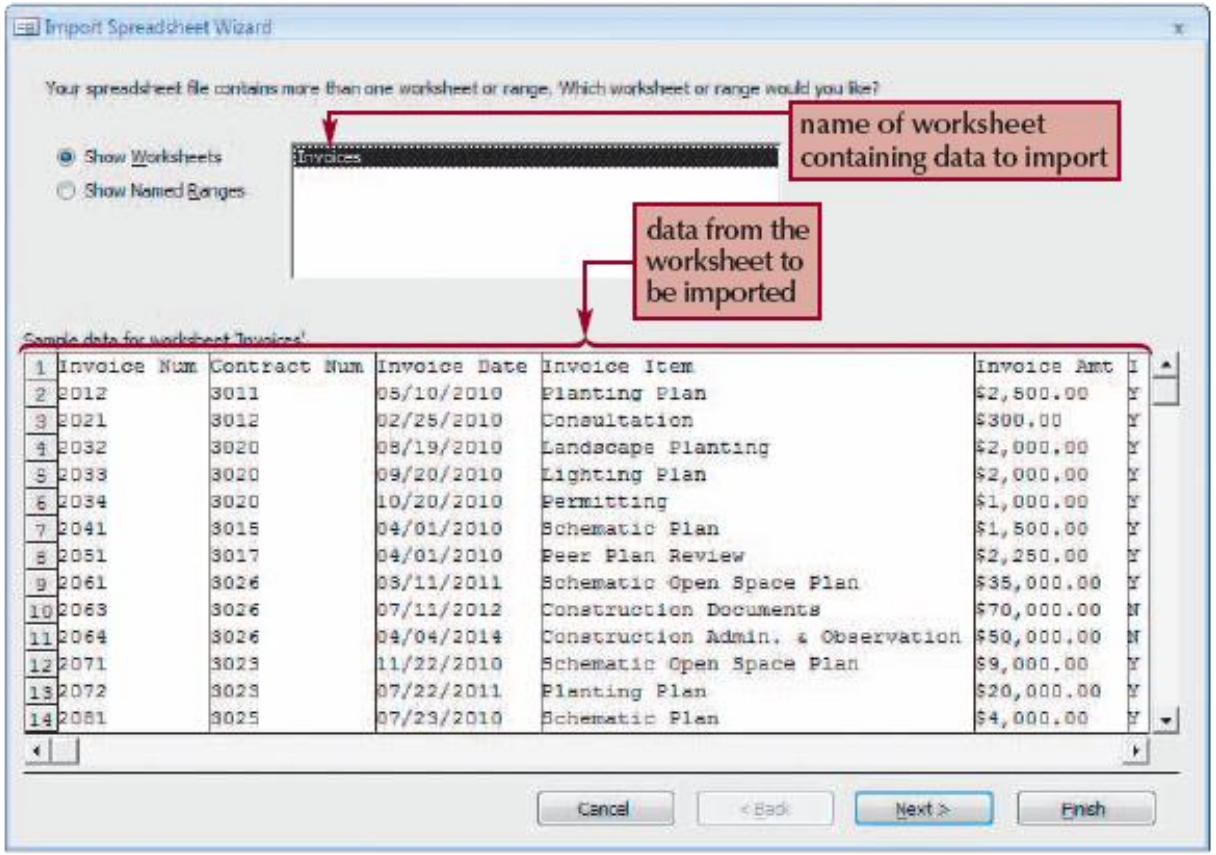
Importing Data from an Excel Worksheet

Get External Data - Excel Spreadsheet dialog box — Figure 2-26



Importing Data from an Excel Worksheet

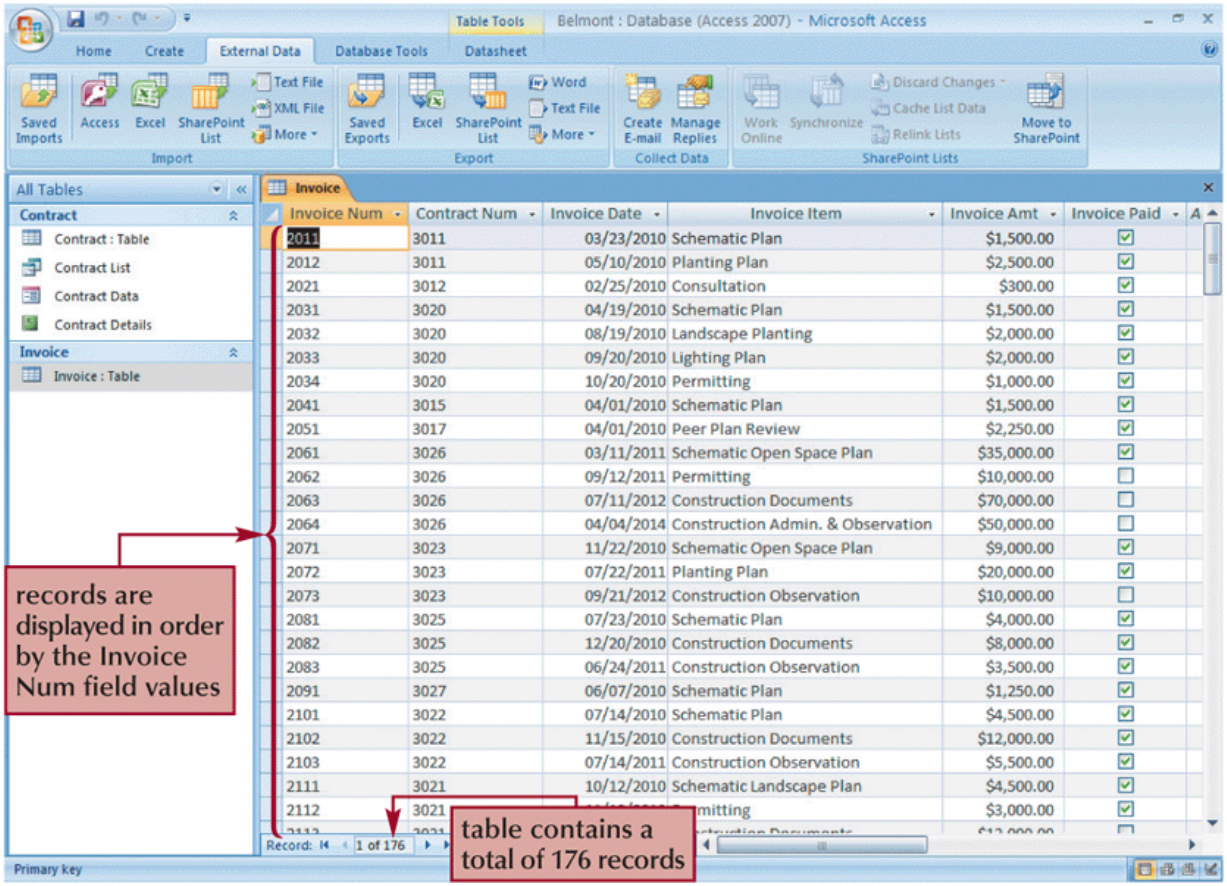
Figure 2-27 First Import Spreadsheet Wizard dialog box



	Invoice Num	Contract Num	Invoice Date	Invoice Item	Invoice Amt	I
2	2012	3011	05/10/2010	Planting Plan	$2,500.00	N
3	2021	3012	02/25/2010	Consultation	$300.00	N
4	2032	3020	08/19/2010	Landscape Planting	$2,000.00	N
5	2033	3020	09/20/2010	Lighting Plan	$2,000.00	N
6	2034	3020	10/20/2010	Permitting	$1,000.00	N
7	2041	3015	04/01/2010	Schematic Plan	$1,500.00	N
8	2051	3017	04/01/2010	Peer Plan Review	$2,250.00	N
9	2061	3026	03/11/2011	Schematic Open Space Plan	$35,000.00	N
10	2063	3026	07/11/2012	Construction Documents	$70,000.00	N
11	2064	3026	04/04/2014	Construction Admin. & Observation	$50,000.00	N
12	2071	3023	11/22/2010	Schematic Open Space Plan	$9,000.00	N
13	2072	3023	07/22/2011	Planting Plan	$20,000.00	N
14	2081	3025	07/23/2010	Schematic Plan	$4,000.00	N

Importing Data from an Excel Worksheet

Invoice table after importing data from Excel — Figure 2-28



WORKING WITH QUERIES

- A Query is a database object used to retrieve specific data based on a criteria/query.

- The **Simple Query Wizard** allows you to select records and fields quickly

Updating a Database

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

Uses of queries

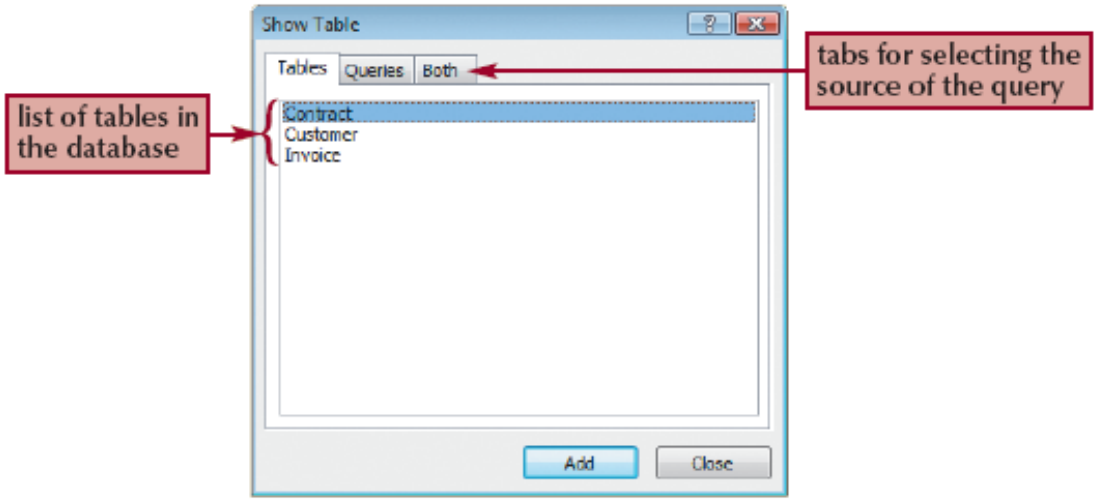
- Display selected fields and records from a table
- Sort records
- Perform calculations
- Generate data for forms, reports, and other queries
- Update data in the tables in a database
- Find and display data from two or more tables

Creating Queries

- Click the **Create** tab on the Ribbon.

- In the Other group on the Create tab, click the **Query Design** button

Show Table dialog box Figure 3-5



Query Design

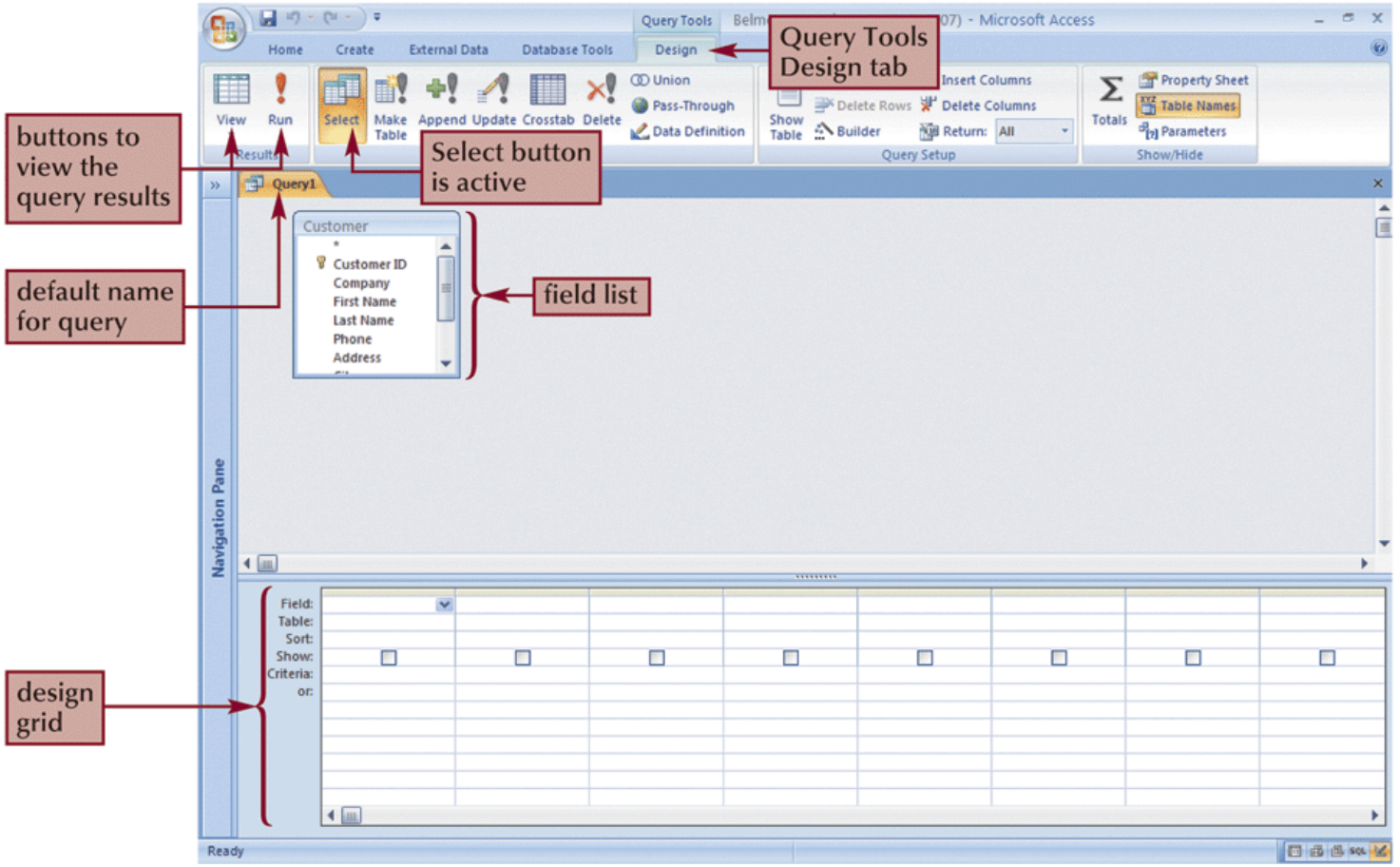
- The Show Table dialog box lists all the tables in the Belmont database.

- Click **Customer** in the Tables list box, click the **Add** button, and then click the **Close** button.

- Access places the Customer table's field list in the Query window and closes the Show Tables dialog box.

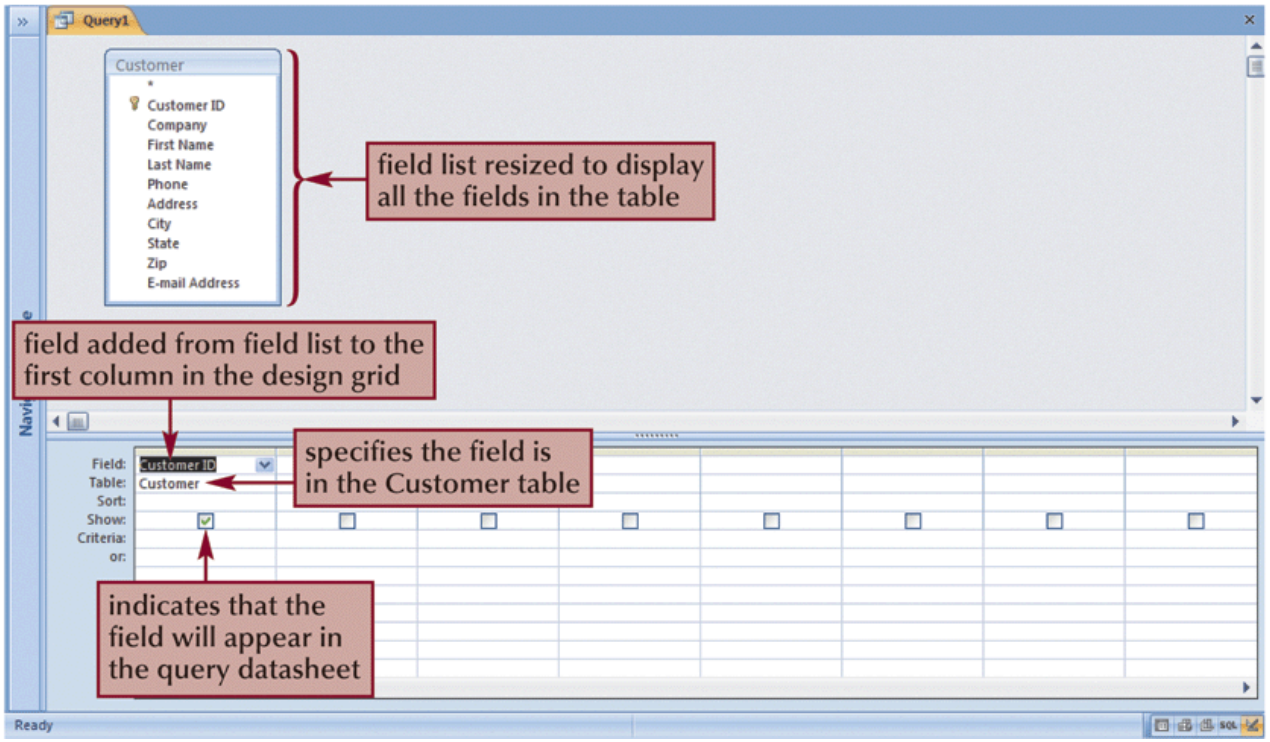
Query Design Window

Figure 3-6 Select query in Design view



Creating and Running a Query

Figure 3-7 Field added to the design grid



Running a Query

- Click the Save button on the Quick Access toolbar. The Save as dialog box opens.
- Type **Customer E-mail** in the Query Name text box and then press the **Enter** key.
- Access saves the query and displays the name on the tab for the query.

Creating a Calculated Field

- In addition to using queries to retrieve, sort, and filter data in a database, you can use a query to perform calculations
  - **Expression Builder** is an Access tool that makes it easy for you to create an expression
- Open the query in Design view
- In the design grid, position the insertion point in the Field text box of the field for which you want to create an expression
- In the Query Setup group on the Query Tools Design tab, click the Builder button
- Use the expression elements and common operators to build the expression, or type the expression directly
- Click the OK button

Creating a New Query That Will Inclue a Calculated Field

- Click the **Create** tab on the Ribbon and then click the **Query Design** button in the Other Group.
- Add the **Contract** and **Invoice** tables to the Query Window and then close the Show Tables dialog box.
- Add the **Contract Num** and **Contract Amt** fields from the Contract field list to columns 1 and 2.
- Add **Invoice Item**, **Invoice Paid**, and **Invoice Amt** fields from the Invoice table to columns 3 to 5.
- In the **Invoice Paid Criteria** text box, enter **No**,

Creating a Calculated Field

- Click the Invoice Paid Show check box and remove the check.
- Save the query with the name Unpaid Invoices With Late Fees.

Creating a Calculated Field

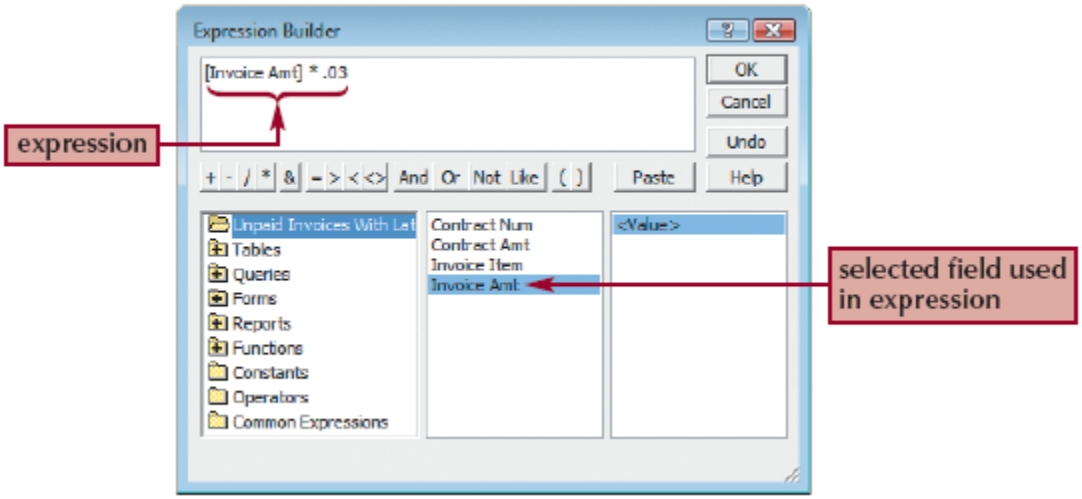
- Click the blank Field text box to the right of the Invoice Amt field. The calculated field will be placed in this box.
- In the Query Setup group on the Query Tools Design tab, click the Building button. Access opens the Expression Builder dialog box.
- Enter the **Invoice Amt** field in the expression either by double-clicking or clicking once and then clicking the **Paste** button.
- Click the ***** button in the row of common operators and then enter **.03**.

Creating a Calculated Field

- You have now completed the expression. It should read **Invoice Amt * .03**, as shown on the next slide.
- Click the OK button to close the Expression Builder dialog box and add the expression in the design grid of the Field text box.
- Press the Home key to position the insertion point to the left of the expression.
- Enter “Late Fee”:
- Run the query. Access displays the query datasheet, which includes the calculated field with the name “Late Fee.”

Creating a Calculated Field

Completed expression for the calculated field — Figure 3-33



Tip

You can also type an expression directly into the expression box, instead of clicking field names, operators, and so on.

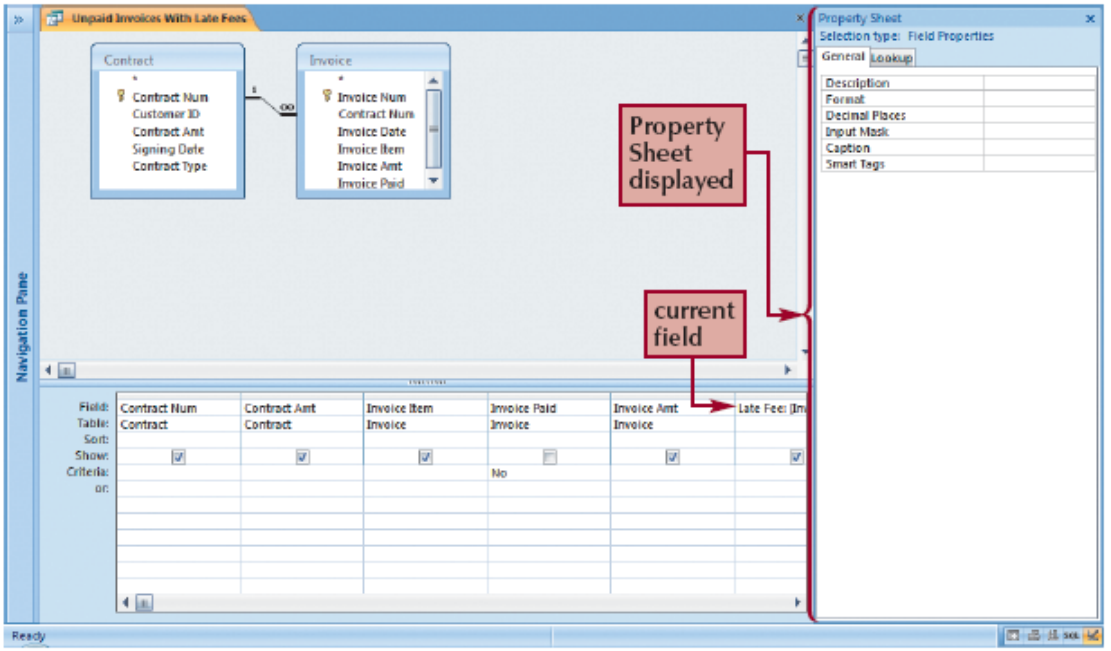
Formatting a Calculated Field

- Switch to Design view.
- Right-click the **Late Fee** calculated field in the design grid to open the shortcut menu and then click on **Properties** in the menu.
- In the Property Sheet for the calculated field, as shown on the next slide:
  - Click the right side of the **Format** text box to display a list of formats and then click on **Currency**.
  - Click the right side of the **Decimal Places** text box and then click on **2**.
- Close the Property Sheet and run the query. The amounts in the calculated field are displayed with dollar signs and two decimal places.
- Save the query and then close it.

Formatting a Calculated Field

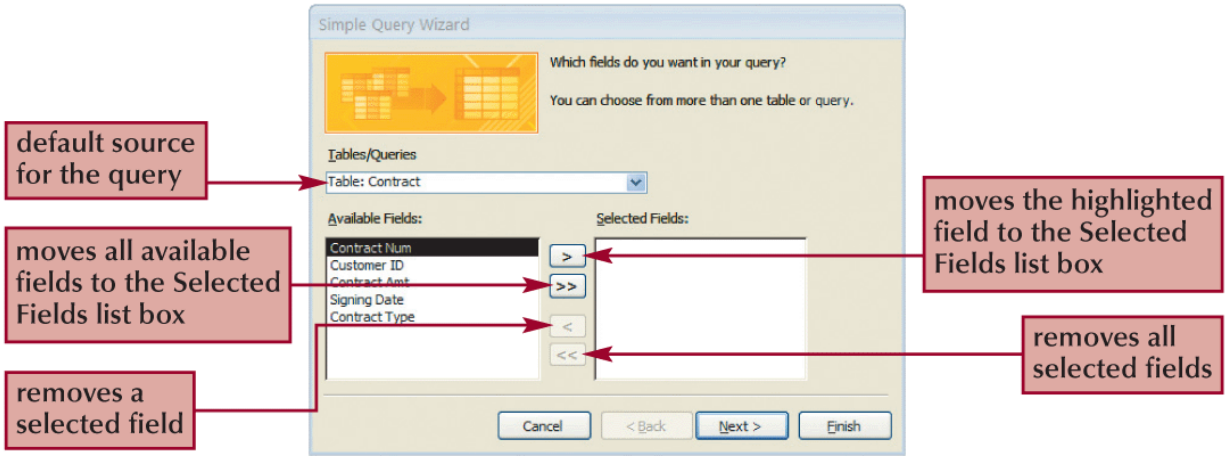
- You can specify a particular format for a calculated field, just as you can for any field, by modifying its properties

Figure 3-35 Property Sheet for the calculated field



Creating a Simple Query

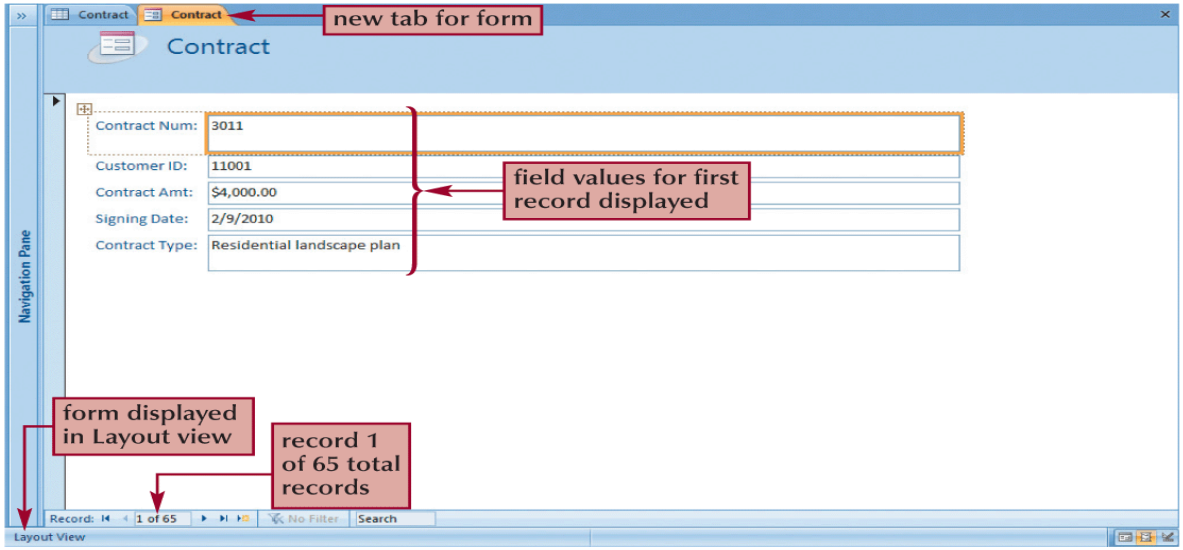
Figure 1-22 First Simple Query Wizard dialog box



WORKING WITH FORMS

- A **form** is an object you use to enter, edit, and view records in a database
- You can design your own forms, use the Form Wizard, or use the **Form tool** to create a simple form with one mouse click.

Form created by the Form tool **Figure 1-24**



Uses of forms

- Used to view and enter data for one record at a time.
- Viewing records. The Filter tool is used to view records that match a given criteria.
- Sorting records. This means arranging the records in a database either alphabetically, numerically.
- Performing calculations on table data.

WORKING WITH REPORTS

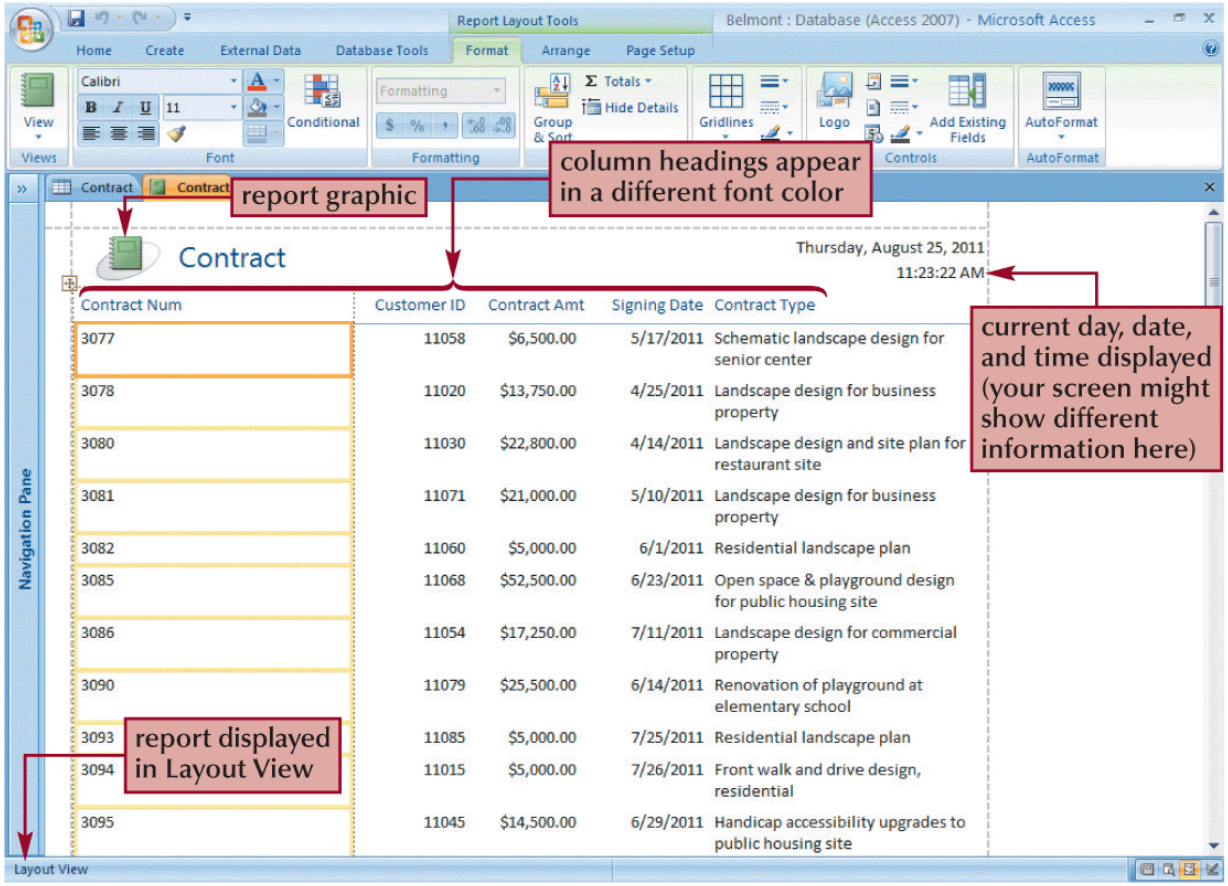
- A **report** is a formatted printout (or screen display) of the contents of one or more tables in a database.

- A report can be generated from a query, filter or table.

- The report can be formatted in a wide variety of ways to suite the desired purpose

Creating a Simple Report

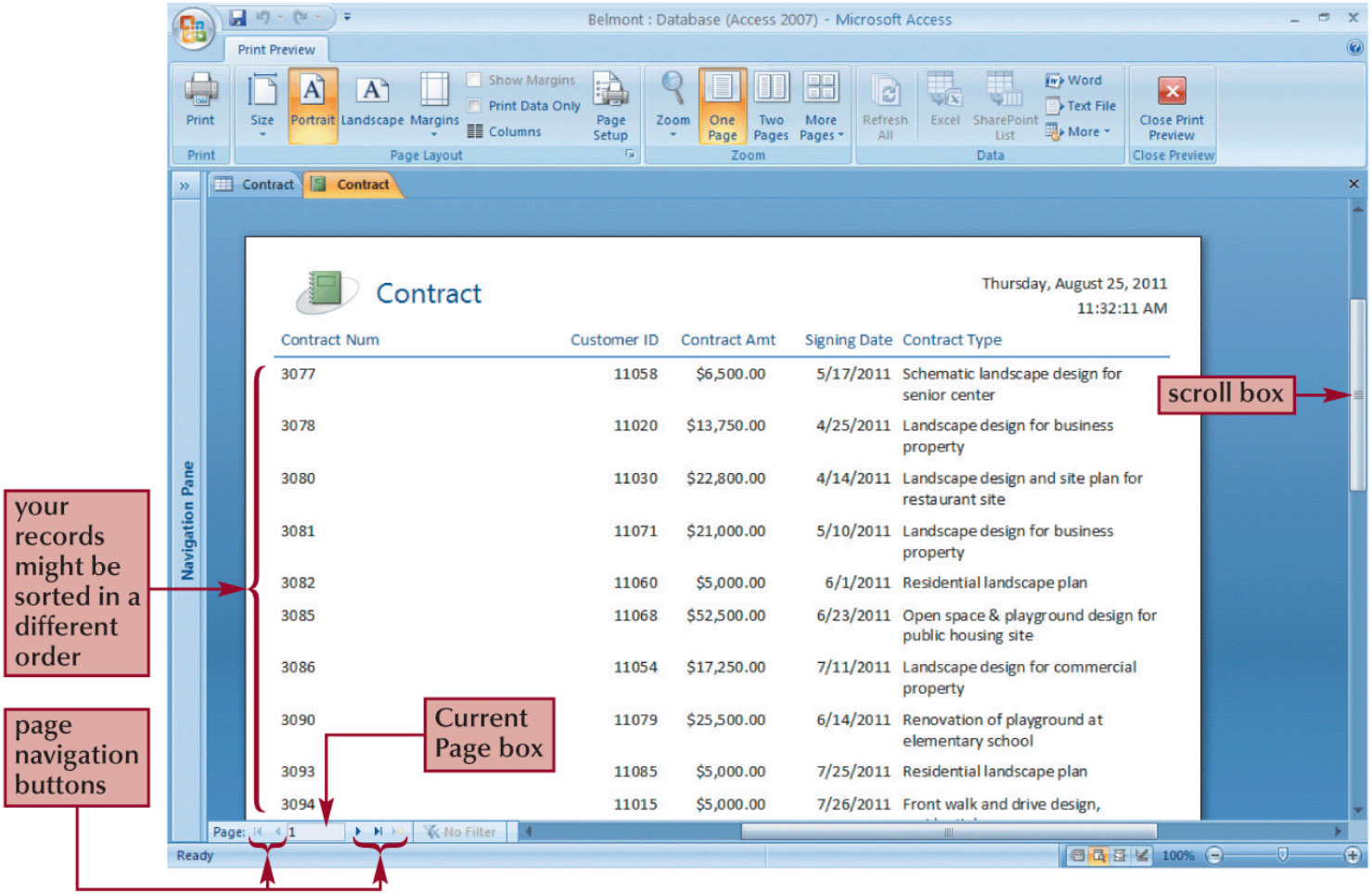
Report created by the Report tool — Figure 1-25



Contract Num	Customer ID	Contract Amt	Signing Date	Contract Type
3077	11058	$6,500.00	5/17/2011	Schematic landscape design for senior center
3078	11020	$13,750.00	4/25/2011	Landscape design for business property
3080	11030	$22,800.00	4/14/2011	Landscape design and site plan for restaurant site
3081	11071	$21,000.00	5/10/2011	Landscape design for business property
3082	11060	$5,000.00	6/1/2011	Residential landscape plan
3085	11068	$52,500.00	6/23/2011	Open space & playground design for public housing site
3086	11054	$17,250.00	7/11/2011	Landscape design for commercial property
3090	11079	$25,500.00	6/14/2011	Renovation of playground at elementary school
3093	11085	$5,000.00	7/25/2011	Residential landscape plan
3094	11015	$5,000.00	7/26/2011	Front walk and drive design, residential
3095	11045	$14,500.00	6/29/2011	Handicap accessibility upgrades to public housing site

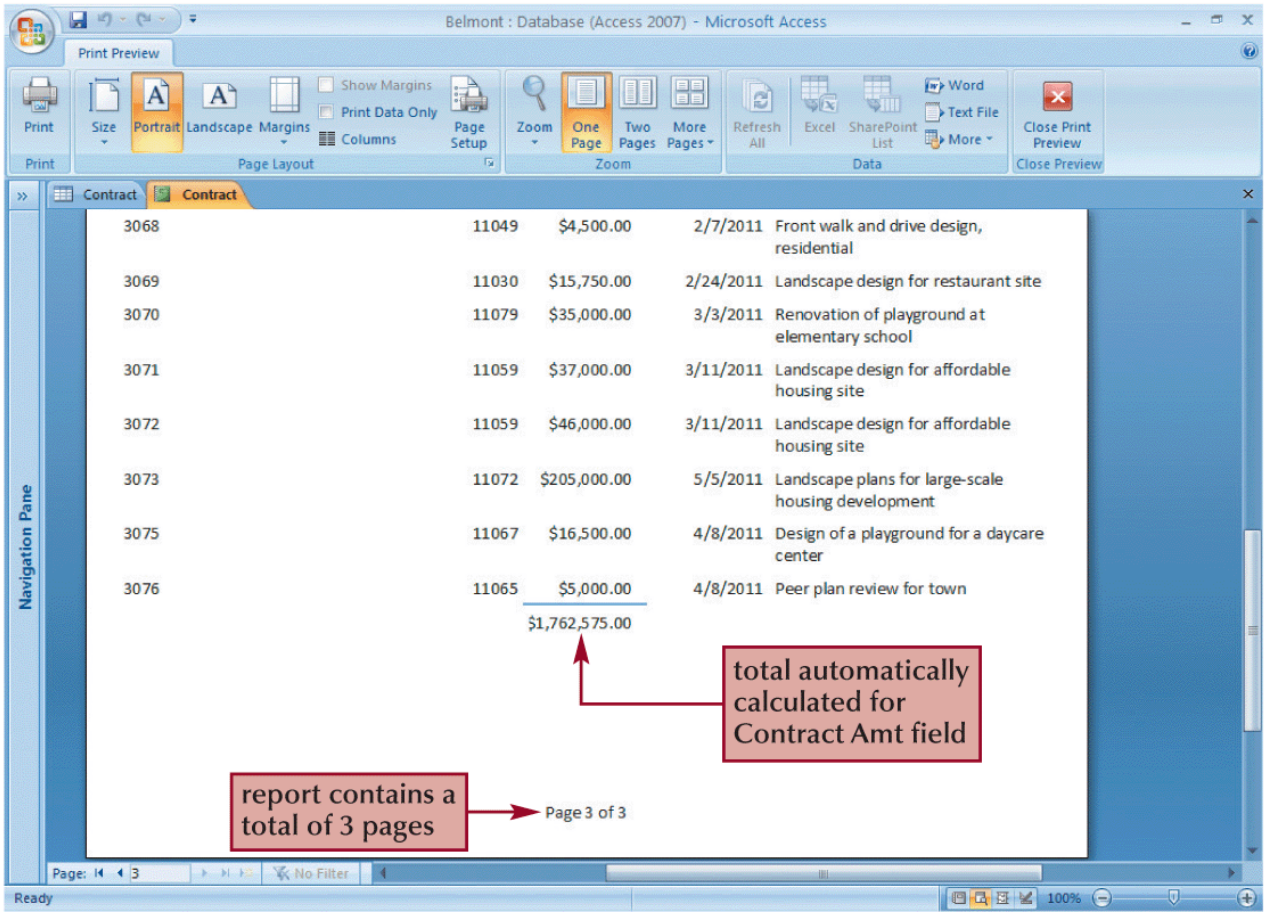
. . . continued

Figure 1-26 First page of the report in Print Preview



. . . continued

Viewing the last page of the report — Figure 1-27



Printing a Report

- Open the report in any view, or select the report in the Navigation Pane.

- Click the Office Button, point to Print, and then click Quick Print

Or

- Click the Office Button, point to Print, and then click Print button.

Foreign Key

- This is a field that references a column, most often the primary key of another table.