



Advanced Database Concepts: Reports & Views

INFO/CSE 100, Spring 2006
Fluency in Information Technology

<http://www.cs.washington.edu/100>

Readings and References

- Reading
 - » *Fluency with Information Technology*
 - Chapter 16, Case Study in Database Design
- References
 - » MS Access Help files
 - keyword “form”
 - » MS Access Help files
 - Section “Reports and Report Snapshots”

Views as Tables

- Recall that the result of a query is a table
- We have been presenting the table to the user in simple tabular form

All Books from Another Press : Select Query

ISBN	Title	Price	Name
1-2	Your Reader	\$12.00	Another Press
2-2	His Reader	\$25.00	Another Press

Record: 3 of 3

All Books by Alex : Select Query

Name	ISBN	Title
Alex	1-1	My Reader
Alex	1-2	Your Reader

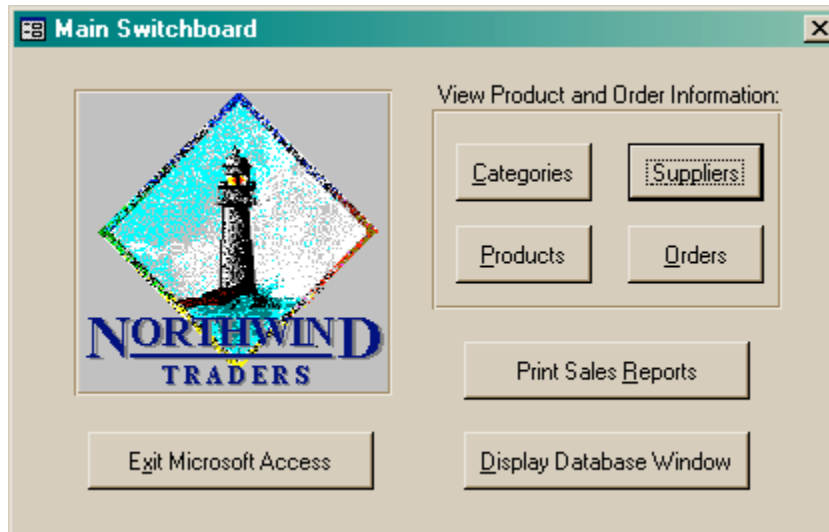
Record: 3 of 3

Book Info for Given ISBN : Select Query

ISBN	Title	Price	authors.Name	publishers.Nam
1-1	My Reader	\$10.00	Alex	A Press

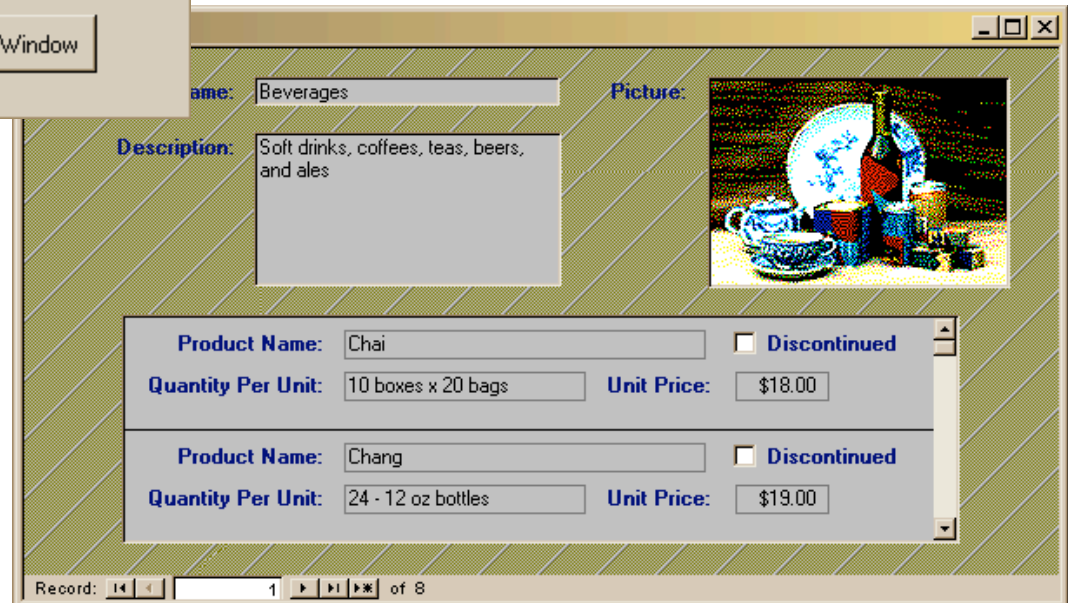
Record: 1 of 1

But tables are not pretty ...



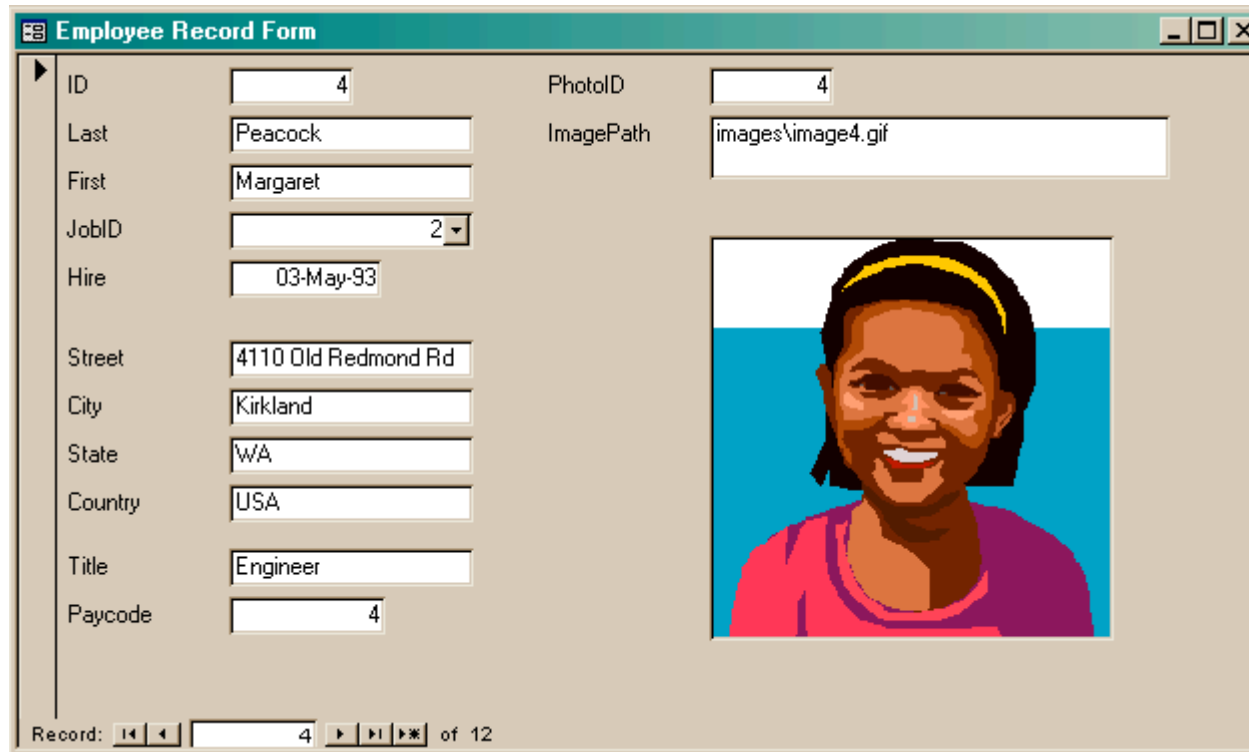
Users need help understanding what they are looking at and what they can do with it ...

... so we developed Forms for controlling the display of data for the user who is reviewing or updating specific records.



Views as Forms

A form is primarily used to enter or display data in a database



A screenshot of a web-based form titled "Employee Record Form". The form contains the following fields and values:

ID	4	PhotoID	4
Last	Peacock	ImagePath	images\image4.gif
First	Margaret		
JobID	2		
Hire	03-May-93		
Street	4110 Old Redmond Rd		
City	Kirkland		
State	WA		
Country	USA		
Title	Engineer		
Paycode	4		

At the bottom of the form, there is a record navigation bar showing "Record: 4 of 12" with navigation buttons for first, previous, next, and last records.

On the right side of the form, there is a photo of a woman with dark hair, wearing a yellow headband and a pink top, smiling. The photo is displayed against a blue background.

Last lecture we developed Forms for better display to the user while updating the table.

But forms are not very compact ...



One Portals Way, Twin Ports WA 98156
 Phone: 1-206-555-1417 Fax: 1-206-555-5938

Ship To: Rattlesnake Canyon Grocery
 2817 Milton Dr.
 Albuquerque NM 87110
 USA

Bill To: Rattlesnake Canyon Grocery
 2817 Milton Dr.
 Albuquerque NM 87110
 USA

Users like to have reports densely packed with information and logically arranged ...

Order ID:	Customer ID:	Salesperson:	Order Date:	Required Date:	Shipped Date:	Ship Via:
11077	RATTC	Nancy Davolio	06-May-1998	03-Jun-1998		United Package

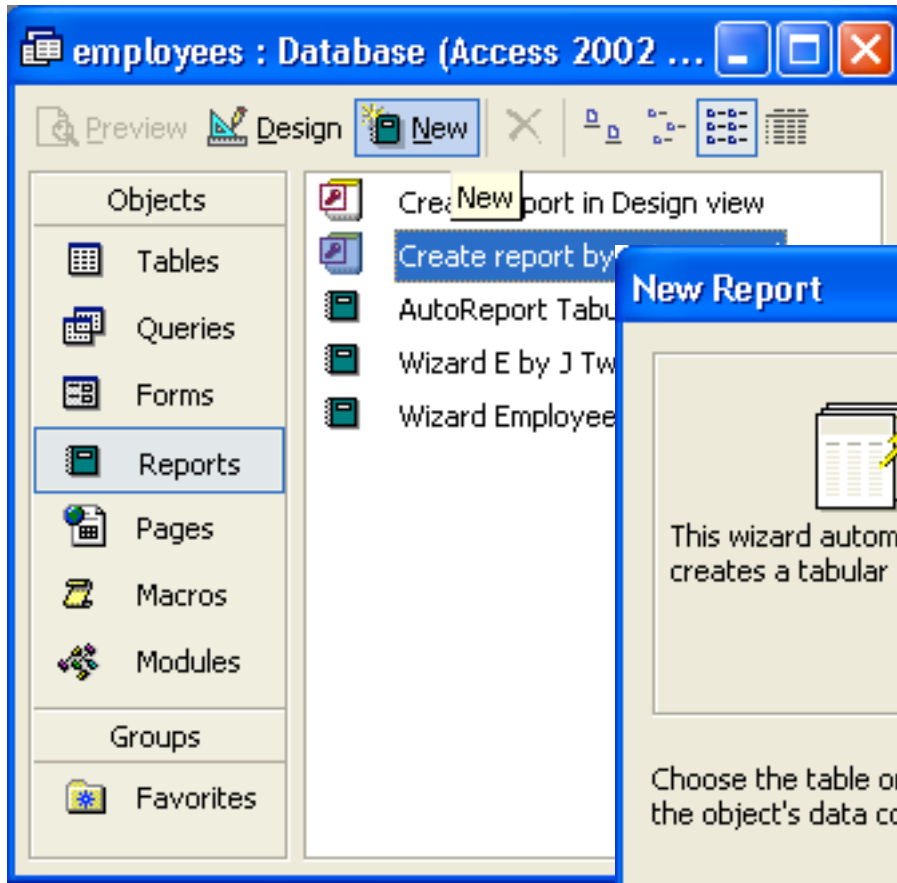
Product ID:	Product Name:	Quantity:	Unit Price:	Discount:	Extended Price:
2	Chang	24	\$19.00	20%	\$364.80
3	Aniseed Syrup	4	\$10.00	0%	\$40.00
4	Chef Anton's Cajun Seasoning	1	\$22.00	0%	\$22.00
6	Grandma's Boysenberry Spread	1	\$25.00	2%	\$24.50
7	Uncle Bob's Organic Dried Pears	1	\$30.00	5%	\$28.50

So this lecture we will develop **Reports** for compact display of multiple records.

Reports

- A Report is another face for a table (or query)
- The report lets the designer arrange the data, label it, provide some control over events, etc
 - » the **presentation**
 - » multiple presentations are possible depending on the specific needs of each user
- Underlying data comes from a table or a query
 - » the **content**
 - » single source of data ensures consistency

How does a report get built?



The New Report wizard can build a complete report for you.

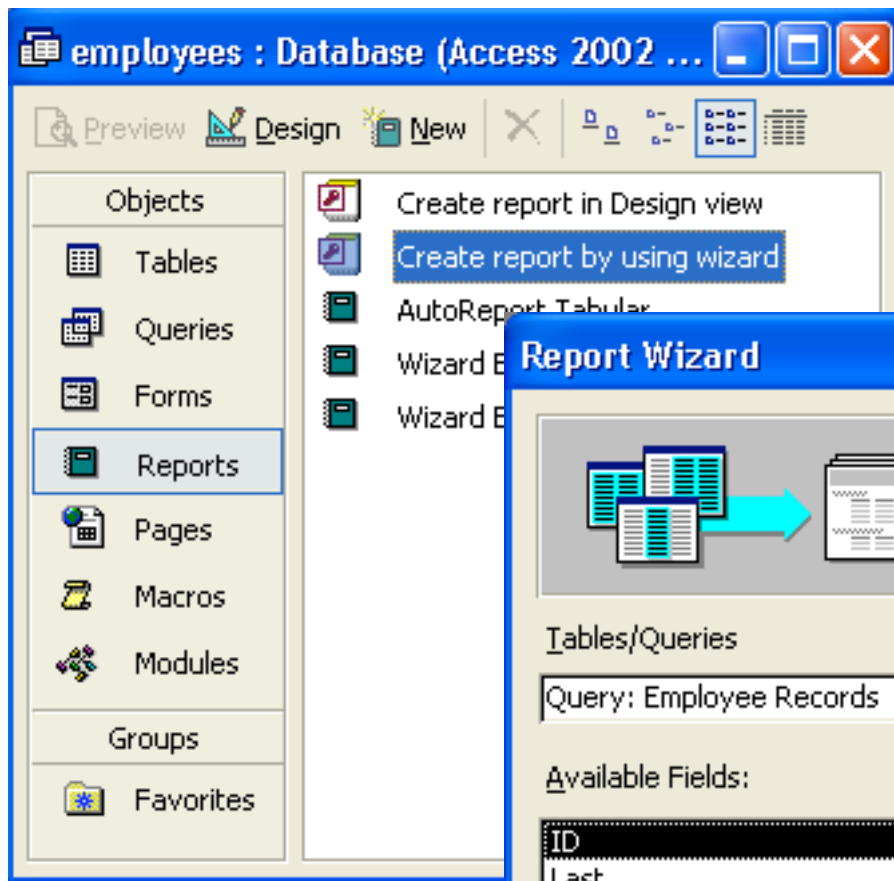
But this wizard is kind of naïve ...

ImagePaths

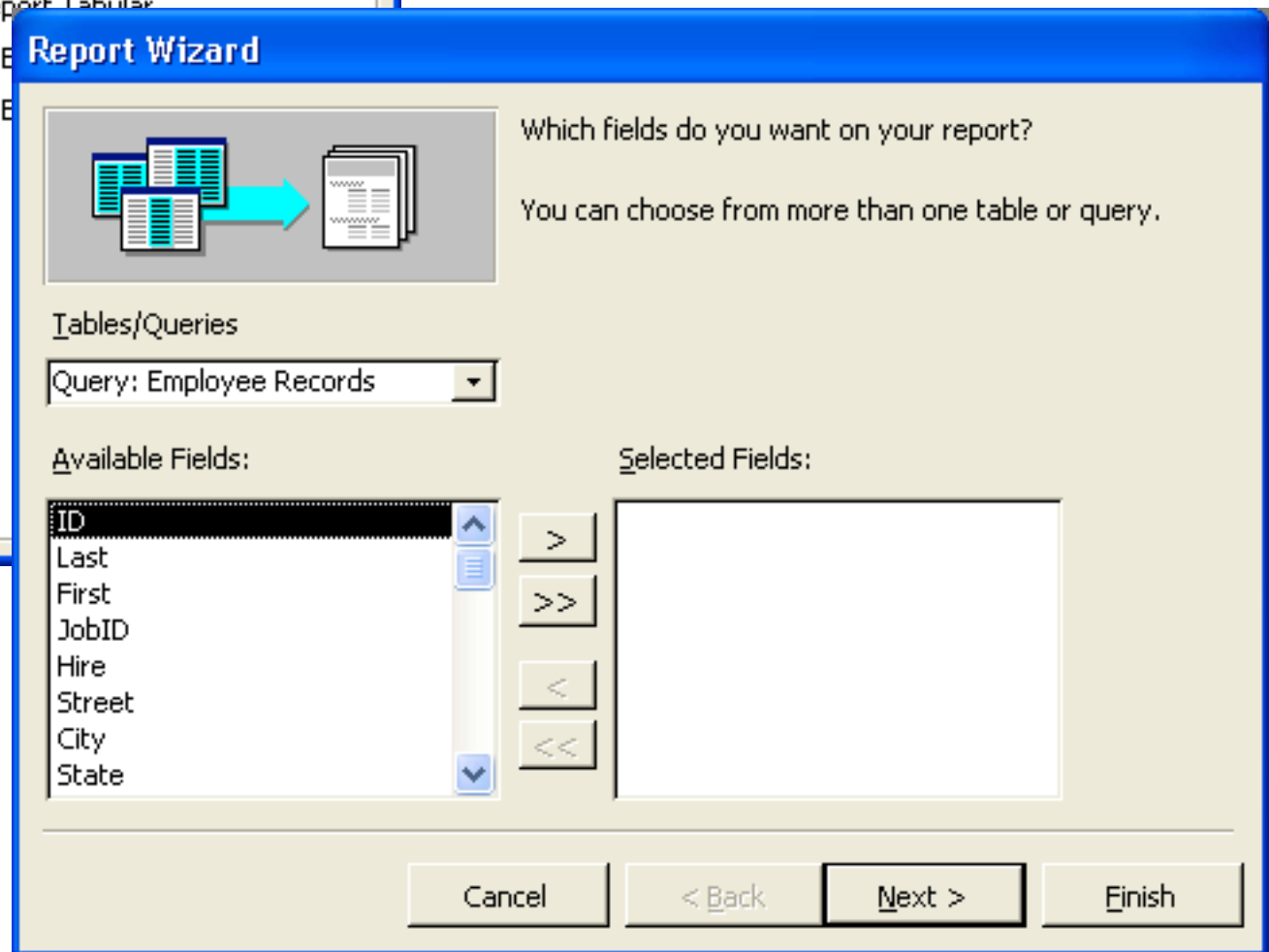
ImagePaths

<i>ID</i>	<i>Last</i>	<i>First</i>	<i>JobID</i>	<i>Hire</i>	<i>Street</i>	<i>City</i>	<i>State</i>	<i>Country</i>	<i>otoID</i>	<i>Title</i>	<i>ycode</i>	<i>ImagePath</i>
1	Davalino	Nanci	0	1ay-92	507 20th Ave	Seattle	WA	USA	1	CEO	8	images\image1.gif
2	Fuller	Andrew	3	ug-92	908 W. Capit	Seattle	WA	USA	2	Administrativ	6	images\image2.gif
3	Wooster	Berton	1	%pr-93	722 Moss Ba	Seattle	WA	USA	3	VP	7	images\image3.gif
4	Peacock	Margaret	2	1ay-93	4110 Old Re	Kirkland	WA	USA	4	Engineer	4	images\image4.gif
5	Buchanan	Steven	3	Oct-94	13 Garrett Hil	Seattle	WA	USA	5	Administrativ	6	images\image5.gif
6	Sullimari	Okan	2	Dec-94	Coventry Hou	Seattle	WA	USA	6	Engineer	4	images\image6.gif
101	Soggy	Peter	2	Jun-04	1300 20th Av	Seattle	WA	USA	7	Engineer	4	images\image7.gif
102	Morken	Xavier	3	ep-03	100 Eastlake	Seattle	WA	USA	8	Administrativ	6	images\image8.gif
103	Wilshire	Bruce	3	Mar-98	34 15th Ave	Seattle	WA	USA	9	Administrativ	6	images\image9.gif
104	Brazely	Tanya	2	Mar-02	103 29th Ave	Seattle	WA	USA	10	Engineer	4	images\image10.gif
105	Compton	Sarah	3	Nov-99	4034 NW 50t	Seattle	WA	USA	11	Administrativ	6	images\image11.gif
106	Zanzy	Ovid	2	Jan-99	4502 NW 52	Seattle	WA	USA	12	Engineer	4	images\image12.gif

Page: 1



You might want to use the Report Wizard instead since it gives you more control.



Employees by JobCode

Title *Administrative*

Paycode *6*

<i>Last</i>	<i>ID</i>	<i>First</i>	<i>JobID</i>	<i>Hire</i>	<i>Street</i>	<i>City</i>	<i>State</i>	<i>Country</i>	<i>ImagePath</i>
Buchanan	5	Steven	3	Oct-94	13 Garrett Hill	Seattle	WA	USA	images/image5.gif
Compton	105	Sarah	3	Nov-99	4034 NW 50th	Seattle	WA	USA	images/image11.gif
Fuller	2	Andrew	3	Aug-92	908 W. Capitol	Seattle	WA	USA	images/image2.gif
Morken	102	Xavier	3	Sep-03	100 Eastlake	Seattle	WA	USA	images/image8.gif
Wilshire	103	Bruce	3	Mar-98	34 15th Ave	Seattle	WA	USA	images/image9.gif

Title *CEO*

Paycode *8*

<i>Last</i>	<i>ID</i>	<i>First</i>	<i>JobID</i>	<i>Hire</i>	<i>Street</i>	<i>City</i>	<i>State</i>	<i>Country</i>	<i>ImagePath</i>
Davalino	1	Nanci	0	May-92	507 20th Ave	Seattle	WA	USA	images/image1.gif

Title *Engineer*

Paycode *4*

<i>Last</i>	<i>ID</i>	<i>First</i>	<i>JobID</i>	<i>Hire</i>	<i>Street</i>	<i>City</i>	<i>State</i>	<i>Country</i>	<i>ImagePath</i>
Brazely	104	Tanya	2	Mar-02	103 25th Ave	Seattle	WA	USA	images/image10.gif
Peacock	4	Margaret	2	May-93	4110 Old Re	Kirkland	WA	USA	images/image4.gif

Better looking report, but you still probably want to tweak it ...

But you probably want to tweak it ...

The image shows a screenshot of Microsoft Access. The main window title is "Microsoft Access - [employees : Database (Access 2002 file format)]". The menu bar includes File, Edit, View, Insert, Tools, Window, and Help. The toolbar contains various icons, with the "Design" icon circled in red. A red arrow points from the "Design" icon to a report wizard window titled "Wizard Employees by JobCode : Report".

The report wizard window shows a design view of a report. The report is titled "Employees by JobCode". It has a "Report Header" section with the title "Employees by JobCode". Below the header is a "Page Header" section with a "Title Header" section. The report body consists of a "Detail" section with a table of employee data. The table has the following columns: Title, Paycode, Last, ID, First, JobID, Hire, Street, City, State, Country, and ImagePath. The "Page Footer" section contains the text "=Now()" and "=Page " & [Page] & " of " & [Page]".

Report Header											
<i>Employees by JobCode</i>											
Page Header											
Title Header											
Title	Paycode	Last	ID	First	JobID	Hire	Street	City	State	Country	ImagePath
		Last	ID	First	JobID	Hire	Street	City	State	Country	ImagePath
Page Footer											
=Now()										="Page " & [Page] & " of " & [Page]	
Report Footer											

Employees by JobCode

Title *Administrative*

Paycode *6*

<i>ID</i>	<i>Last</i>	<i>First</i>	<i>JobID</i>	<i>Hire</i>	<i>Street</i>	<i>City</i>	<i>State</i>	<i>Country</i>	<i>ImagePath</i>
5	Buchanan	Steven	3	17-Oct-94	13 Garrett Hill	Seattle	WA	USA	images/image5.gif
105	Compton	Sarah	3	17-Nov-99	4034 NW 50th St	Seattle	WA	USA	images/image11.gif
2	Fuller	Andrew	3	14-Aug-92	908W. Capital Way	Seattle	WA	USA	images/image2.gif
102	Morken	Xavier	3	14-Sep-03	100 Eastlake Drive	Seattle	WA	USA	images/image8.gif
103	Wilshire	Bruce	3	01-Mar-98	34 15th Ave NE	Seattle	WA	USA	images/image9.gif

Title *CEO*

Paycode *8*

<i>ID</i>	<i>Last</i>	<i>First</i>	<i>JobID</i>	<i>Hire</i>	<i>Street</i>	<i>City</i>	<i>State</i>	<i>Country</i>	<i>ImagePath</i>
1	Davalino	Nandi	0	01-May-92	507 20th Ave E	Seattle	WA	USA	images/image1.gif

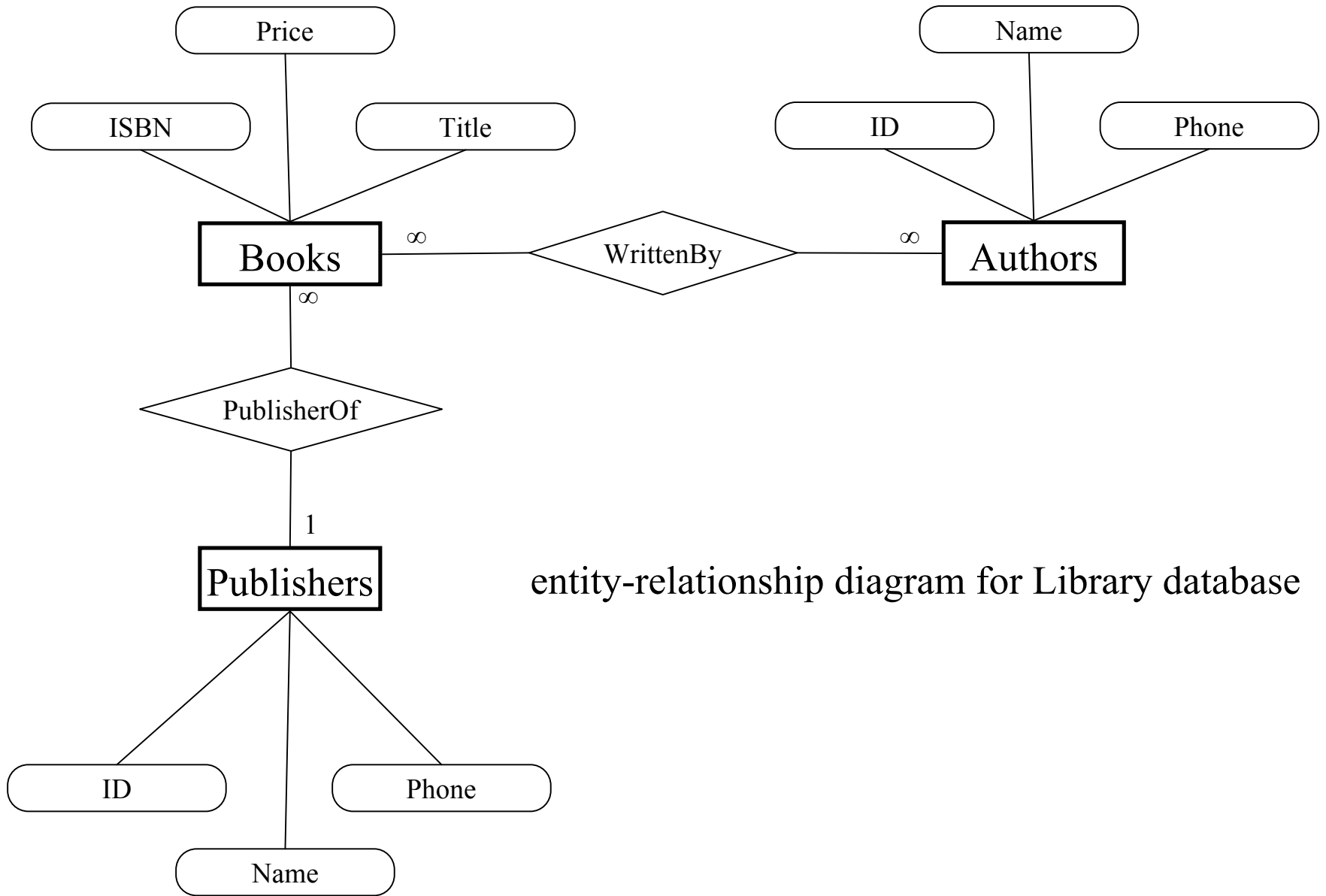
Title *Engineer*

Paycode *4*

<i>ID</i>	<i>Last</i>	<i>First</i>	<i>JobID</i>	<i>Hire</i>	<i>Street</i>	<i>City</i>	<i>State</i>	<i>Country</i>	<i>ImagePath</i>
104	Brazely	Tanya	2	03-Mar-02	103 25th Ave NW	Seattle	WA	USA	images/image10.gif
4	Peacock	Margaret	2	03-May-93	4110 Old Redmond R	Kirkland	WA	USA	images/image4.gif
101	Soggy	Peter	2	01-Jun-04	1300 20th Ave W	Seattle	WA	USA	images/image7.gif

Explore the Design capabilities

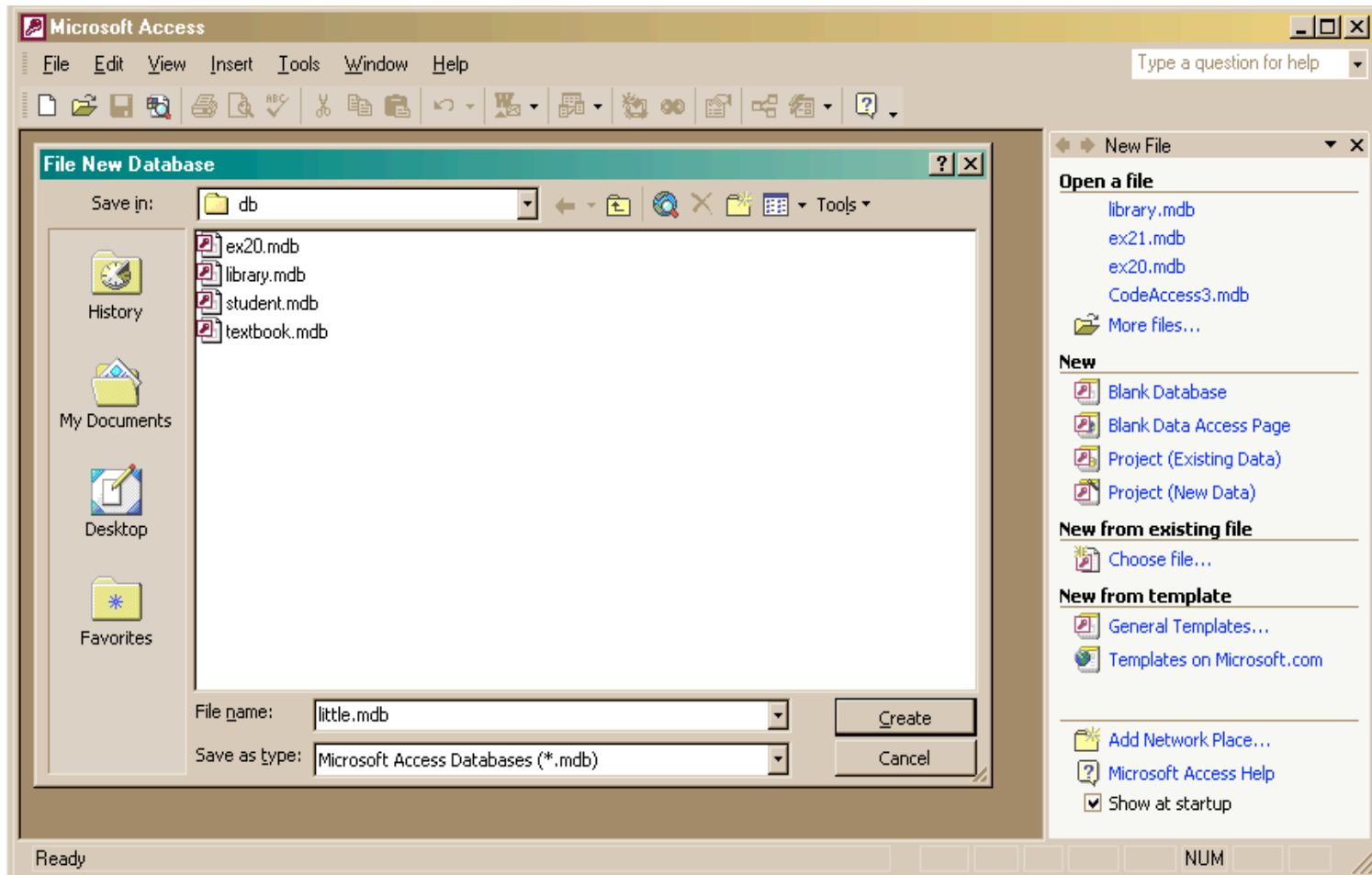
- Properties of the various controls can be set
- Controls and labels can be moved around
- Images and patterns can be applied
- Totals, averages, subtotals etc can be calculated
- Information can be grouped by selected fields
- Etc, etc – there is a lot of flexibility in how these reports get generated



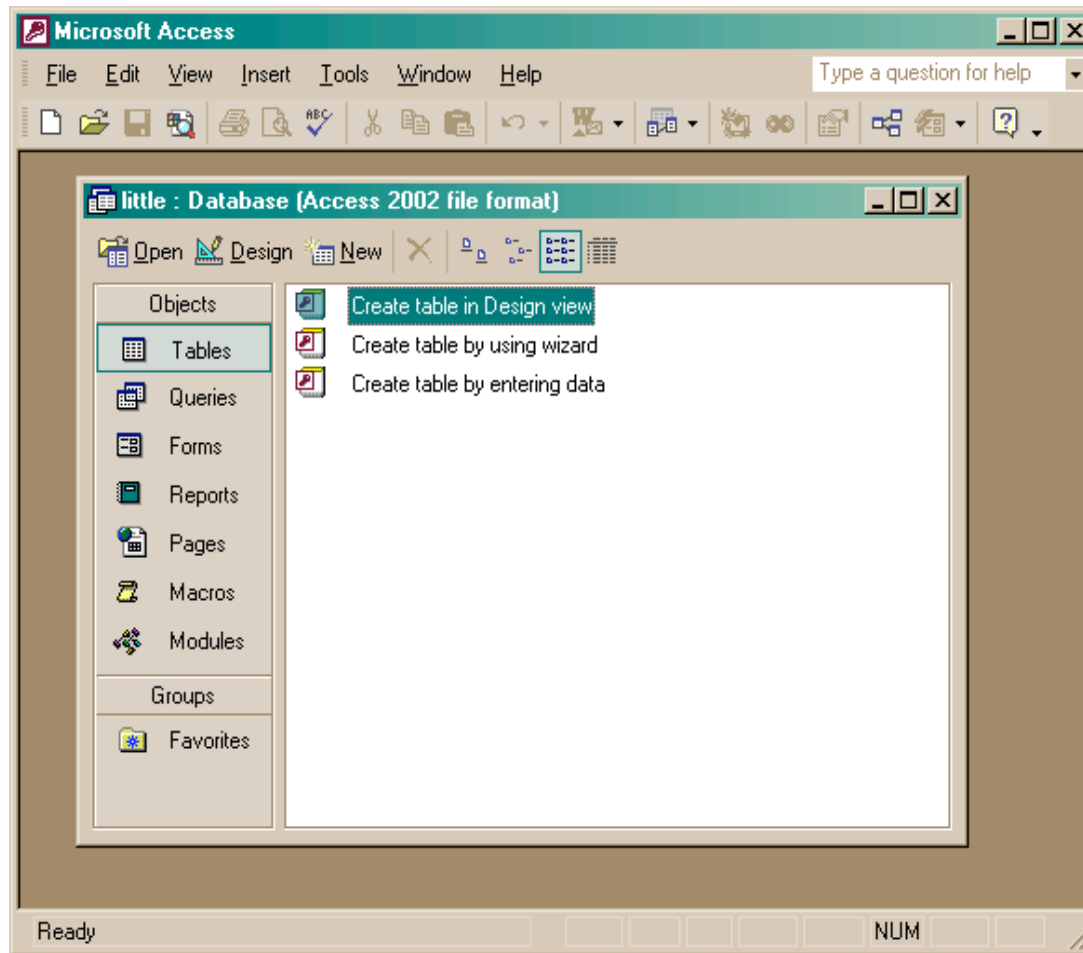
entity-relationship diagram for Library database



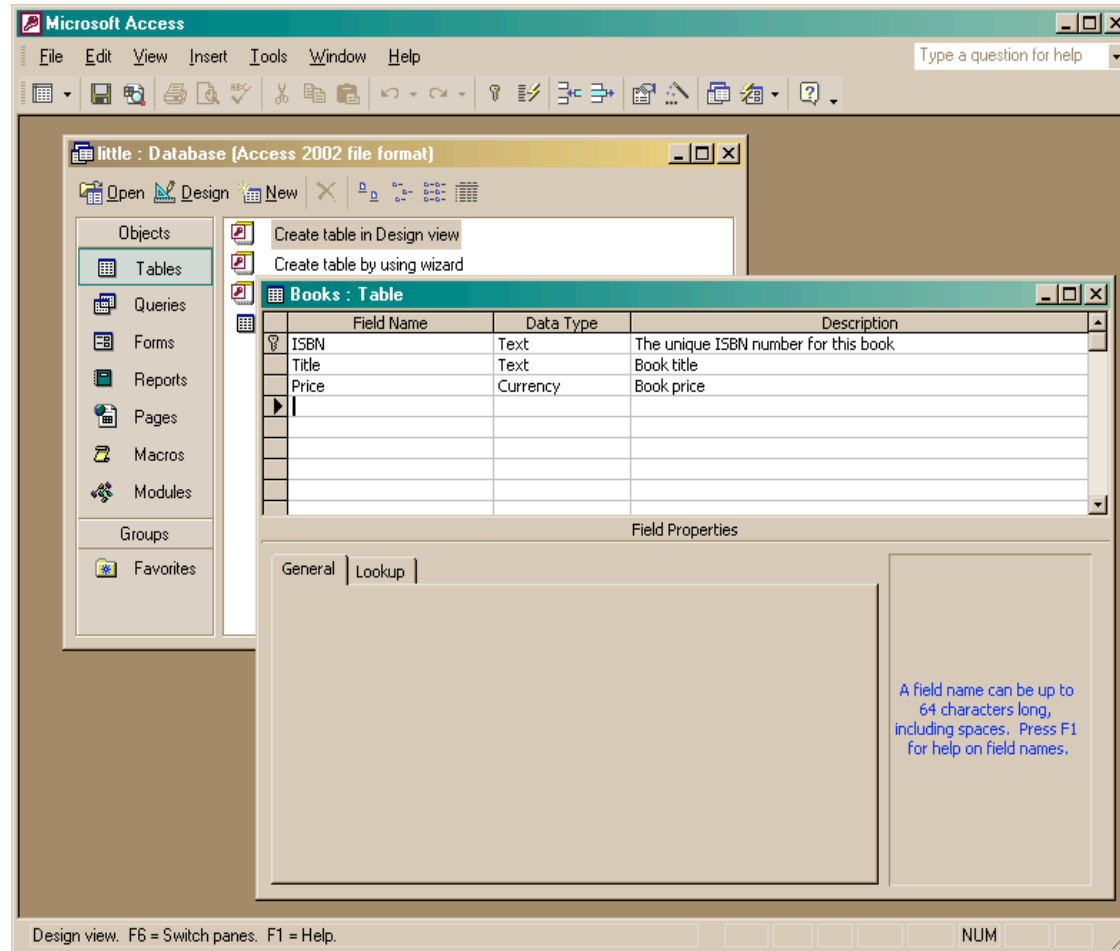
Create a new database



Create a new table in the database



Creating a table in Design view





Entering Table Data

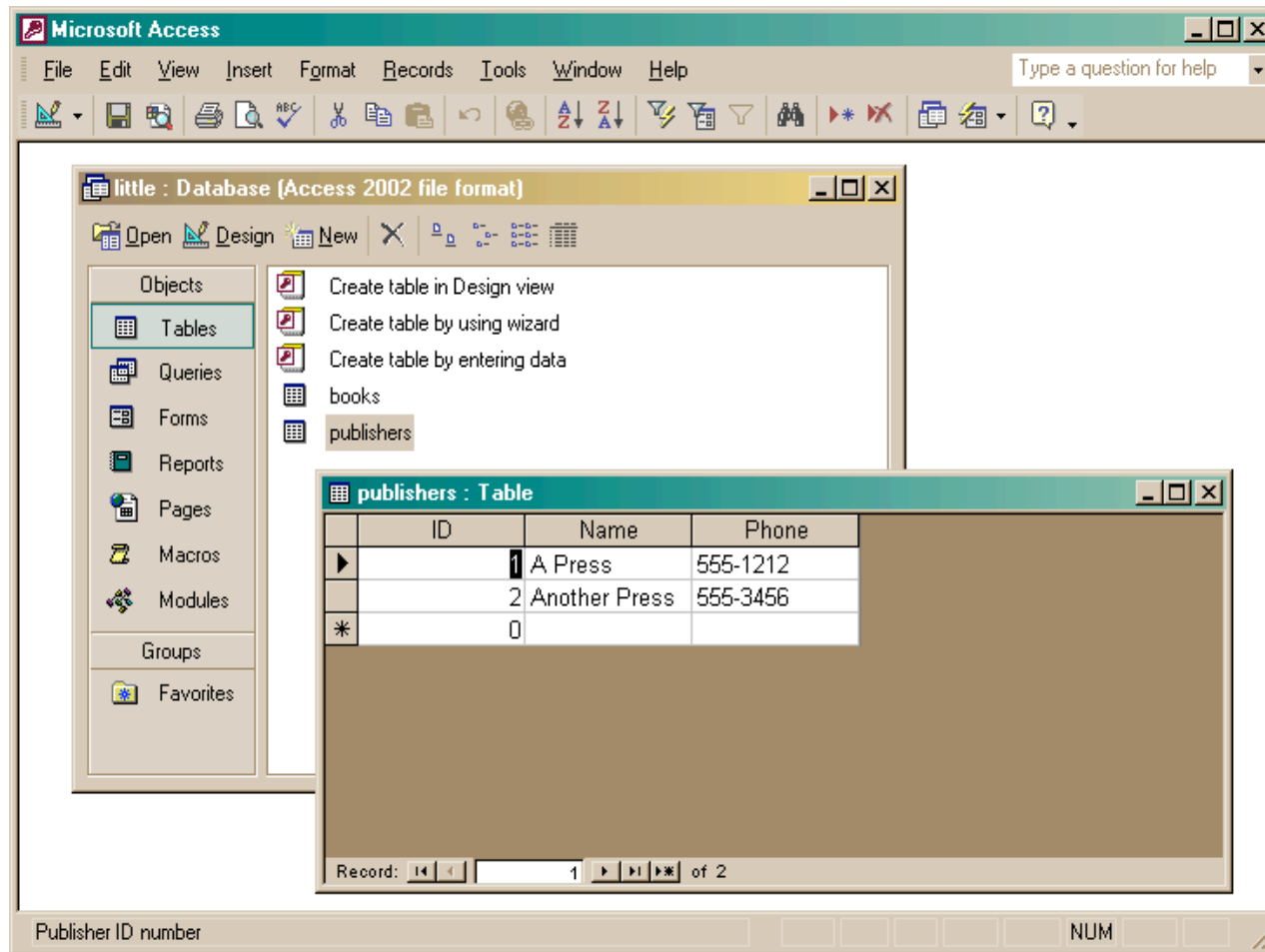
The screenshot shows the Microsoft Access interface. A window titled 'Database [Access 2002 file format]' is open, displaying the 'Objects' pane on the left with 'Tables' selected. A 'Books : Table' window is open, showing a table with the following data:

ISBN	Title	Price
1-1	My Reader	\$10.00
1-2	Your Reader	\$12.00
		\$0.00

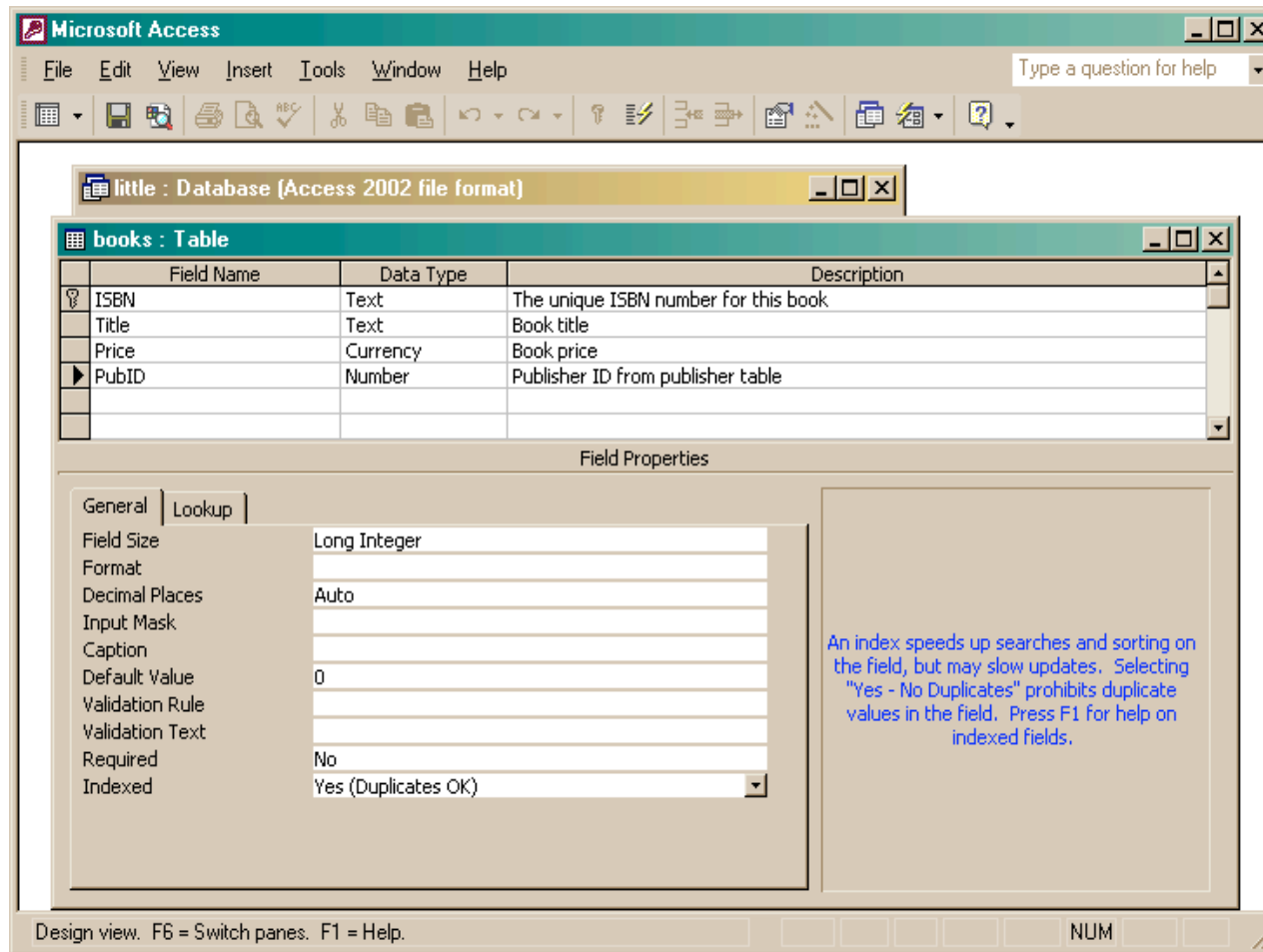
The status bar at the bottom indicates 'Record: 3 of 3' and 'NUM'.



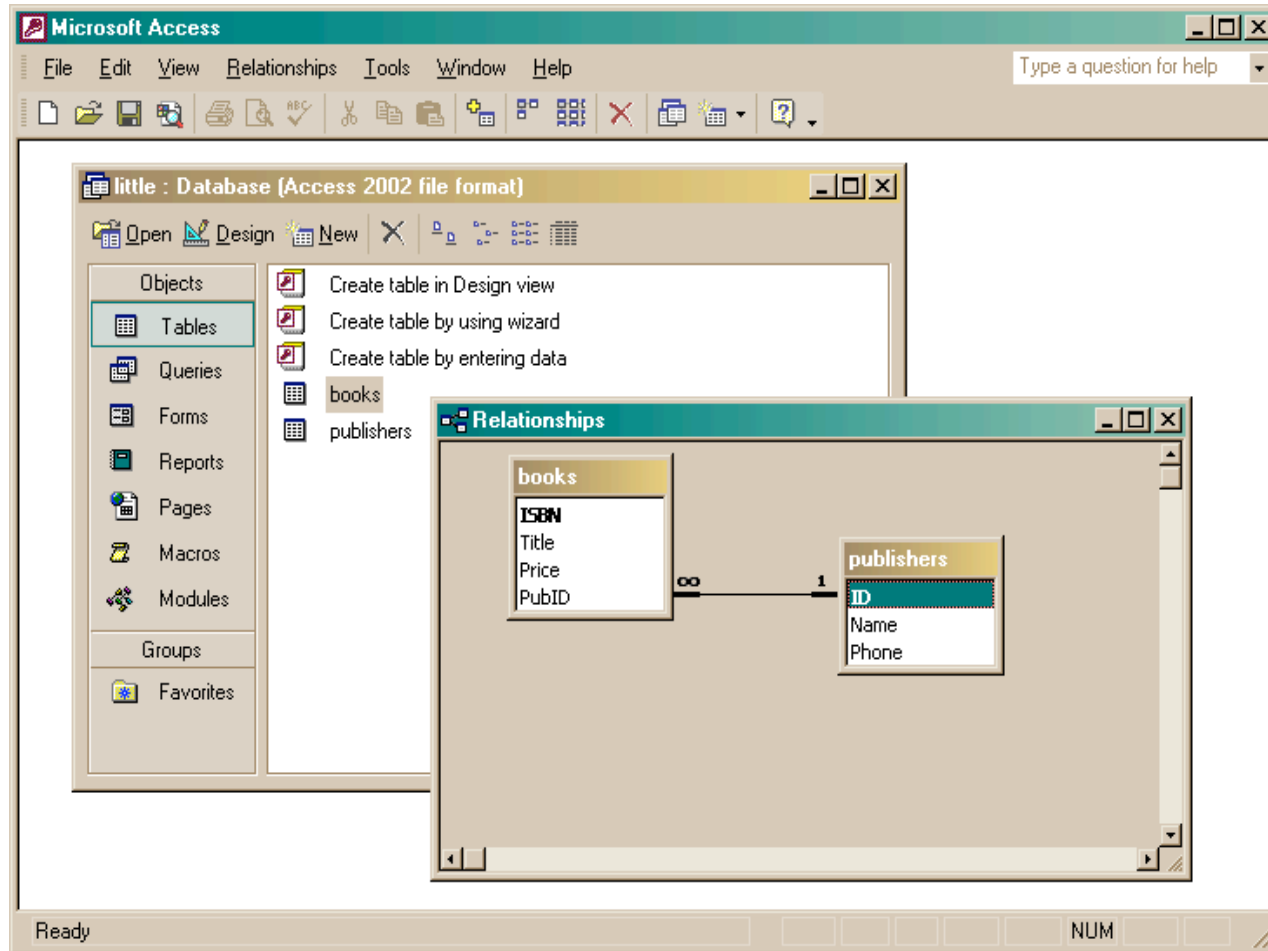
Build another table

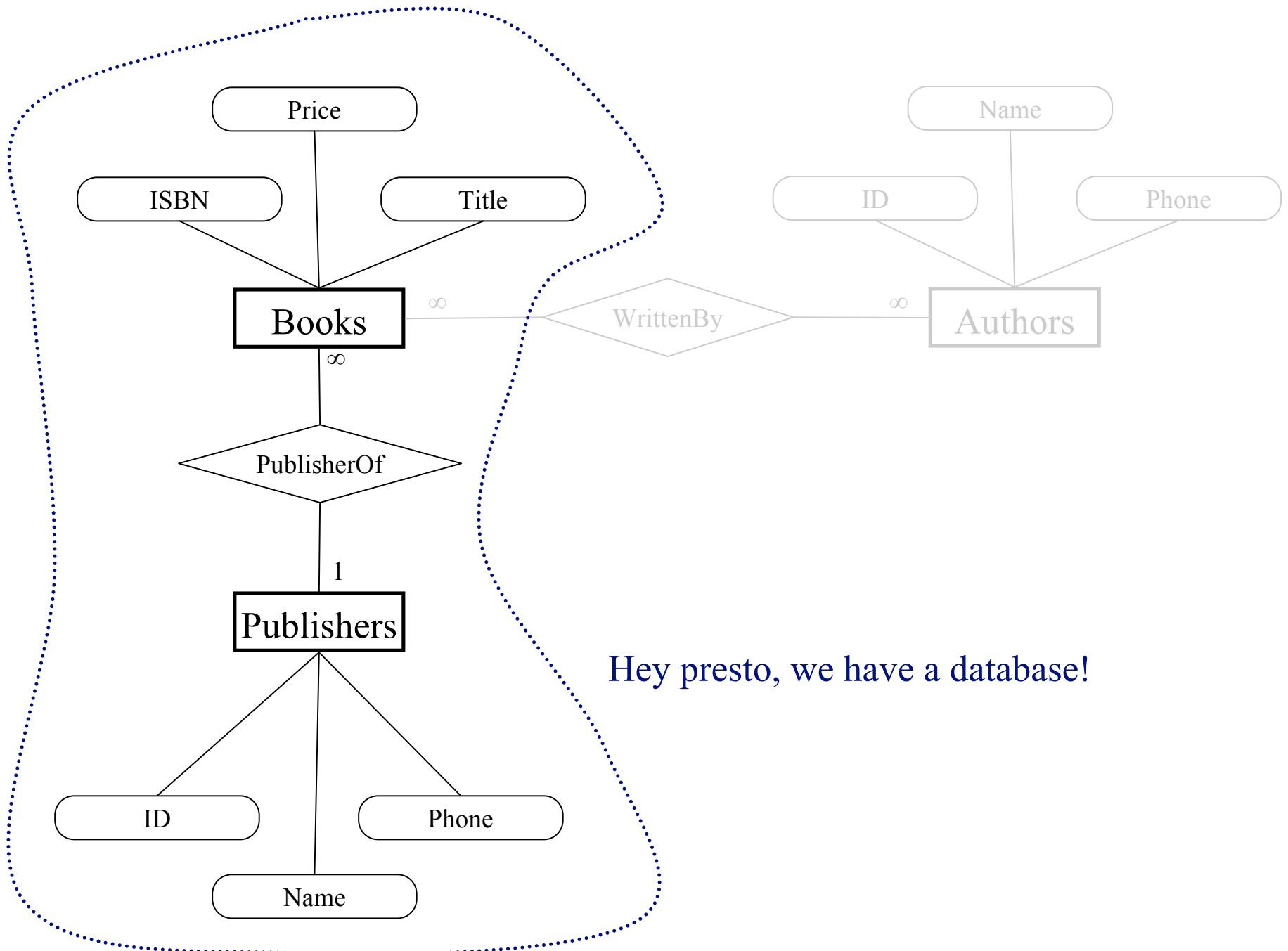


Add publisher ID to books



Create the link between the tables





Hey presto, we have a database!



Two tables with a relationship

books : Table

	ISBN	Title	Price	PubID
▶ 1-1		My Reader	\$10.00	1
1-2		Your Reader	\$12.00	2
2-2		His Reader	\$25.00	2
*			\$0.00	0

Record: 1 of 3

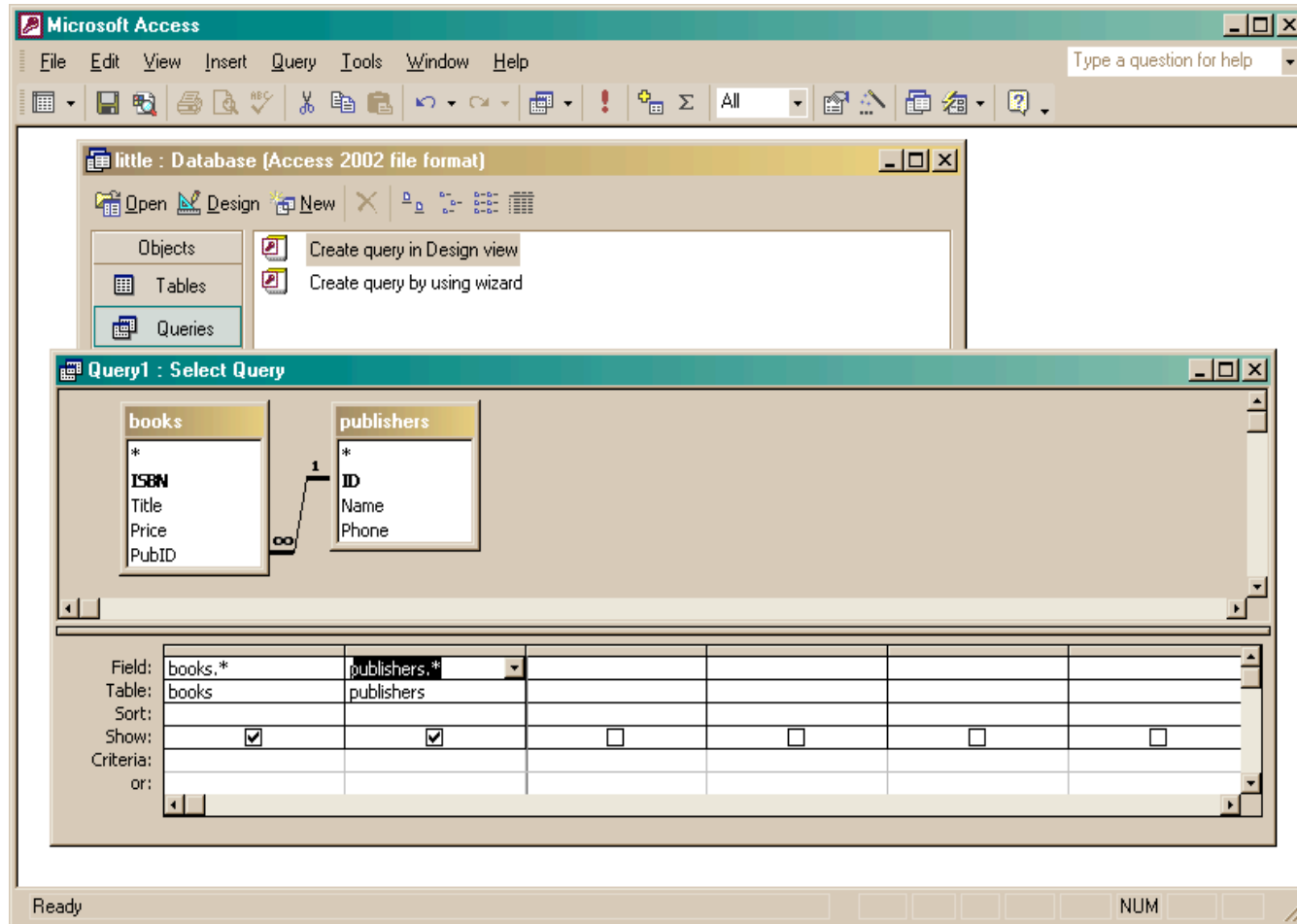
publishers : Table

	ID	Name	Phone
▶ +	1	A Press	555-1212
-	2	Another Press	555-3456
	ISBN	Title	Price
	1-2	Your Reader	\$12.00
	2-2	His Reader	\$25.00
*			\$0.00
*			

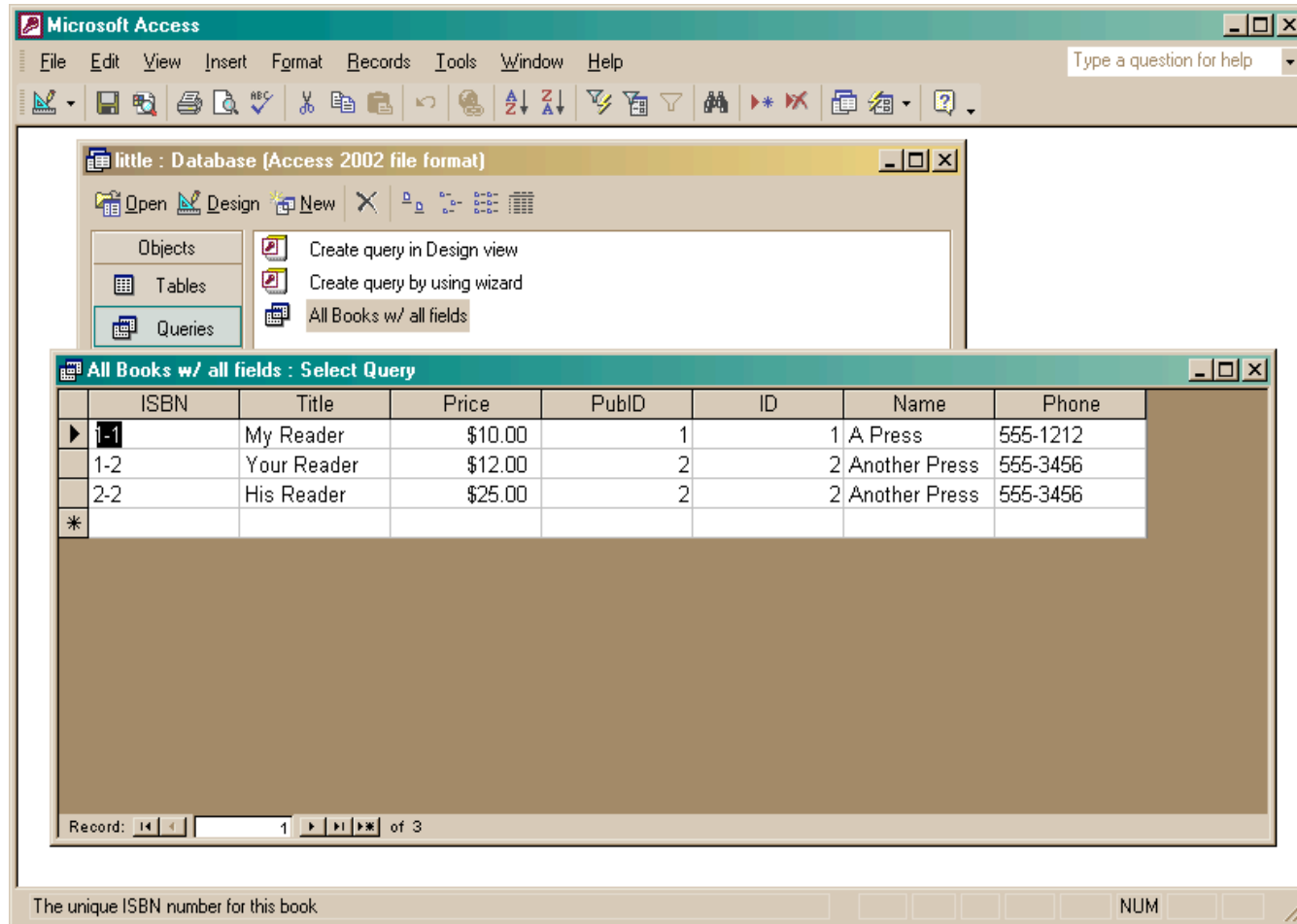
Record: 1 of 2

Relationships: books (ISBN, Title, Price, PubID) is related to publishers (ID, Name, Phone) with a one-to-many relationship.

Create a query



The query produces a new (virtual) table





Project (select particular columns)

The screenshot shows Microsoft Access with a database named 'little : Database (Access 2002 file format)'. The 'Queries' pane on the left shows a query named 'Title & Publisher'. The main window displays the 'Title & Publisher : Select Query' design view, showing a relationship between the 'books' table (with fields ISBN, Title, Price, PubID) and the 'publishers' table (with fields ID, Name, Phone). A 1-to-many relationship is indicated between the 'ID' field in 'publishers' and the 'PubID' field in 'books'. Below the design view is a table with the following data:

Field:	ISBN	Title	Name
Table:	books	books	publishers
Sort:			
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:			
or:			

Overlaid on the right is a data table view for the 'Title & Publisher : Select Query' showing the following data:

	ISBN	Title	Name
▶ 1-1		My Reader	A Press
1-2		Your Reader	Another Press
2-2		His Reader	Another Press
*			

Record: 1 of 3



Select particular rows

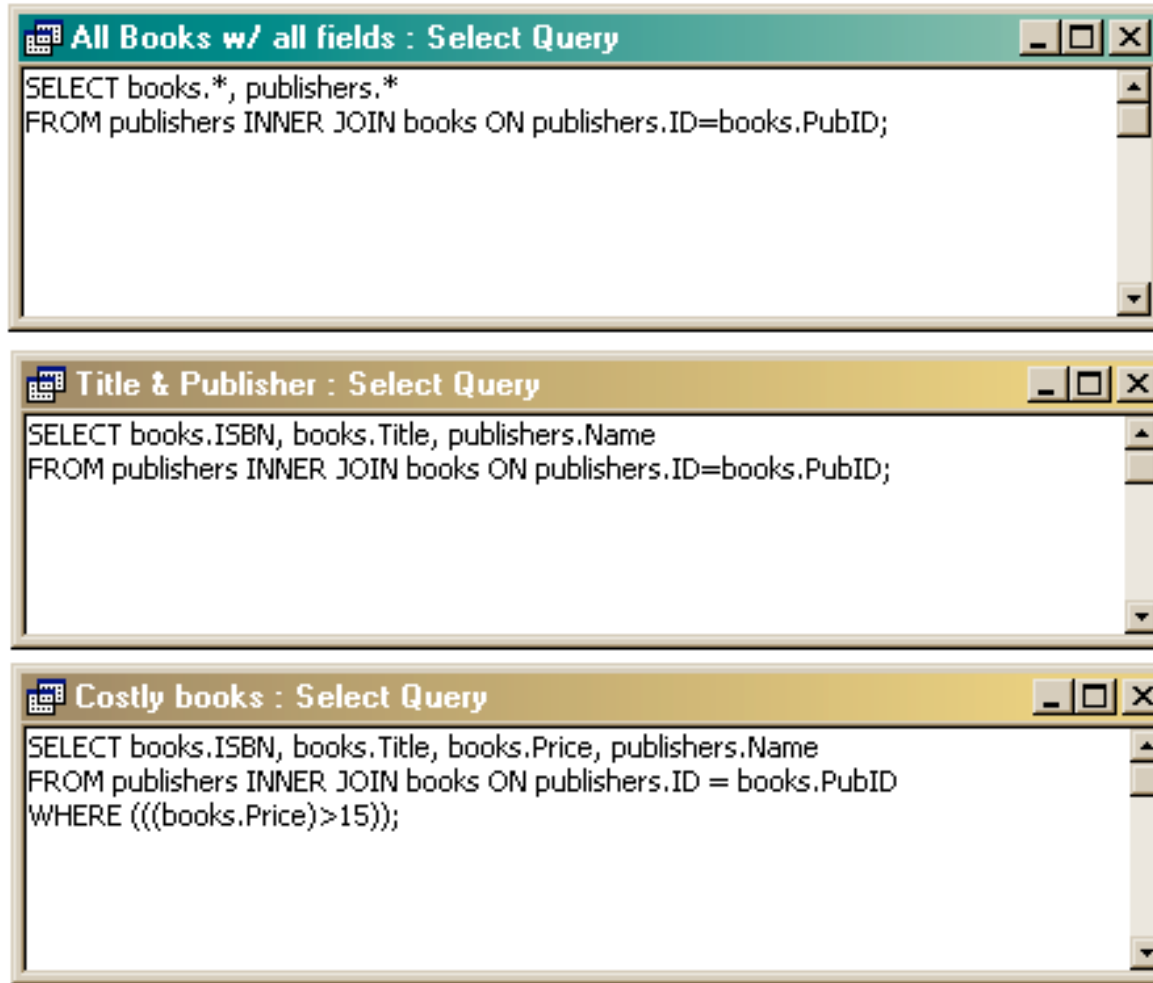
The screenshot shows Microsoft Access with a database named 'little : Database (Access 2002 file format)'. A query named 'Costly books : Select Query' is open, displaying a table with the following data:

ISBN	Title	Price	Name
2-2	His Reader	\$25.00	Another Press

The design view below the table shows the following criteria:

Field:	Table:	Sort:	Show:	Criteria:
ISBN	books		<input checked="" type="checkbox"/>	
Title	books		<input checked="" type="checkbox"/>	
Price	books		<input checked="" type="checkbox"/>	>15
Name	publishers		<input checked="" type="checkbox"/>	
PubID			<input type="checkbox"/>	

SQL behind the scenes



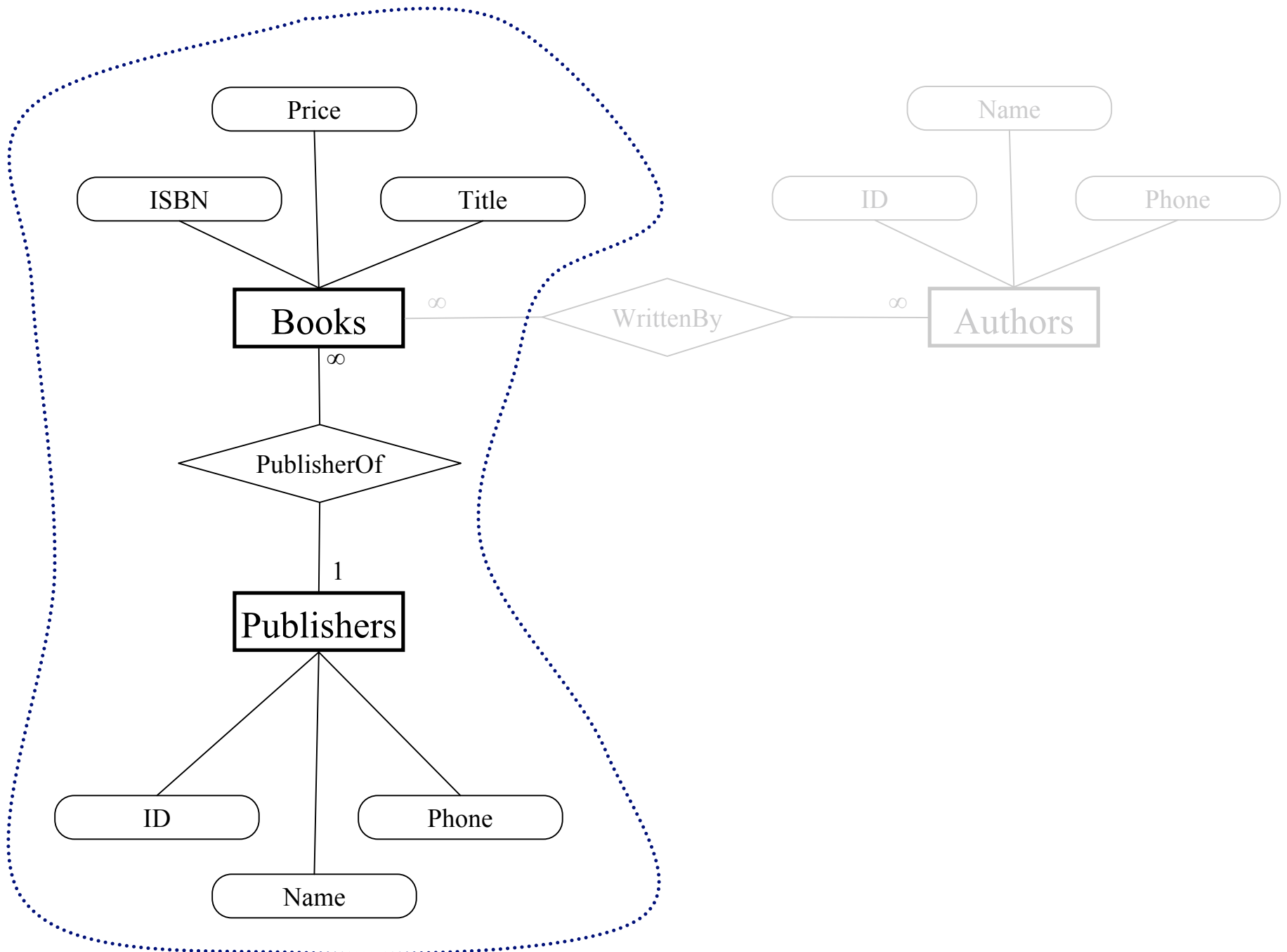
```
All Books w/ all fields : Select Query
SELECT books.*, publishers.*
FROM publishers INNER JOIN books ON publishers.ID=books.PubID;

Title & Publisher : Select Query
SELECT books.ISBN, books.Title, publishers.Name
FROM publishers INNER JOIN books ON publishers.ID=books.PubID;

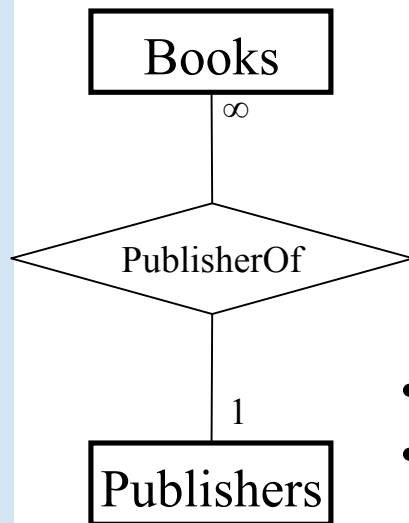
Costly books : Select Query
SELECT books.ISBN, books.Title, books.Price, publishers.Name
FROM publishers INNER JOIN books ON publishers.ID = books.PubID
WHERE (((books.Price)>15));
```

Recall: Structure of the database

- A database contains one or more *tables*
 - » Tables include *entities* with *attributes*
 - » There are *relationships* defined between the entities in the various tables
 - » Retrieve information from the tables using *queries*
- We designed and partially implemented a simple library database



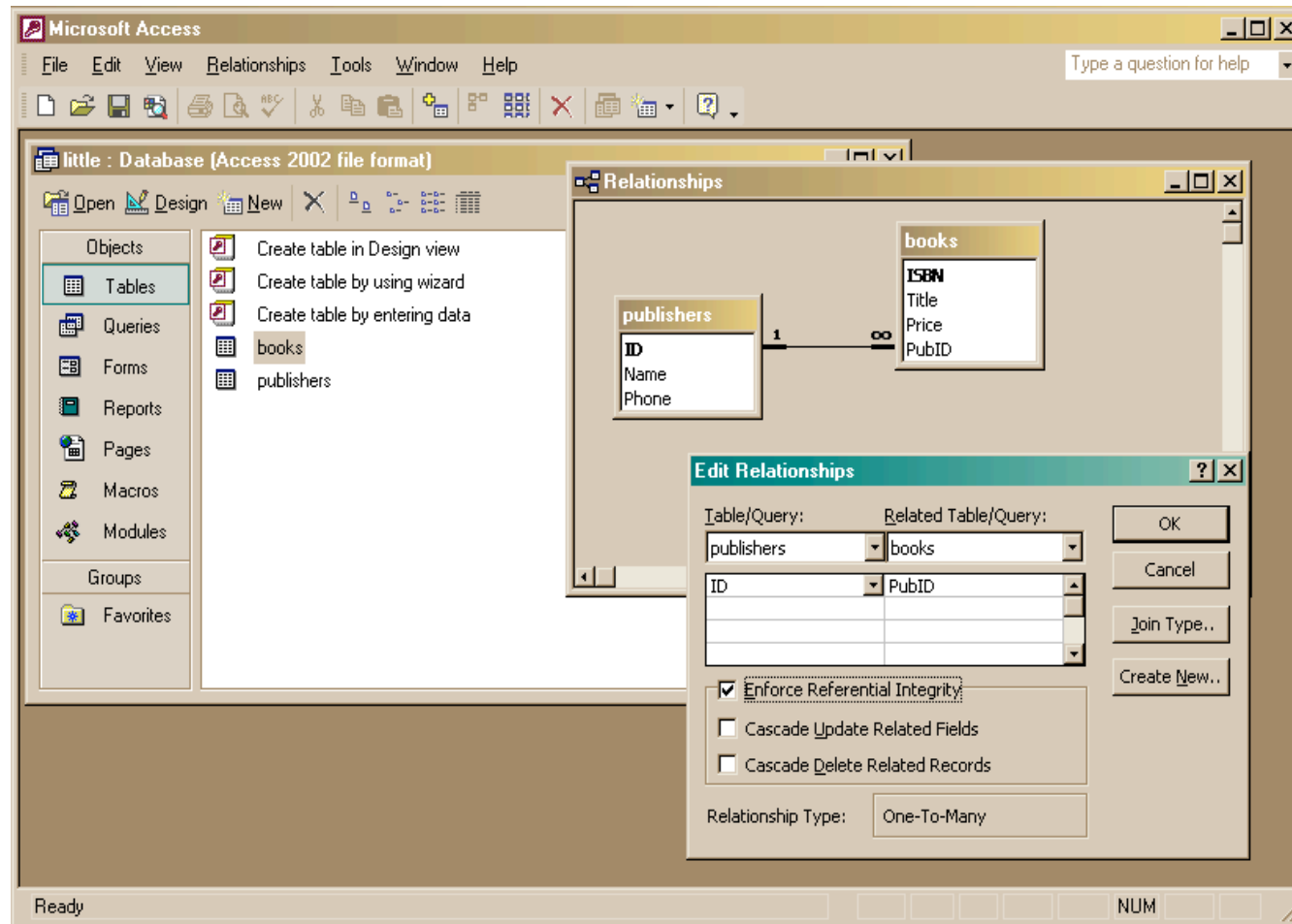
What is the relationship?



This relationship is 1-to-many:

- One publisher is responsible for many books.
 - Each book has only one publisher.
-
- The two tables are joined using the publisher ID number.
 - The publisher ID is the *primary key* for each entry in the publishers table.
 - Therefore, each publisher must have a unique publisher ID.
 - The publisher ID is a *foreign key* for each entry in the books table and we have requested *referential integrity*
 - Therefore, the given publisher ID must exist in the publishers table.

Referential Integrity



PubID must reference an actual publisher

All Books w/ all fields : Select Query

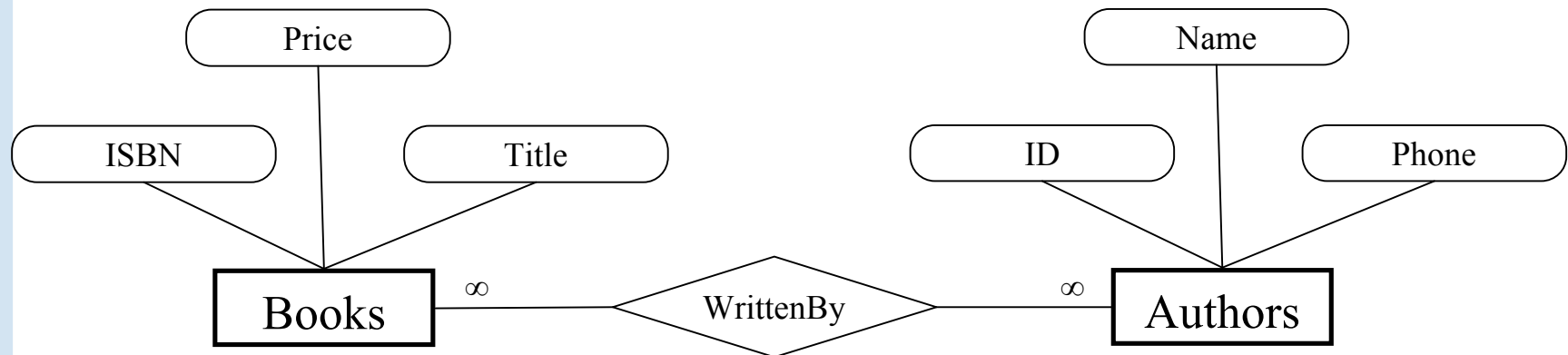
	ISBN	Title	Price	PubID	ID	Name	Phone
▶	1-1	My Reader	\$10.00	1	1	A Press	555-1212
	1-2	Your Reader	\$12.00	2	2	Another Press	555-3456
	2-2	His Reader	\$25.00	2	2	Another Press	555-3456
*							

Record: 1 of 3

All Books w/ all fields : Select Query

```
SELECT books.*, publishers.*
FROM publishers INNER JOIN books ON publishers.ID=books.PubID;
```

What is the relationship?

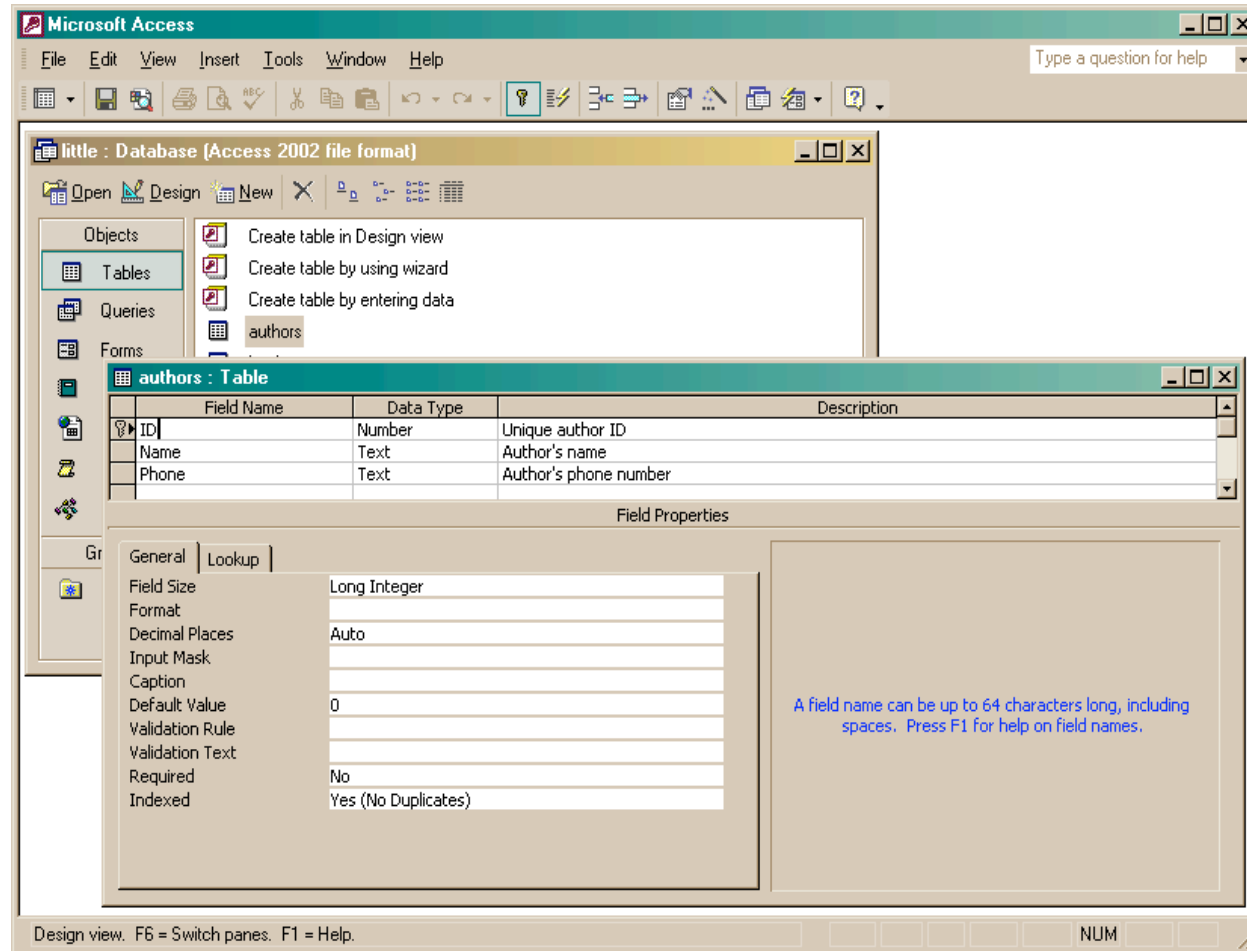


This relationship is many-to-many:

- One book may have several authors.
 - One author may have written several books.
-
- We need a unique identifier for each book.
 - We already selected the ISBN as the primary key and asked Access to make sure that there are no duplicates
 - We need a unique identifier for each author
 - We will define an author table with a unique ID for each author



authors table



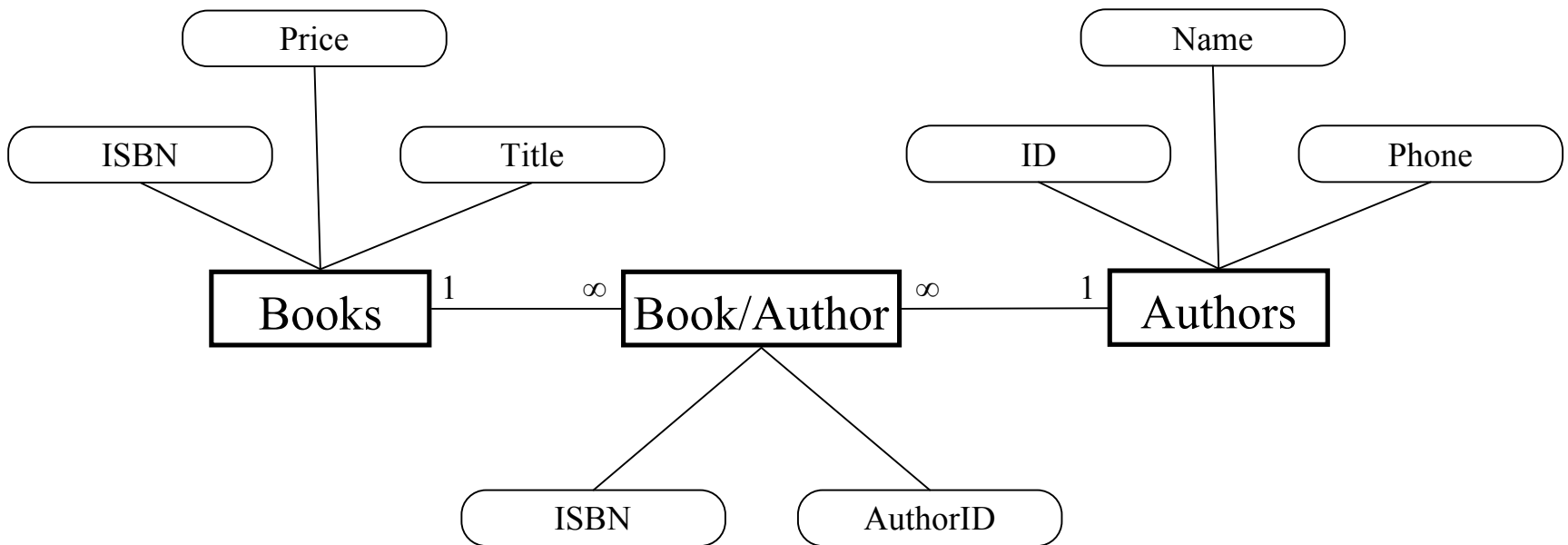
Link one book with many authors?

- We DO want:
 - » to link each book to one or more authors
- We DON'T want
 - » to specify extra fields (author1, author2, author3,...)
 - this is wasteful and limits the max number of authors
 - » to specify each book entry several times, naming a different author in each row
 - this duplicates all the other information about the book

Add a cross-reference table!

- Refine the design so that it includes another table that is a book-author cross reference
 - » Each entity in the table is a single cross reference
 - Attribute: ISBN
 - Attribute: Author ID
 - » No primary key
- Now we can break the many-to-many relationship into two 1-to-many relationships that we already know how to implement

Define new cross-reference entities





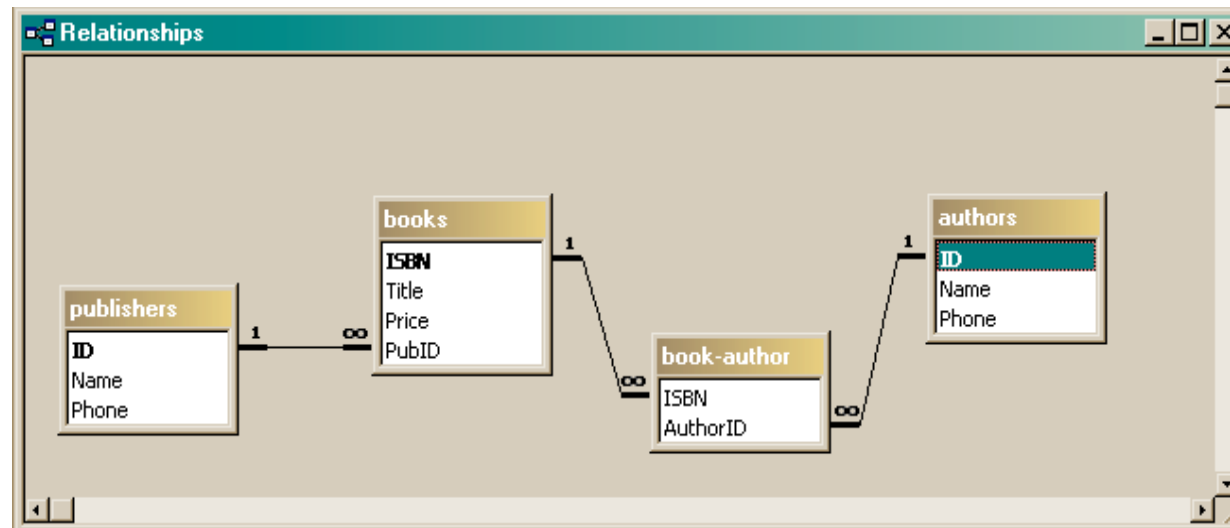
book-author table

The screenshot shows Microsoft Access with a database named 'little : Database [Access 2002 file format]'. The 'Tables' pane on the left lists 'authors', 'book-author', 'books', and 'publishers'. The 'authors' table is open in a data view, showing columns ID, Name, and Phone. The 'books' table is also open, showing columns ISBN, Title, and Price. A third table, 'book-author', is open in a data view, showing columns ISBN and AuthorID. The 'book-author' table contains the following data:

ISBN	AuthorID
1-1	1
1-2	1
2-2	2
2-2	3
*	

At the bottom of the 'book-author' table view, there is a text label 'An author of the book' and a 'NUM' field.

Define the new relationships



Define a query that uses the relationship

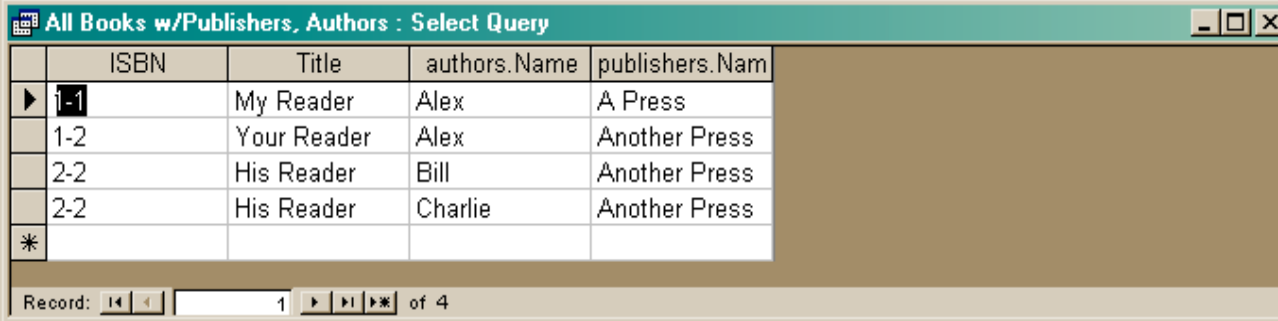
The screenshot displays a database query builder interface. At the top, a window titled "All Books w/Publishers, Authors : Select Query" shows a relationship diagram with four tables: publishers, books, book-author, and authors. The publishers table is connected to the books table (1 to ∞), the books table to the book-author table (1 to ∞), and the book-author table to the authors table (∞ to 1). Below the diagram is a table with columns for Field, Table, Sort, Show, and Criteria. The Field column contains ISBN, Title, Name, and Name. The Table column contains books, books, authors, and publishers. The Show column has checkboxes for each field. Below this is another window titled "All Books w/Publishers, Authors : Select Query" containing the following SQL query:

```
SELECT books.ISBN, books.Title, authors.Name, publishers.Name
FROM publishers INNER JOIN (books INNER JOIN (authors INNER JOIN [book-author] ON authors.ID = [book-author].AuthorID) ON
books.ISBN = [book-author].ISBN) ON publishers.ID = books.PubID;
```

Query By Example

actual SQL

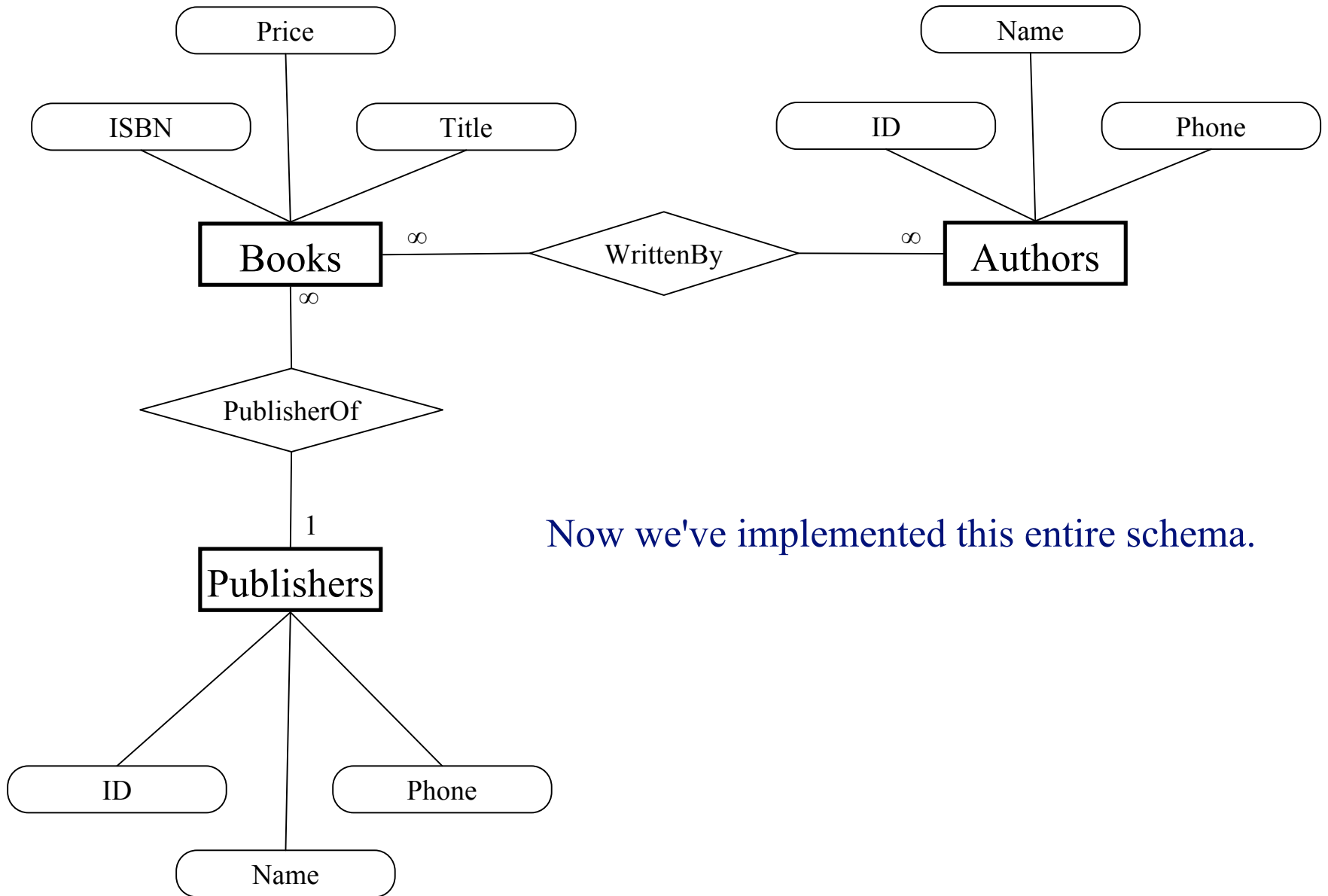
Get the new view of the data



	ISBN	Title	authors.Name	publishers.Nam	
▶	1-1	My Reader	Alex	A Press	
	1-2	Your Reader	Alex	Another Press	
	2-2	His Reader	Bill	Another Press	
	2-2	His Reader	Charlie	Another Press	
*					

Record: 1 of 4

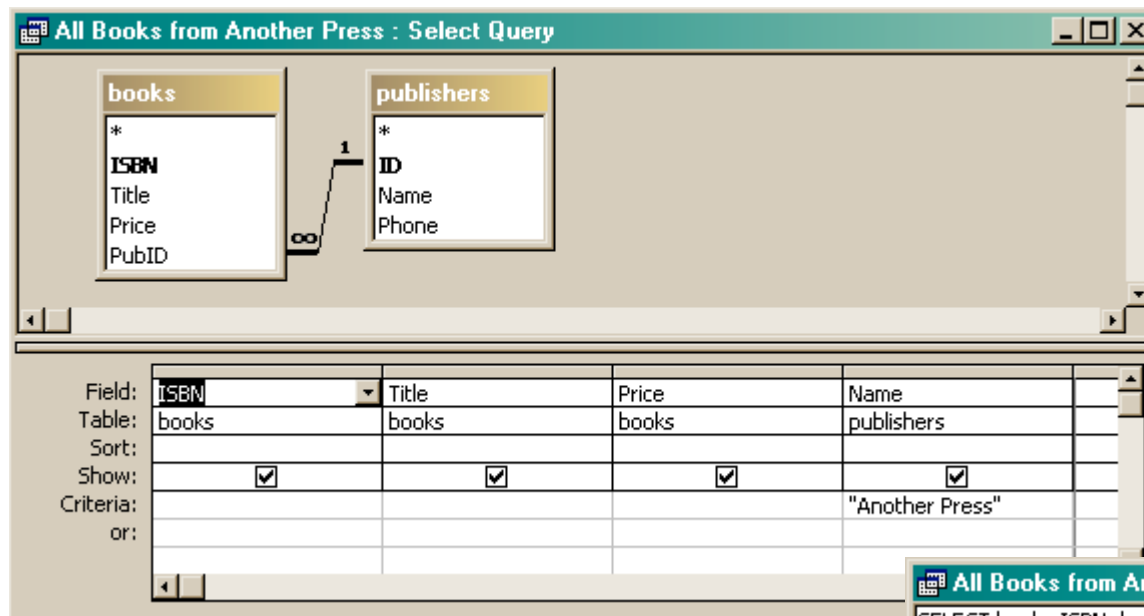
- Notice that this view has redundant data
 - » That's okay, because we are not storing it this way, just presenting it
 - » The redundant items (Alex, Another Press) came from a single entry in a table – they are guaranteed to be identical



Now we've implemented this entire schema.

View: All Books from “Another Press”

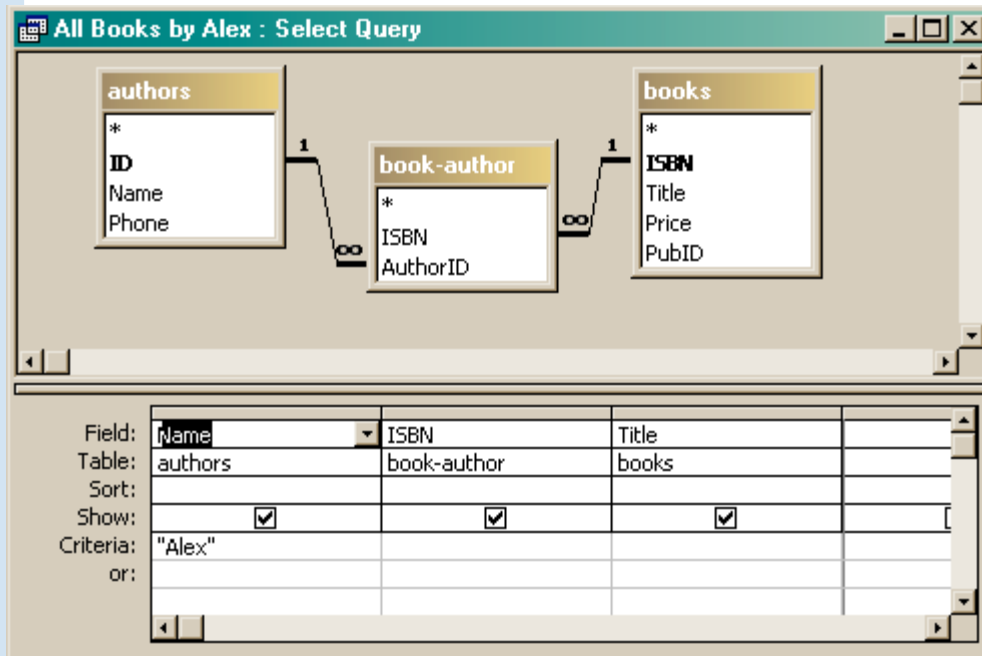
ISBN	Title	Price	Name
1-2	Your Reader	\$12.00	Another Press
2-2	His Reader	\$25.00	Another Press



```
SELECT books.ISBN, books.Title, books.Price, publishers.Name
FROM publishers INNER JOIN books ON publishers.ID=books.PubID
WHERE (((publishers.Name)='Another Press'));
```



View: All Books by Alex



Name	ISBN	Title
Alex	1-1	My Reader
Alex	1-2	Your Reader

Record: 3 of 3

```

SELECT authors.Name, [book-author].ISBN, books.Title
FROM books INNER JOIN (authors INNER JOIN [book-author] ON authors.ID=[book-author].AuthorID) ON books.ISBN=[book-author].ISBN
WHERE (((authors.Name)="Alex"));
    
```

View: All info about a given ISBN

Enter Parameter Value

ISBN?

1-1

OK Cancel

Book Info for Given ISBN : Select Query

	ISBN	Title	Price	authors.Name	publishers.Nam
▶ 1-1		My Reader	\$10.00	Alex	A Press
*					

Record: 1 of 1

Book Info for Given ISBN : Select Query

publishers: ID, Name, Phone

books: ISBN, Title, Price, PubID

book-author: ISBN, AuthorID

authors: ID, Name, Phone

Field:	ISBN	Title	Price	Name	Name
Table:	books	books	books	authors	publishers
Sort:					
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:	[ISBN?]				
or:					

Book Info for Given ISBN : Select Query

```
SELECT books.ISBN, books.Title, books.Price, authors.Name, publishers.Name
FROM publishers INNER JOIN (books INNER JOIN (authors INNER JOIN [book-author] ON authors.ID = [book-author].AuthorID) ON
books.ISBN = [book-author].ISBN) ON publishers.ID = books.PubID
WHERE (((books.ISBN)=[ISBN? ]));
```