



Microsoft Access -

A Primer for Relational Database Design and Use

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Microsoft Access – Module 1

An Overview of MS-Access




What is Microsoft Access?

Microsoft Access is a relational database management system (DBMS or RDBMS). At the very core, it is a software “engine” that provides an interface between physical data and user application queries.

Other examples of DBMS applications include:

- Oracle
- mySQL
- SQL Server (Microsoft)
- DB2 (IBM)
- Informix



Why choose MS-Access over SPSS / Excel?

Although there is always overlap, the following rules might help when deciding when / when not to use MS Access:


- MS Access is best used for long-term data storage and/or data sharing.
- MS Excel is best used for minor data collection, manipulation, and especially visualization.
- SPSS is best used for minor data collection and especially data analysis.

It is easy to export data from MS Access to Excel → SPSS



SPSS stands for Statistical Package for the Social Sciences

SPSS stands for Statistical Package for the Social Sciences: A software system for data management and analysis. SPSS may be used for many univariate and multivariate statistical analyses and has facilities for sorting and merging files and manipulating data. SPSS can deal automatically with complex files.




Why choose MS-Access over other DBMS systems?

Cheap, readily available (packaged with MS-Office Premium).

Easy to use (relative to other systems –Oracle may require one FTE(Full Time Equivalent) to maintain the server as a database administrator and another FTE to serve as an application developer).

Includes front-end tools for rapid application development (RAD). This also makes MS-Access a good prototype environment.



Why choose other DBMS systems over MS-Access?

MS-Access can handle a large number of records, but is somewhat slow compared to some of the high-end platforms.

Multiple users may use the database simultaneously, but MS-Access is known to become unstable with greater than 3-5 users.

There is a “snob factor”. I personally recommend the use of other systems (Oracle, SQL Server, MySQL, etc) when writing grant proposals - especially phase II type grants).



What is in an MS-Access file -

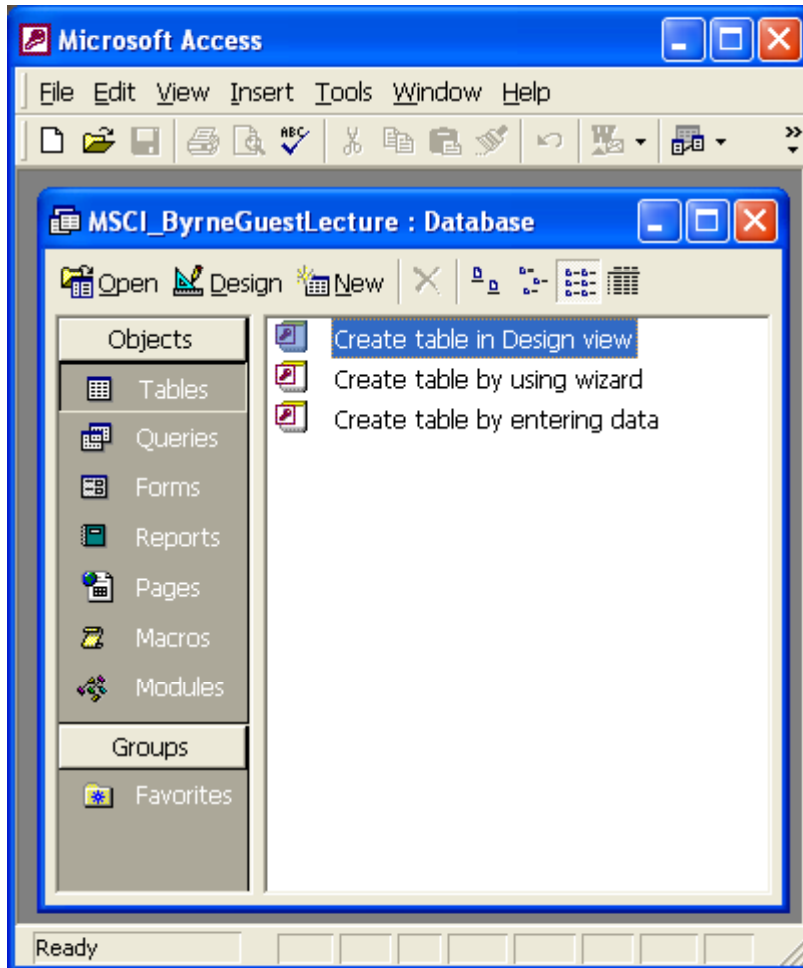
1?

Although the term “database” typically refers to a collection of related data tables, an Access database includes more than just data. In addition to tables, you can add:

- Saved queries (stored procedures) - organizing and/or manipulating data
- Forms – gui interaction with data, event programming
- Reports – customized results for printing (~ static forms)
- Macros and VB programs for extending functionality

Microsoft provides some logical integration of these tools through “wizards”. However, these are pretty basic - most developers must pick and choose the best approach when implementing applications.

What is in an MS-Access file - 2?



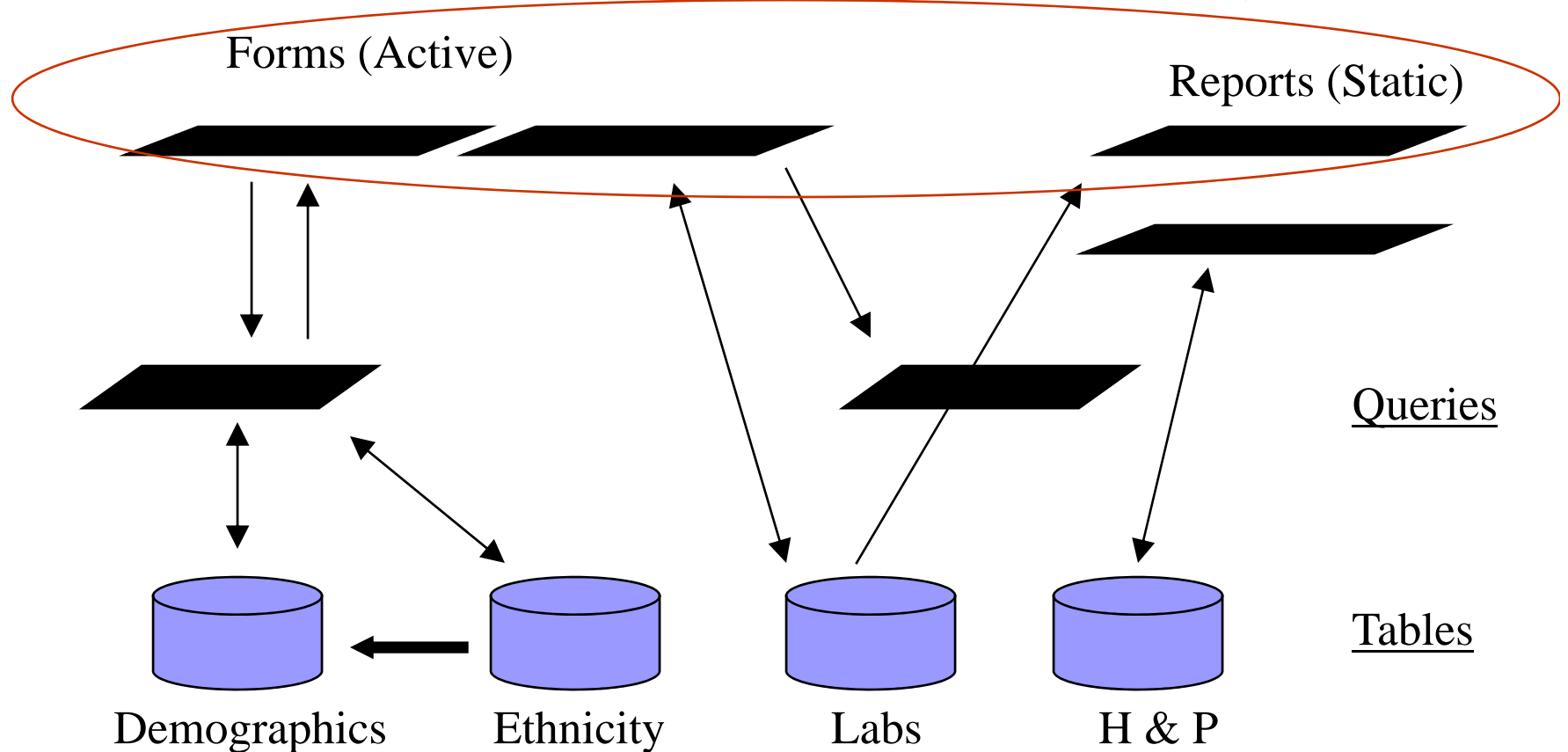
Unless advanced techniques are employed, all entities are stored in one *.mdb file. When running, a locking file (*.ldb) is also visible. Only the mdb file needs to be copied to transfer the database to another computer or location.

Ex.

MSCI_ByrneGuestLecture.mdb

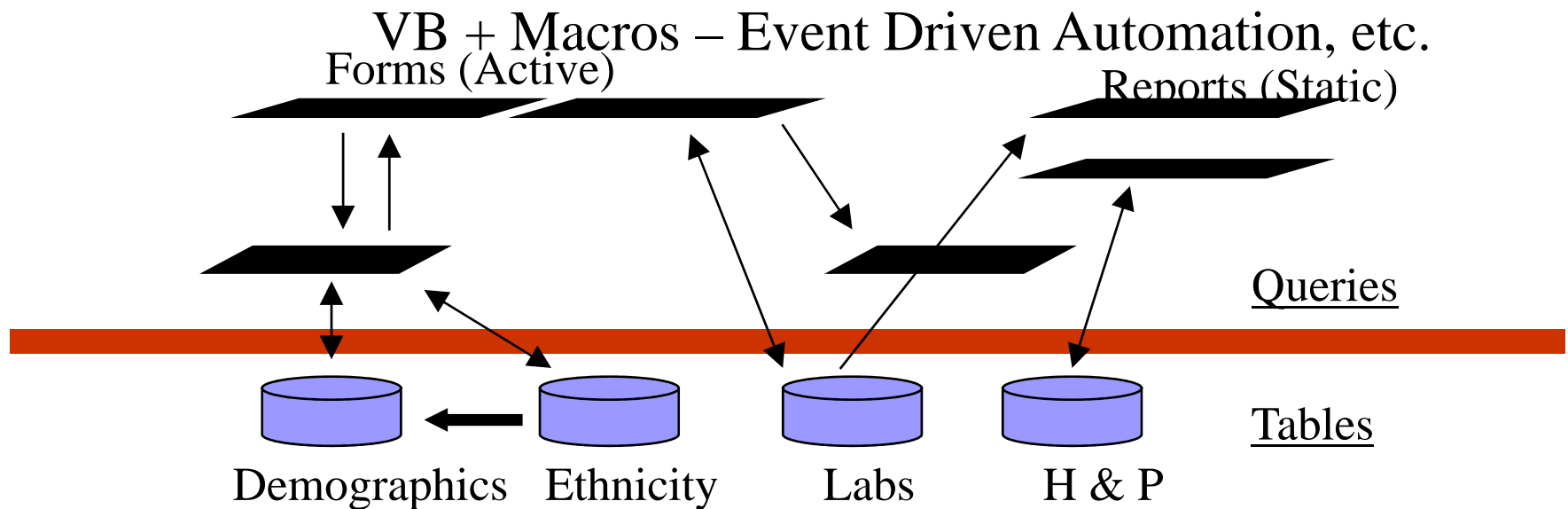
What is in an MS-Access file - 3?

VB + Macros – Event Driven Automation, etc.




Advanced – Splitting

Front-End File - Contains all Application Entities (Forms, Queries, etc.) and links to data tables in back-end file. Note you may have more than one FE to accommodate different user types.



Back-End File - Contains all Data Tables



Microsoft Access – Module 1 Summary

MS-Access is a powerful relational database program. It has many integrated features and can be greatly customized to fit most personal/departmental needs for data collection and storage.



Microsoft Access – Module 2

Creating / Working with Tables



Tables – Glucose Measurement Database

We wish to construct a database to track waking glucose measurements for an indefinite amount of time on 100 patients receiving 3 possible drug combinations.

Why would this be difficult in MS-Excel or SPSS?

Tables Overview

- ◆ Think of Access as a collection of spreadsheets that are relationally linked.

Demographics

Patient_ID
Fname
Lname
Address
Phone
Gender
Race
DOB
Height

Glucose

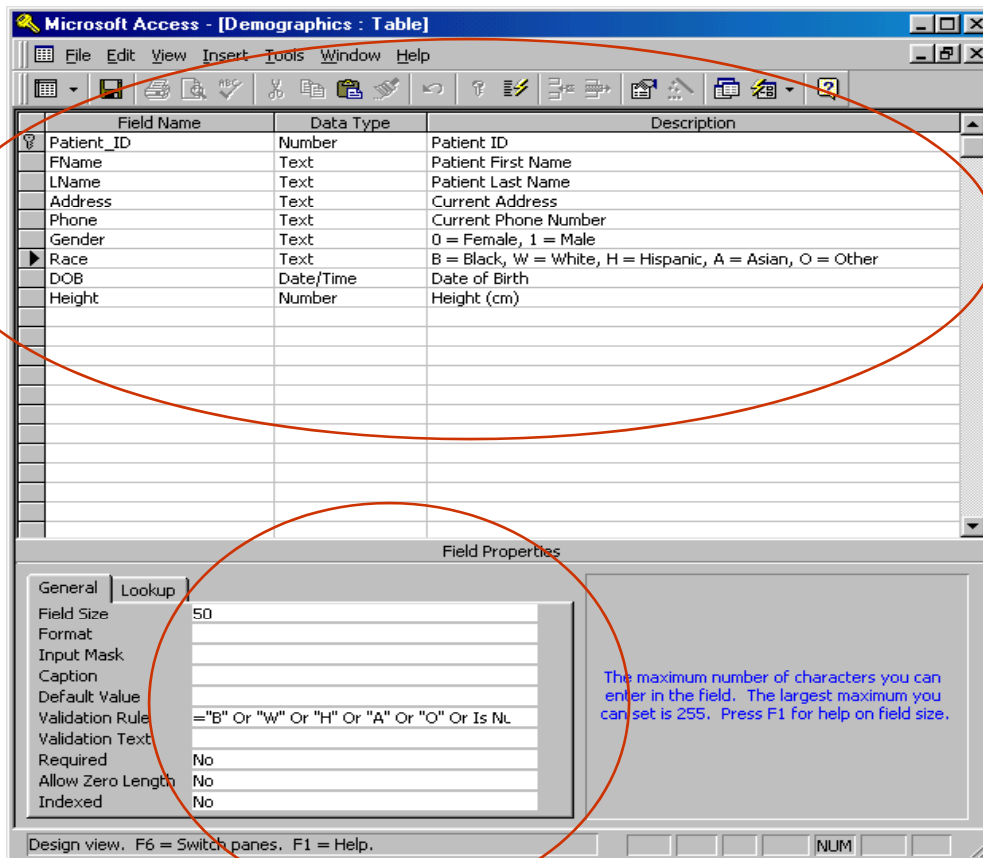
Glucose_ID
Patient_ID
Date
Weight
Med_ID
Glucose

Meds

Med_ID
DrugCombination

STORE DATA ONE TIME / ONE PLACE
DO NOT STORE CALCULATED DATA

Table Demonstration - Live



General Setup for Tables
Describe General Options
Show Validation Rule

Relationships

Lookup Option

Table Relationships - Live

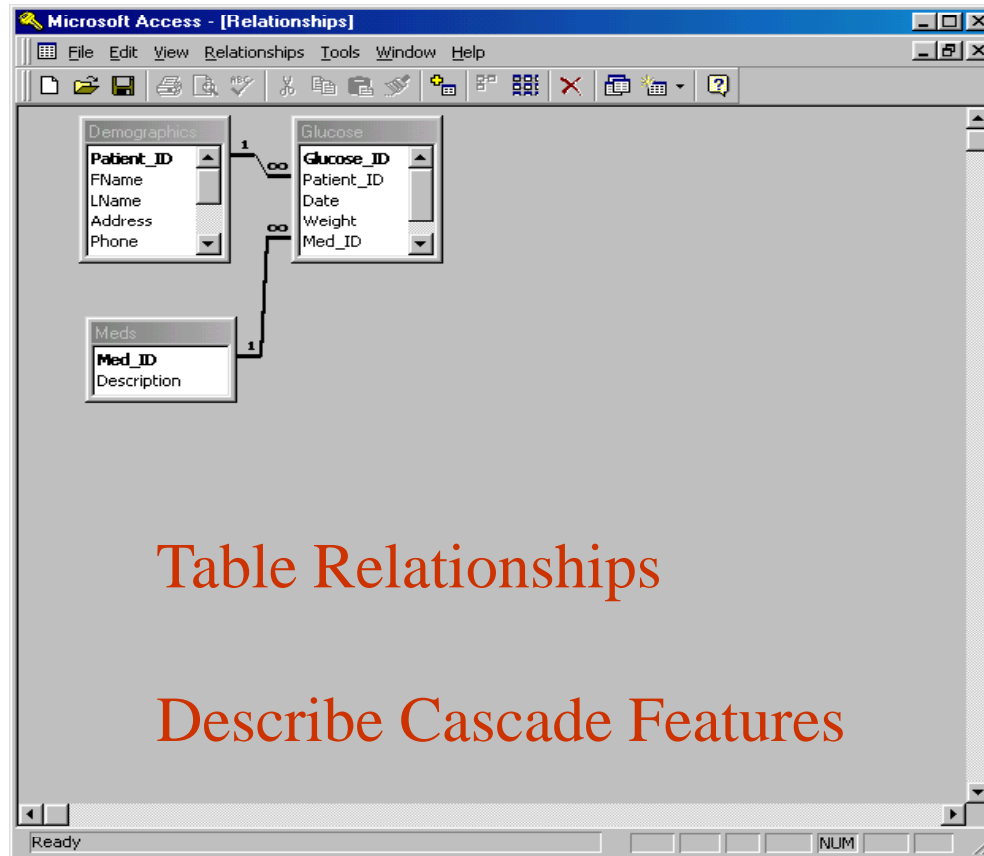
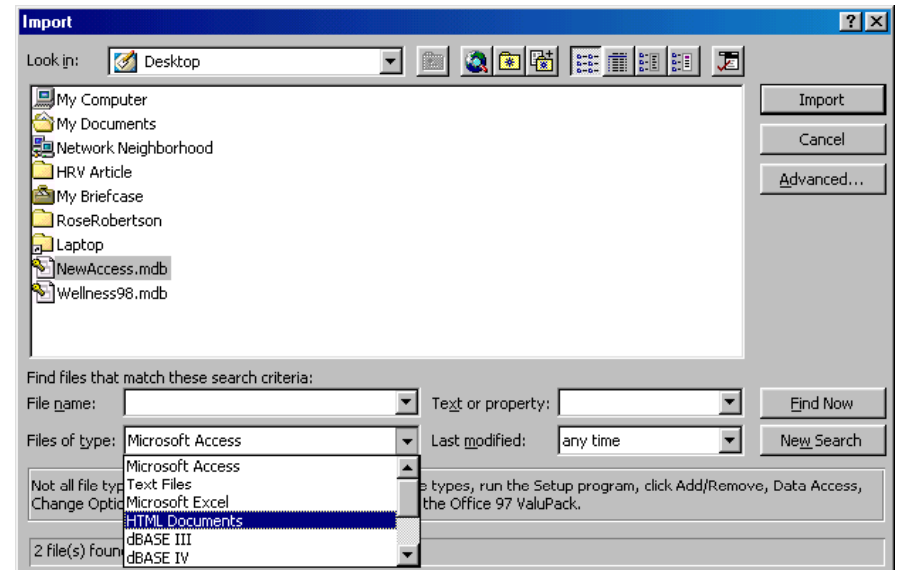
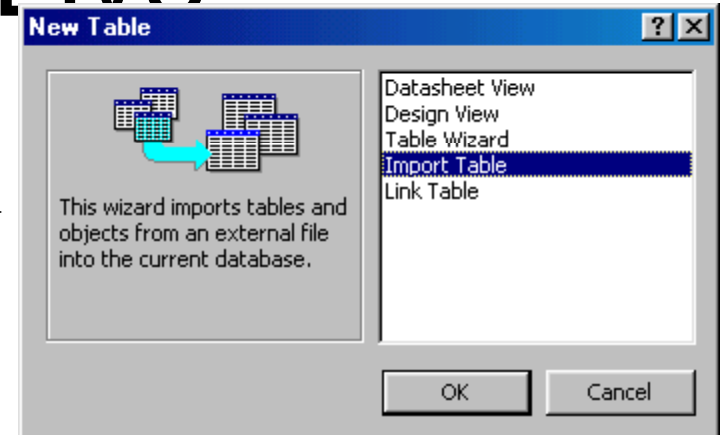


Table Import / Link - Live

Importing a Table makes a copy of existing data

Linking a Table lets you control existing data through Access (Exercise Caution !)

Note that you may import non-Access files.





MS Access – Module 2 Summary

Data storage principles

1. Attempt to store data 1 time / 1 place;
2. Do not store data that may be calculated from other fields (utilize queries); and
3. Strive for very discrete data storage (no ambiguity – garbage in / garbage out).
4. Choose real or arbitrary (autonumber) unique identifier for each record.

Relationships

Use table relationships to automatically cascade delete and update records.

Other Data Sources

Import = Copy; Link = Live Connect.



Microsoft Access – Module 3

Creating / Working with Queries



Query Overview - 1

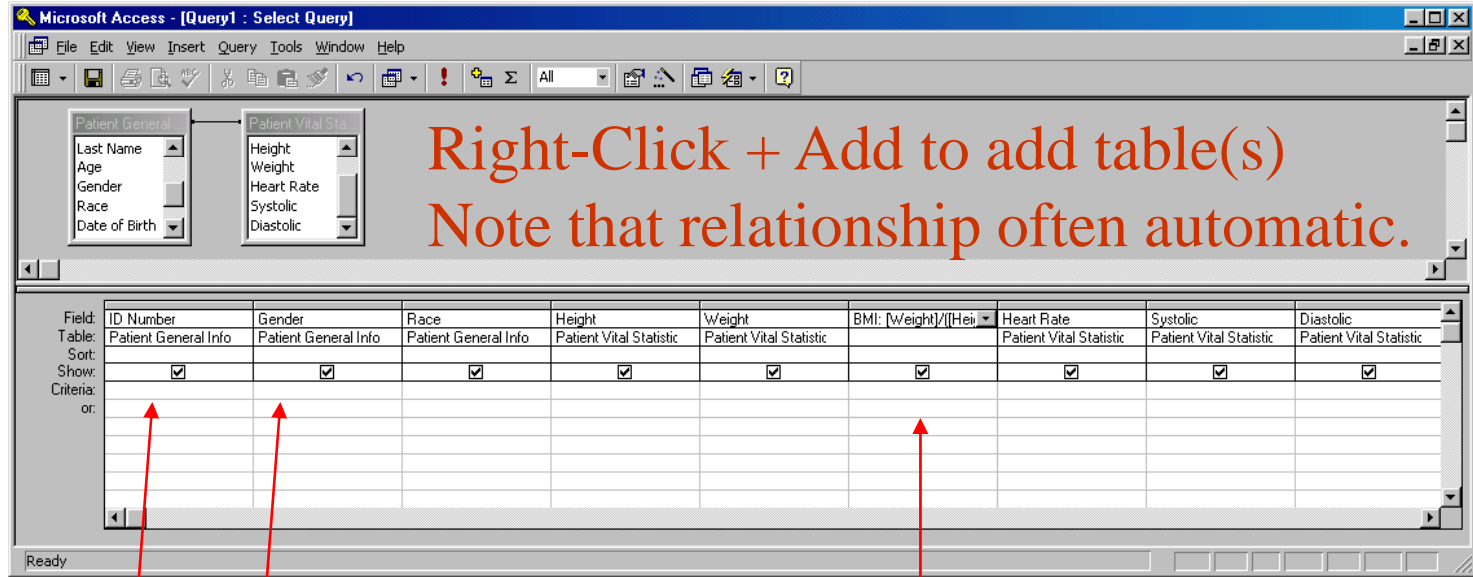
- ◆ An MS-Access query is a set of stored SQL instructions that manipulate and/or select data from one or more tables.
- ◆ Select Query – Data grouping and/or filtering
- ◆ Make-Table Query – Select + creates/populates new table.
- ◆ Update Query – Updates fields from specified table data
- ◆ Append Query – Runs query on one table, appends results to a table
- ◆ Delete Query – Delete selected records from table



Query Overview - 2

- ◆ SQL (Structured Query Language) is a very widely used database language designed specifically for communicating with databases
- ◆ SQL is not proprietary – almost every DBMS supports SQL (including MS-Access).
- ◆ SQL is relatively easy to learn, but extremely powerful – one of the easiest ways to learn is to use MS-Access Query by Example methods, then look at the generated SQL command
- ◆ Remember that a query is nothing more than the database engine running the stored SQL command (it looks and sometimes acts like a table, but really adds little mass to the database file)

2-Table Query Example - Live

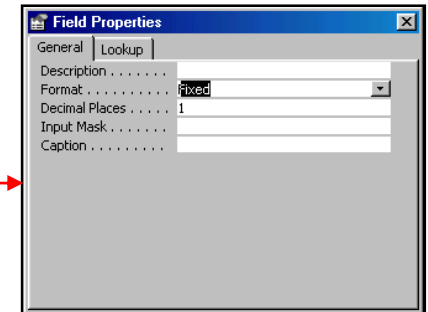


Drag and Drop Fields

Calculated Field

Right-Clicking gray area above field enables property changes.

BMI: [Weight]/([Height]/100)^2



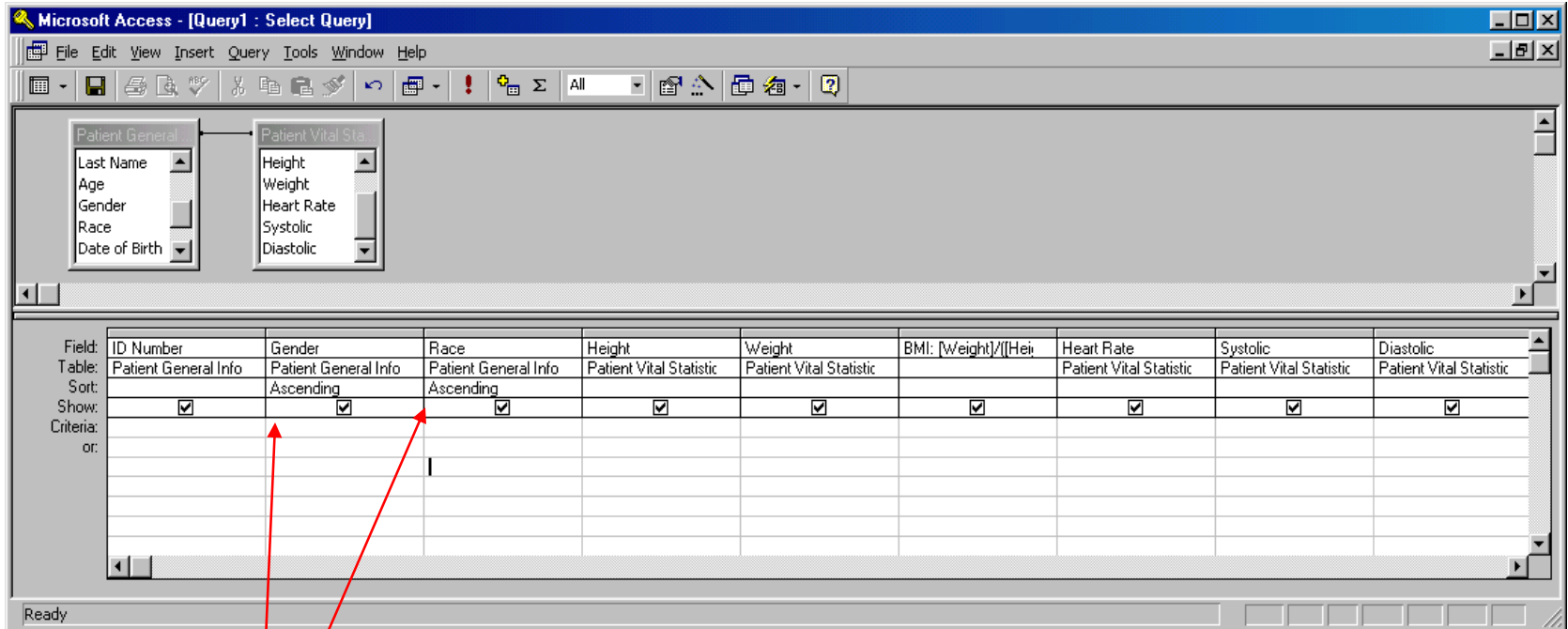


Query – Calculating Fields

Name the calculated field, then type a colon, then type the equation using brackets ([]) around table fields. If there is ambiguity in the field names between tables, you may need to type table.[field] format.

Ex: BMI: [Weight]/([Height]/100)^2

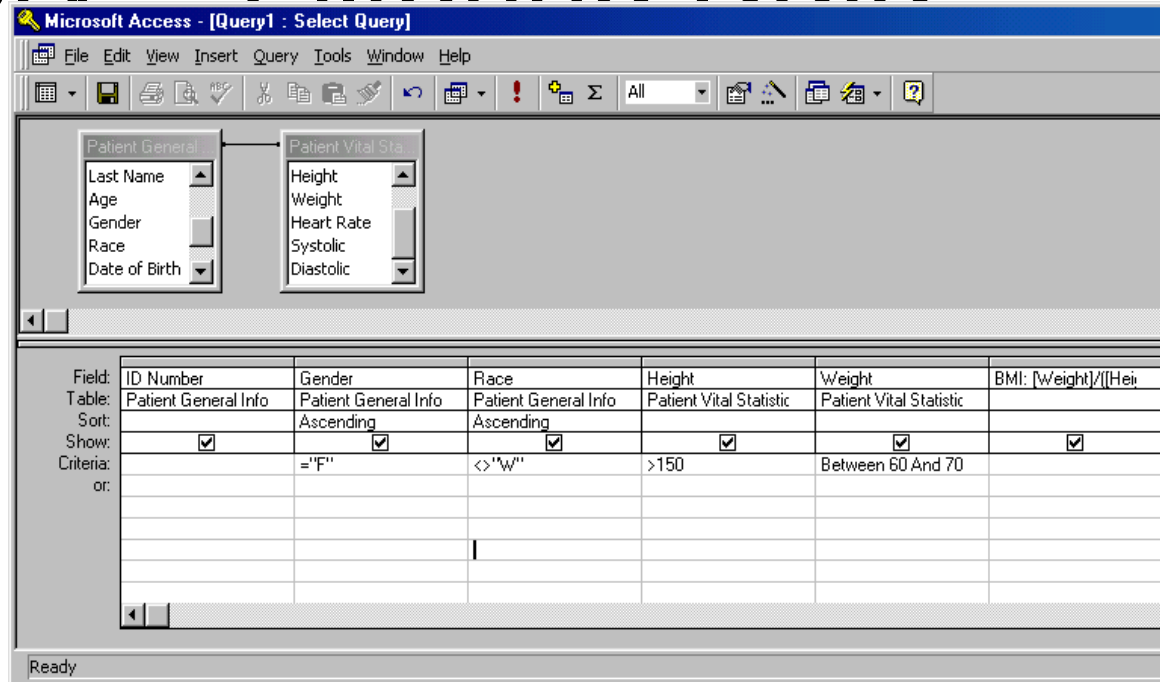
Query – Sorting Data



Choose Ascending or Descending in the Sort Row

This query would sort by Gender THEN by Race.

Query – Filtering Data



This query will return all records in the database for:

Females

who are not white

whose height are greater than 150 cm

and who weigh between 60 and 70 kg

You need not “show” the data field to use as a filter.

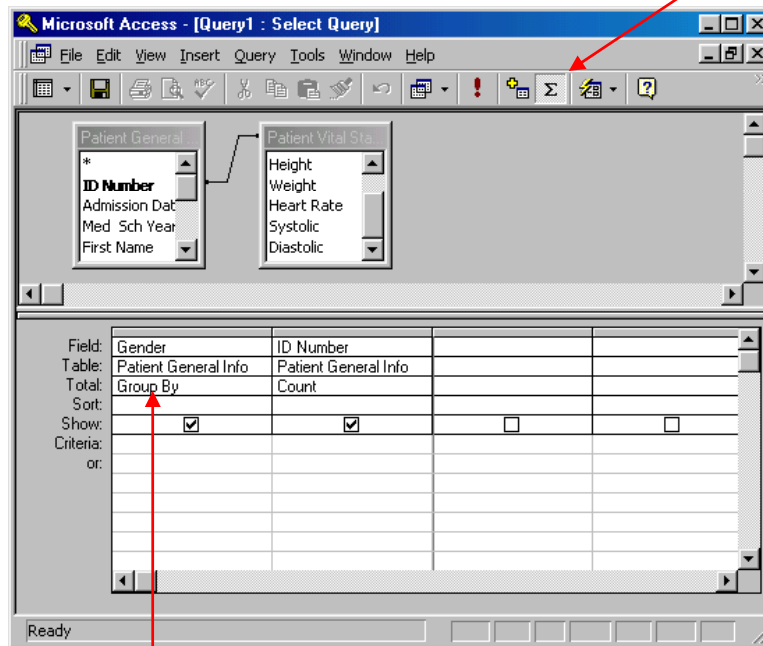


Query – Filter Operators

=	equals
>	greater than
>=	greater than or equal
<	less than
<=	less than or equal
<>	not equal to
Between	between two values
Is Null	field is empty
is not null	field is not empty
Like	Matches a pattern (Like John*)
OR	Logical OR (one or other is true)
AND	Logical AND (both are true)
etc.	

Query – Grouping Data - 1

Clicking the Totals Button Enables Grouping, Counting and Statistical Options

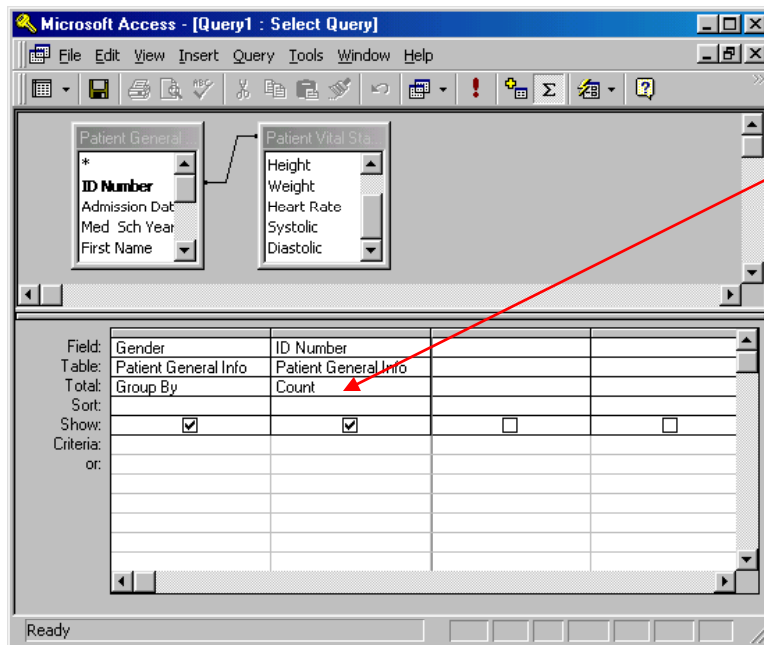


Notice new "Total" row.
Each field (column) can be set.



Running this Query indicates there are 203 Females and 261 Males in the database.

Query – Grouping Data -2



Totals Options Include:

Group By

Sum

Avg

Min

Max

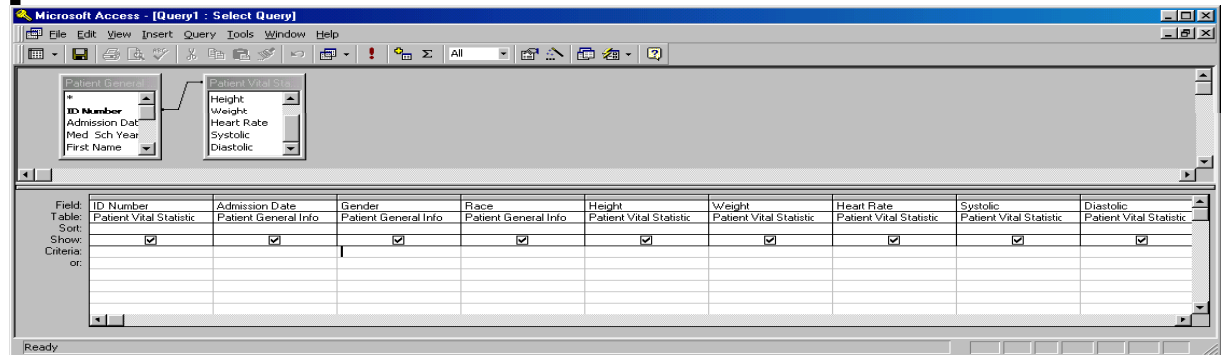
Count

StDev

Var

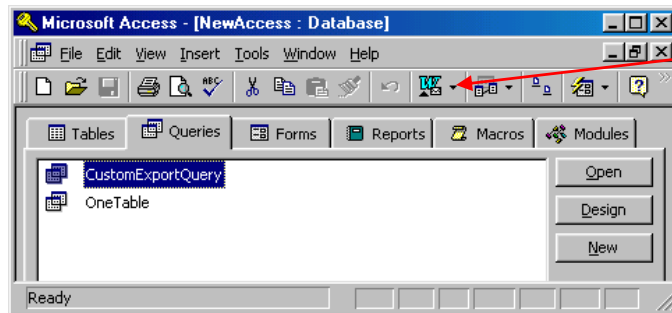
Query – Export Data

1) Create and Save Query



2)

Use OfficeLinks (Excel Toggle Option) to “Analyze it with Excel”



3) Data Automatically Exported to Excel

The screenshot shows the Microsoft Excel spreadsheet view for a file named 'CustomExportQuery.xls'. The data is displayed in a table format with columns A through J and rows 287 through 297. The data is as follows:

	A	B	C	D	E	F	G	H	I	J
287	F	W	157.2	52.6	91	128		81		
288	M	W	174.4	71.2	70	117		77		
289	M	O	169.4	48.2	89	131		72		
290	M	W	177.6	81.6	73	143		72		
291	F	O	162.3	49.3	97	32		86		
292	F	W	159.9	52	86	123		72		
293	F	W	160	54	73	102		71		
294	F	W	178.3	69.6	56	102		68		
295	F	W	171.3	63.6	87	117		64		
296	M	W								
297	F	O	152.5	50.8	73	97		60		



MS Access – Module 3 Summary

Queries are extremely easy to set up/use and provide an up-to-date snapshot of your data at any time.

Queries may be used to calculate values based upon existing fields, join fields from separate tables, globally update or delete data, and export linked/calculated data to external programs.

Under the hood, queries are really nothing more than stored SQL statements that are run upon command. They add little mass to the file application.

If you use MS-Access for nothing else, you should learn to import data and become proficient with query functionality.



MS-Access Import/Query Practice

Import data from the sample Excel file “msci_data.xls” into an Access database table. Design and save a new query named to display only the following fields: 1) Case; 2) Sex; 3) BMI_Av (a calculated field computed by averaging BMI_1 and BMI_2). Select filter criteria in the query to show only those records where: 1) age is between 30 and 90; 2) the sex field equals 0; and 3) and the survdays field contains a value between 100 and 300.

Using the imported table from part A, design and save a new query named Question2 to provide summary data for each sex / alive combination (ie we want to see 4 rows of data). For each of these combinations compute: 1) count of case numbers; 2) average of length of stay (LOS); and 3) standard deviation of length of stay (LOS).



Microsoft Access – Module 4

Creating / Working with
Forms/Reports



Graphical User Interface (GUI)

Although it is possible to enter data directly into a table, you can enhance data quality by forcing data entry through forms.

Depending upon your users, you may wish to set things up so they never even see the database window. In other words, you can design your application so they only touch the data through programmed forms.



Graphical User Interface (GUI)

Continuing with the glucose database we formulated earlier, we'll now attempt to build a graphical user interface to:

- 1) Collect Data
- 2) Periodically report data through pre-formatted reports
- 3) Quit the program

GUI – Forms/Report Live

GCRC Glucose Protocol - [MainMenu : Form]

Vanderbilt University

Vanderbilt General Clinical Research Center
Waking Glucose Measurement Study

Enter Glucose Measurements

Report Measurements For Individual

Quit

Form View

GCRC Glucose Protocol - [Glucose : Form]

Vanderbilt University

Vanderbilt General Clinical Research Center
Waking Glucose Measurement Study

Patient_ID:

Date:

Weight:

Glucose:

Drug_A:

Record: 1 of 26

Patient ID

GCRC Glucose Protocol - [Glucose]

Vanderbilt University

Vanderbilt General Clinical Research Center
Waking Glucose Measurement Study

Glucose_Patient_ID	Date	Weight	Height	Glucose
111222	Home Visit	81000	90	90
Summary for Glucose_Patient_ID= 111222 (Patient history)				
Arg	111224	Home Visit	81000	90
	81000	90	91	91
	81000	90	91	101
	81000	90	91	90
	81000	90	91	90
	81000	90	91	90
	81000	90	91	111
	81000	90	91	90
	81000	90	91	90
Summary for Glucose_Patient_ID= 111224 (Patient history)				
Arg				91.01

Page: 1 of 1

Ready

Out of Program



MS Access – Module 4 Summary

Use forms and reports together to build a data software application.

Design to the lowest common denominator (Murphy will use your program early and often)

Always look for and design carrots to win over the true data entry personnel. If it saves them time or offers something they couldn't do before, they might use the application.

Look for champions – bright, energetic individuals who will try something new, etc.



MS Access – Resources

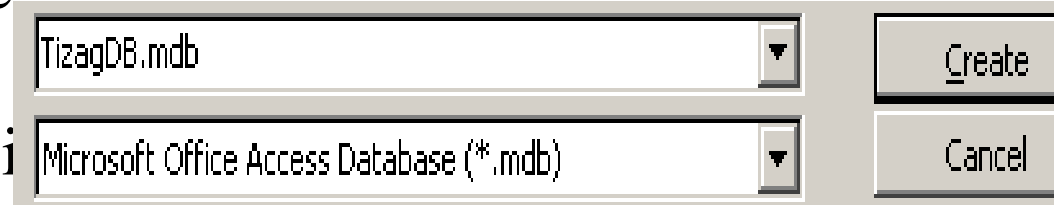
I cannot recommend the BEST MS-Access book.
However, I can recommend the following series of books
that I usually turn to when learning new technology:

- Visual Quickstart Series – beginner/intermediate level
- O'Reilly Series – intermediate/advanced level

There is also an excellent tutorial on the web:

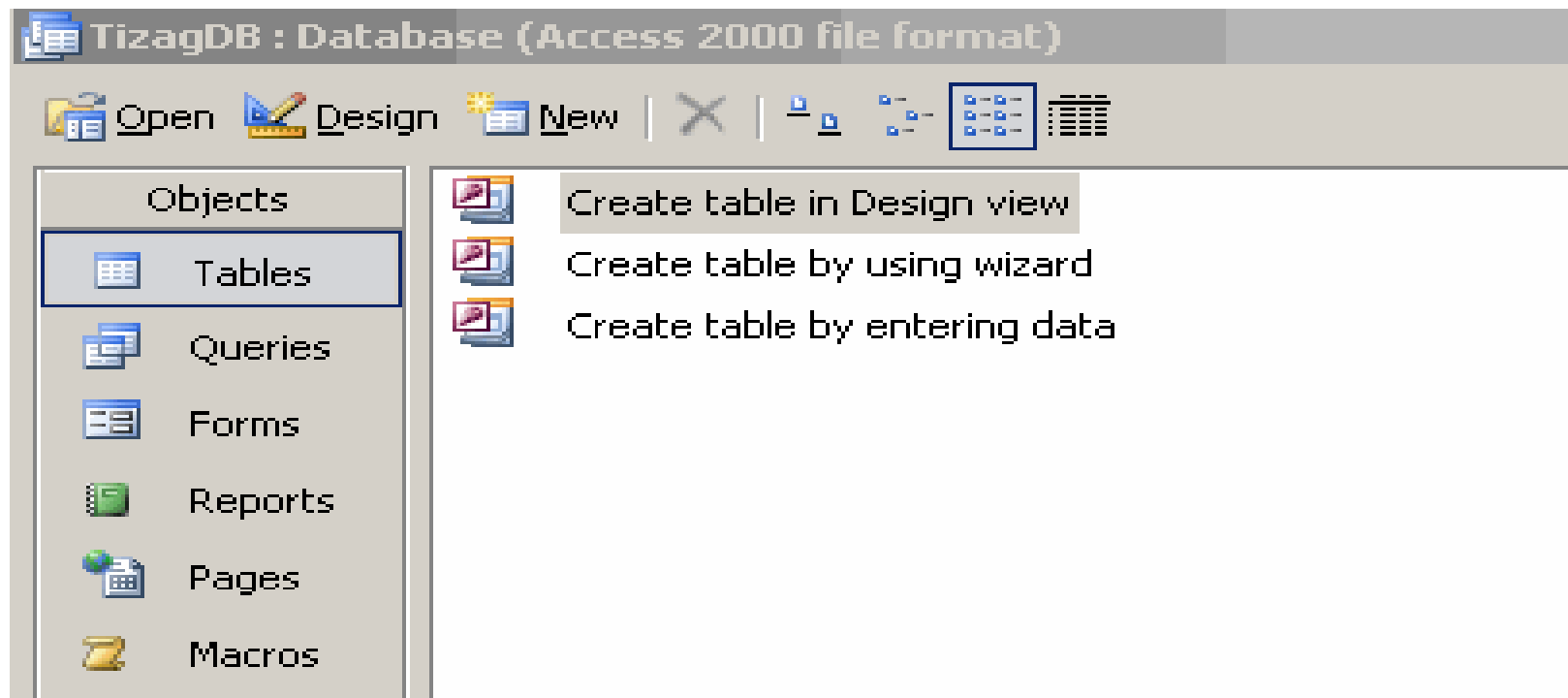
<http://mis.bus.sfu.ca/tutorials/MSAccess/tutorials.html>

4. Left-click the option "Blank database...", which will then ask you to name your database. Helpful Hint: Access databases are saved with the .mdb extension.



5. Name your file (we chose TizagDB) and press Create. This will automatically save your blank database, so remember where you put it!

The Access Database interface should now be displayed and you are well on your way to learning Access!



A table in Access is quite different than a table in real life. Instead of having wooden legs and being used for meals, Access Tables are a grid made up of rows and columns. Here's an example of a table in Access:




	Employee	Product	Price	SaleNumber
▶	Bob	Sneaker	\$40.00	1
	Bob	Sneaker	\$60.00	2
	Bob	Slipper	\$5.00	3
	Bob	Heel	\$12.00	4
	Bob	Dress	\$150.00	5
*			\$0.00	0



Table1 : Table			
	Field Name	Data Type	
▶	Employee	Text	▼

Table1 : Table			
	Field Name	Data Type	
	Employee	Text	
	Product	Text	
	Price	Currency	
▶	SaleNumber	Number	▼

	Field Name	Data Type
	Employee	Text
	Product	Text
	Price	Currency
	SaleNumber	Number

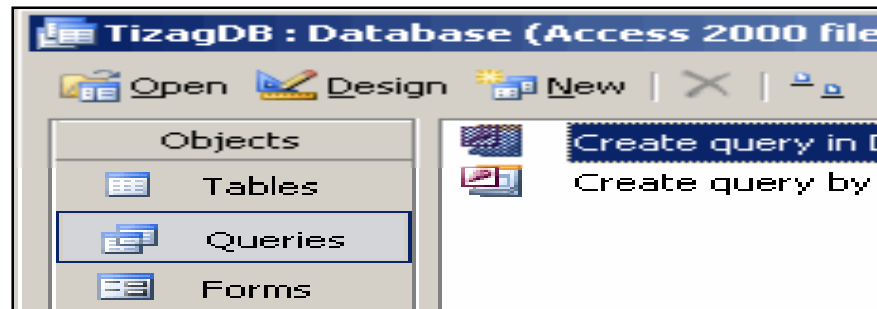
Save As ? X

Table Name:

Choosing a Table to Query

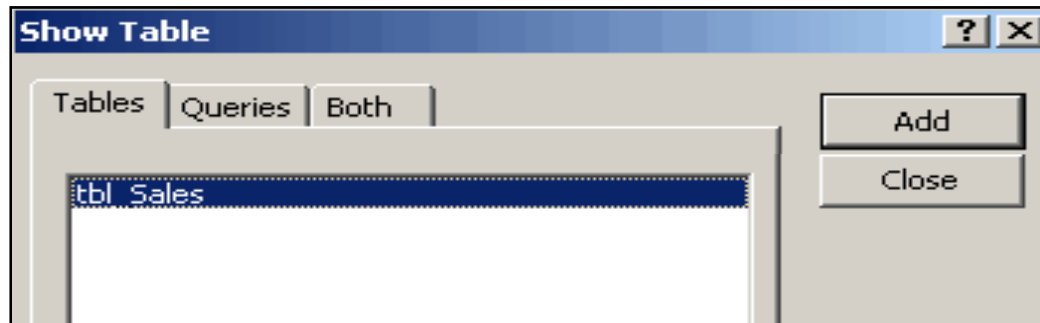
Choosing a Table to Query

Before you can create a query you have to navigate to the Query Tab in your Access database. Select **Queries** from the Objects Pane.



“Creating an Access query with the “Design view” “Design view”

1. Double-click "create Query in Design view“
2. Add the table **tbl_Sales**





Access Forms

Access provides an easy way to enter data into your Access tables with forms. In Access you have the ability to quickly make and customize these data entry forms to streamline the data input process.

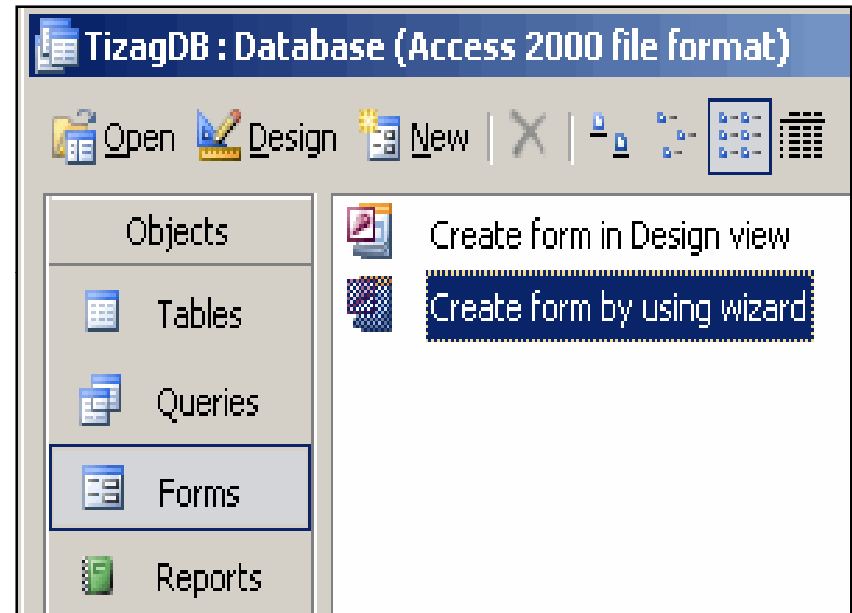
Using our previous example, imagine that Bob, from Bob's Shoe Store, has recently hired someone to enter all the sales data at the end of each business day. The only problem is this person does not know how to use Access, so Bob needs to make them a custom form in Access! This lesson will guide you through the process of creating a data input form in Access

Creating an Access Form

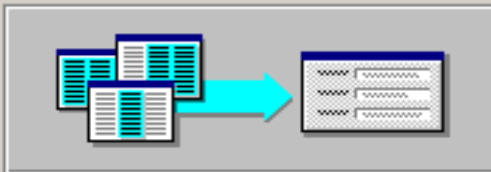
Creating an Access Form

Although we haven't recommended the various wizards that Access had available in the previous lessons, the **form wizard** is actually very useful and should save you a bunch of time! Let's create a simple data input form for the new employee!

Navigate to the **Forms** section in Access



Form Wizard



Which fields do you want to add to the form?

You can choose from the following fields:

Tables/Queries

Table: tbl_Sales

Available Fields:

Employee

Selected Fields:

Tables/Queries

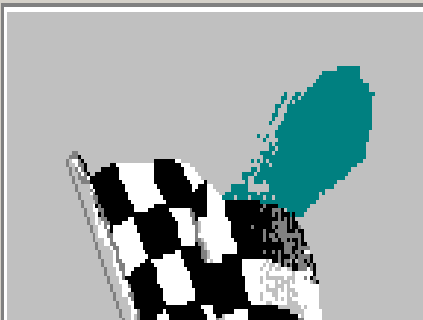
Table: tbl_Sales

Available Fields:

Selected Fields:

Employee
Product
Price
SaleNumber

Form Wizard



What title do you want to use for the form?

frm_EmployeeEntry

Create form by using wizard

frm_EmployeeEntry

frm_EmployeeEntry

Employee	Bob
Product	Sneaker
Price	\$40.00
SaleNumber	1

Record: 1 of 5



Access Reports

Having all your data stored in Access is great for maintaining a database, but it isn't the best when you want to share the data or view it away from a computer. The solution to this problem is to create an Access report that will let you design a ready-to-print document of your desired database information.

Sticking with our example of business owner Bob, CEO of Bob's Shoe Store, let's explore how he would go about printing out a sales report that he can peruse on his flight to the annual Shoe Owner's of the World Convention (SOWC).





Creating an Access Report

Bob wants a report to show the sales for each product, as well as the total sales for his company. Luckily, because he has all his sales information in an Access database, he can create this report in about a minute!

Navigate to the **Reports** section in Access

Objects

- Tables
- Queries
- Forms
- Reports**

 **Create report in Design view**
 Create report by using wizard

Tables/Queries

Query: qry_ProdSales

Available Fields:

Selected Fields:

Product
Price

> >> < <<

To remove a grouping level that you added, click on it, then click <.

Product

Price

> <

You can sort records by up to four fields in ascending or descending order.

1	Price
2	
3	

Summary Options

What summary values would you like calculated?

Field	Sum	Avg	Min	Max
Price	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Report Wizard

What title do you want for your report?

rpt_Sales

That's all the information the wizard needs to



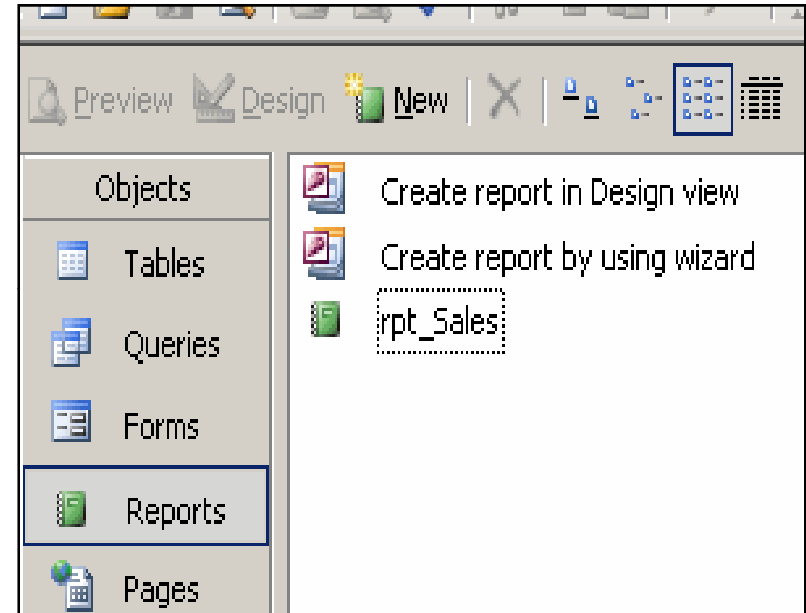
rpt_Sales

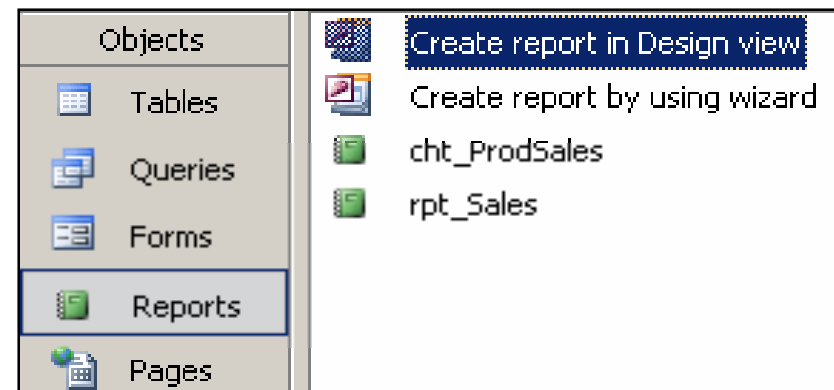
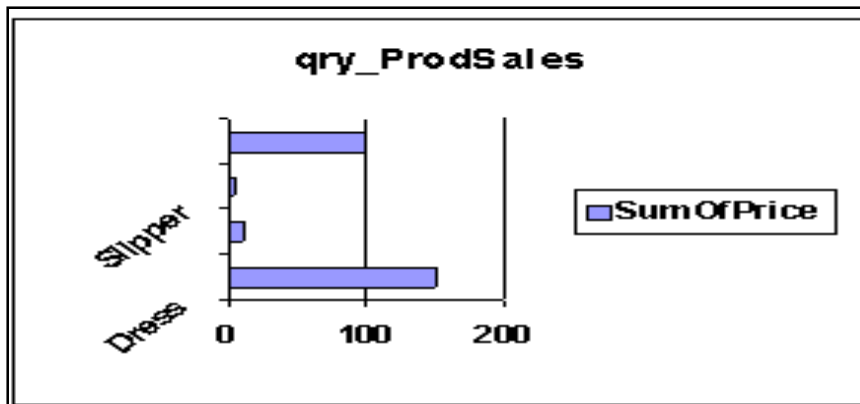
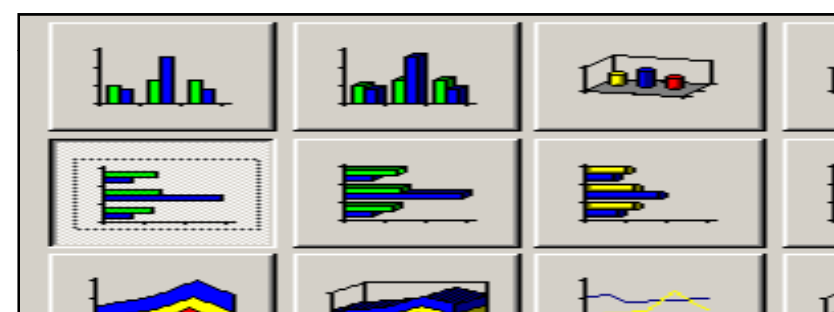
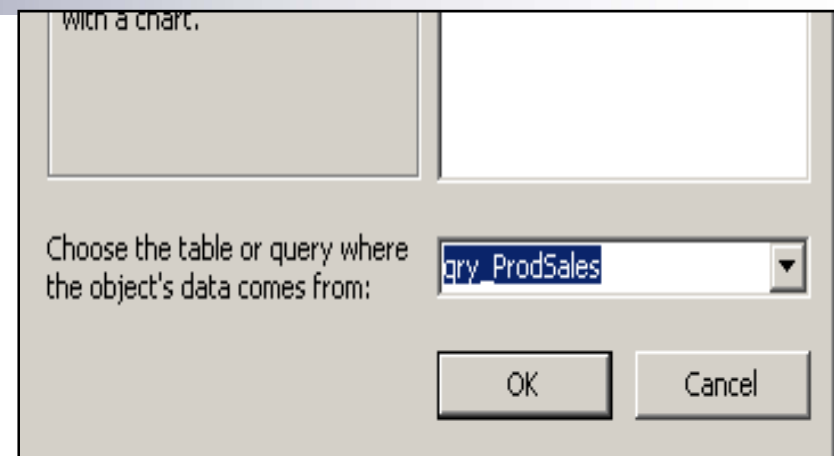
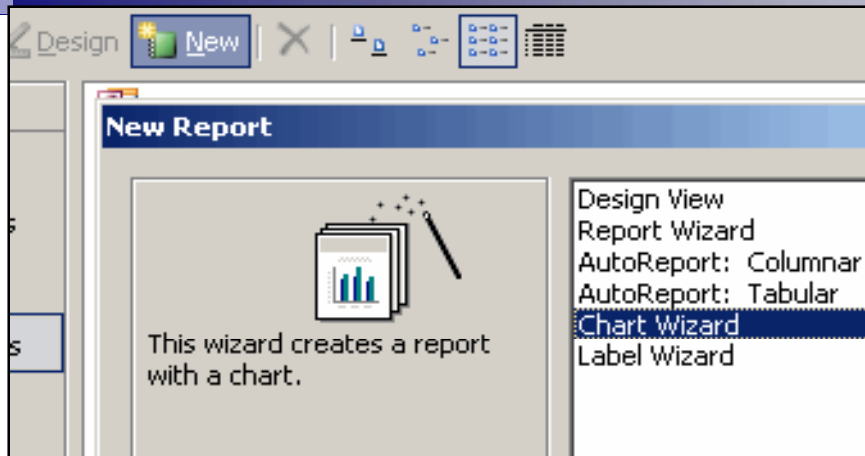
Product	Price
Dress	\$150.00
Summary for 'Product' = Dress (1 detail record)	
Sum	\$150.00
Heel	\$12.00
Summary for 'Product' = Heel (1 detail record)	
Sum	\$12.00
Slipper	\$5.00
Summary for 'Product' = Slipper (1 detail record)	
Sum	\$5.00
Sneaker	\$40.00
	\$60.00
Summary for 'Product' = Sneaker (2 detail records)	
Sum	\$100.00
Grand Total	\$267.00

Access Charts

Access Charts

In the Access Query Lesson we created a query to find the total sales for each type of product. We will be taking this query and making a histogram from it. The chart wizard can be found inside the *Reports* area of Access. Navigate to the reports area.







THANK YOU