

Databases Using MS Access

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Why Learn M.S. Access?

- Learn to manipulate large datasets
- Learn the basics of relational databases
- Engineers need to manipulate large amounts of data
- Data sometimes comes in a variety of formats
- Data is both numeric and character or “string” data
- MS Access is part of the Office suite that you already have in your computer

Relational Structure

- Data is organized into independent 2-dimensional arrays (or a table)
- No formal linkages required between arrays
- Easy to modify the structure of a 2-D table
- Theoretically least complex and most intuitive structure for user
- However: 2-dimensional tables can be very large and cumbersome to manipulate
- Moreover, real world data comes from different sources and thus creating relationships between data sets

Basic Elements of Relational Database

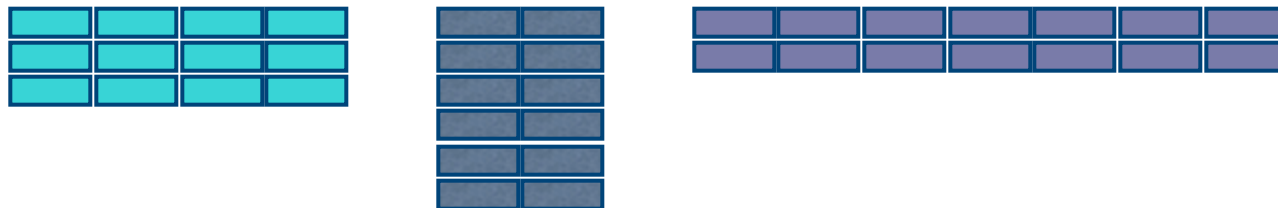
Table:

columns

rows

| | | | |
|--|--|--|--|
| | | | |
| | | | |
| | | | |

Database: collection of tables



Alternative Relational Terms Used in Textbooks or in the Database Literature

table = relation = array

row = record = tuple

column = field = attribute

Table Concepts

- Table may have a name intended to convey the meaning of the table as a whole
 - **Size** of table refers to the number of **rows**
 - **Degree** of table refers to the number of **columns**
- The order of the rows or columns is not important (as long as we keep headings with columns). i.e. a sorted table is considered the same table
- Often denoted by table name with attributes BOOK (ISBN, Title, Price)

Relationship Between Multiple Tables in Relational DBMS

| Date | Parameter | Conc |
|---------|-----------|------|
| 2/1/96 | Pb | 2.4 |
| 2/2/96 | tol | 1.7 |
| 2/3/96 | tol | 0.3 |
| 2/14/96 | Cu | 0.5 |

| Name | Parameter | Conc |
|---------|-----------|------|
| copper | Cu | mg/L |
| toluene | tol | ug/L |
| lead | Pb | mg/L |

Design Principles for Relational Database

- Required key fields
- Normalization
 - first normal form
 - second normal form
 - third normal form

Key Field

- A key is a field or combination of fields that uniquely identify each record
- Duplicate entries in key fields are not allowed within a table
- It is good practice, and often required, for each table to have key field(s)
- examples
 - single key field: unique ID sample number
 - multiple key field: date + time + location + pollutant

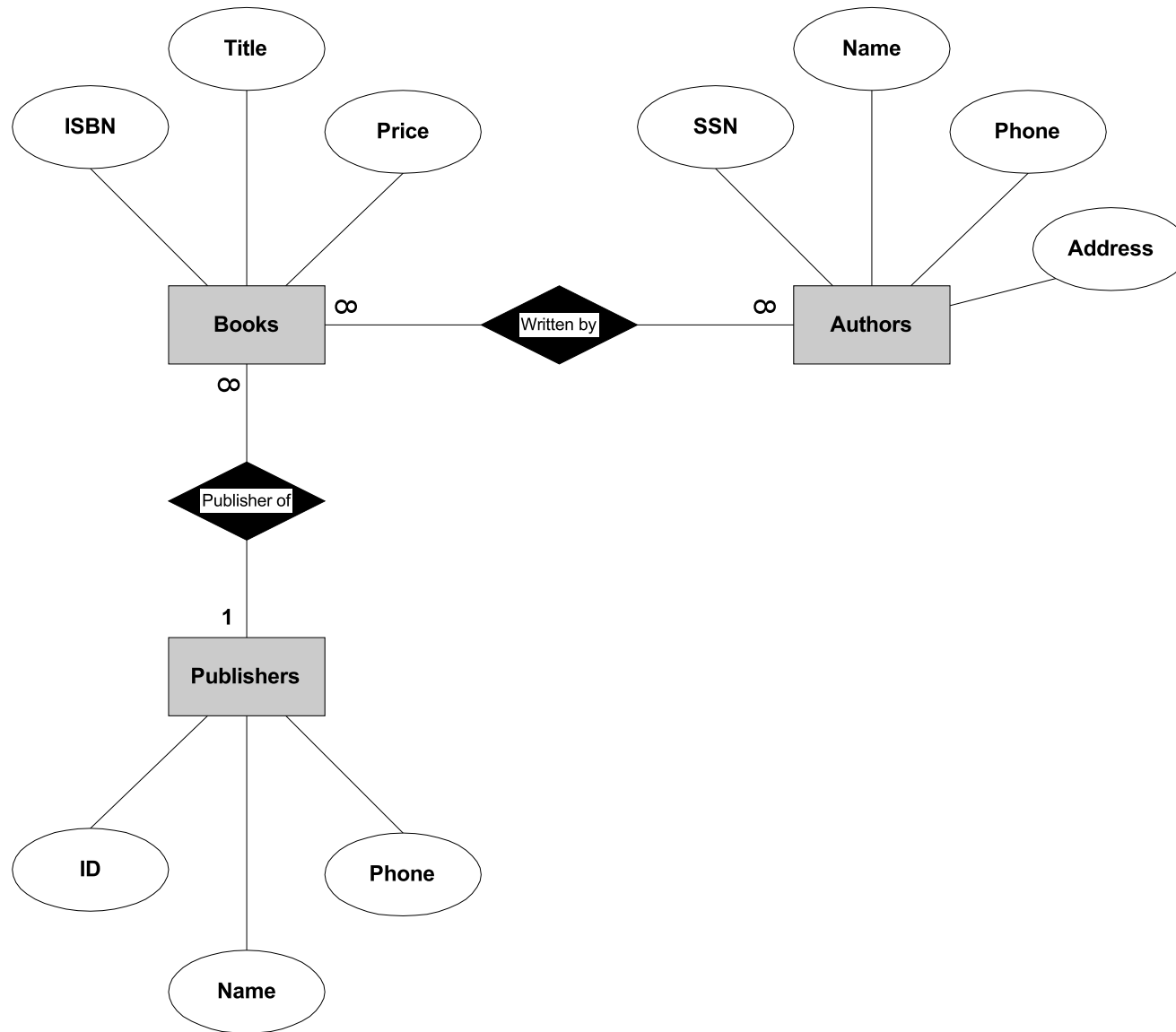
Keys

- Set of attributes that uniquely defines any entity from among all possible entities in the entity class that may appear in the database is called a superkey. Ex: ISBN
- Superkeys can contain more attributes than absolutely necessary, e.g. SSN and LastName for USCitizen class
- Key is minimal superkey, e.g SSN

Entity-Relationship Diagram

- Used to display the entity classes in a database model with their attributes and relationships
- entity class - rectangles
- attributes - ellipses
- relations - diamonds

Example Entity-Relationship Diagram



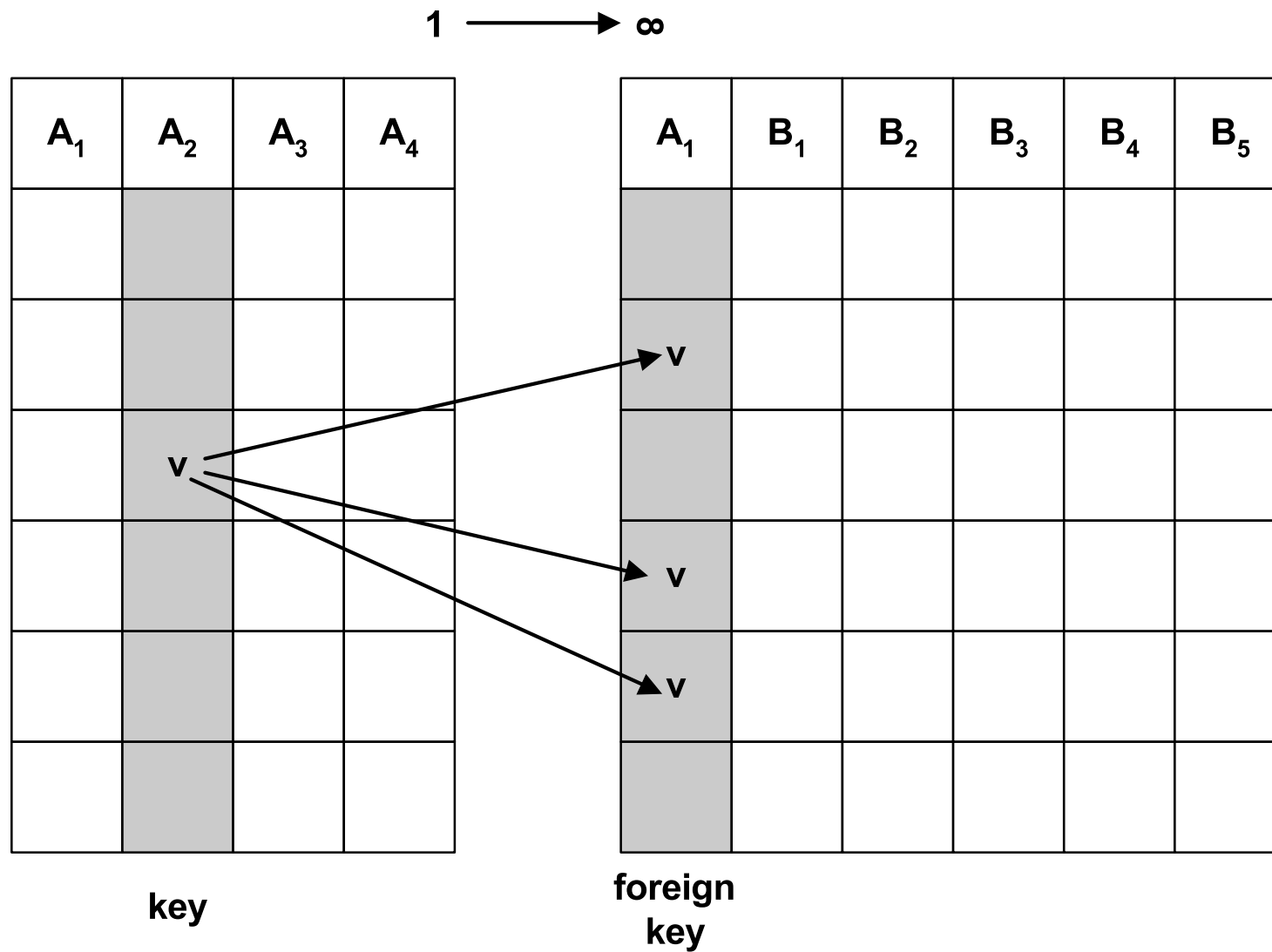
Relationship Types

- One-to-one
 - each entity in one table related to at most one entry in related table (i.e. fairly rare)
- One-to-many
 - each entity in one table related to many entities in related table
- Many-to-many

Implementing One-to-Many Relationships

- Add key attribute from related table. Thus, to implement ***Publisher Of*** relationship
 - BOOK(ISBN, Title, Price) becomes
 - BOOK(ISBN, Title, Price, PublisherID)
 - Publisher ID in Book entity class is referred to as ***foreign key***, since is key for foreign entity class

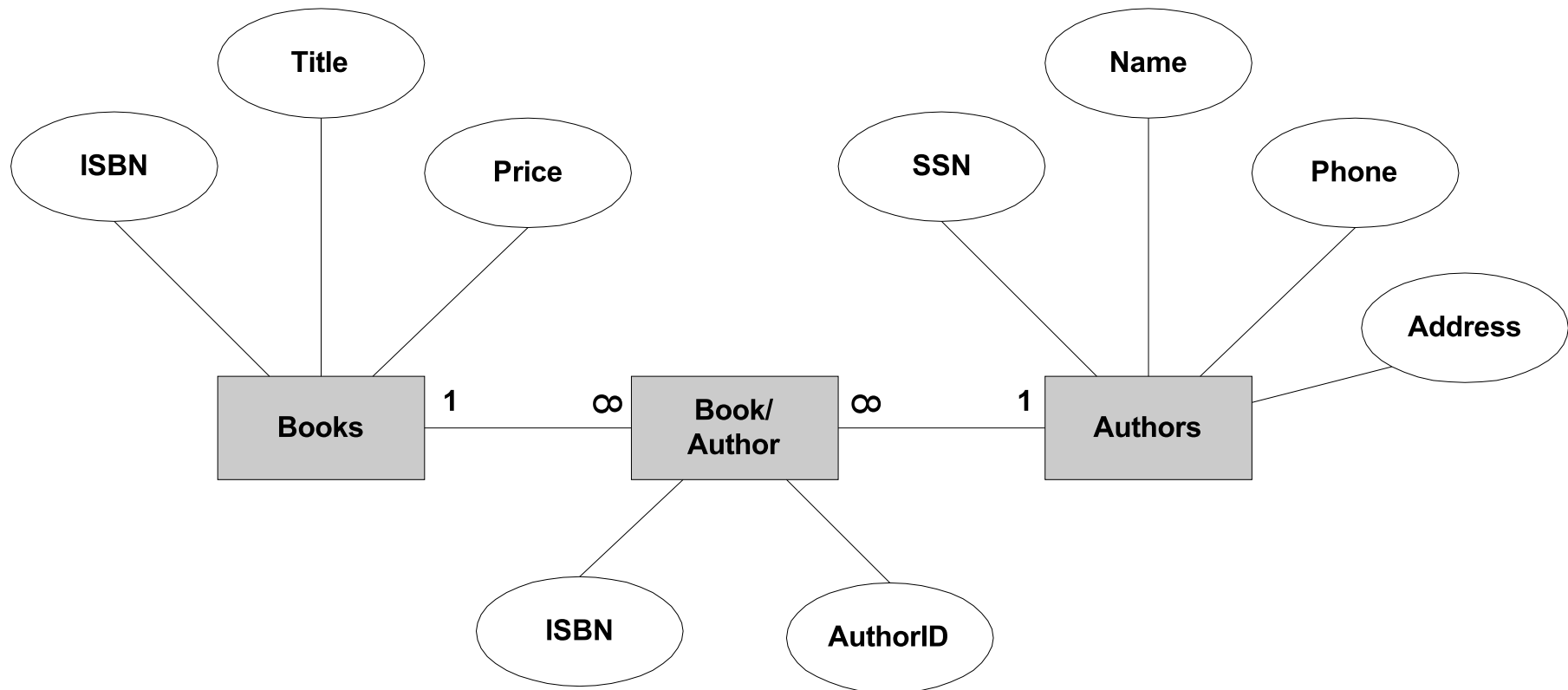
One-to-Many Relationship



Implementing Many-to-Many Relationships

- More involved than one-to-many
- Cannot simply treat as 2 one-to-many, would result in redundancy
- Need to add new table then treat as 2 one-to-many relationships
 - BOOK/AUTHOR(ISDN,SSN)
- Usually not shown on initial ERD

Example Many-to-Many Relationship



Referential Integrity

- When using foreign keys to implement relationships, each value of foreign key must have matching value in related table, otherwise ***dangling reference***
- This restriction termed referential constraint
- Ensuring referential restraint is termed ensuring referential integrity.

Referential Integrity, continued

- Referential integrity can be lost by adding new records with foreign key that does not exist in related table
- Referential integrity can also be lost if value of key is changed or deleted, e.g. delete a publisher in Publisher database
- Many records in the Book database now have dangling references

Cascading Updates and Deletions

- Options in many database programs.
- Cascading update:
 - If value in referenced key is changed, then all matching entries in the foreign key are automatically changed.
- Cascading delete:
 - If value in referenced key is deleted, then all matching records with same value in foreign key are deleted.
 - Maintains referential integrity, but should be used with extreme caution.

First Normal Form

- No more than one value may be contained in each field
- The following table is not in first normal form because
- There are multiple values in the Parameter and Concentration fields

| Date | Station No. | Agency | River Mile | Parameter | Conc |
|---------|-------------|--------|------------|-----------------|------|
| 2/12/96 | 107062 | USGS | 111.2 | Benzene | 0.8 |
| | | | | Chloro- form | 1.2 |
| 2/13/97 | LA66 | USEPA | 137.7 | Toluene | 2.7 |
| | | | | Benzene | 1.1 |

Conversion to First Normal Form

- Split records containing multiple entries in a field into multiple records instead.
- The follow table shows the results of converting previous table to 1st normal form

| Date | Station No. | Agency | River Mile | Parameter | Conc |
|---------|-------------|--------|------------|------------|------|
| 2/12/96 | 107062 | USGS | 111.2 | Benzene | 0.8 |
| 2/12/96 | 107062 | USGS | 111.2 | Chloroform | 1.2 |
| 2/13/97 | LA66 | USEPA | 137.7 | Toluene | 2.7 |
| 2/13/97 | LA66 | USEPA | 137.7 | Benzene | 1.1 |

Second Normal Form

- All non-key fields must be a fact about the entire key
- Following table is not in 2nd normal form because 2 of the fields (agency, river mile) relate only to station number, not to the rest of the key (date, parameter)

| Date | Station No. | Agency | River Mile | Parameter | Conc |
|---------|-------------|--------|------------|------------|------|
| 2/12/96 | 107062 | USGS | 111.2 | Benzene | 0.8 |
| 2/12/96 | 107062 | USGS | 111.2 | Chloroform | 1.2 |
| 2/13/97 | LA66 | USEPA | 137.7 | Toluene | 2.7 |
| 2/13/97 | LA66 | USEPA | 137.7 | Benzene | 1.1 |

key

key

**non
key**

**non
key**

key

**non
key**

Conversion to 2nd Normal Form

Table 1

| Date | Station No. | Parameter | Conc |
|---------|-------------|------------|------|
| 2/12/96 | 107062 | Benzene | 0.8 |
| 2/12/96 | 107062 | Chloroform | 1.2 |
| 2/13/97 | LA66 | Toluene | 2.7 |
| 2/13/97 | LA66 | Benzene | 1.1 |

key **key** **key** **non
key**

Table 2

| Station No. | Agency | River Mile |
|-------------|--------|------------|
| 107062 | USGS | 111.2 |
| LA66 | USEPA | 137.7 |

key **no
key** **no
key**

- To convert table to 2nd normal form, non-key fields should be moved to a new table

Third Normal Form

- A non-key field may not contain a fact about another non key field

| Sample ID | Station No. | Date Station Establ. | Sample Date | Parameter | Conc |
|-----------|-------------|----------------------|-------------|------------|------|
| 101 | 107062 | 1964 | 1/14/96 | Benzene | 0.8 |
| 102 | 107062 | 1964 | 1/15/96 | Chloroform | 1.2 |
| 103 | 108935 | 1979 | 1/17/96 | Toluene | 2.7 |

key

**non
key**

**non
key**

**non
key**

**non
key**

**non
key**



Conversion to 3rd Normal Form

- Non-key fields that refer to other non-key fields should be moved to new table

Table 1

| Sample ID | Station No. | Sample Date | Parameter | Conc |
|-----------|-------------|-------------|------------|------|
| 101 | 107062 | 1/14/96 | Benzene | 0.8 |
| 102 | 107062 | 1/15/96 | Chloroform | 1.2 |
| 103 | 108935 | 1/17/96 | Toluene | 2.7 |

key **non key** **non key** **non key** **non key**

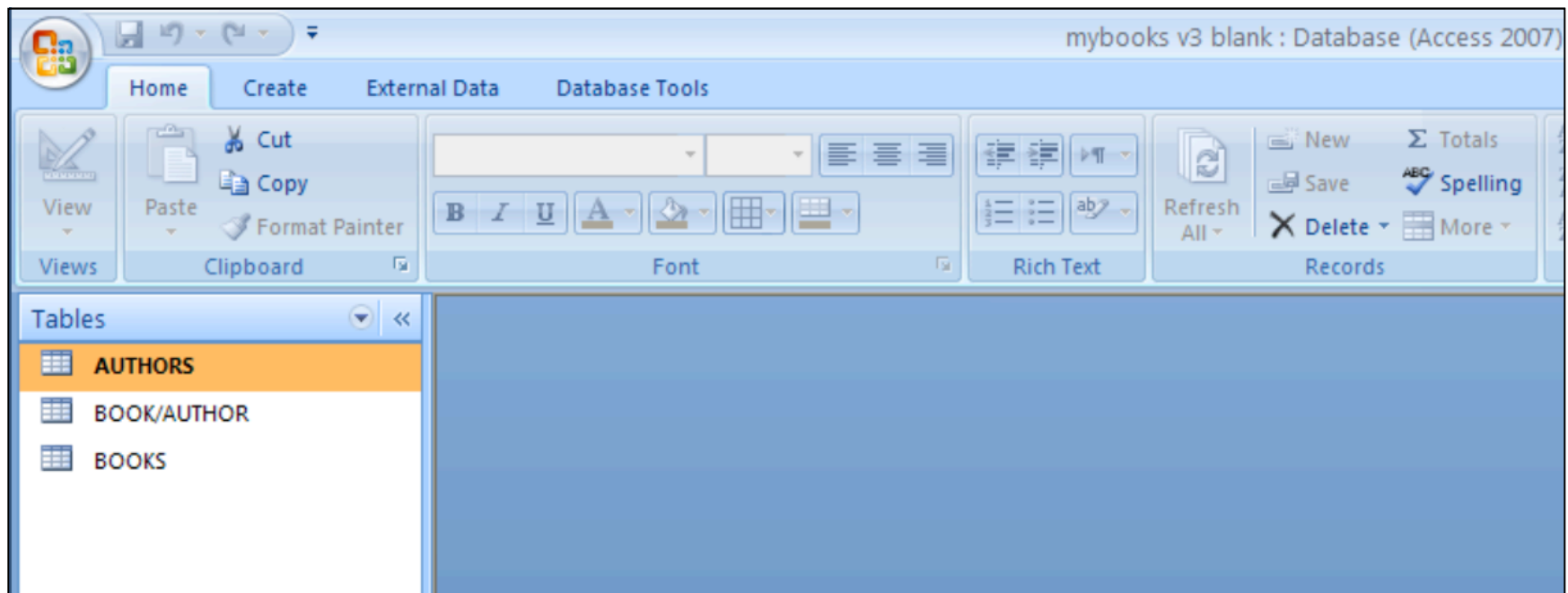
Table 2

| Station No. | Date Station Establ. |
|-------------|----------------------|
| 107062 | 1964 |
| 108935 | 1979 |

key **non key**

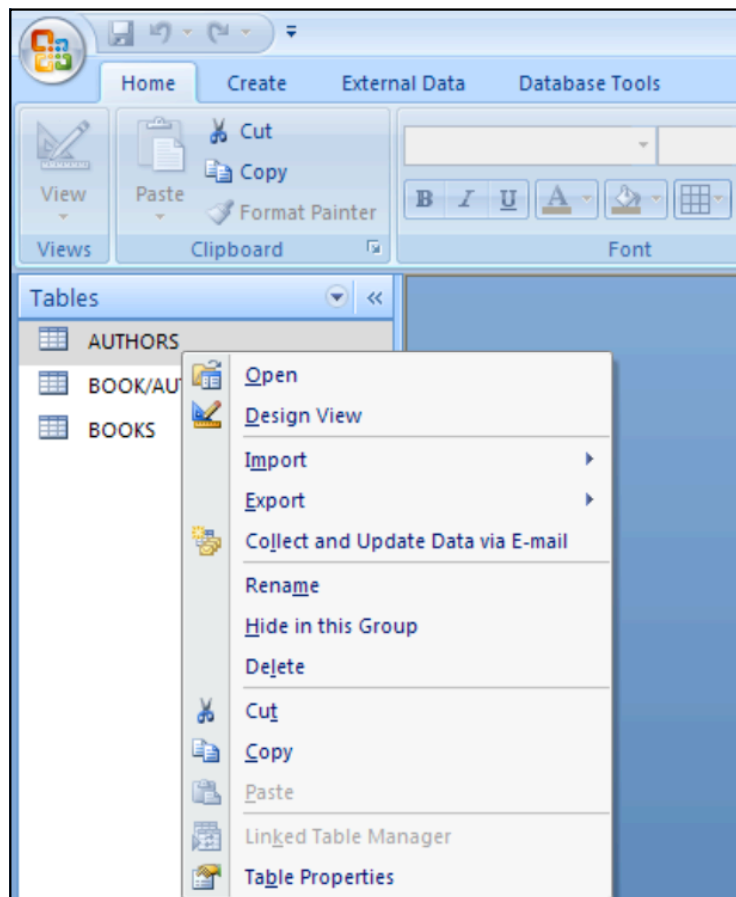
Example Database (mybooks v3 blank) (Download the data from the web site)

- Authors Table
- Book/Author Table
- Books Table



View Content of Data (mybooks v3 blank)

- Select the Authors Table (right click to select the context menu)



A screenshot of the Microsoft Access interface showing the 'Authors' table in Datasheet view. The ribbon is set to 'Table Tools - Datasheet'. The table has four columns: 'AuID', 'AuName', 'AuPhone', and 'Add New Field'. The data is as follows:

| AuID | AuName | AuPhone | Add New Field |
|------|-------------|--------------|---------------|
| 1 | Austen | 111-111-1111 | |
| 10 | Jones | 123-333-3333 | |
| 11 | Snoopy | 321-321-2222 | |
| 12 | Grumpy | 321-321-0000 | |
| 13 | Sleepy | 321-321-1111 | |
| 2 | Melville | 222-222-2222 | |
| 3 | Homer | 333-333-3333 | |
| 4 | Roman | 444-444-4444 | |
| 5 | Shakespeare | 555-555-5555 | |
| 6 | Joyce | 666-666-6666 | |
| 7 | Spencer | 777-777-7777 | |
| 8 | Mill | 888-888-8888 | |
| 9 | Smith | 123-222-2222 | |
| * | | | |

Content of Authors Table

View Content of Data (Other Tables)

- Select the Book/Author Table (right click to select the context menu). Repeat for the Book Table.

Table Tools: Home, Create, External Data, Database Tools, Datasheet

Calibri 11

Views: View, Paste, Copy, Format Painter

Clipboard: Cut, Copy, Format Painter

Font: B, I, U, A, [Color], [Background Color], [Grid]

Tables: AUTHORS, BOOK/AUTHOR, BOOKS

| ISBN | AuID |
|---------------|------|
| 0-103-45678-9 | 3 |
| 0-11-345678-9 | 2 |
| 0-12-333433-3 | 8 |
| 0-123-45678-0 | 6 |
| 0-12-345678-9 | 1 |
| 0-321-32132-1 | 11 |
| 0-321-32132-1 | 12 |
| 0-321-32132-1 | 13 |
| 0-55-123456-9 | 9 |
| 0-55-123456-9 | 10 |
| 0-555-55555-9 | 5 |
| 0-91-045678-5 | 5 |
| 0-91-335678-7 | 7 |
| 0-99-777777-7 | 5 |

Book/Author Table

Table Tools: Home, Create, External Data, Database Tools, Datasheet

Calibri 11

Views: View, Paste, Copy, Format Painter

Clipboard: Cut, Copy, Format Painter

Font: B, I, U, A, [Color], [Background Color], [Grid]

Rich Text: [Text Color], [Text Background Color], [Text Size], [Text Style]

Refresh All

Tables: AUTHORS, BOOK/AUTHOR, BOOKS

| ISBN | Title | PubID | Price |
|---------------|---------------|-------|---------|
| 0-103-45678-9 | Iliad | 1 | \$25.00 |
| 0-11-345678-9 | Moby Dick | 3 | \$49.00 |
| 0-12-333433-3 | On Liberty | 1 | \$25.00 |
| 0-123-45678-0 | Ulysses | 2 | \$34.00 |
| 0-12-345678-9 | Jane Eyre | 3 | \$49.00 |
| 0-321-32132-1 | Balloon | 3 | \$34.00 |
| 0-55-123456-9 | Main Street | 3 | \$22.95 |
| 0-555-55555-9 | MacBeth | 2 | \$12.00 |
| 0-91-045678-5 | Hamlet | 2 | \$20.00 |
| 0-91-335678-7 | Fairie Queene | 1 | \$15.00 |
| 0-99-777777-7 | King Lear | 2 | \$49.00 |
| 0-99-777777-7 | Emma | 1 | \$20.00 |
| 0-99-777777-7 | C++ | 1 | \$29.95 |
| 0-99-777777-7 | Visual Basic | 1 | \$25.00 |
| | | | \$0.00 |

Books Table

Inspecting the Database Field Types

- When a table is created you need to specify the field type for each record
- Use the **Design View** to accomplish this

The image displays two screenshots of Microsoft Access. The left screenshot shows the 'Books Table (data view)' with a grid of data. The right screenshot shows the 'Books Table (design view)' with a table structure and field properties.

| ISBN | Title | PubID | Price |
|---------------|---------------|-------|---------|
| 0-103-45678-9 | Iliad | 1 | \$25.00 |
| 0-11-345678-9 | Moby Dick | 3 | \$49.00 |
| 0-12-333433-3 | On Liberty | 1 | \$25.00 |
| 0-10-123456-7 | Ulysses | 2 | \$34.00 |
| 0-13-567890-1 | Jane Eyre | 3 | \$49.00 |
| 0-14-678901-2 | Balloon | 3 | \$34.00 |
| 0-15-789012-3 | Main Street | 3 | \$22.95 |
| 0-16-890123-4 | MacBeth | 2 | \$12.00 |
| 0-17-901234-5 | Hamlet | 2 | \$20.00 |
| 0-18-012345-6 | Fairie Queene | 1 | \$15.00 |

| Field Name | Data Type | Description |
|------------|-----------|-------------|
| ISBN | Text | |
| Title | Text | |
| PubID | Text | |
| Price | Currency | |

The 'Field Properties' window for the 'ISBN' field is visible, showing:

- Field Size: 50
- Format: (empty)
- Input Mask: (empty)
- Caption: (empty)
- Default Value: (empty)

A note in the bottom right of the design view states: "A field name can be up to 64 characters including spaces. Press F1 for help on names."

Database Field Data Types

- Access provides 11 data types for your records
- Common types:
 - Text
 - Number
 - Date/time
 - Currency

Books Table (design view)

| Field Name | Data Type |
|------------|-----------|
| ISBN | Text |
| Title | Text |
| PubID | Text |
| Price | Currency |

| Property | Value |
|-----------------|----------|
| Format | Currency |
| Decimal Places | Auto |
| Input Mask | |
| Caption | |
| Default Value | 0 |
| Validation Rule | |
| Validation Text | |
| Required | No |
| Indexed | No |
| Smart Tags | |
| Text Align | General |

Adding the Publishers Table

- The current database is pretty useless unless we relate the fields of some of the 2-dimensional tables in a useful way
- Lets add a table that contains the Publisher of each book
- Note that in the Books Table we have a Publisher ID field

| BOOKS | | | | |
|-------|---------------|---------------|-------|---------|
| | ISBN | Title | PubID | Price |
| | 0-103-45678-9 | Iliad | 1 | \$25.00 |
| | 0-11-345678-9 | Moby Dick | 3 | \$49.00 |
| | 0-12-333433-3 | On Liberty | 1 | \$25.00 |
| | 0-123-45678-0 | Ulysses | 2 | \$34.00 |
| | 0-12-345678-9 | Jane Eyre | 3 | \$49.00 |
| | 0-321-32132-1 | Balloon | 3 | \$34.00 |
| | 0-55-123456-9 | Main Street | 3 | \$22.95 |
| | 0-555-55555-9 | MacBeth | 2 | \$12.00 |
| | 0-91-045678-5 | Hamlet | 2 | \$20.00 |
| | 0-91-335678-7 | Fairie Queene | 1 | \$15.00 |
| | 0-99-777777-7 | King Lear | 2 | \$49.00 |
| | 0-99-999999-9 | Emma | 1 | \$20.00 |

Books Table

Adding the Publishers Table

- Select the “Create” panel and define a new table
- Later rename the table as PUBLISHERS
- Add three fields to the table:

- PubID
- PubName
- PubPhone

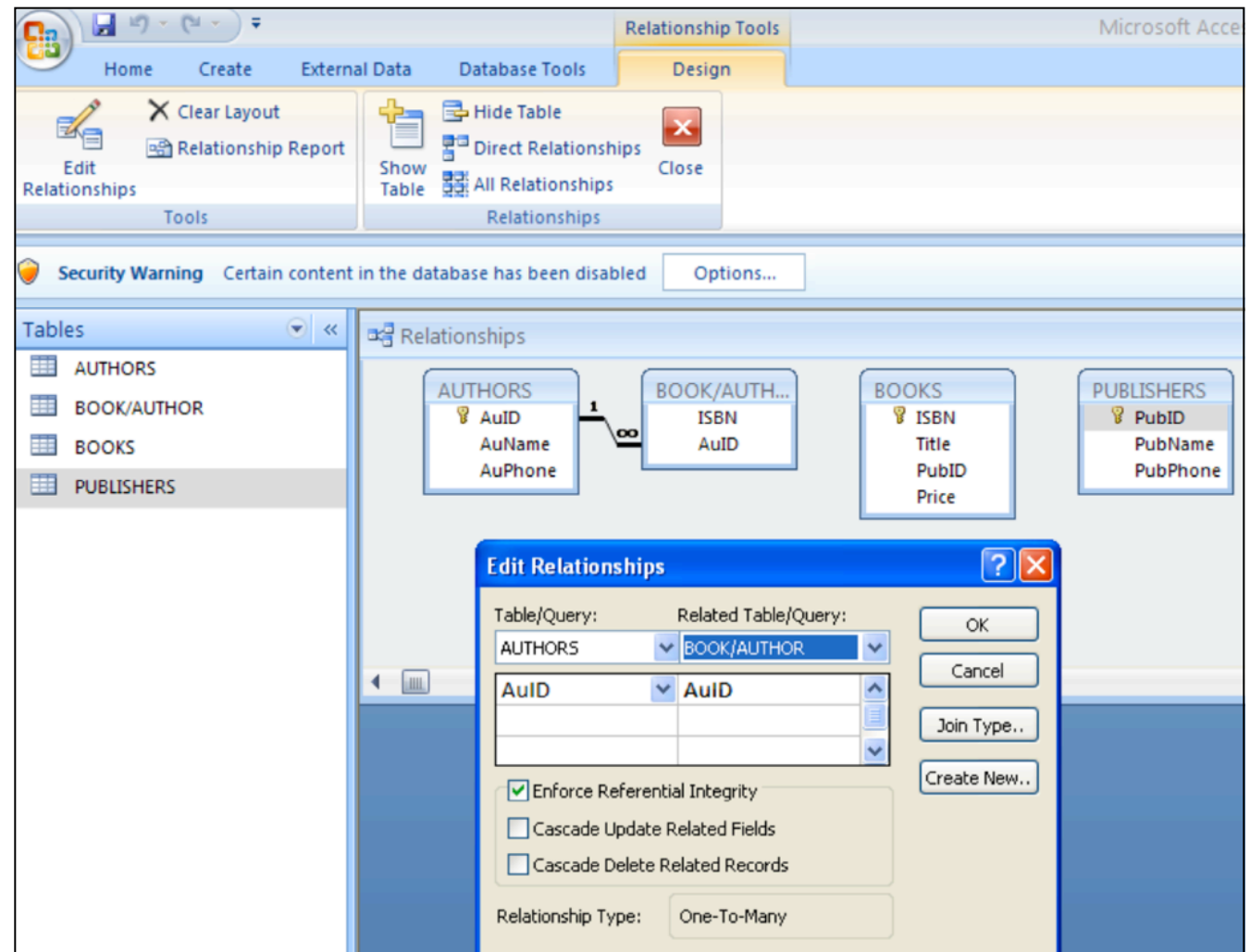
The screenshot shows the Microsoft Access interface. The 'Table Tools' ribbon is active, with the 'Create' tab selected. The 'Tables' task pane on the left shows a list of tables: AUTHORS, BOOK/AUTHOR, BOOKS, and PUBLISHERS. The 'PUBLISHERS' table is selected and its data is displayed in the main window. The table has four columns: PubID, PubName, PubPhone, and Add New Field. There are three rows of data.

| PubID | PubName | PubPhone | Add New Field |
|-------|-------------|--------------|---------------|
| 1 | Big House | 123-456-7890 | |
| 2 | Alpha Press | 999-999-9999 | |
| 3 | Small House | 714-000-0000 | |

Publishers Table

Establishing Relationships Between Tables

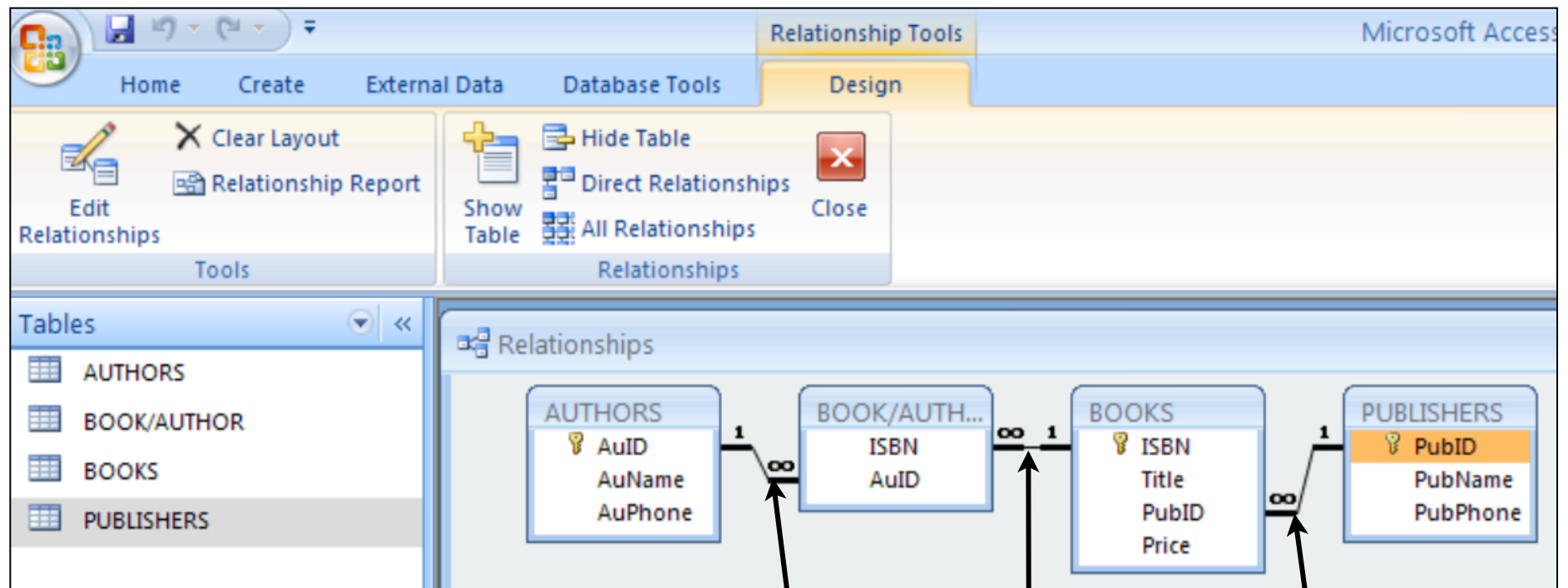
- Select the “Database Tools” panel and define relationships
- First add the tables that you want to relate
- Select “Edit Relationships”



Can create a table relationship using the table format

Final Relationships

- Edit the relationships and join variables with same names among the tables



All relationships between tables are one-to-many

What Happened After Relationships are Established?

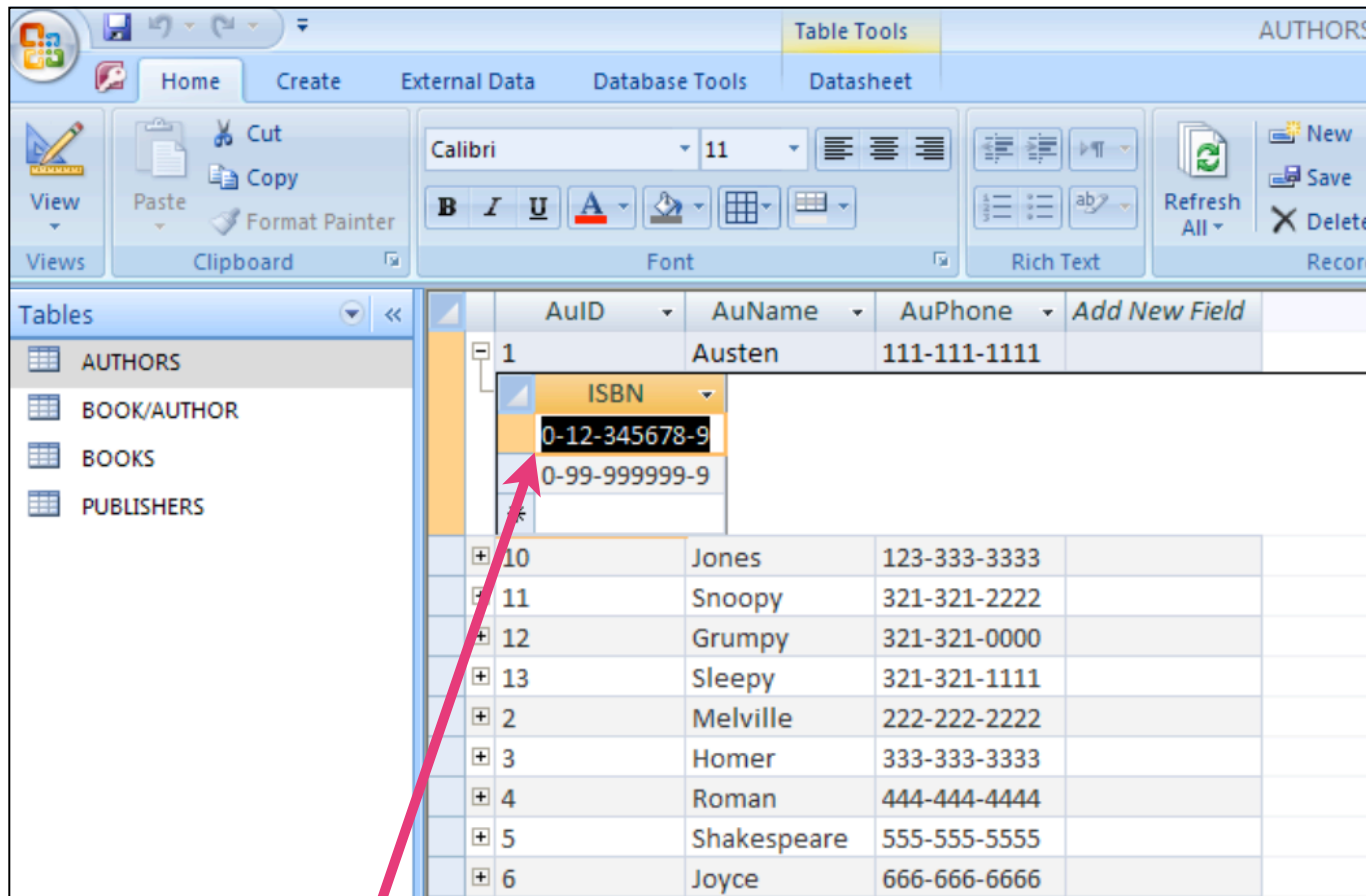
- You can easily inspect the data sets that are related

| PubID | PubName | PubPhone | Add New Field |
|-------|---------------|---------------|---------------|
| 1 | Big House | 123-456-7890 | |
| | ISBN | Title | Price |
| | 1-1111-1111-1 | C++ | \$29.95 |
| | 0-99-999999-9 | Emma | \$20.00 |
| | 0-91-335678-7 | Fairie Queene | \$15.00 |
| | 0-103-45678-9 | Iliad | \$25.00 |
| | 0-12-333433-3 | On Liberty | \$25.00 |
| | 1-22-233700-0 | Visual Basic | \$25.00 |
| * | | | \$0.00 |
| 2 | Alpha Press | 999-999-9999 | |
| 3 | Small House | 714-000-0000 | |
| * | | | |

Each Publisher Instance (or record) has several associated Books

After Relationships are Established

- You can easily inspect the data sets that are related

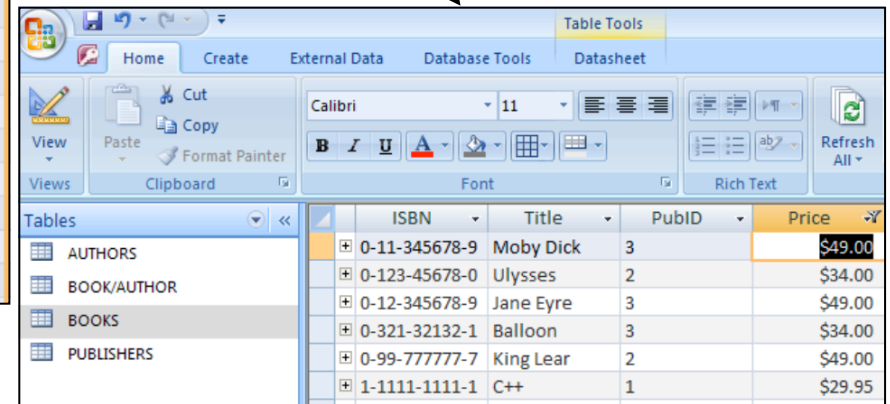
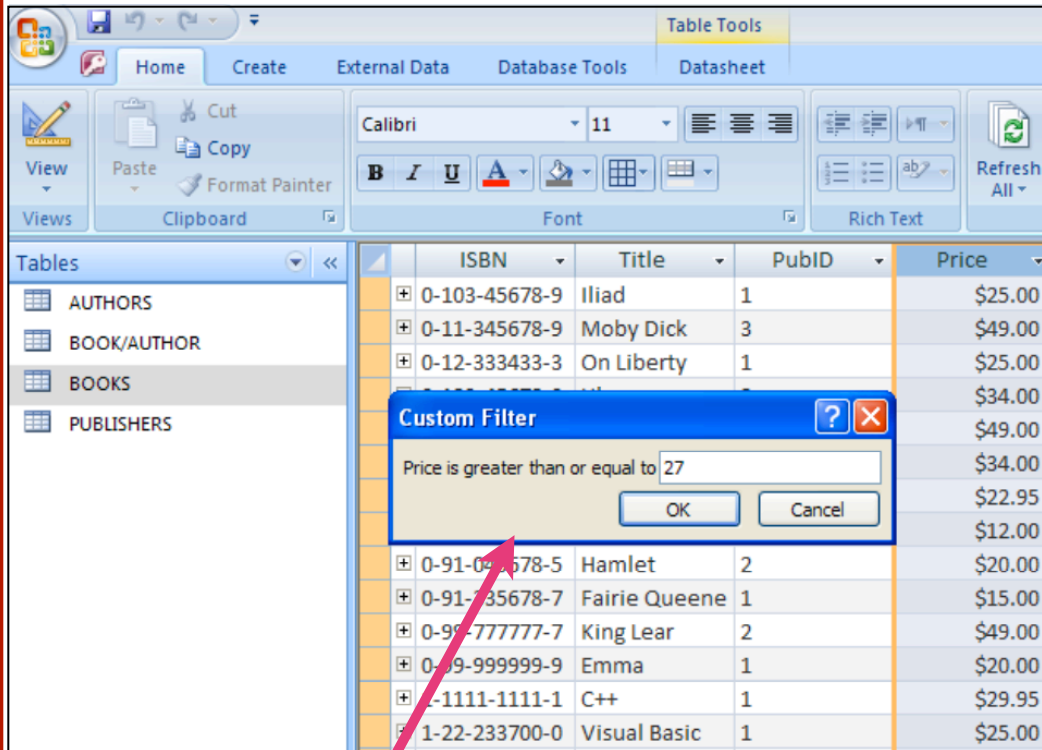


| AuID | AuName | AuPhone | Add New Field |
|------|-------------|--------------|---------------|
| 1 | Austen | 111-111-1111 | |
| 10 | Jones | 123-333-3333 | |
| 11 | Snoopy | 321-321-2222 | |
| 12 | Grumpy | 321-321-0000 | |
| 13 | Sleepy | 321-321-1111 | |
| 2 | Melville | 222-222-2222 | |
| 3 | Homer | 333-333-3333 | |
| 4 | Roman | 444-444-4444 | |
| 5 | Shakespeare | 555-555-5555 | |
| 6 | Joyce | 666-666-6666 | |

Each Author Instance (or record) has several associated ISBN numbers

Basic Filtering in the Database

- Quick filters are included in Access to perform basic selections (just like in Excel)



Books with a price of \geq \$27.00

Result

Basic Queries in the Database

- The power of the database manager resides in making queries
- Query: from the Latin word “*quaerere*” (to ask)
- Queries are instructions provided to the database that meet a certain criteria
- Queries can contain complex logical statements
- Queries can be saved so that they can be reused (filters are temporary search mechanisms)

Basic Queries in the Database (The Query Wizard)

- Simple to use (2-3 step process)
- Less control (“canned approach” to construct queries)

BOOKS - Microsoft Access

Table Tools: Home, Create, External Data, Database Tools, Datasheet

Tables: AUTHORS, BOOK/AUTHOR, BOOKS, PUBLISHERS

| ISBN | Title | PubID | Price |
|---------------|---------------|-------|---------|
| 0-103-45678-9 | Iliad | 1 | \$25.00 |
| 0-11-345678-9 | Moby Dick | 3 | \$49.00 |
| 0-12-333433-3 | On Liberty | 1 | \$25.00 |
| 0-123-45678-0 | Ulysses | 2 | \$34.00 |
| 0-12-345678-9 | Jane Eyre | 3 | \$49.00 |
| 0-321-32132-1 | Balloon | 3 | \$34.00 |
| 0-55-123456-9 | Main Street | 3 | \$22.95 |
| 0-555-55555-9 | MacBeth | 2 | \$12.00 |
| 0-91-045678-5 | Hamlet | 2 | \$20.00 |
| 0-91-335678-7 | Fairie Queene | 1 | \$15.00 |
| 0-99-777777-7 | King Lear | 2 | \$49.00 |
| 0-99-999999-9 | Emma | 1 | \$20.00 |
| 1-1111-1111-1 | C++ | 1 | \$29.95 |
| 1-22-233700-0 | Visual Basic | 1 | \$25.00 |
| * | | | \$0.00 |

Simple Query Wizard

Which fields do you want in your query?
You can choose from more than one table or query.

Tables/Queries: Table: BOOKS

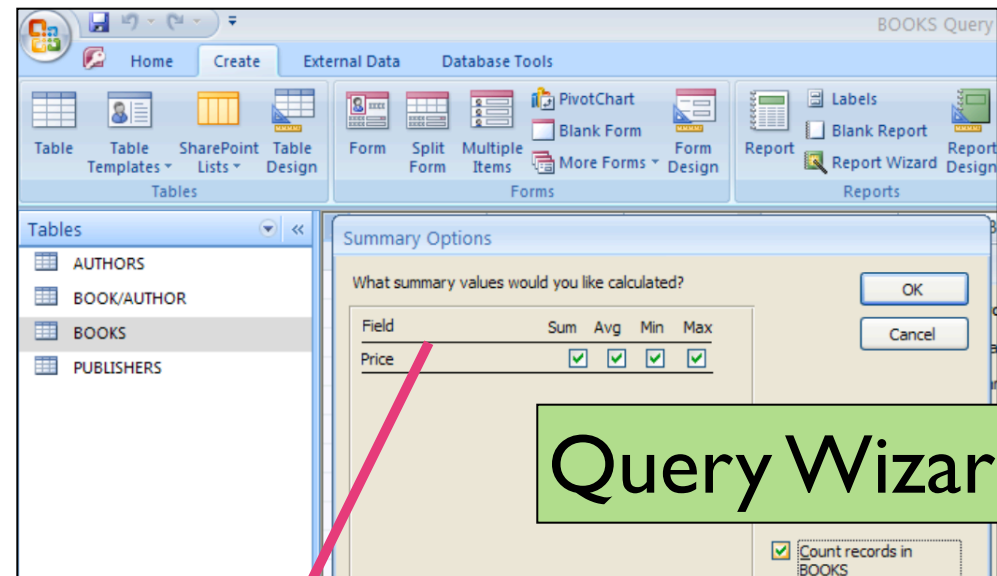
Available Fields: ISBN, Title, PubID

Selected Fields: Price

Buttons: Cancel, < Back, Next >, Finish

Basic Queries in the Database (The Query Wizard)

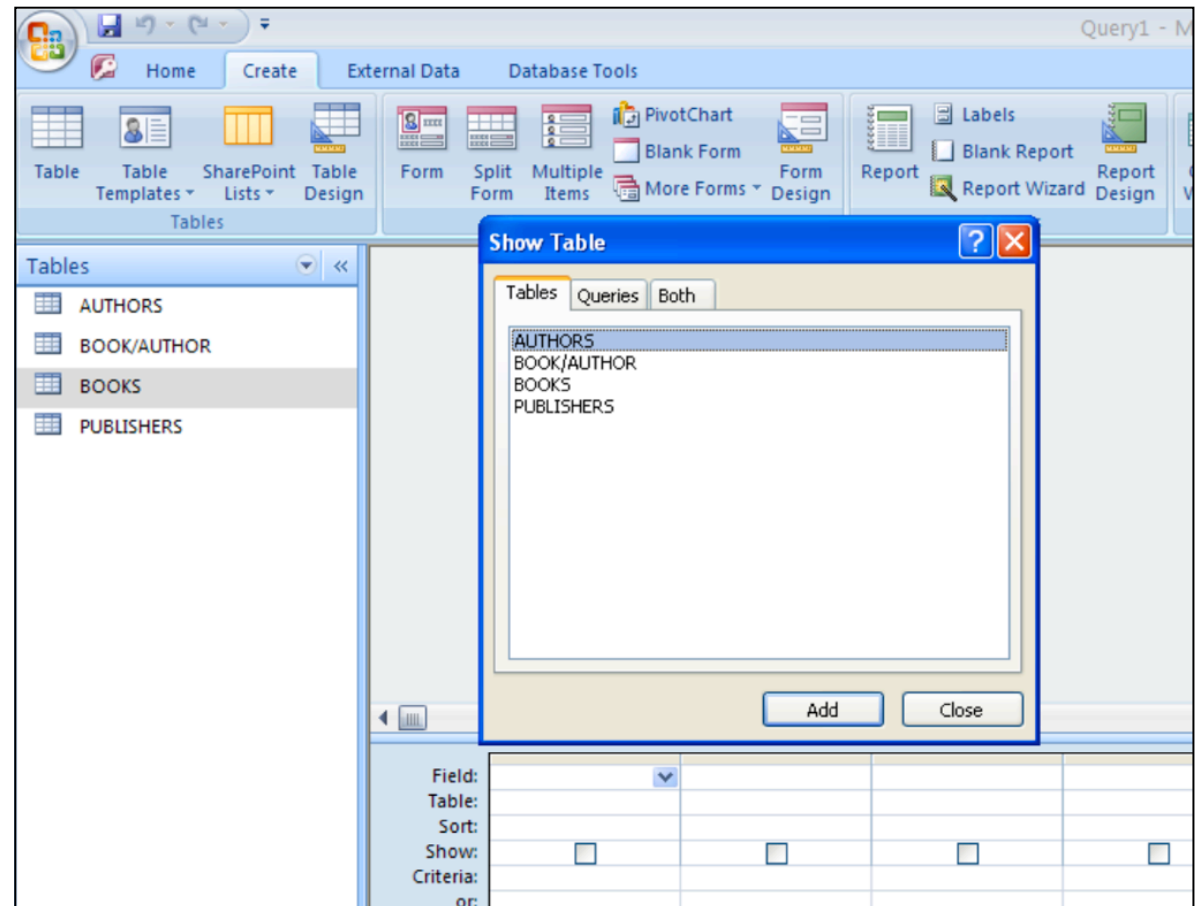
- Want to get a summary with the average, sum and min/max cost of the books in the Books Table



| | Sum Of Price | Avg Of Price | Min Of Price | Max Of Price | Count Of BO |
|--|--------------|--------------|--------------|--------------|-------------|
| | \$409.90 | \$29.28 | \$12.00 | \$49.00 | 14 |

Basic Queries in the Database (The Query Design)

- A better way to make queries is to use the “Query Design” interface
- Look under “Create” tab in Access 2007



Query Design Interface

Basic Queries in the Database (The Query Design)

- A better way to make queries is to use the “Query Design” interface
- Look under “Create” tab in Access 2007

The screenshot shows the Microsoft Access 2007 interface in Query Design view. The ribbon includes 'Home', 'Create', 'External Data', 'Database Tools', and 'Design'. The 'Design' ribbon has sections for 'Query Type' (with options like Union, Pass-Through, Data Definition), 'Query Setup' (with options like Insert Rows, Delete Rows, Insert Columns, Delete Columns, Show Table, Builder, Return), and 'Results' (with View and Run buttons). The 'Tables' task pane on the left lists 'AUTHORS', 'BOOK/AUTHOR', 'BOOKS', and 'PUBLISHERS'. The 'BOOKS' table is selected, showing fields: ISBN, Title, PubID, and Price. The 'Criteria' row in the design grid shows '<28' for the Price field and '1' for the PubID field. A green callout box with the text 'Query: Books with price < 28 and Publisher 1' has two arrows pointing to the '<28' and '1' entries in the design grid.

Output of the Query

- Saves your queries for reuse in the Navigation panel

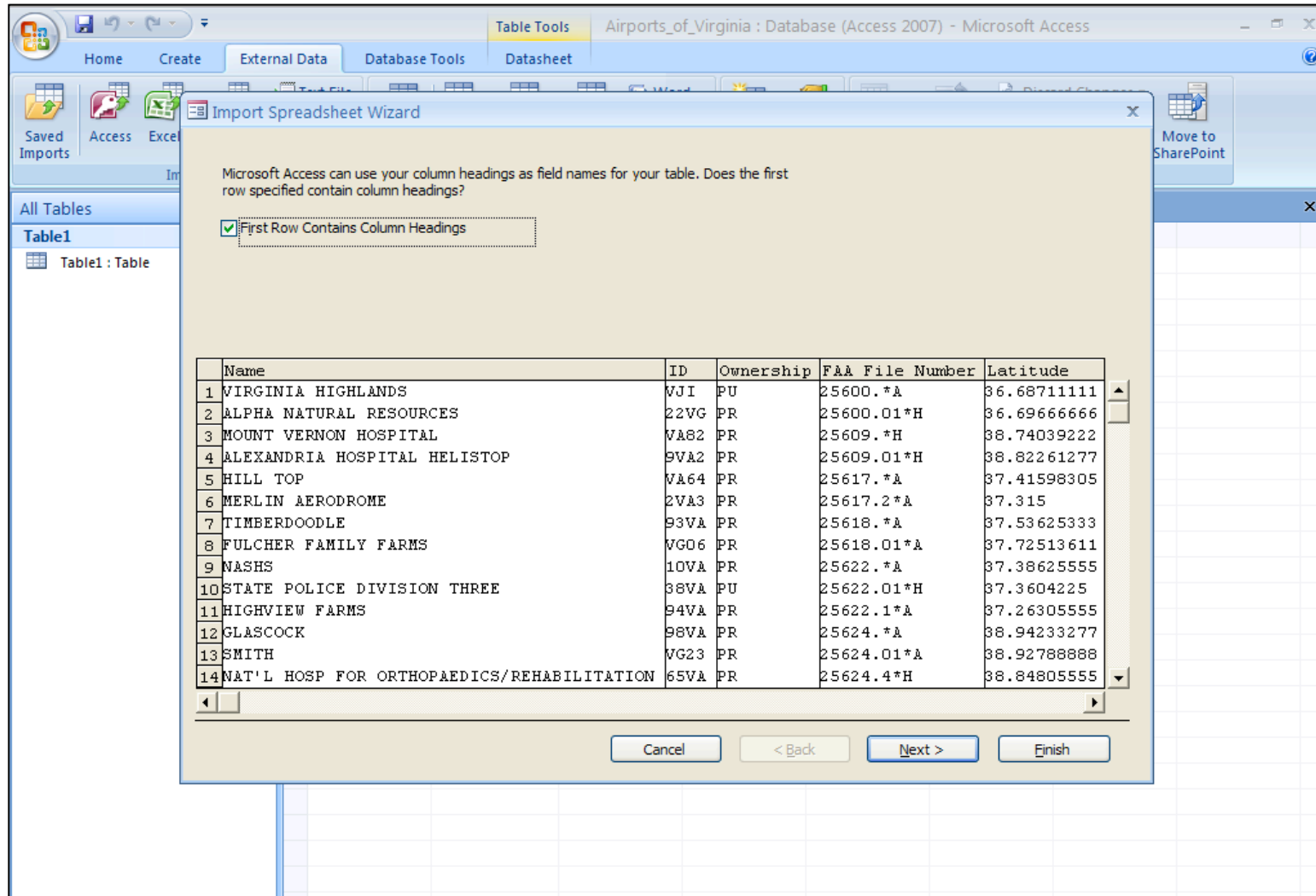
| Price | PubID |
|---------|-------|
| \$25.00 | 1 |
| \$25.00 | 1 |
| \$15.00 | 1 |
| \$20.00 | 1 |
| \$25.00 | 1 |
| \$0.00 | |

- Select “Queries” in the navigation panel

| ISBN | TI |
|-----------------|-------|
| + 0-103-45678-9 | Iliad |
| + 0-11-345678-9 | Moby |
| + 0-12-333433-3 | On Li |
| + 0-123-45678-0 | Ulyss |

Importing Data into Access

- Can import data from many sources (like Excel or text files)



Importing Data into Access

- As you import data, you can specify the data types for each field of the data to import

Import Spreadsheet Wizard

You can specify information about each of the fields you are importing. Select fields in the area below. You can then modify field information in the 'Field Options' area.

Field Options

Field Name: Data Type:

Indexed: Do not import field (Skip)

| | Name | ID | Ownership | FAA File Number | Latitude |
|----|--|------|-----------|-----------------|-------------|
| 1 | VIRGINIA HIGHLANDS | VJI | PU | 25600.*A | 36.68711111 |
| 2 | ALPHA NATURAL RESOURCES | 22VG | PR | 25600.01*H | 36.69666666 |
| 3 | MOUNT VERNON HOSPITAL | VA82 | PR | 25609.*H | 38.74039222 |
| 4 | ALEXANDRIA HOSPITAL HELISTOP | 9VA2 | PR | 25609.01*H | 38.82261277 |
| 5 | HILL TOP | VA64 | PR | 25617.*A | 37.41598305 |
| 6 | MERLIN AERODROME | 2VA3 | PR | 25617.2*A | 37.315 |
| 7 | TIMBERDOODLE | 93VA | PR | 25618.*A | 37.53625333 |
| 8 | FULCHER FAMILY FARMS | VG06 | PR | 25618.01*A | 37.72513611 |
| 9 | NASHS | 10VA | PR | 25622.*A | 37.38625555 |
| 10 | STATE POLICE DIVISION THREE | 38VA | PU | 25622.01*H | 37.3604225 |
| 11 | HIGHVIEW FARMS | 94VA | PR | 25622.1*A | 37.26305555 |
| 12 | GLASCOCK | 98VA | PR | 25624.*A | 38.94233277 |
| 13 | SMITH | VG23 | PR | 25624.01*A | 38.92788888 |
| 14 | NAT'L HOSP FOR ORTHOPAEDICS/REHABILITATION | 65VA | PR | 25624.4*H | 38.84805555 |

Cancel < Back Next > Finish

Importing Data into Access

- Selecting the Primary Key of the data (I am letting Access define a new column for me)

Microsoft Access recommends that you define a primary key for your new table. A primary key is used to uniquely identify each record in your table. It allows you to retrieve data more quickly.

Let Access add primary key.
 Choose my own primary key.
 No primary key.

| ID1 | Name | ID | Ownership | FAA File Number | Latitude |
|-----|--|------|-----------|-----------------|----------|
| 1 | VIRGINIA HIGHLANDS | VJI | PU | 25600.*A | 36.687 |
| 2 | ALPHA NATURAL RESOURCES | 22VG | PR | 25600.01*H | 36.696 |
| 3 | MOUNT VERNON HOSPITAL | VA82 | PR | 25609.*H | 38.740 |
| 4 | ALEXANDRIA HOSPITAL HELISTOP | 9VA2 | PR | 25609.01*H | 38.822 |
| 5 | HILL TOP | VA64 | PR | 25617.*A | 37.415 |
| 6 | MERLIN AERODROME | 2VA3 | PR | 25617.2*A | 37.315 |
| 7 | TIMBERDOODLE | 93VA | PR | 25618.*A | 37.536 |
| 8 | FULCHER FAMILY FARMS | VG06 | PR | 25618.01*A | 37.725 |
| 9 | NASHS | 10VA | PR | 25622.*A | 37.386 |
| 10 | STATE POLICE DIVISION THREE | 38VA | PU | 25622.01*H | 37.360 |
| 11 | HIGHVIEW FARMS | 94VA | PR | 25622.1*A | 37.263 |
| 12 | GLASCOCK | 98VA | PR | 25624.*A | 38.942 |
| 13 | SMITH | VG23 | PR | 25624.01*A | 38.927 |
| 14 | NAT'L HOSP FOR ORTHOPAEDICS/REHABILITATION | 65VA | PR | 25624.4*H | 38.848 |

Buttons: Cancel, < Back, Next >, Finish

Importing Data into Access

- Imported Virginia Airports Excel file

The screenshot shows the Design View of a table in Microsoft Access. The table is named 'export_virginia_airports'. The fields and their data types are as follows:

| Field Name | Data Type |
|-----------------|------------|
| ID1 | AutoNumber |
| Name | Text |
| ID | Text |
| Ownership | Text |
| FAA File Number | Text |
| Latitude | Number |
| Longitude | Number |

The 'ID1' field is highlighted as the primary key. Below the field list, the 'General' and 'Lookup' tabs are visible in the property sheet.

Design View

The screenshot shows the Datasheet View of the 'export_virginia_airports' table. The data is as follows:

| ID1 | Name | ID | Ownership | FAA File Number | Latitude | Longitude |
|-----|--------------------|----|-----------|-----------------|------------------|-------------------|
| 1 | VIRGINIA HIGH VJI | | PU | 25600.*A | 36.6871111111111 | -82.0333333333333 |
| 2 | ALPHA NATUR/ 22VG | | PR | 25600.01*H | 36.6966666666666 | -81.9953333333333 |
| 3 | MOUNT VERN VA82 | | PR | 25609.*H | 38.7403922222222 | -77.0771999999999 |
| 4 | ALEXANDRIA H 9VA2 | | PR | 25609.01*H | 38.8226127777777 | -77.1041452777777 |
| 5 | HILL TOP VA64 | | PR | 25617.*A | 37.4159830555555 | -77.9538902777777 |
| 6 | MERLIN AEROD 2VA3 | | PR | 25617.2*A | 37.315 | -77.8661111111111 |
| 7 | TIMBERDOODL 93VA | | PR | 25618.*A | 37.5362533333333 | -79.0233563888888 |
| 8 | FULCHER FAMIL VG06 | | PR | 25618.01*A | 37.7251361111111 | -79.0830805555555 |
| 9 | NASHS 10VA | | PR | 25622.*A | 37.3862555555555 | -78.8130686111111 |
| 10 | STATE POLICE 38VA | | PU | 25622.01*H | 37.3604225 | -78.8689038888888 |
| 11 | HIGHVIEW FAR 94VA | | PR | 25622.1*A | 37.2630555555555 | -78.8494444444444 |
| 12 | GLASCOCK 98VA | | PR | 25624.*A | 38.9423327777777 | -77.5422133333333 |
| 13 | SMITH VG23 | | PR | 25624.01*A | 38.9278888888888 | -77.5627691666666 |
| 14 | NAT'L HOSP FO 65VA | | PR | 25624.4*H | 38.8480555555555 | -77.0769444444444 |
| 15 | STARR 4VA5 | | PR | 25624.7*A | 37.6595861111111 | -78.9222438888888 |
| | DW FARR 69VA | | PR | 25626.1*A | 37.8570841666666 | -77.4205369444444 |
| | IS VG24 | | PR | 25626.12*A | 37.7818088888888 | -77.4938724999999 |
| | WATER 4VG2 | | PR | 25626.13*A | 37.8580555555555 | -77.5472222222222 |
| | R 4VA6 | | PR | 25627.*A | 37.8806802777777 | -75.5060366666666 |
| | WYOMINGBURG 25VA | | PR | 25628.*A | 37.8176388888888 | -77.1030277777777 |
| | SKY BRYCE VG18 | | PR | 25631.*A | 38.8159458333333 | -78.7702980555555 |

Data View

Importing the Runways Excel File

- Import a second file containing runways at the Virginia Airports

Microsoft Access can use your column headings as field names for your table. Does the first row specified contain column headings?

First Row Contains Column Headings

| | FAA File Number | Runway Label | Length (feet) | Width (ft) | Surface | Lights |
|----|-----------------|--------------|---------------|------------|---------|--------|
| 1 | 25600.*A | 06/24 | 4471 | 75 | ASPH-G | |
| 2 | | 06/24 | 4471 | 75 | ASPH-G | ODALS |
| 3 | 25600.01*H | H1 | 600 | 100 | TURF | |
| 4 | | H1 | 600 | 100 | TURF | |
| 5 | 25609.*H | H1 | 75 | 75 | CONC | |
| 6 | | H1 | 75 | 75 | CONC | |
| 7 | 25609.01*H | H1 | 35 | 35 | ASPH | |
| 8 | | H1 | 35 | 35 | ASPH | |
| 9 | 25617.*A | 10/28 | 2000 | 120 | TURF-F | |
| 10 | | 10/28 | 2000 | 120 | TURF-F | |
| 11 | 25617.2*A | 14/32 | 3200 | 100 | TURF-G | |
| 12 | | 14/32 | 3200 | 100 | TURF-G | |
| 13 | 25618.*A | 04/22 | 1400 | 75 | TURF | |
| 14 | | 04/22 | 1400 | 75 | TURF | |

Buttons: Cancel, < Back, Next >, Finish

Imported Runway File

- Imported Virginia Airports Runway Excel file

The screenshot shows the Design View of a table in Microsoft Access. The ribbon includes 'Table Tools' and 'Design'. The table structure is as follows:

| Field Name | Data Type |
|-----------------|------------|
| ID | AutoNumber |
| FAA File Number | Text |
| Runway Label | |
| Length (feet) | |
| Width (ft) | |
| Surface | |
| Lights | |

Design View

The screenshot shows the Data View of the same table. The data is as follows:

| ID | FAA File Number | Runway Label | Length (feet) | Width (ft) | Surface | Lights |
|----|-----------------|--------------|---------------|------------|---------|--------|
| 1 | 25600.*A | 06/24 | 4471 | 75 | ASPH-G | |
| 2 | | 06/24 | 4471 | 75 | ASPH-G | ODALS |
| 3 | 25600.01*H | H1 | 600 | 100 | TURF | |
| 4 | | H1 | 600 | 100 | TURF | |
| 5 | 25609.*H | H1 | 75 | 75 | CONC | |
| 6 | | H1 | 75 | 75 | CONC | |
| 7 | 25609.01*H | H1 | 35 | 35 | ASPH | |
| 8 | | H1 | 35 | 35 | ASPH | |
| 9 | 25617.*A | 10/28 | 2000 | 120 | TURF-F | |
| 10 | | 10/28 | 2000 | 120 | TURF-F | |
| 11 | 25617.2*A | 14/32 | 3200 | 100 | TURF-G | |
| 12 | | 14/32 | 3200 | 100 | TURF-G | |
| 13 | 25618.*A | 04/22 | 1400 | 75 | TURF | |
| 14 | | 04/22 | 1400 | 75 | TURF | |
| 15 | 25618.01*A | 11/29 | 3000 | 100 | TURF-G | |
| 16 | | 11/29 | 3000 | 100 | TURF-G | |
| 17 | 25622.*A | 05/23 | 1800 | 20 | ASPH | |
| 18 | | 05/23 | 1800 | 20 | ASPH | |
| 19 | 25622.01*H | H1 | 80 | 80 | TURF | |