

Week 7 - Lab 1: Multi-table queries, Aggregate Qureies

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Overview

- In this tutorial, we will learn how to create:
 - Table Relationships
 - Multi-table Queries
 - Aggregate Queries

Example Files

- Get the Example files from the lab manual:
 - [http://wiki.ucalgary.ca/page/Courses/Computer_Science/CPSC_203/CPSC_203_Template/Labs_Template/Week 2 - Lab 2: Multi-table queries, Aggregate Qureies](http://wiki.ucalgary.ca/page/Courses/Computer_Science/CPSC_203/CPSC_203_Template/Labs_Template/Week_2_-_Lab_2:_Multi-table_queries,_Aggregate_Queries)

Relationships

- Relationships are **links** that associate a field in one table with a field in another table.

Students	
Student Name	Address
John	Elm St.
Jane	Oak St.

Math Class	
Student Name	Grade
John	A
Jane	B

Relationships are important if we want to be able perform queries with multiple tables

Students		Math Class	
Student Name	Address	Student Name	Grade
John	Elm St.	John	A
Jane	Oak St.	Jane	B

Both tables share a common field, the Student Name field. By linking the Student Name fields, you ensure that John in the Students table is the same John listed in the the Math Class table

Relationships Example

- Create a new database with these three tables

	Field Name	Data Type
🔑	CustomerID	AutoNumber
	FirstName	Text
	LastName	Text
	CompanyName	Text

	Field Name	Data Type
🔑	OrderID	AutoNumber
	CustomerID	Number
	ProductID	Number
	Quantity	Number

	Field Name	Data Type
🔑	ProductID	AutoNumber
	Description	Text

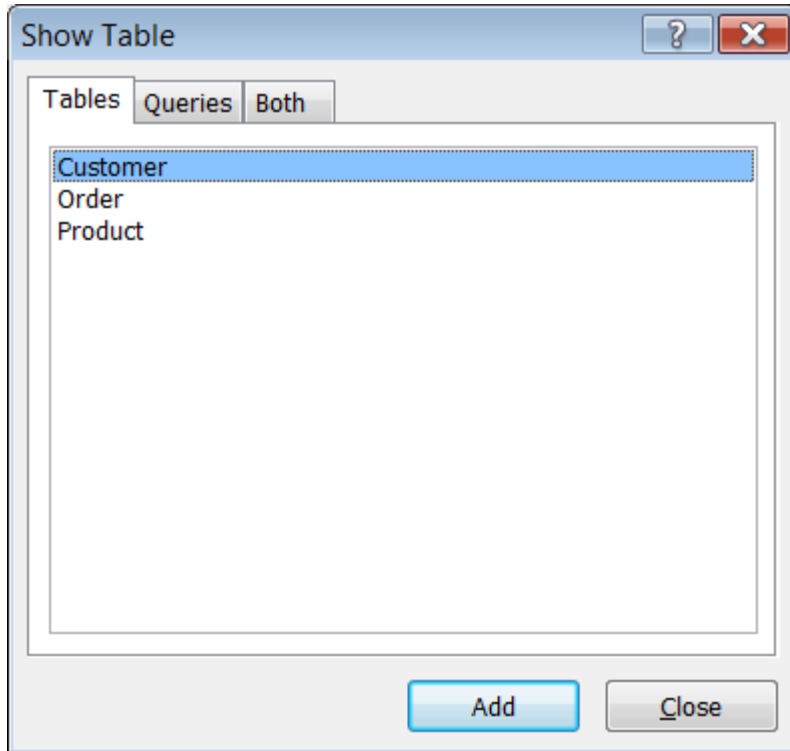
Relationships Example

The screenshot displays the Microsoft Access interface. The ribbon is set to 'Table Tools' > 'Design'. The 'Database Tools' group contains the 'Relationships' button, which is highlighted. A tooltip for the 'Relationships' button is visible, containing the text: 'Define how the data in tables is related, such as ID fields or name fields in different tables that should match.'

The 'All Tables' task pane on the left lists three tables: Customer, Order, and Product. The main workspace shows a partial view of the 'Customer' table with columns for 'Product' and 'Description'. An orange line is drawn across the workspace, indicating a relationship between the 'Customer' table and the 'Product' table.

Table Name	Fields
Customer	Product, Description
Order	
Product	

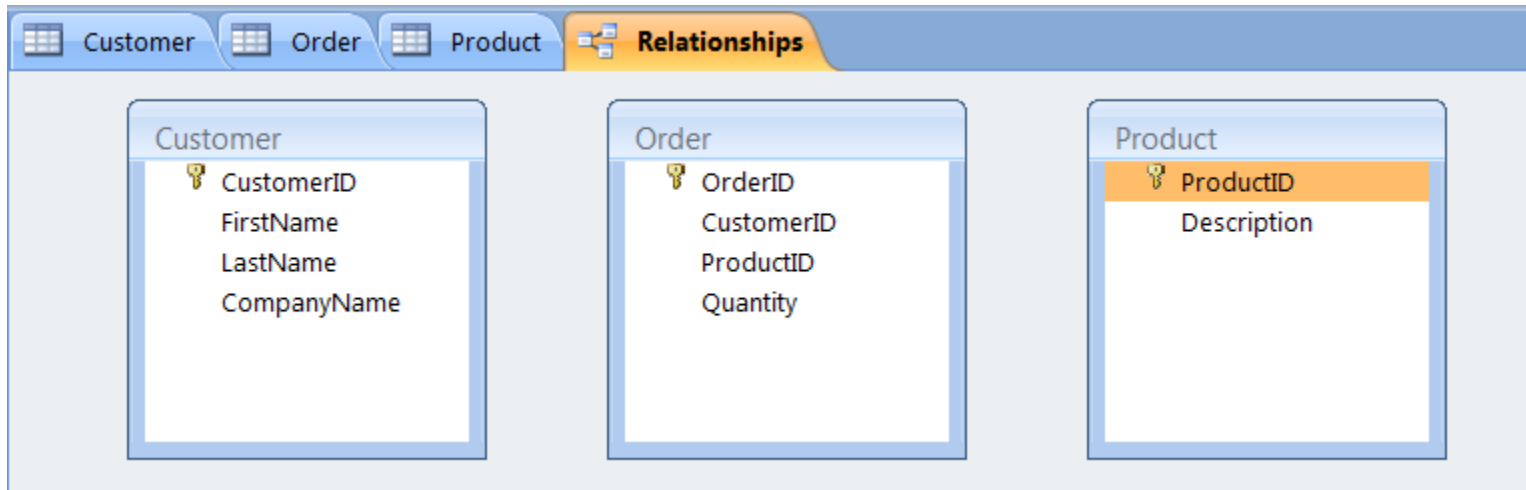
Relationships Example



Press Ctrl and click on the three table names to select them all, then press the Add button.

When the tables are added, close the Show Table dialog.

Relationships Example



First we need to determine which fields tables have in common.

Order.CustomerID → Customer.CustomerID

Order.ProductID → Product.ProductID

Relationships Example

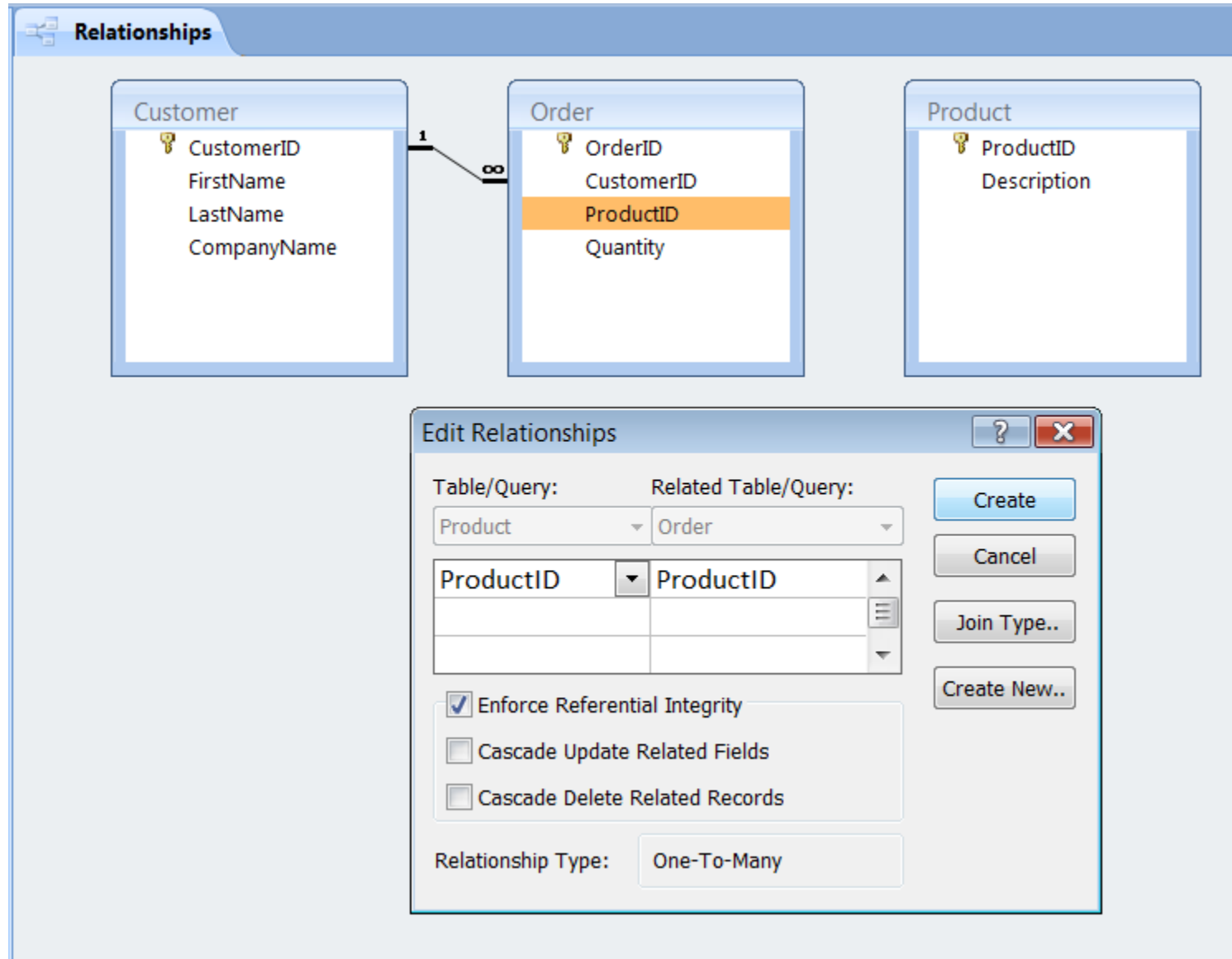
The screenshot displays a database Relationships tool interface. At the top, a blue header bar contains the word "Relationships" next to a small icon. Below the header, three table objects are shown in light blue boxes:

- Customer**: Contains fields CustomerID (primary key), FirstName, LastName, and CompanyName.
- Order**: Contains fields OrderID (primary key), CustomerID (foreign key), ProductID, and Quantity. The CustomerID field is highlighted in orange.
- Product**: Contains fields ProductID (primary key) and Description.

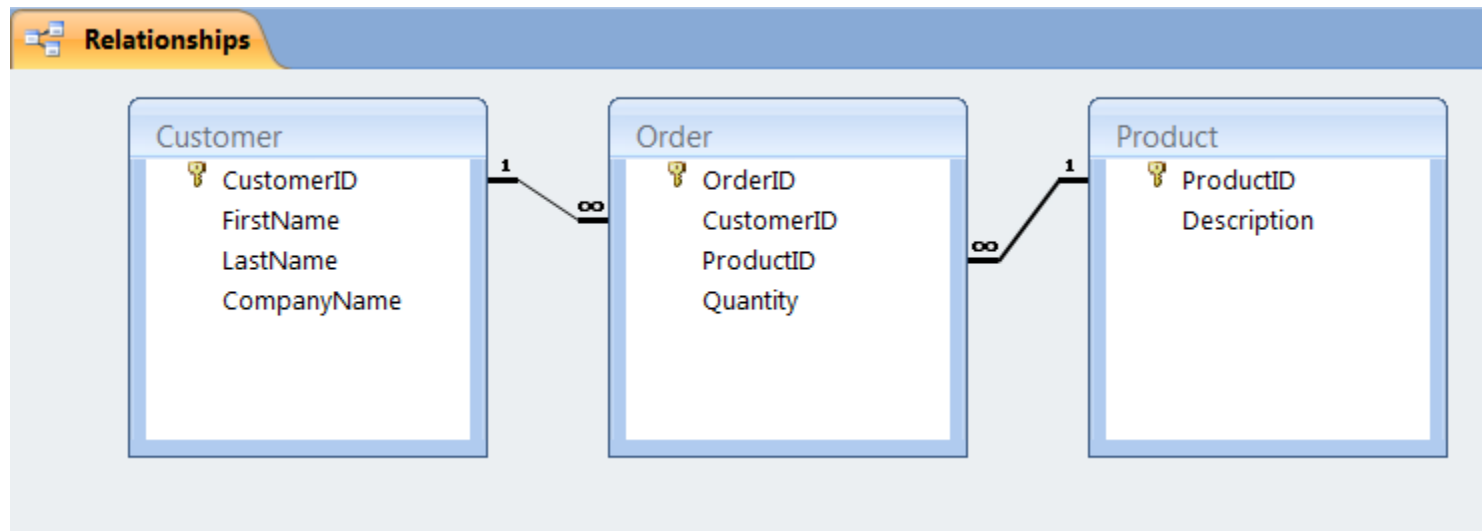
An "Edit Relationships" dialog box is open in the foreground. It has a title bar with a question mark and a close button. The dialog contains the following elements:

- Table/Query:** A dropdown menu showing "Customer".
- Related Table/Query:** A dropdown menu showing "Order".
- Fields:** A table with two columns. The first column has "CustomerID" selected in a dropdown. The second column has "CustomerID" selected in a dropdown. There are up/down arrows and a menu icon to the right of the second column.
- Options:** Three checkboxes:
 - Enforce Referential Integrity
 - Cascade Update Related Fields
 - Cascade Delete Related Records
- Relationship Type:** A dropdown menu showing "One-To-Many".
- Buttons:** "Create", "Cancel", "Join Type..", and "Create New..".

Relationships Example

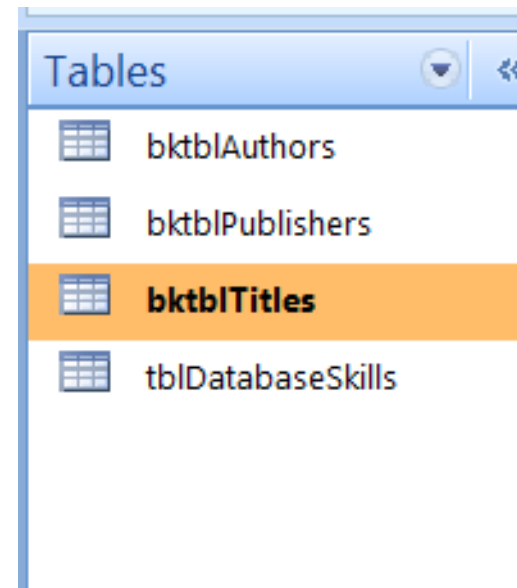


Relationships Example

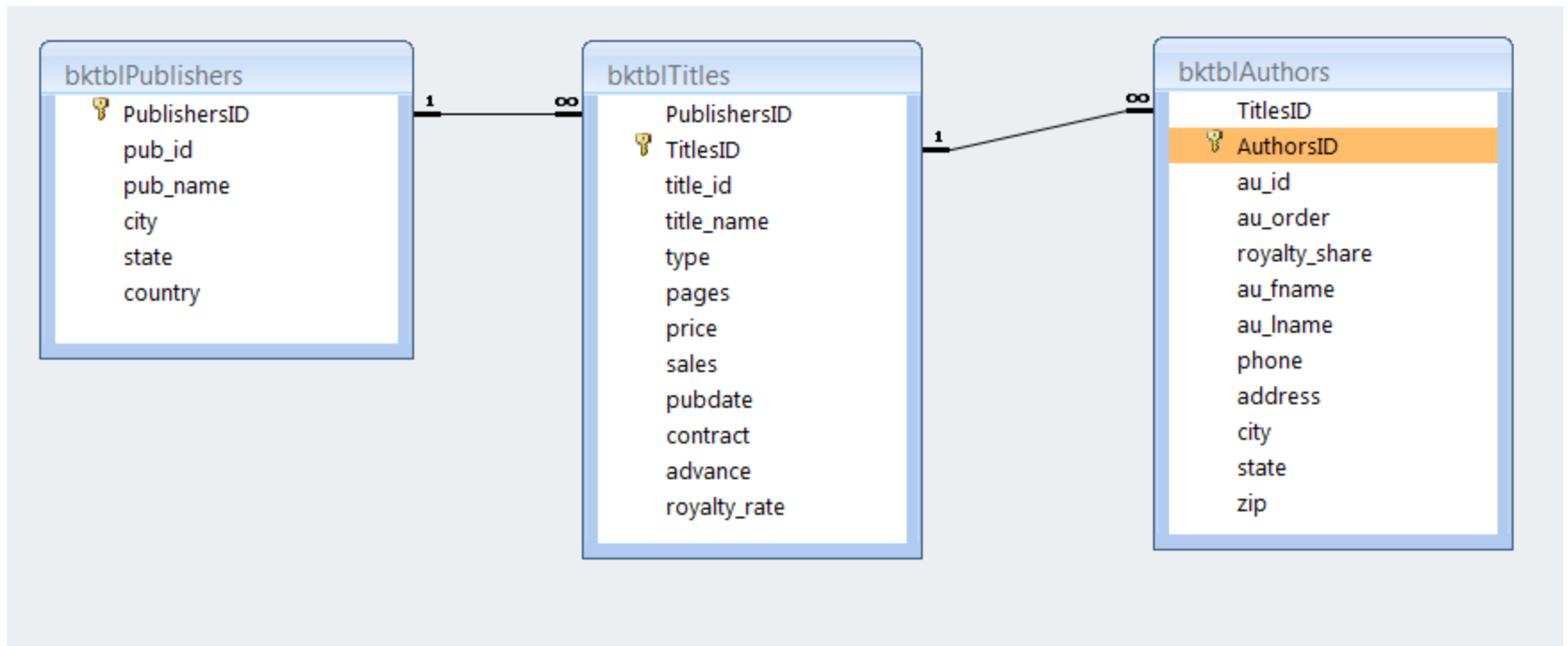


Multi-table Queries

- Use the access database provided named "W08_BookExampleWQueries_20080228.mdb".

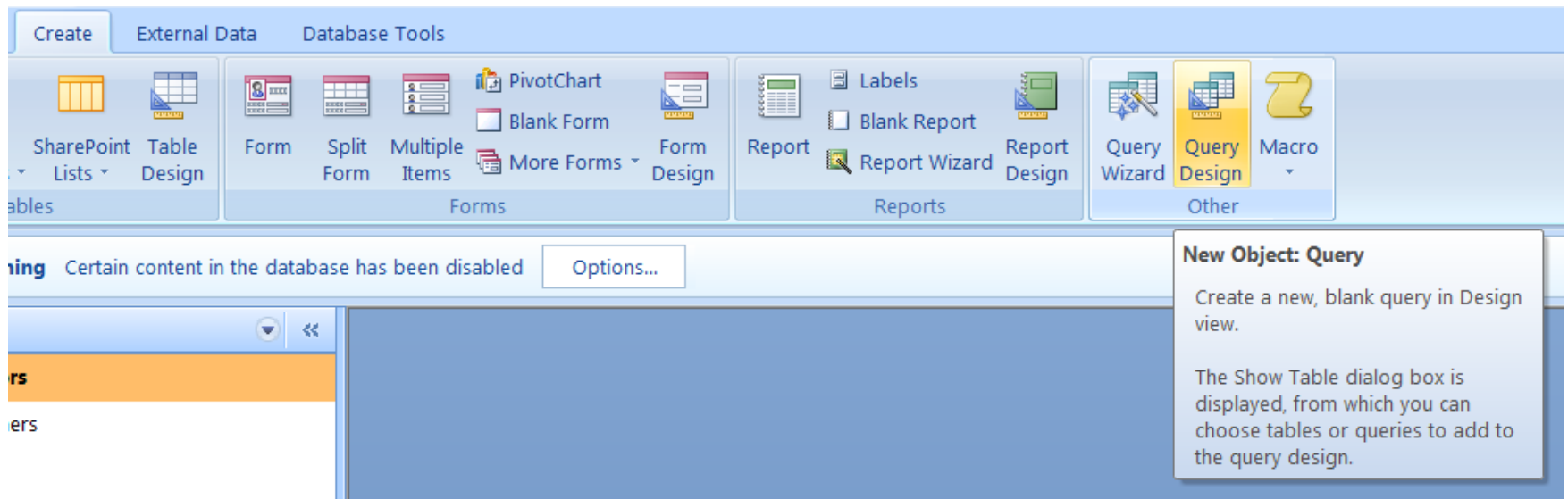


Multi-table Queries



Multi-table Queries

- We will see a small set of basic query patterns.
- Complicated patterns of data analysis can be created by linking together sequential simple queries.



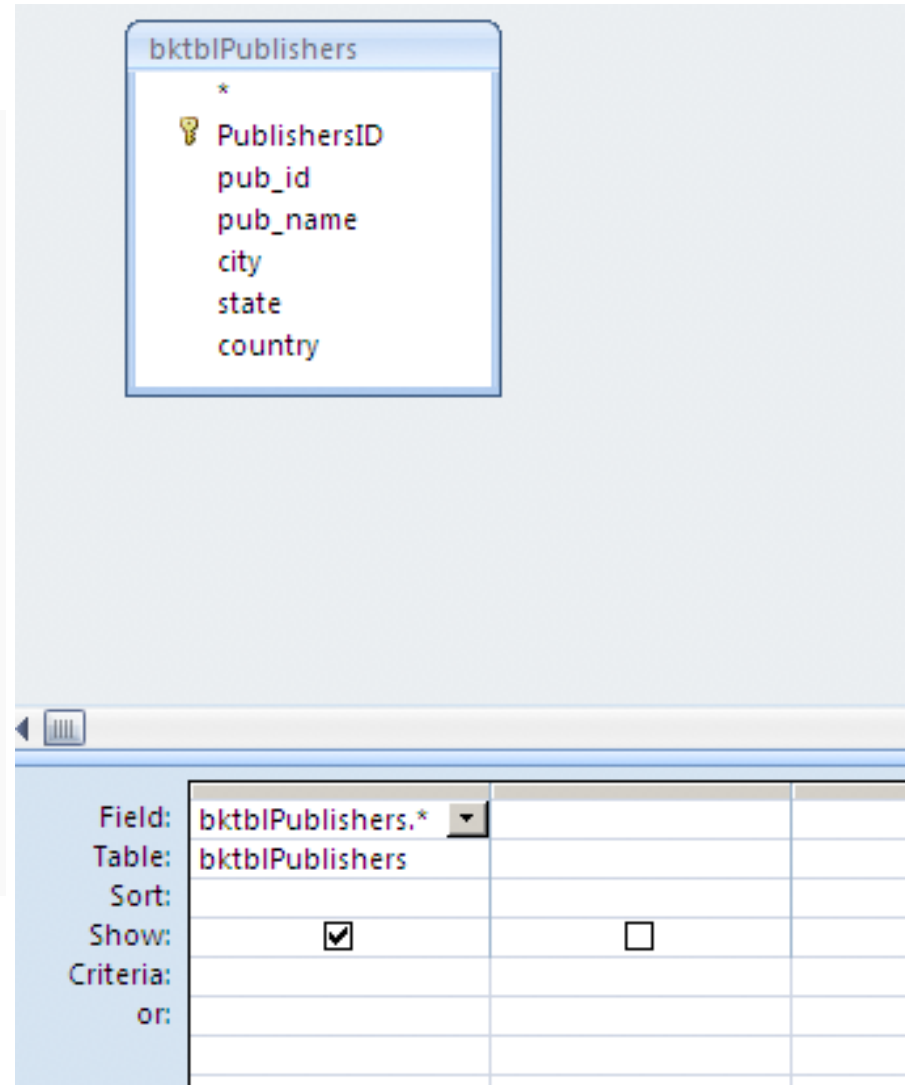
Query 1

Give me ALL the data in a table.

This query retrieves all data from a single table and displays the information.

PATTERN:

```
SELECT * FROM TableName;
```



Query 1

Result:

PublishersID	pub_id	pub_name	city	state	country
1	P01	Abatis Publish	New York	NY	USA
2	P02	Core Dump Bo	San Francisco	CA	USA
3	P03	Schadenfreude	Hamburg		Germany
4	P04	Tenterhooks P	Berkeley	CA	USA
*	(New)				

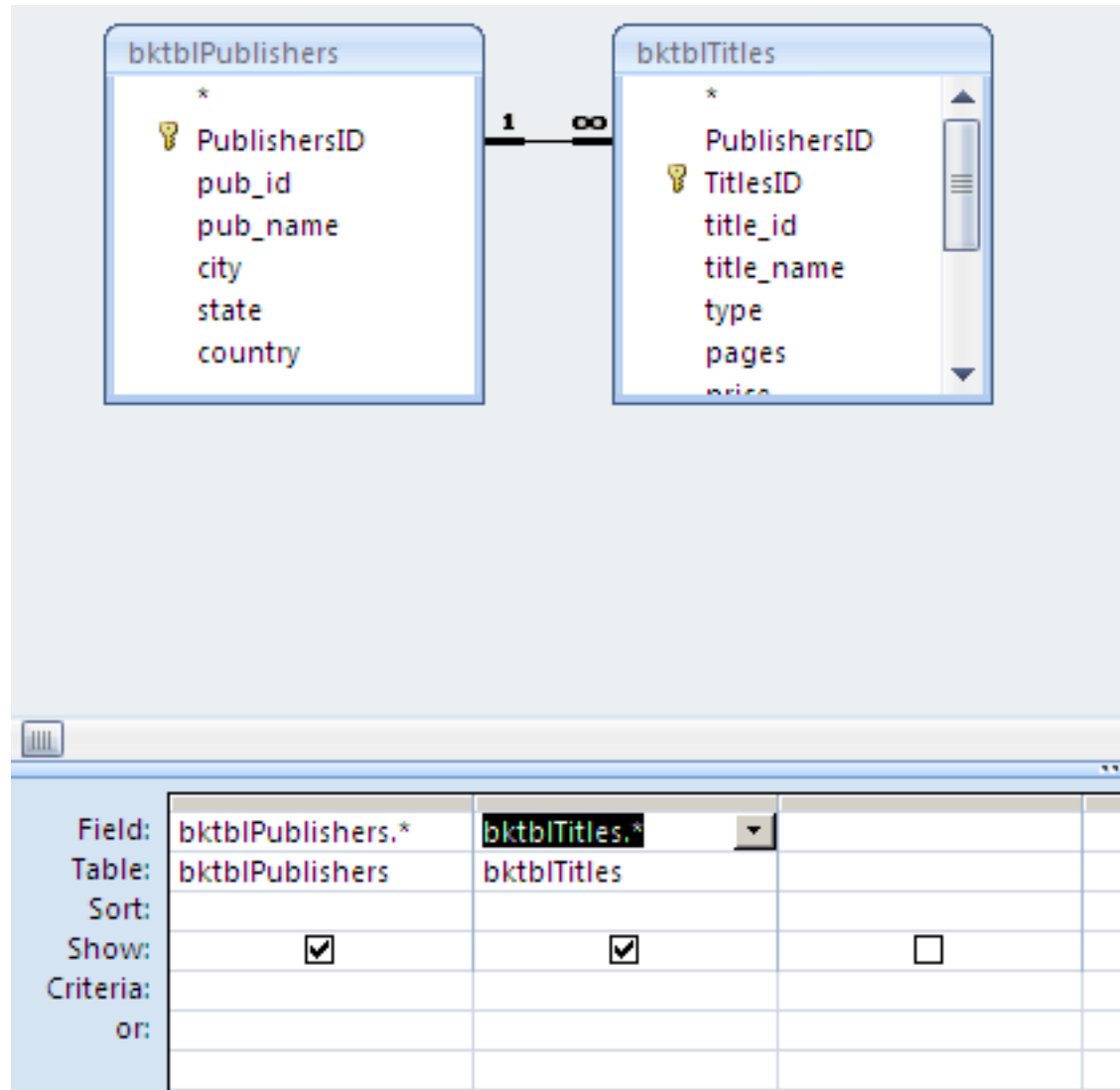
Query 2

Give me ALL the data across SEVERAL tables

PATTERN:

```
SELECT * FROM TableName1, TableName2 ..... TableNameN  
WHERE( Table1.Pkey = Table2.Fkey) .....  
And (TableNameN-1.Pkey = TableNameN.Fkey) ;
```

Query 2



Relationships have to be defined before creating the query.

Query 2

bktblPublist	pub_id	pub_name	city	state	country	bktblTitles.F	TitlesID	title_id
1	P01	Abatis Publishe	New York	NY	USA	1	1	T01
1	P01	Abatis Publishe	New York	NY	USA	1	2	T04
1	P01	Abatis Publishe	New York	NY	USA	1	3	T05
1	P01	Abatis Publishe	New York	NY	USA	1	4	T06
1	P01	Abatis Publishe	New York	NY	USA	1	5	T08
1	P01	Abatis Publishe	New York	NY	USA	1	6	T09
1	P01	Abatis Publishe	New York	NY	USA	1	7	T10
1	P01	Abatis Publishe	New York	NY	USA	1	8	T11
1	P01	Abatis Publishe	New York	NY	USA	1	9	T12
2	P02	Core Dump Box	San Francisco	CA	USA	2	10	T03
3	P03	Schadenfreude	Hamburg		Germany	3	11	T02
3	P03	Schadenfreude	Hamburg		Germany	3	12	T07
3	P03	Schadenfreude	Hamburg		Germany	3	13	T13
*	(New)						(New)	

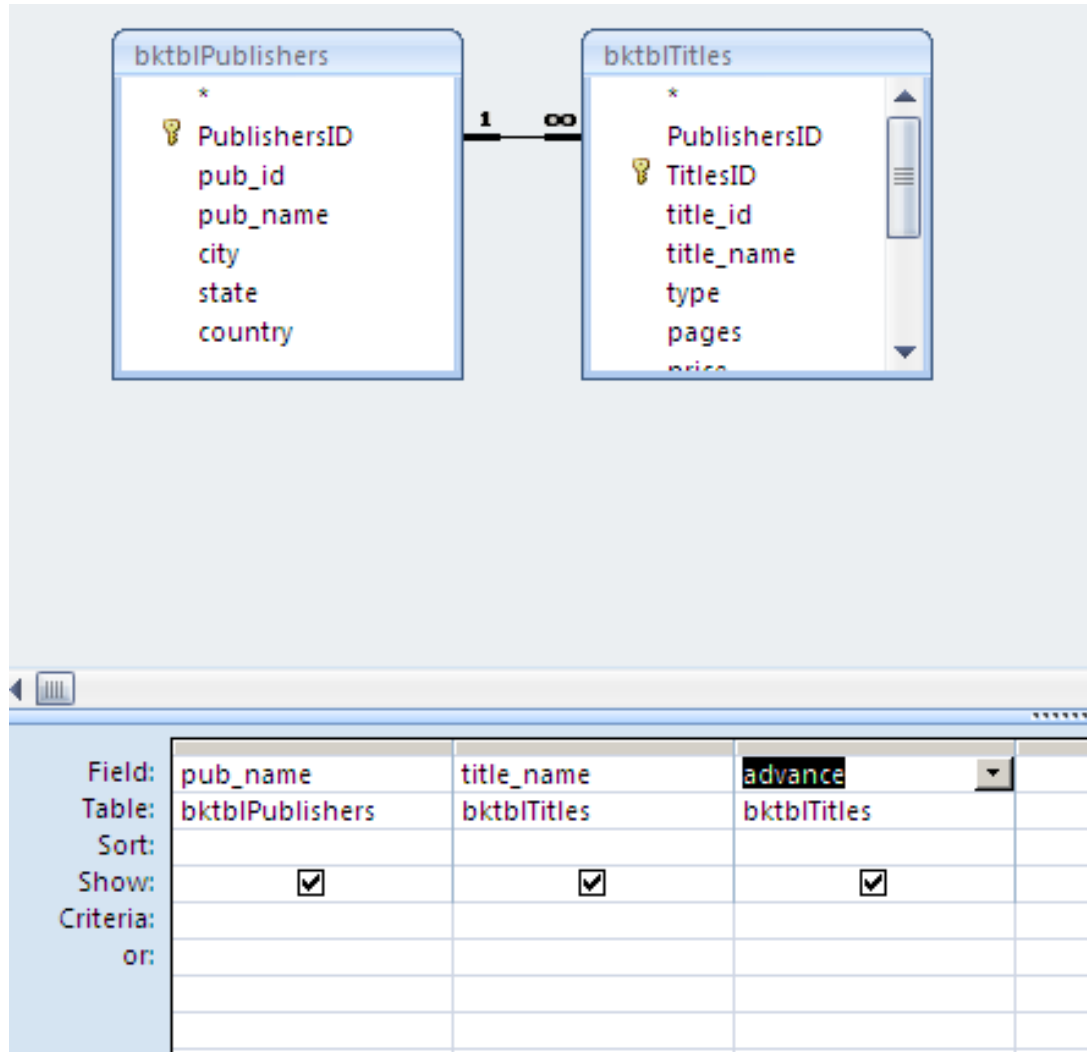
Query 3

Give Me Selected fields from Several Tables

PATTERN:

```
SELECT TableNamei.FieldNamej, TableNamep.FieldNameq ....  
FROM TableNamei, TableNamep ...  
WHERE( TableNamei.Pkey = TableNamep.Fkey) ....  
AND (...) ... ; bleNameN.Fkey) ;
```

Query 3



Query 3

	pub_name	title_name	advance	
	Abatis Publishers	1977!	10000	
	Abatis Publishers	But I Did It Unconsciously	20000	
	Abatis Publishers	Exchange of Platitudes	100000	
	Abatis Publishers	How About Never?	20000	
	Abatis Publishers	Just Wait Until After School	0	
	Abatis Publishers	Kiss My Boo-Boo	0	
	Abatis Publishers	Not Without My Faberge Egg		
	Abatis Publishers	Perhaps It's a Glandular Problem	100000	
	Abatis Publishers	Spontaneous, Not Annoying	50000	
	Core Dump Books	Ask Your System Administrator	15000	
	Schadenfreude Press	200 Years of German Humor	1000	
	Schadenfreude Press	I Blame My Mother	1000000	
	Schadenfreude Press	What Are The Civilian Applications	20000	
*				

Query 4

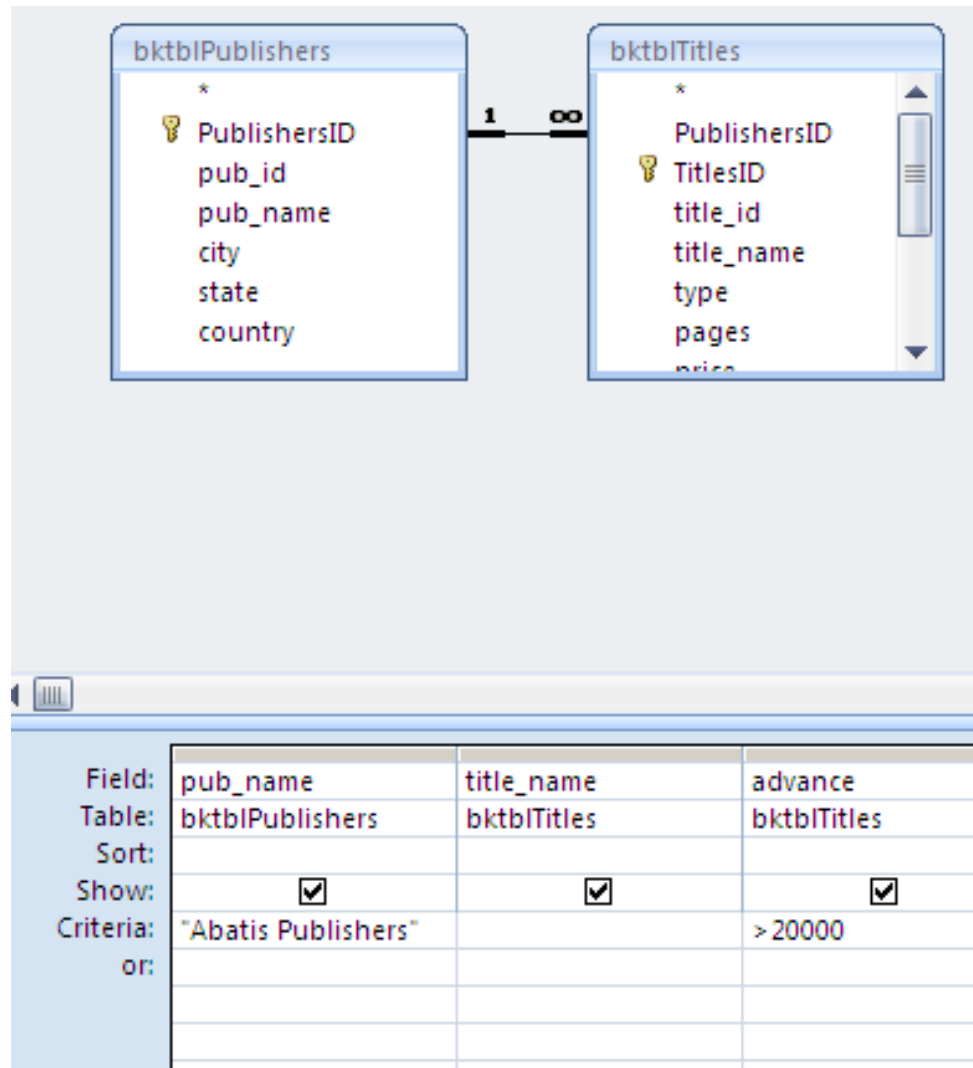
Give me Selected fields from Several Tables with Constraints

Using the logical AND constraint.

AND PATTERN:

```
SELECT TableNamei.FieldNamej, TableNamep.FieldNameq ....  
FROM TableNamei, Tablenamep ...  
WHERE ( Tablei.Pkey = Tablep.Fkey) ....  
AND TableNamei.FieldNamej = "VALUE1" AND ...  
TableNamep.FieldNameq = "Value2" ;
```

Query 4



Query 4

▲	pub_name ▼	title_name ▼	advance ▼
	Abatis Publishers	Exchange of Platitudes	100000
	Abatis Publishers	Perhaps It's a Glandular Problem	100000
	Abatis Publishers	Spontaneous, Not Annoying	50000

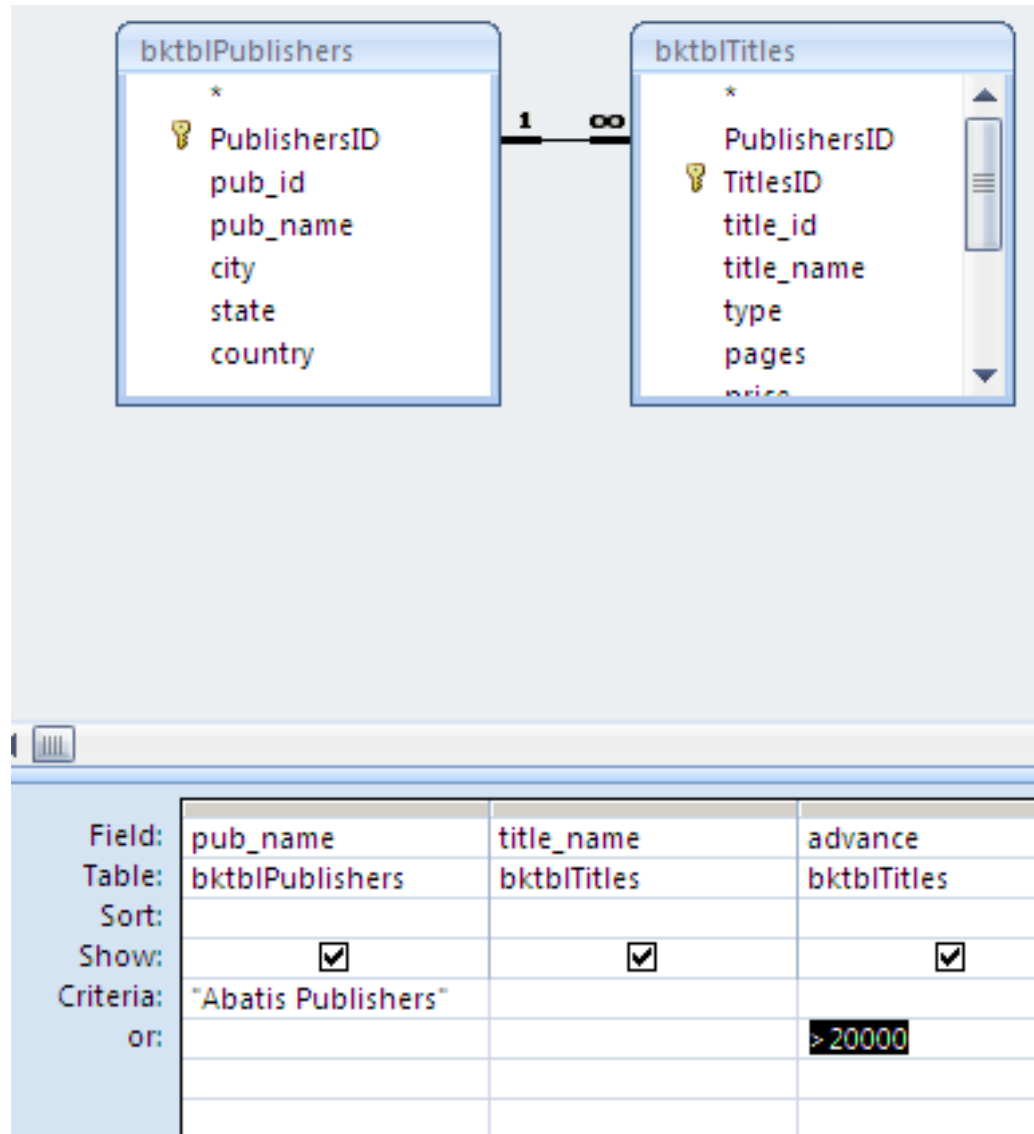
Query 4

Using the logical OR constraint.

OR PATTERN:

```
SELECT TableNamei.FieldNamej, TableNameep.FieldNameeq ....  
FROM TableNamei, Tablenamep ...  
WHERE ( Tablei.Pkey = Tablep.Fkey) ....  
AND TableNamei.FieldNamej = "Value1"  
OR TableNameep.FieldNameeq = "Value2" ;
```

Query 4



Query 4

pub_name	title_name	advance
Abatis Publishers	1977!	10000
Abatis Publishers	But I Did It Unconsciously	20000
Abatis Publishers	Exchange of Platitudes	100000
Abatis Publishers	How About Never?	20000
Abatis Publishers	Just Wait Until After School	0
Abatis Publishers	Kiss My Boo-Boo	0
Abatis Publishers	Not Without My Faberge Egg	
Abatis Publishers	Perhaps It's a Glandular Problem	100000
Abatis Publishers	Spontaneous, Not Annoying	50000
Schadenfreude Press	I Blame My Mother	1000000

Query 5

Give Me Selected Fields from Several Tables with Custom Calculations

For example, determining sales profits based on the information retrieved such as: book title sales, book price, book advance, and book royalty rate.

PATTERN:

```
SELECT TableNamei.FieldNamej, TableNamep.FieldNameq .... ,  
CalcField =TableNamei.FieldNamej <operator>  
TableNameP.FieldNameq <operator> ....  
FROM TableNamei, Tablenamep ...  
WHERE ( TableNamei.Pkey = TableNamep.Fkey) .... ;
```

Query 5

The screenshot displays the Microsoft Access interface. On the left, the Query Design View shows two tables: **bktblPublishers** and **bktblTitles**. A relationship line connects the **PublishersID** field in **bktblPublishers** to the **TitlesID** field in **bktblTitles**, with a '1' on the **bktblPublishers** side and an '∞' on the **bktblTitles** side. The **bktblPublishers** table has fields: PublishersID, pub_id, pub_name, city, state, and country. The **bktblTitles** table has fields: TitlesID, title_id, title_name, type, pages, and price.

The **Expression Builder** dialog box is open, showing the following expression in the text box:

```
sales_profits: ((([bktblTitles.sales]*[bktblTitles.price])-[bktblTitles.advance])*(1-[bktblTitles.royalty_rate]))
```

Below the dialog box, a table lists the fields and tables used in the query:

Field:	pub_name	title_name	advance	sales	price	royalty_rate	sales_profits: ((([bkt
Table:	bktblPublishers	bktblTitles	bktblTitles	bktblTitles	bktblTitles	bktblTitles	bktblTitles
Sort:							
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:							
or:							

Query 5

pub_name	title_name	advance	sales	price	royalty_rate	sales_profit:
Abatis Publishers	1977!	10000	566	21.99	0.05	2324.023
Abatis Publishers	But I Did It Unconsciously	20000	13001	12.99	0.08	136972.3508
Abatis Publishers	Exchange of Platitudes	100000	201440	6.95	0.09	1183007.28
Abatis Publishers	How About Never?	20000	11320	19.95	0.08	189367.28
Abatis Publishers	Just Wait Until After School	0	4095	10	0.04	39312
Abatis Publishers	Kiss My Boo-Boo	0	5000	13.95	0.05	66262.5
Abatis Publishers	Not Without My Faberge Egg					
Abatis Publishers	Perhaps It's a Glandular Problem	100000	94123	7.99	0.07	606399.7761
Abatis Publishers	Spontaneous, Not Annoying	50000	100001	12.99	0.09	1136601.8209
Core Dump Books	Ask Your System Administrator	15000	25667	39.95	0.07	939668.8845
Schadenfreude Press	200 Years of German Humor	1000	9566	19.95	0.06	178451.198
Schadenfreude Press	I Blame My Mother	1000000	1500200	23.95	0.11	31087513.1
Schadenfreude Press	What Are The Civilian Applications	20000	10467	29.99	0.06	276271.0102

Query 6

Give me Aggregate queries using selected fields from several tables

For example, this query will obtain all book publishers and performs an average calculation to determine what each book publisher's average is for giving an advance to book authors.

PATTERN:

```
SELECT TableNamei.FieldNamej,  
StatFunction(TableNamep.FieldNameq) As StatFieldnameq ....  
FROM TableNamei, Tablenamep ...  
WHERE( TableNamei.Pkey = TableNamep.Fkey) ....  
GROUPBY TableNamei.FieldNamej ;
```


Query 6

The screenshot shows a Microsoft Access interface. At the top, two tables are displayed: **bktblPublishers** and **bktblTitles**. **bktblPublishers** has fields: PublishersID (primary key), pub_id, pub_name, city, state, and country. **bktblTitles** has fields: PublishersID, TitlesID (primary key), title_id, title_name, type, pages, and price. A one-to-many relationship is shown between PublishersID in bktblPublishers and PublishersID in bktblTitles.

Below the tables is a query design grid. The grid has columns for Field, Table, Total, Sort, Show, and Criteria. The 'Field' column contains 'pub_name' and 'advance'. The 'Table' column contains 'bktblPublishers' and 'bktblTitles'. The 'Total' column has 'Group By' for 'pub_name' and 'Avg' for 'advance'. The 'Sort' column is empty. The 'Show' column has a checked box for 'pub_name' and an unchecked box for 'advance'. The 'Criteria' column is empty. A dropdown menu is open over the 'Avg' entry in the 'Total' column, listing aggregation functions: Avg, Min, Max, Count, StDev, Var, First, Last, Expression, and Where.

Field:	pub_name	advance
Table:	bktblPublishers	bktblTitles
Total:	Group By	Avg
Sort:		Group By
Show:	<input checked="" type="checkbox"/>	Sum <input type="checkbox"/>
Criteria:		Avg
or:		Min
		Max
		Count
		StDev
		Var
		First
		Last
		Expression
		Where

pub_name	AvgOfadvance
Abatis Publishers	37500
Core Dump Books	15000
Schadenfreude Press	340333.333333333

Query 7

Give me Aggregate queries using selected fields from several tables with Constraints on the Groups Shown

Same as query (six), however with some constraints using logical AND as well as logical OR operations.

AND PATTERN:

```
SELECT TableNamei.FieldNamej,  
StatFunction(TableNamep.FieldNameq) As StatFieldnameq ....  
FROM TableNamei, Tablenamep ...  
WHERE( TableNamei.Pkey = TableNamep.Fkey) ....  
GROUPBY TableNamei.FieldNamej  
HAVING TableNamei.FieldNamej = "Value1"  
AND ... TableNamep.FieldNameq = "Value2";
```

Query 7

The screenshot displays the Microsoft Access interface for creating a query. At the top, two tables are shown: **bktblPublishers** and **bktblTitles**. **bktblPublishers** has fields: PublishersID (primary key), pub_id, pub_name, city, state, and country. **bktblTitles** has fields: PublishersID, TitlesID (primary key), title_id, title_name, type, pages, and price. A 1-to-many relationship is established between PublishersID in bktblPublishers and PublishersID in bktblTitles.

Below the design grid is the query criteria grid:

Field:	pub_name	advance	
Table:	bktblPublishers	bktblTitles	
Total:	Group By	Group By	
Sort:			
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Criteria:	"Abatis Publishers"	>1000	
or:			

pub_name	advance
Abatis Publishers	10000
Abatis Publishers	20000
Abatis Publishers	50000
Abatis Publishers	100000

Query 7

OR PATTERN:

```
SELECT TableNamei.FieldNamej,  
StatFunction(TableNamep.FieldNameq) As StatFieldnameq ....  
FROM TableNamei, Tablenamep ...  
WHERE( TableNamei.Pkey = TableNamep.Fkey) ....  
GROUPBY TableNamei.FieldNamej  
HAVING TableNamei.FieldNamej = "Value1"  
OR ... TableNamep.FieldNameq = "Value2";
```

Query 7

Query Design Grid:

Field:	pub_name	advance	
Table:	bktblPublishers	bktblTitles	
Total:	Group By	Group By	
Sort:			
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Criteria:	"Abatis Publishers"	>1000	
or:			

pub_name	advance
Abatis Publishers	
Abatis Publishers	0
Abatis Publishers	10000
Abatis Publishers	20000
Abatis Publishers	50000
Abatis Publishers	100000
Core Dump Books	15000
Schadenfreude Press	20000
Schadenfreude Press	1000000