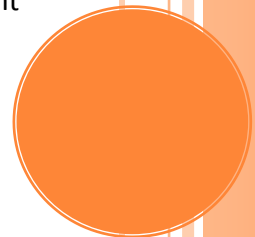




Level 6 Relational Database Unit 3 – Relational Database Development Environment

National Council for Vocational Awards

This module has been developed to further the learner's knowledge of modern database systems and to equip the learner with the ability to design, implement and maintain Relational Database Systems.



Relational Databases in Access

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Database A 'collection of data' or information which is stored in a way that can easily be accessed and found.

1. Opening Microsoft Access 2007

To use Microsoft Office Access 2007 open the application from the programs menu go to **Start > Programs > Microsoft Office > Microsoft Access 2007**. The program should open like this.



2. Open a Previously Created Database

Recently created databases can be opened from the shortcut list on the right side of the application. If the database you have created is not available in this window click into the More... option at the top of the shortcut list and browse to the database you wish to open.

3. Open and Save a New Database

NOTE: A DBMS (for example Access) requires the file which will contain the database should be created and saved before any data can be entered into the database. This means that the process of creating a new database starts with saving it and giving it a filename.

New Blank Database

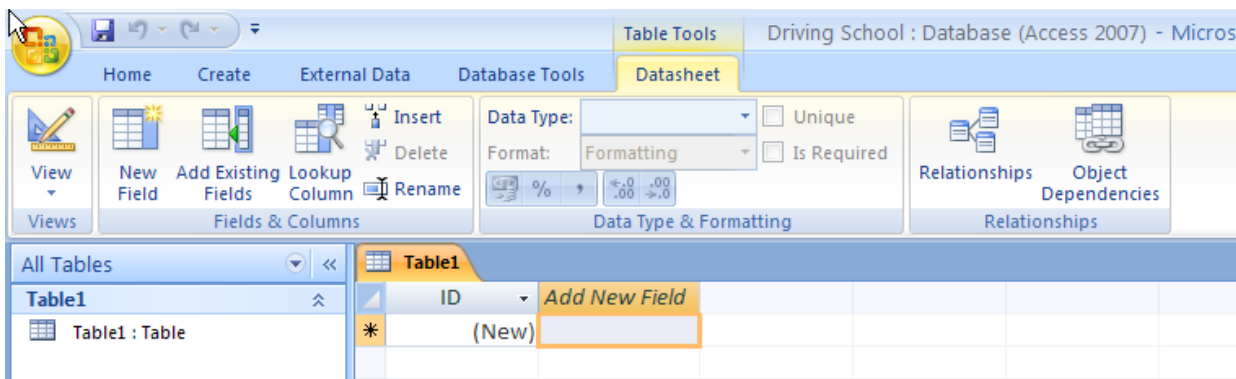
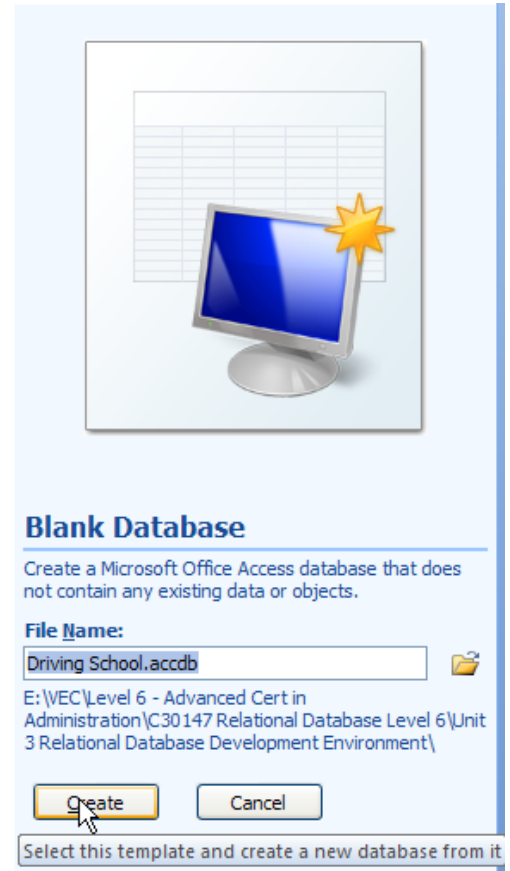
To create a blank database click on the **New Blank Database** link at the top left of the application.



This will open the **Blank Database** task pane at the right of the application. To save a database you must first name the database in the **File Name** text box. Then browse to the location the database file will be saved into, using the folder to the right of the text box.

When the location has been selected and the database has been named click on the **Create** button to create the database.

This will automatically open the new database which is saved as the name you select. In this example the database has been named as Driving School on the blue title bar at the top of the application.



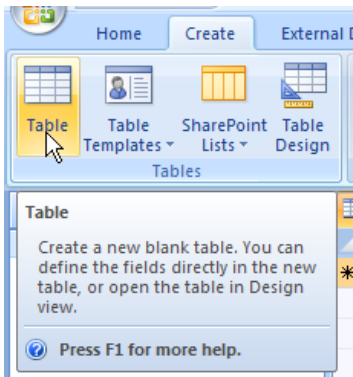
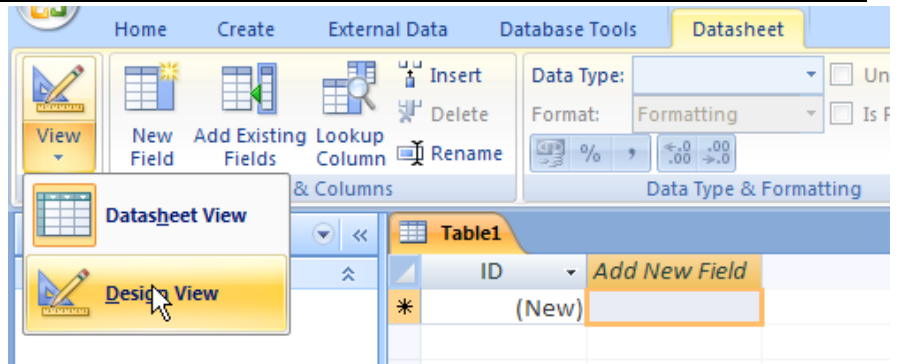
NOTES:

Table

This is a collection of records about a particular subject. It is presented in table format so that it is easy to read and understand. Each column constitutes a particular field. Each row constitutes one particular record.

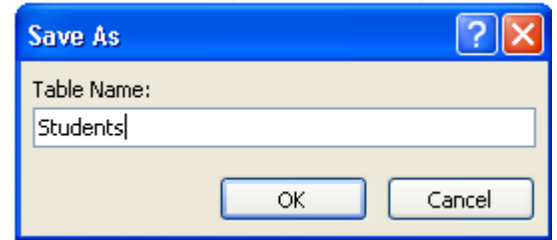
4. Create a Table

The first table is automatically created for you in **Datasheet View**. Tables are more accurately created in **Design View** to change to design view click on the **View** button as shown below on the **Datasheet** menu.



NOTE: To create further tables go to the **Create** menu and click on the **Table** button as shown.

When you click on the design view button you will be asked to save the table before you create it. Name the table and click on ok.



Create the table by completing the Field Name, Data Type, Description and Field Properties of the **Fields** in the table.

Field Name	Data Type	Description
StudentID	Number	Student ID Number
Title	Text	Title of the student e.g. Mr, Miss, Mrs, Other
Surname	Text	The surname of the student
Forename	Text	The forename of the student
Address1	Text	
Address2	Text	
Address3	Text	
Tel No	Text	
Date of Birth	Date/Time	
Sex	Text	Look up wizard to allow values to be typed into drop down list
Theory Test Date	Date/Time	
Passed Theory Test	Yes/No	If the student has passed the theory test.
Practical Test Date	Date/Time	The date the students practical test will take place.
Passed Practical Test	Yes/No	If the student has passed the practical test.

Field

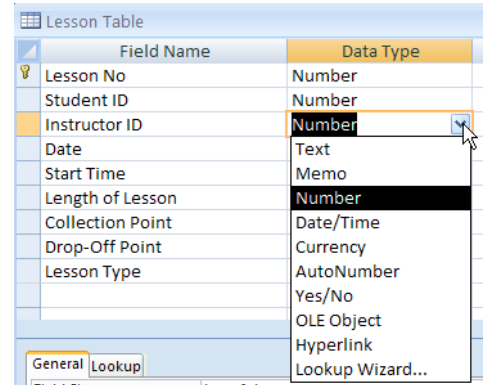
Each separate piece of data stored in a database is referred to as a field. A field could contain a person's name, a book title, an author, an account balance, a date of birth, etc. A field may contain no data, in which case it is referred to as a blank field.

Data Types Data Types are used to describe the type of information which will be stored in any particular field. It is important that if two fields will be used to relate different tables together, that the data types of these field match.

Data Type Examples include the following:

- Text** This is the default setting. Used for shorter text entries. Can be a combination of text, numbers, spaces and symbols. Maximum length of 255 characters but you can set it fewer using the Field Size property.
- Number** Used to store numeric data, any integer or real number.
- Date/Time** This stores a data or a time or a date and the time. There are several formats for a date/time field.
- Currency** Monetary values, normally this will be set to Euros and work to two decimal places.
- Logical** Only allows logical values such as Yes/No, True/False.
- Yes/No** A logical field which can only contain one of two values, usually yes/no or a box which is ticked for yes or blank for no.
- Memo** A note or text box which will allow text to be stored in the database. Used for longer text entries. Maximum length 65,535 characters!
- Auto Number** An AutoNumber field will number records automatically as you enter more data. The field acts as a counter. Duplicates are avoided and so AutoNumber fields are ideal as the primary key field. An AutoNumber cannot be edited and when an AutoNumber is deleted Access does not allow you to go back and reuse this number.
- OLE Object** An object linked to or embedded in a Microsoft Access table. This might be an image or a sound or a file created in another package such as Microsoft Excel or Microsoft Word. Most commonly used as an image place holder.
- Lookup Wizard** This data type creates a lookup table so that you can choose a value from a drop-down box. It also allows the addition of a typed list or will allow the creation of a link between two fields in two different tables (this can be used to create relationships between tables).
- Hyperlink** A hyperlink address. This can be linked to:
1. An object in your Access file, e.g. another table.

2. Another locally stored file.
3. A web page.
4. An e-mail address.



To select the data type of any field click into the data type cell and select the required type from the drop down menu.

Description

The description should be added by the designer of the database to allow future editors of the database to easily understand what the information in any field relates to.

Field Properties

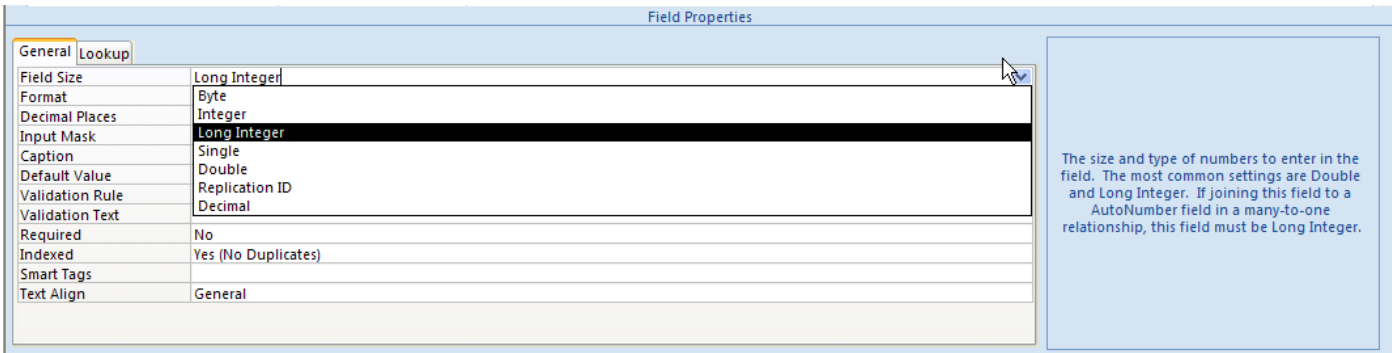
Field properties are used to tell Access how you want the data stored and displayed. For example a date can be displayed 19/06/94 or 19th June 1994 or 19-June-94.

Field Properties are described as follows:

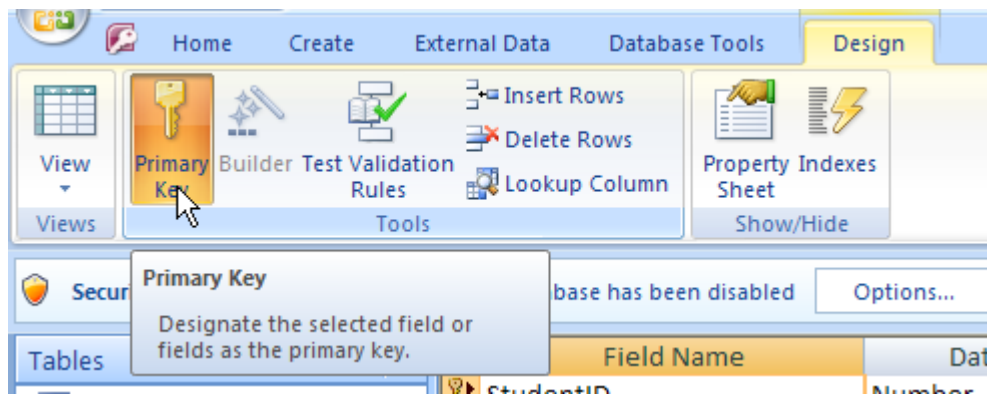
Property	Description
Field Size	This is used to fix the maximum length of a text field. The default value is 50 characters. The maximum length is 255.
Format	This fixes how data can be displayed, for example dates can be displayed in many different forms such as 13/01/01 or 13 Jan 01 or 13 th January 2001.
Input Mask	This sets a pattern for the data to be entered into this field (see additional notes pages 31, 32, 33, 34).
Caption	This is the field label in a form or report. You are not likely to need to use this property.
Default Value	This is the value entered into the field when the record is created. It is usually left blank but can be very powerful.
Validation Rule	This defines the data entry rules.
Validation Text	This is the error message if data is invalid.
Required	This indicates whether an entry must be made or not. If an entry is required, it is best not to set this property until the database is fully working.
Indexed	This allows data to be stored in the order of this field, which speeds up searches.

Allow Zero Length	This is used with text fields to decide whether records in that field are allowed to contain zero length or empty text strings.
Unicode Compression	This is a method of compressing the data entered in this field.

If you are unsure or cannot remember the description of any property, click into the property and it is display in the text box to the right of the **Field Properties** window.



Primary Key This is the field that identifies each record as unique, i.e. different from any other record. Typically it would be an identity number such as employee ID, student ID, etc. Two of the major uses of a primary key are to prevent the input of duplicate records and to create and index. To identify any field as the primary key of the table click on the field name which you want to change to the primary key, go to the **Design** toolbar and click on the **Primary Key** button.



NOTES:

The **Driving School** database contains four tables as shown below. Create the four tables with the table names, field names and data types as shown below.

Student Table

	Field Name	Data Type	Properties
PK	Student ID	Number	
	Title	Text / Lookup Wizard and type values	Mr, Mrs, Miss, Ms, Other
	Surname	Text	
	Forename	Text	
	Address1	Text	
	Address2	Text	
	Address3	Text	Default Value - Monaghan
	Tel No	Text	
	Date of Birth	Date/Time	Short Date
	Gender	Text / Lookup Wizard and type values	Validation Rule - "Male" or "Female" Validation Text – Gender must be Male or Female
	Theory Test Date	Date/Time	Short Date
	Passed Theory Test	Yes/No	Default Value to on or 1.
	Practical Test Date	Date/Time	Short Date
	Passed Practical Test	Yes/No	
	Pass Plus Req	Yes/No	
	Issued Card	Yes/No	

Lesson Table

	Field Name	Data Type	Properties
PK	Lesson No	Number	
FK	Student ID	Number / Lookup Wizard from Student Table Primary Key	Long Integer
FK	Instructor ID	Number / Lookup Wizard from Instructor Table Primary Key	Long Integer
	Date	Date/Time	Short Date
	Start Time	Date/Time	Medium Time
	Length of Lesson	Text	Default Value – 1 hour
	Collection Point	Text	Default Value – Home Address Field Size 30
	Drop-Off Point	Text	Default Value – Home Address Field Size 30
FK	Lesson Type	Text / Lookup Wizard from Lesson Type Table Primary Key	

NOTES:

Instructor Table

	Field Name	Data Type	Properties
PK	Instructor ID	Number	
	Title	Text / Lookup Wizard and type values	Mr, Mrs, Miss, Ms, Other Field Size 6
	Surname	Text	Field Size 20
	Forename	Text	Field Size 20
	Address1	Text	Field Size 30
	Address2	Text	Field Size 30
	Address3	Text	Default Value – Monaghan Field Size 30
	Home Tel No	Text	Field Size 15
	Mobile No	Text	Field Size 15

Lesson Type

	Field Name	Data Type	
PK	Lesson Type	Text	Field Size 25
	Cost	Currency	

Lesson Type Table should be completed as follows:

LESSON TYPE	COST
Introductory	€12.00
Pass Plus	€17.00
Standard	€15.00
Test	€25.00

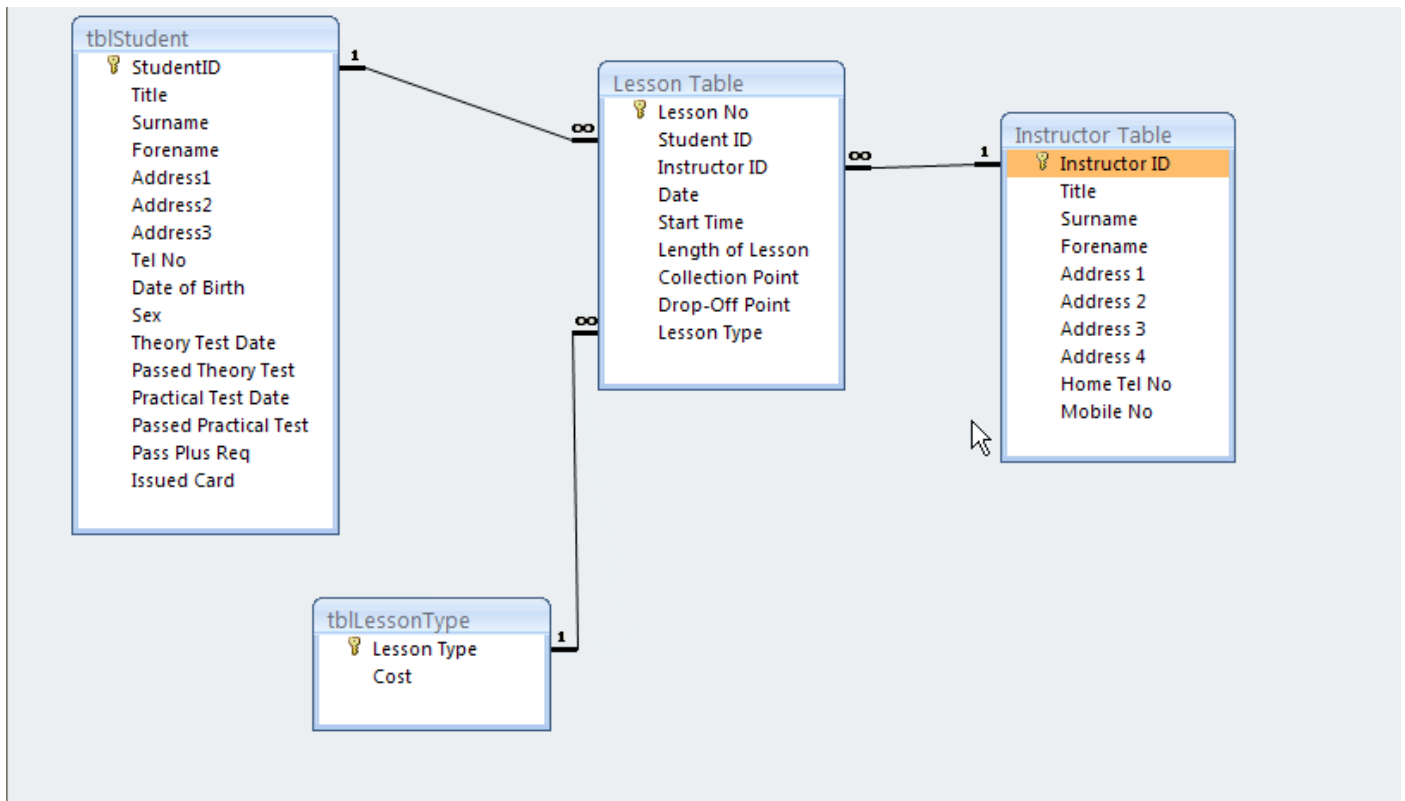
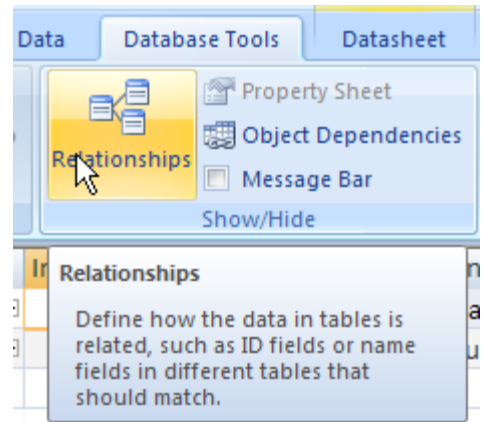
Foreign Key - FK

A foreign key is a primary key from one table in another table. Foreign keys are used to establish relationships between tables.

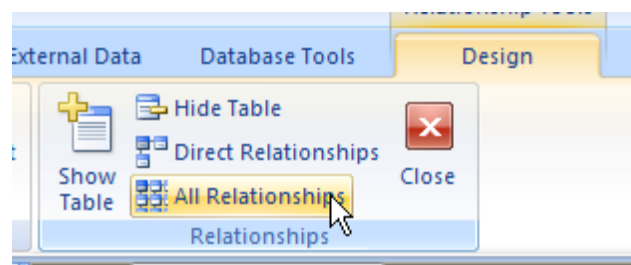
5. Create Relations Between Tables

To view the relationships between tables in a database go to the **Database Tools** ribbon and click on the Relationships button. This will automatically open the relationships window.

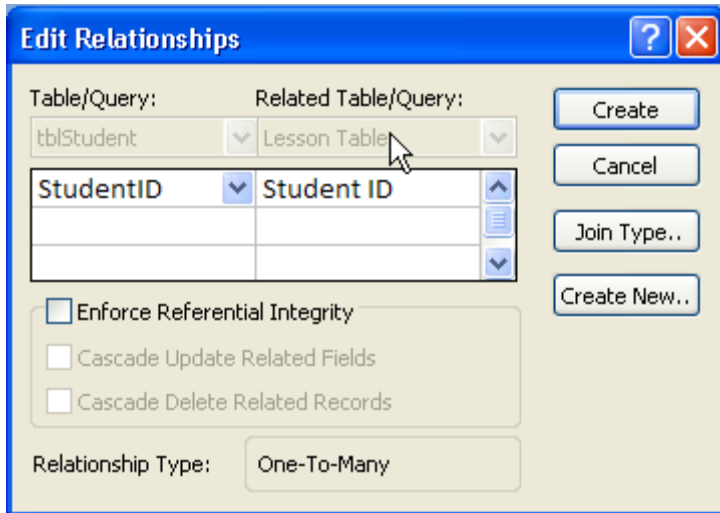
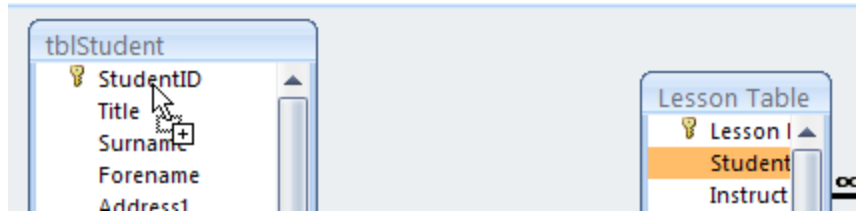
If you have set up the Pass IT Driving correctly your relationship should appear like this. NOTE: You do not need to create the relationships as they have already been created through the linked **Fields** using the **Lookup Wizards**.



If you cannot see all the fields you have created in your database click on the **Design** toolbar and click on the **All Relationships** button.



If you need to set up a relationship which was not or could not be created through a Lookup follow the following steps. Click on the field in the table where the Field is not the primary key and drag to the table where the field is the primary key.

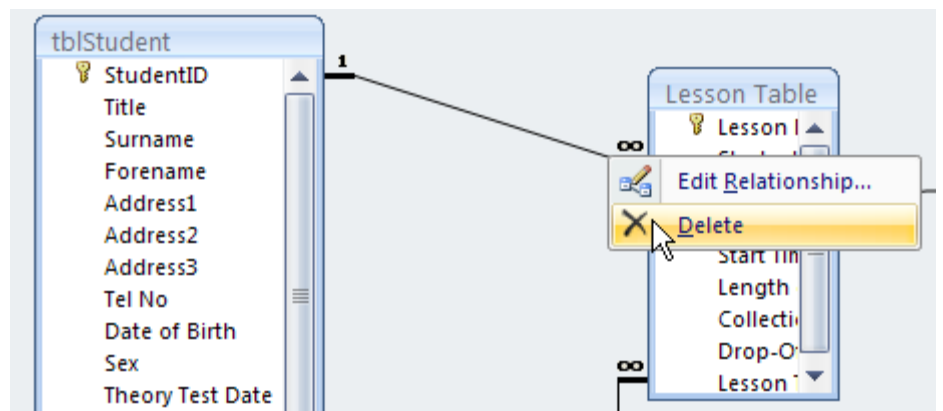


The **Edit Relationship** window will open and the relationship can be created at this point. Here you can turn on referential integrity by selecting the tick box.

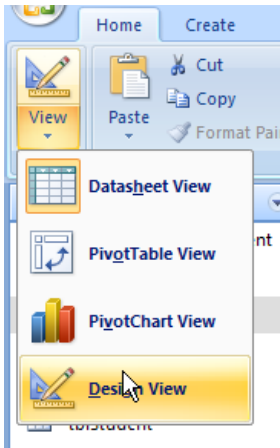
6. Delete a Relationship

To delete a relationship which has been created incorrectly or which is not required go to the Relationship view for the database, right click on the relationship and click on Delete. The relationship should be saved after a relationship is deleted.

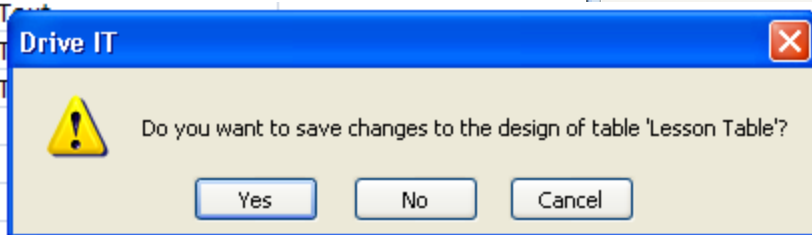
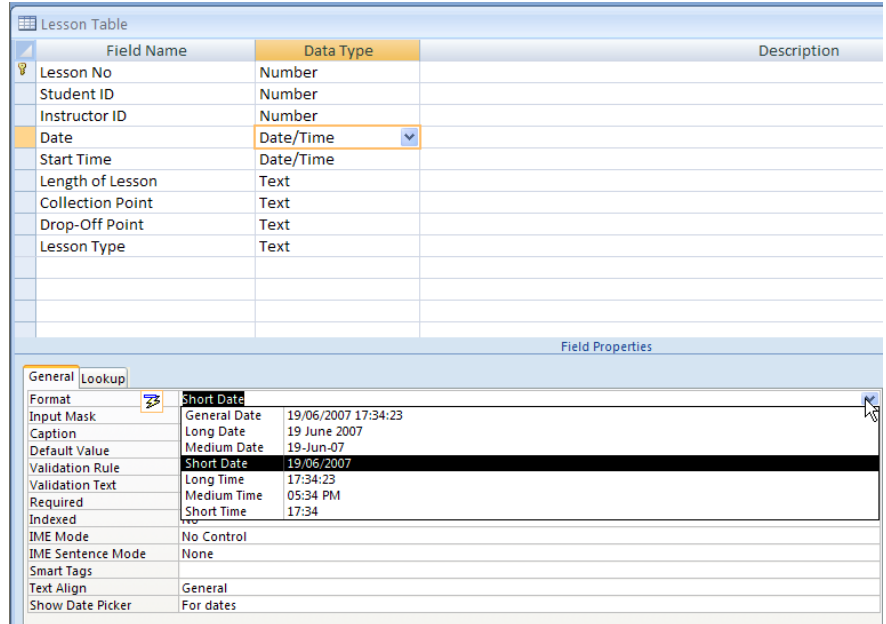
NOTE: It is important to ensure that all tables, forms or reports connected to the relationship you are deleting are closed before you attempt to delete the relationship. If this is not the case the relationship cannot be deleted.



7. Tables Edit and Save



To edit and save a table after it has been created, view the table in Design view. Make any changes required to the structure of the table, in the example shown the Field Properties are being changed. Fields can also be deleted or inserted by right click on the box to the left of the field name and selecting delete or insert.



It is important to save any changes applied after the table has been changed.

NOTES:

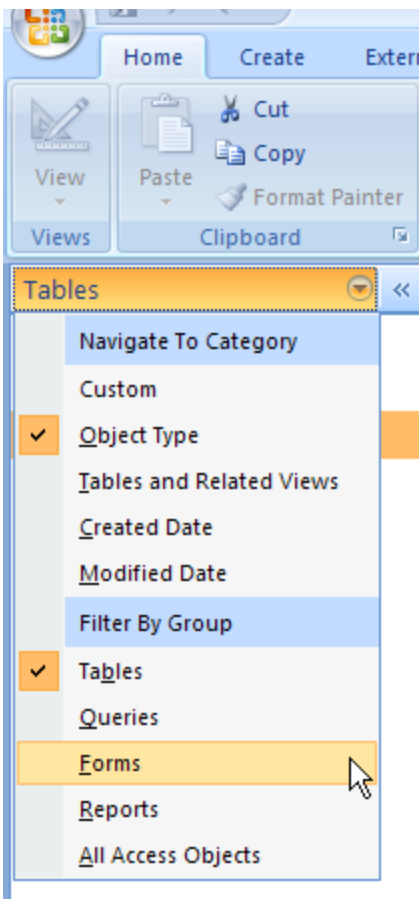
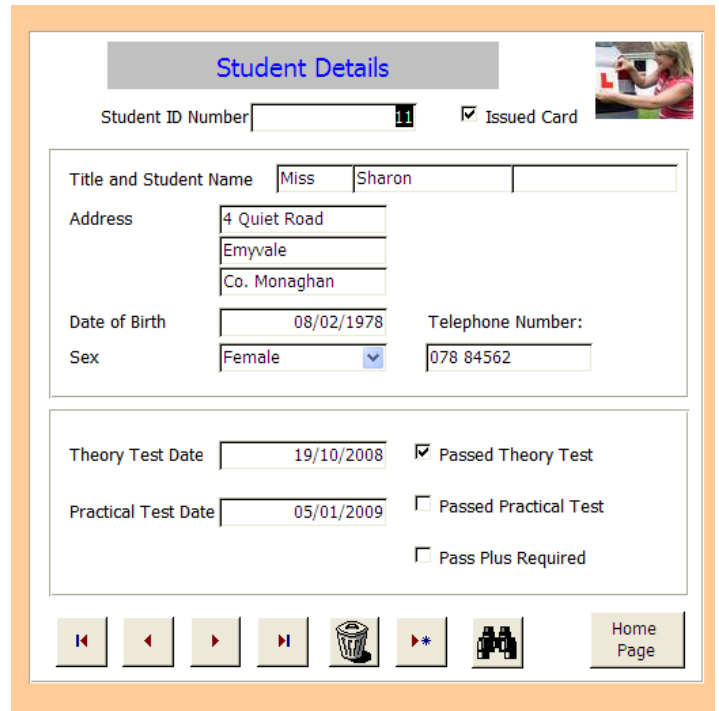
8. Create a Form

Record

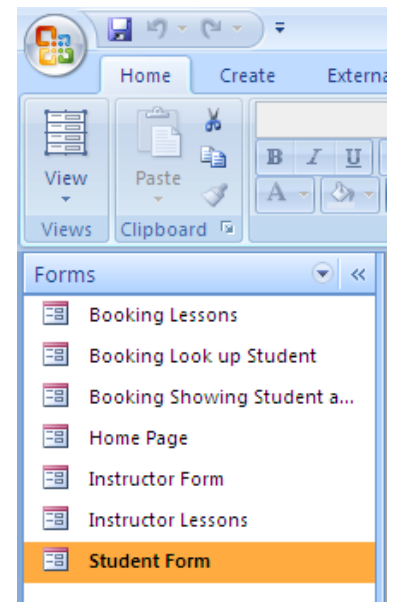
This is a collection of data about one person, thing or event. It contains all the fields that make up the data for a single entry in the database or a particular topic.

Form

Instead of working with data in tabular format it may be presented one record at a time. This is done using a form that you design so that the fields are displayed in whatever layout or order you choose. The DBMS will then display one record at a time in this format. It is possible to enter, change and view records using the form view or table view.

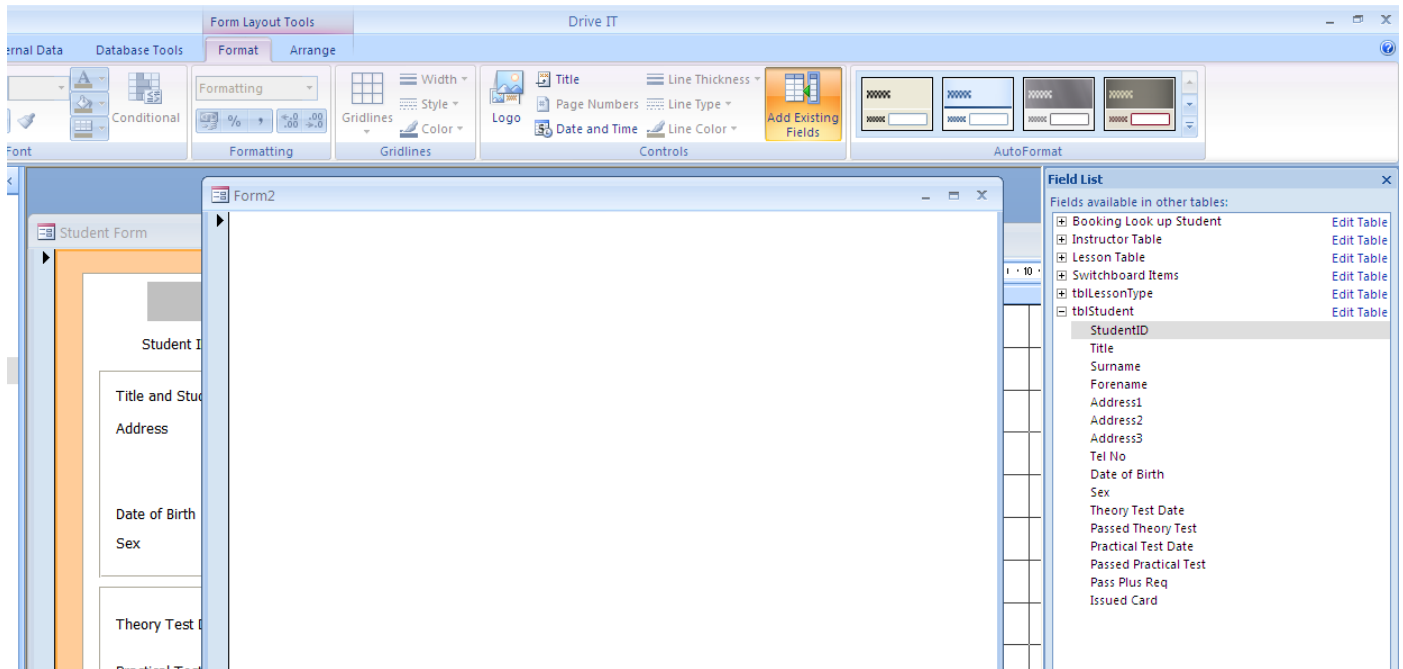


To access forms go to the **Navigation Pane** on the left side of the page. Click the drop down menu as shown and select **Object Type** and **Forms**. From this menu you will see all of the created forms in your database. In this example there are 7 forms in this database. We will use the **Student Form** as our example.

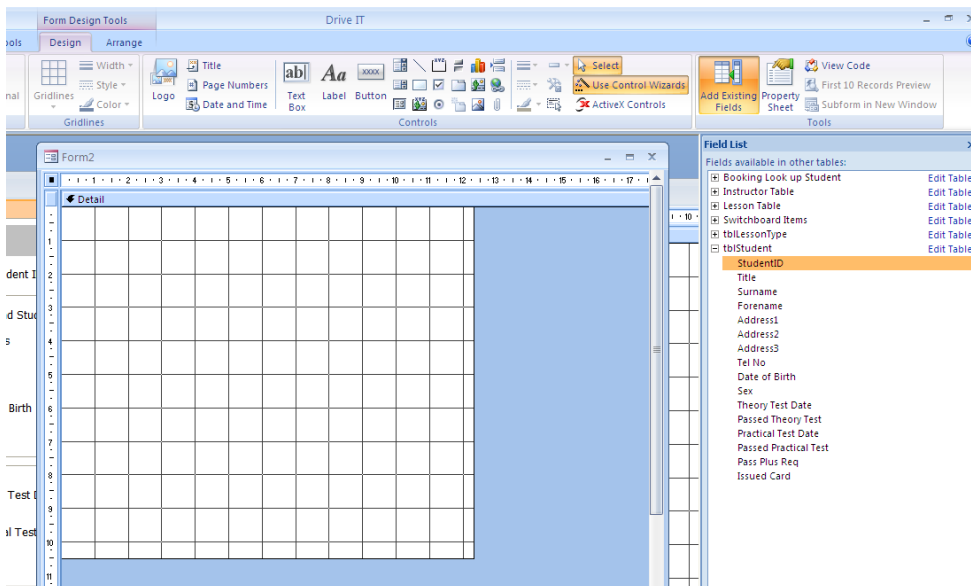


New Form

A new form is created by going to the **Create** menu and clicking on **Blank Form**. This will give you a new blank form and the **Field List** menu to the right of the screen.



ALL editing should be done in the **Design View** to get to the design view go to the **View** button in the top left of the **Home** menu and click the drop down arrow. Use the design view to create all your forms.



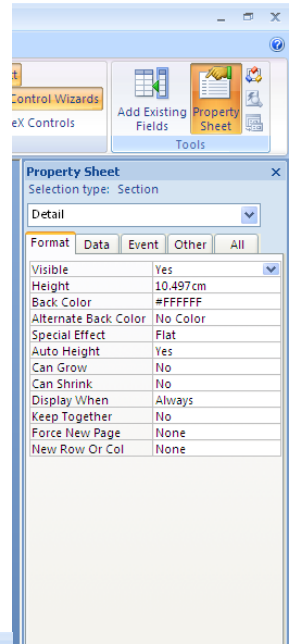
Note that the design view changes the form into a grid with a ruler for easy positioning of **objects**.

To change any part of the form you need to change the **Properties** the properties window is available in the **Design** menu at the top right corner. Click on this to turn the properties sheet off and on.

Within the properties sheet all of the features of the different objects can be changed. As you click on the object in the properties sheet the relevant properties appear in the properties window.

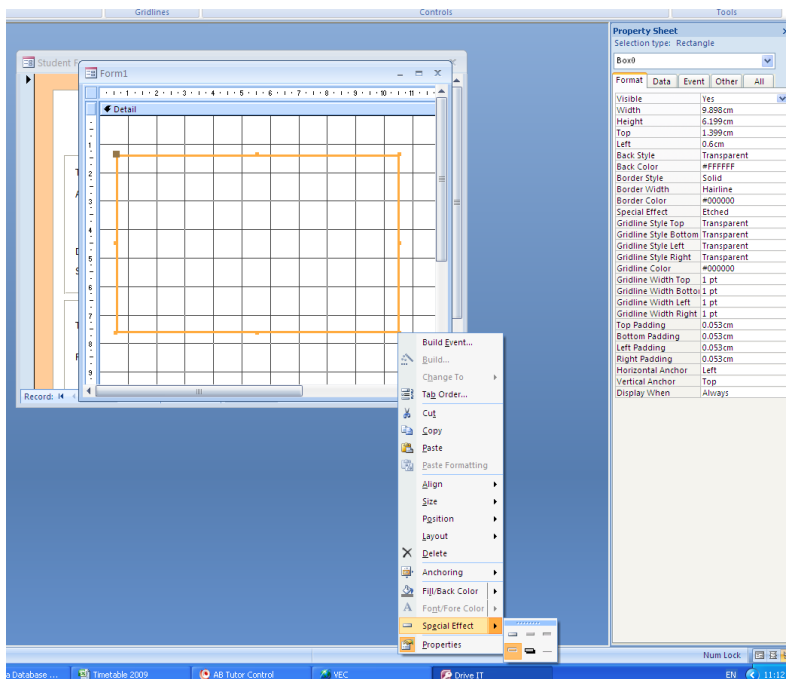
Adding Objects

Objects are added to the form from the **Controls** options on the **Design** toolbar.



To add an object click on that object in the Controls toolbar, go to the form

and drag the shape of the object you wish to add. When the object is selected the **Properties** window automatically changes to the properties of that window.

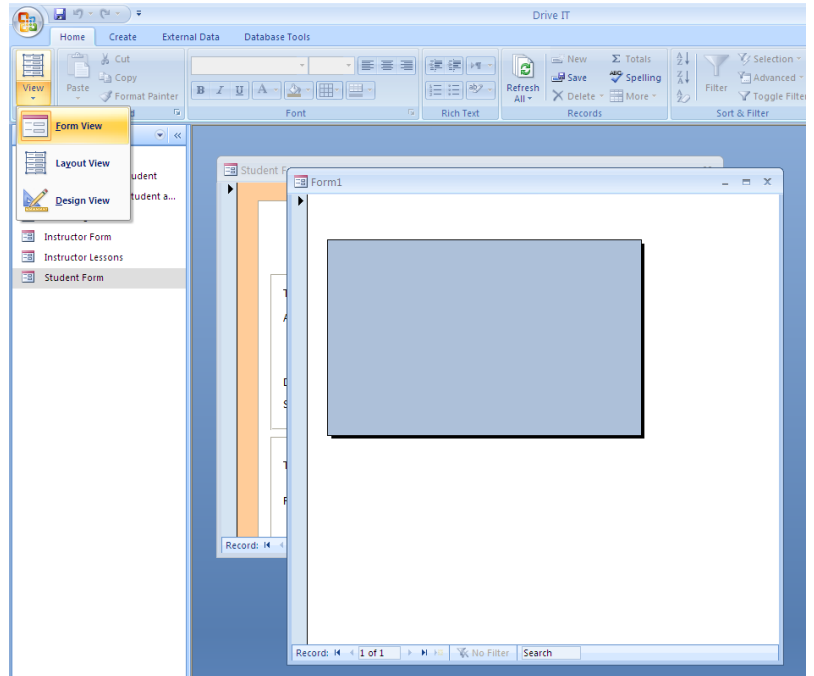


In addition some of the properties can be easily changed by right clicking on the object which is selected.

NOTES

With the rectangle which has been added above I have change the **Special Effect** and the **Background Colour** on the right click short cut menu. To see how this would look as a form change the view back to the **Form** view. To do this go to the View button in the top left corner again and drop down the menu to **Form View**.

To go back to editing change the view back to Design View.



Adding Buttons and Labels

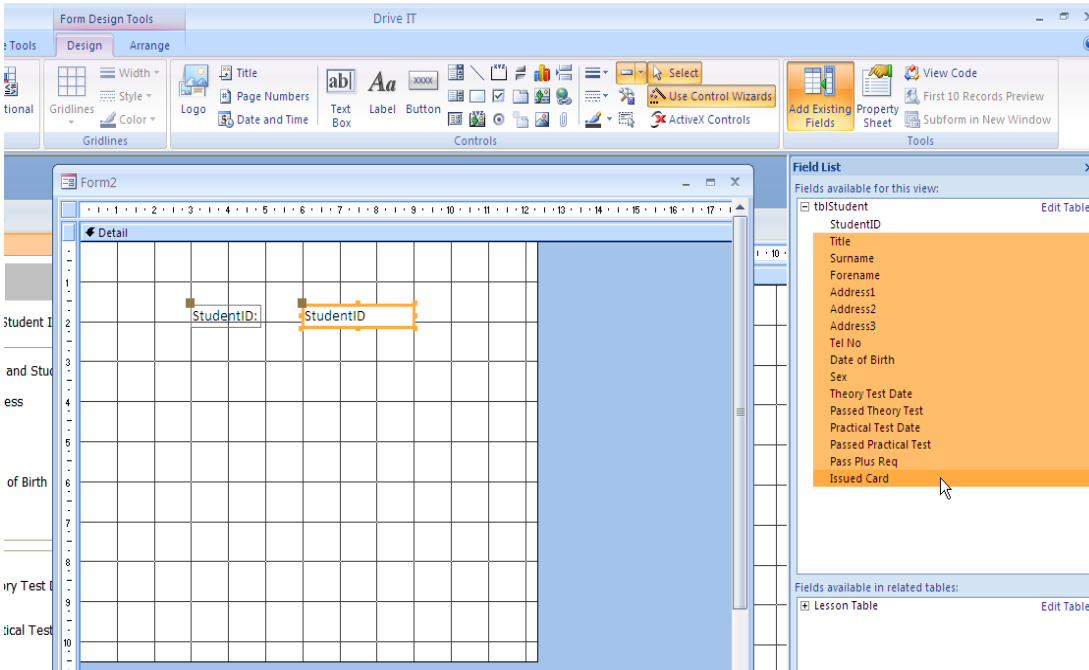
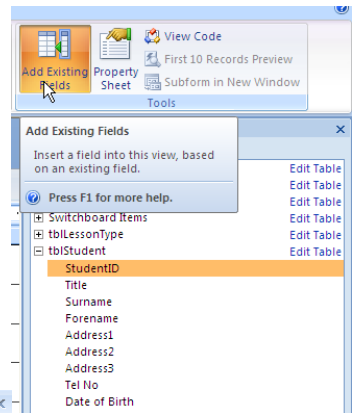
Buttons and **Labels** can be added from the design view. Using the add objects buttons as shown.



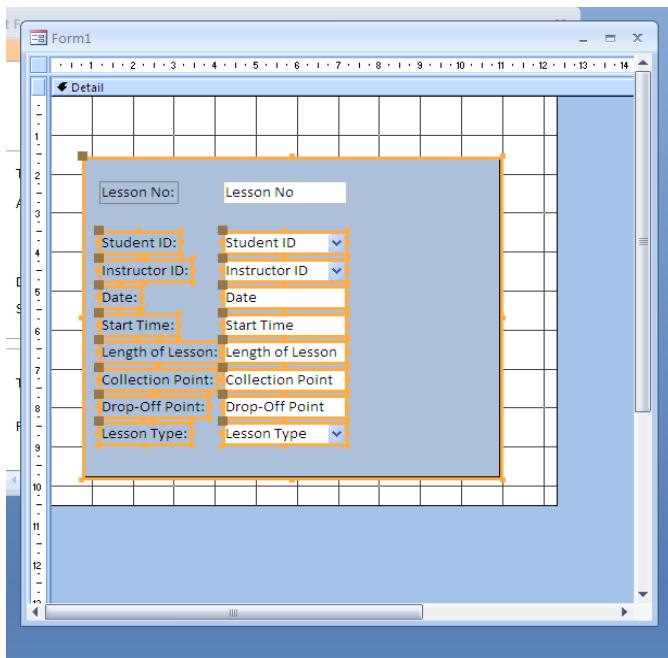
NOTES

Adding Existing Fields

To add existing fields to a table, first ensure the table is open in **Design View**. Click on the **Add Existing Fields** button this will turn off the properties window, to turn it on again when needed click on the **Property Sheet** button.



To add a field click on the field and drag it to the form. To add multiple fields first add one field from the table, then click on the second field, hold the **shift** button and click on the last field. Drag the fields to the table.



To multiple select different objects in a table click on the object hold the Shift key and click on the next object.



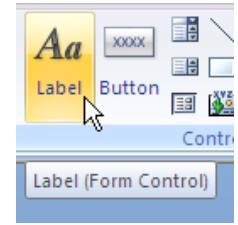
9. Forms, Editing and Saving

Moving Objects

To move objects around the form click on the object you wish to use you will notice it change colour and the movement tool will show on the border of the object. To move the object click with the movement icon showing and drag it to the new location.



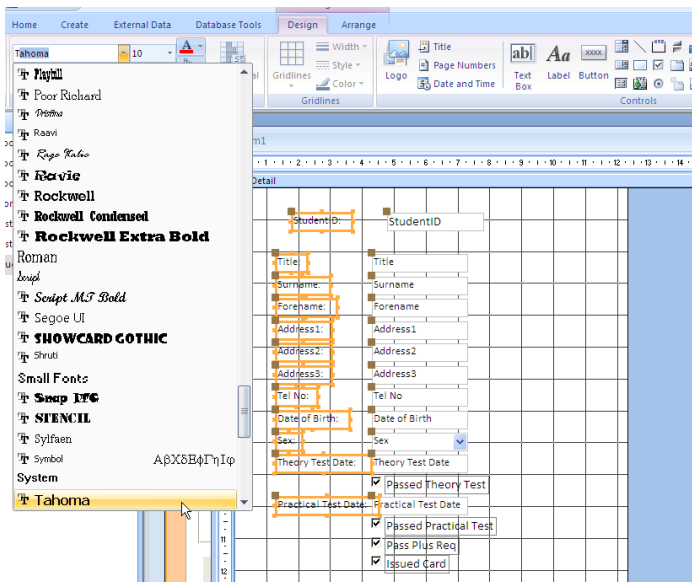
NOTE: In the example shown above a linked text box is selected. It is very important not to edit the text in the text box or you will change the link to the table. If you wish to add a label to the form ensure you use a label object.



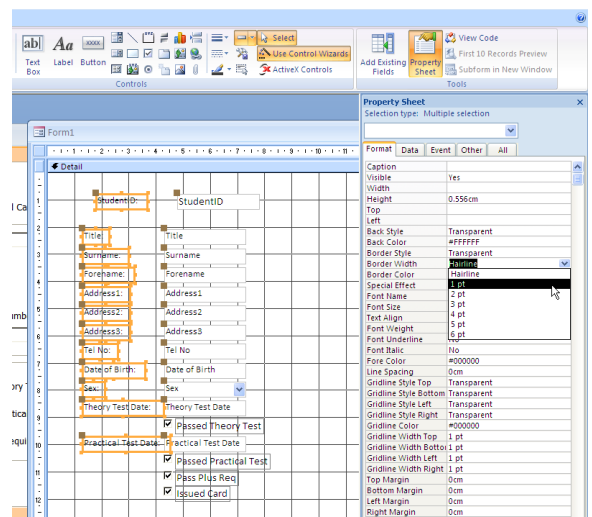
When you move a text box its label will move with it, to avoid this and only move the text box or the label for the text box click on the square in the top left corner of the object and drag to the new location. You can also delete a label connected to a text box by right clicking on this box.

Select Several Objects

It is sometimes useful to change more than one property at a time, for example in the student form all the labels have been changed to Tahoma font, size 10 with a grey line around the label box.

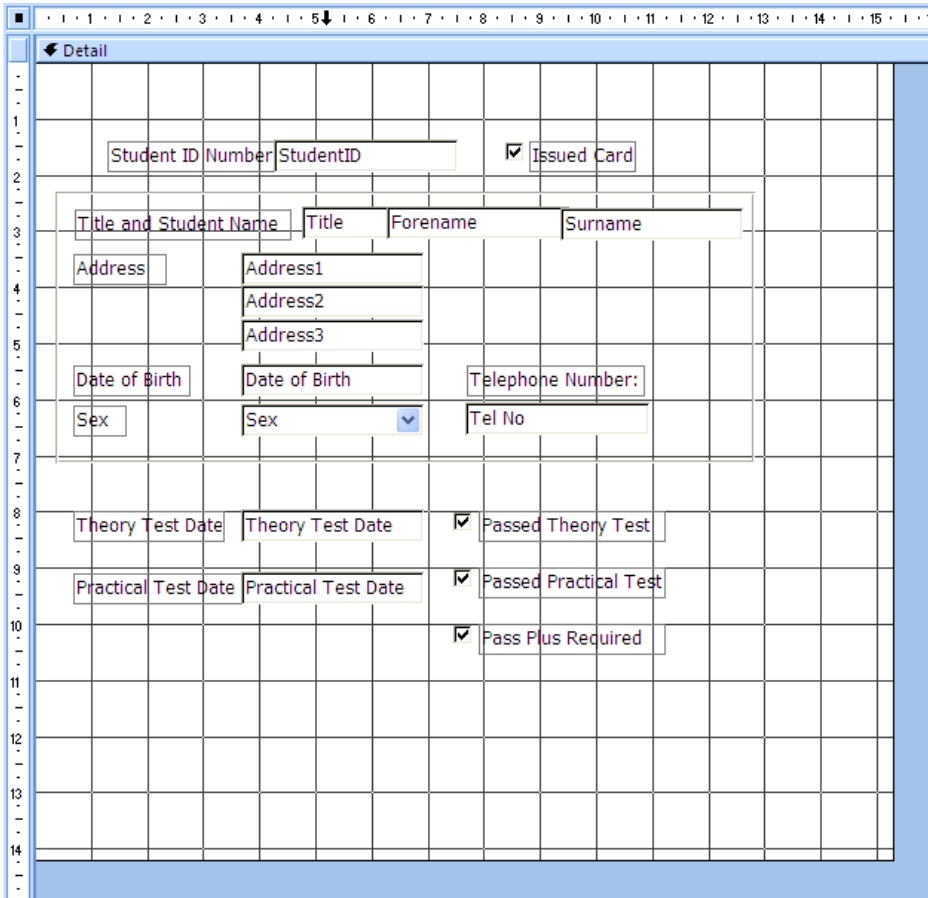


To select more than one object click on the first object and hold the **SHIFT** button, continue to hold the shift button and select the other required objects.



NOTE: Properties of any object can be changed on the design toolbar and in the Property Sheet.

Now create or Rearrange your text boxes and labels to look as follows:

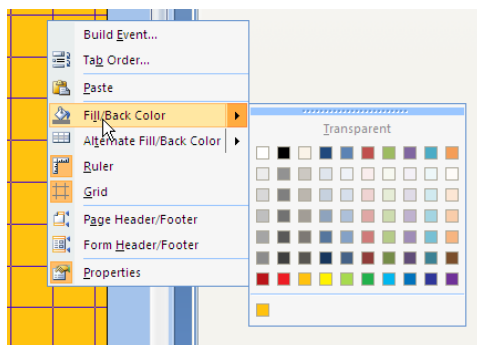
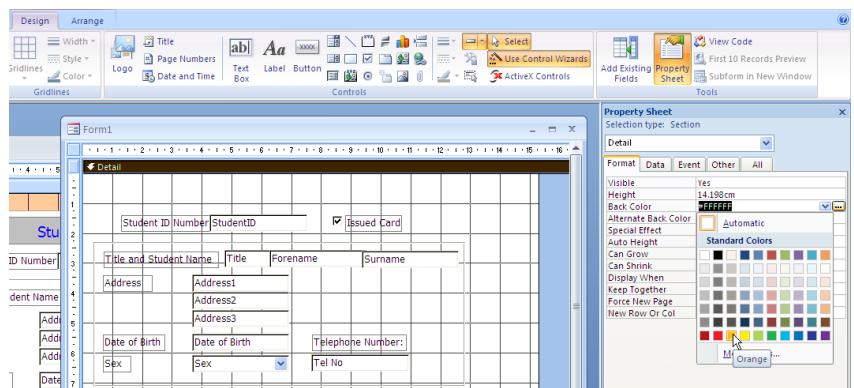


Remember if you wish to separate a label and a text box use the box in the top left corner of the object.

To group related objects together you could surround them with a border as shown. This border is an empty rectangle.

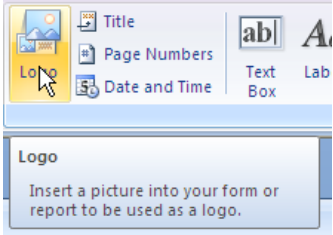
Change Colour

To change a background colour or the colour of an object first select the object. Note that if you are changing the background of the actual form you must first click on the background and then go to properties and change the **Back Colour**.



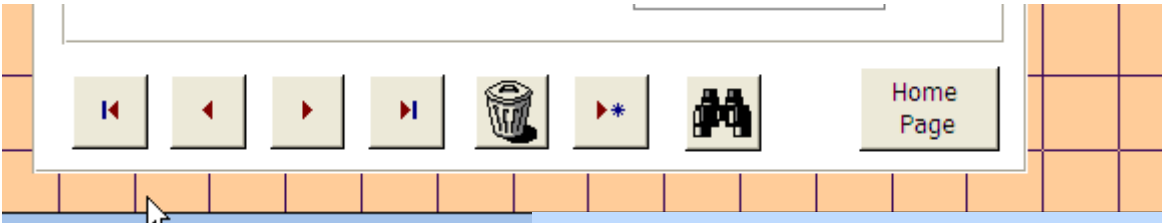
This can also be done by right clicking on the object or on the background and selecting **Fill Back Colour**.

Complete the form with labels and images. Pictures are added using the logo tool which will add an image or a logo.



Record Navigation Buttons

Navigation Buttons allow you to move through the table to each different records, you can add new records, delete records and search for records.



To add a button go the **form button** and ensure the wizard is turned on. Follow the wizard and select the correct options.



NOTE

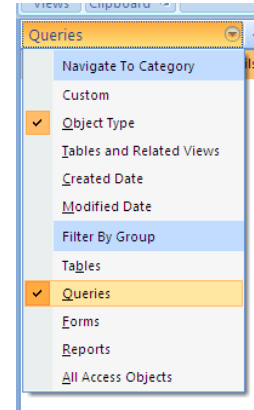
10. Query a Database

This is a question you ask about the information stored in a database. A query usually results in a selection of data being presented to the user. It should be noted, that when a query is saved it is only the question which is saved and not the answer or result.

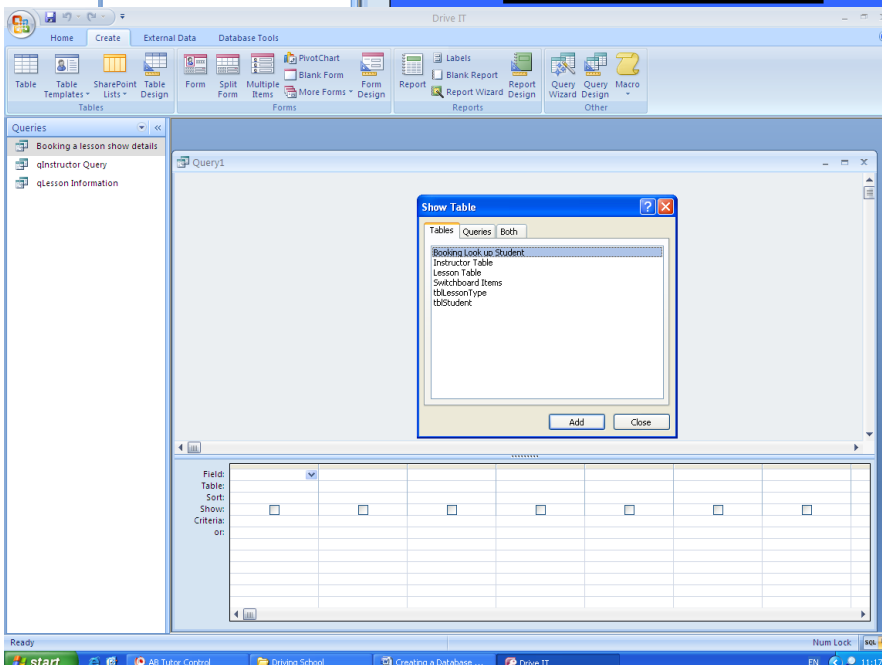
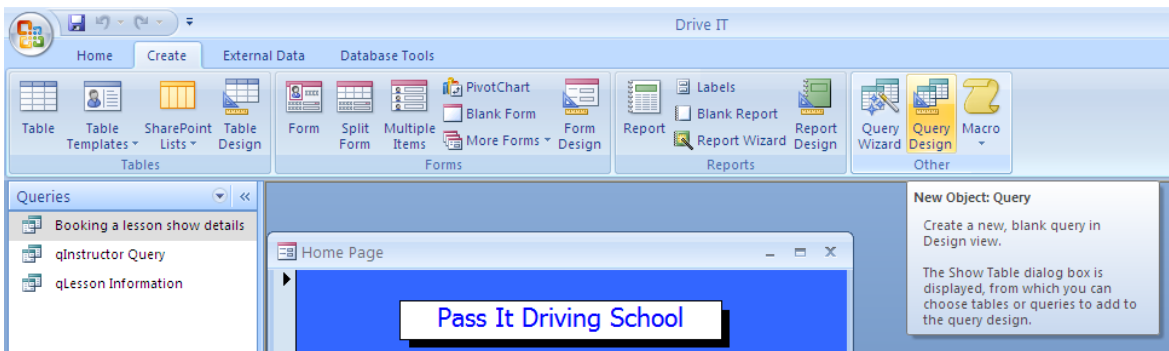
Query a database

To create a query follow the following steps:

First change the group to **Queries** in the **Navigation Pane**.



Then select the **Create** tab on the ribbon. In the create tab there is an **Other** section with **Query Design** as one of the options. This allows you to create a new query in the design format.



This will open the query in design view.

Choose the tables you will add to your query and click on **Add**.

Choose the related field names you are going to use in your query, add them to the list at the bottom of the page.

There are three methods to do this:

- You can add each field one at a time by clicking on the text and dragging and dropping to the bottom.
- You can double click in the name of the table (blue bar) and drag all the field names to the bottom of the page at the same time.
- Or select the field name from the **Field** drop down box at the top of the criteria section at the bottom of the page.

Deciding the criteria

Criteria are the information and rules you will search your database with.

The following symbols and words can be used to search a database.

AND <i>(Boolean operator)</i>	OR <i>(Boolean operator)</i>	NOT <i>(Boolean operator)</i>
<	>	=
* Wildcard	Sort A to Z	Sort Z to A
[] Parameter	#For Dates#	<>

Example Queries

To query the database you need to set the criteria you wish to look for, the following queries are based on different databases. They can be used as examples to help you create your own queries.

1. Find all movies which are set to the Action Genre.

Year	Genre	Score
top250	top250	top250
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	"Action"	

2. Find all movies which are in the ranking as the top ten films i.e. less than or equal to 10.

Field:	Top250Ranking	Title
Table:	top250	top250
Sort:		
Show:	<input checked="" type="checkbox"/>	
Criteria:	<=10	
or:		

NOTES

Or on the second criteria line...
 Using AND and NOT combined e.g.
Not "PG" And Not "U"

3. a) Find all movies which rated PG or U. Use AND
 OR NOT
 b) And Not PG and Not U

Field:	Title	Certificate
Table:	top250	top250
Sort:		Ascending
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:		"PG" Or "U"
or:		

Field:	Title	Certificate
Table:	top250	top250
Sort:		
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:		Not "PG" And Not "U"
or:		

4. Find a comedy movie which has a PG age rating i.e. two criteria in two separate fields.

Field:	Title	Genre	Certificate
Table:	top250	top250	top250
Sort:			
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:		"Comedy"	"PG"
or:			

NOTES

5. a) Find a Movie which starts with the letter 'J'.
- b) Find a movie which ends in the letter 'y'.
- c) Find a movie with the word 'and' in the title (consider words such as 'Grande').

Field:	Top250Ranking	Title	Year
Table:	top250	top250	top250
Sort:			
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Criteria:		Like "J*"	
or:			

Field:	Top250Ranking	Title	Year
Table:	top250	top250	top250
Sort:			
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Criteria:		Like "*y"	
or:			

Field:	Top250Ranking	Title	Year
Table:	top250	top250	top250
Sort:			
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:		Like "**and**"	
or:			

NOTES

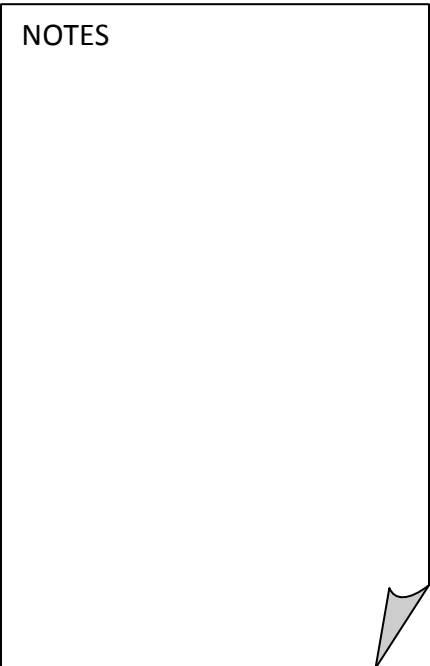
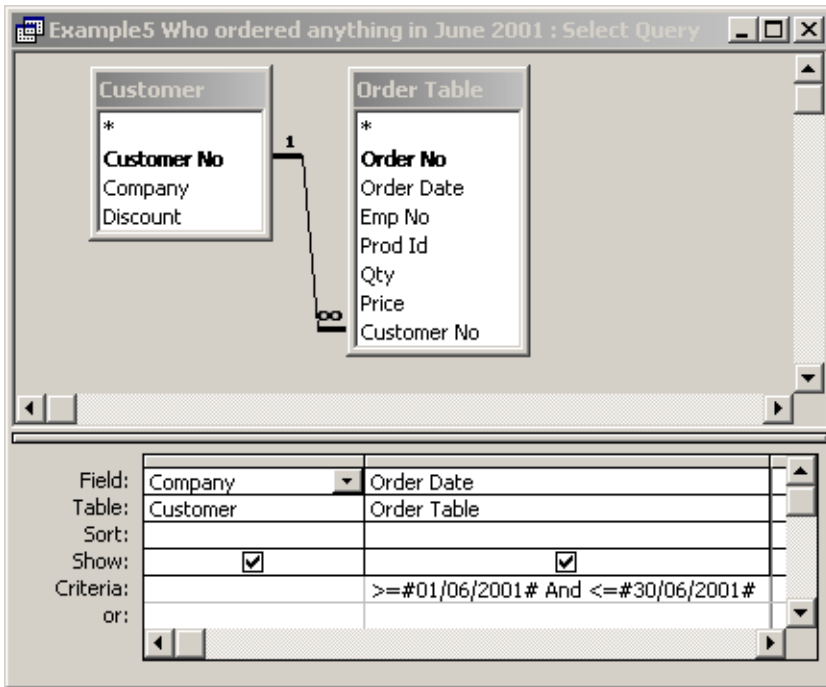
'And' is also a Boolean operator.

6. List films in descending order of year i.e. most recent first.

Field:	Title	Year
Table:	top250	top250
Sort:		Descending
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:		
or:		

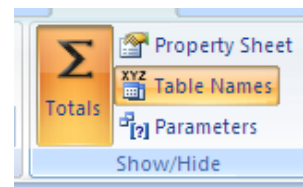
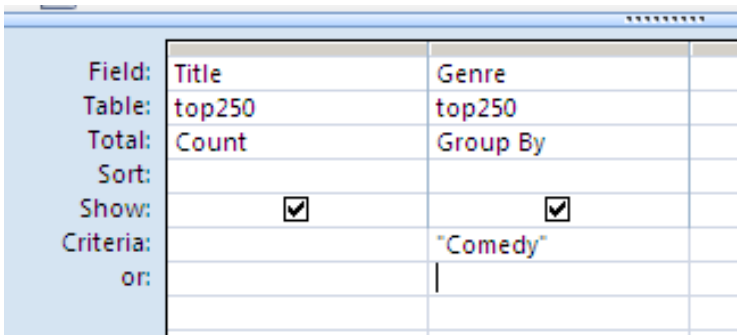
NOTES

7. Which customers ordered anything in June 2001. Note that this query cannot be used in the 250 Movie database but can be used in the Driving School Database under Lesson Date.

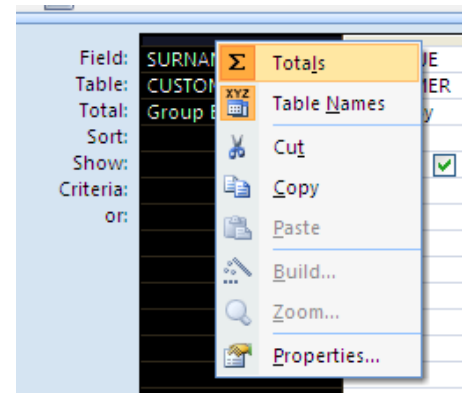


Using dates, >= (greater than or equal to) and <= (less than or equal to). We could have used Between 01/6/01 and 30/6/01. In Access, dates are surrounded by # (hash).

- 8. a) Count the number of Comedy films in the 250 Movie Database.
- b) Count the number of films in each Genre.



To turn on Totals.



In addition the 'totals' can be used for: avg, max, min, sum, std (standard deviation) and var (variance).

9. a) All Genres in the database. Use the parameter to ask the user for the name of the Genre.
 b) Any Genre and any Certificate.

Field:	Year	Genre	S
Table:	top250	top250	t
Sort:			
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Criteria:		[Enter a Genre]	
or:			

Field:	Year	Genre	Score
Table:	top250	top250	top250
Sort:			
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:		[Enter a genre]	
or:		[Enter a second genre]	

Field:	Title	Genre	Certificate
Table:	top250	top250	top250
Sort:			
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:		[Enter a Genre]	[Enter a Certificate]
or:			

NOTES

10. List all employees who have been hired between two given dates.

Field:	Employee Table.*	Hire Date
Table:	Employee Table	Employee Table
Sort:		
Show:	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Criteria:		>=[From:] And <=[To:]
or:		

Field:	Title	Year
Table:	top250	top250
Sort:		
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:		>=[Enter Start Year] And <=[Enter end year]
or:		

NOTES

Query Tasks

Task 1:

Write four questions you could ask from the Movies Database using the above symbols and words. Look at the first question it is an example.

Question	Symbol or Word
How many films had the rating 12 or 18?	12 OR 18
1.	
2.	
3.	
4.	

Task 2:

If you are finished writing down the questions you can put these queries into your data base and write down the answers.

1.
2.
3.
4.