



Chapter 7

Introduction to the Microsoft Access Database

Objectives

This laboratory exercise introduces the database called Microsoft Access. You will explore the help manual that is provided with Access, examine a previously created database and modify this previously created database. This lab is restricted to a database that consists of just one table.

This lab will cover:

- Adding a new field to a table
- Adding and deleting records
- Creating a Form
- Creating a Report
- Creating a Query

Preparation

Read the whole of the chapter before beginning the exercises.

Exercise 1 – The Help Manual

Launch Microsoft Access from the Start/Programs/Microsoft Office menu.

Access 2003/2002:

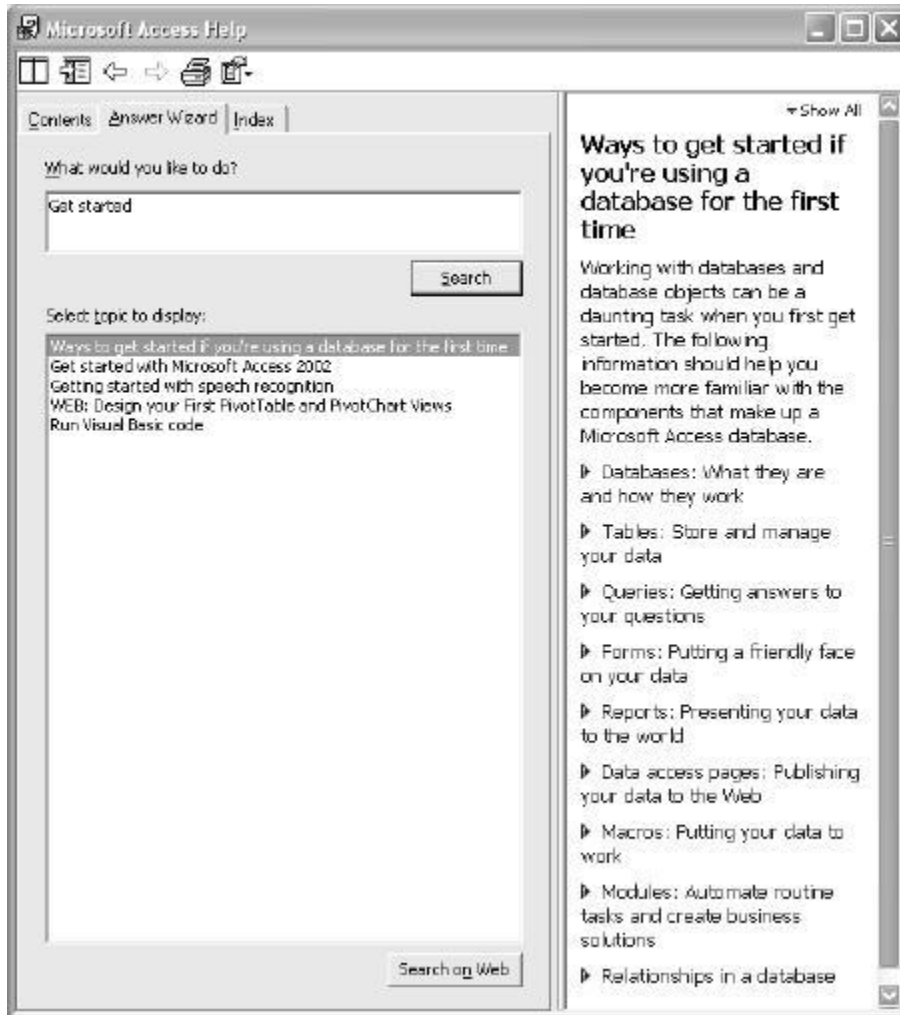
A window will appear asking if you want to create a new database or open an existing database. Do neither – just click on the Cancel button. You will now just have an empty window for the Microsoft Access application. Click on **Help** from the command menu and choose **Microsoft Access Help**. In the help wizard balloon type **Get Started** and then click on the Search button. Then choose **Get Started with Microsoft Access 2002** followed by **Using a database for the first time**. The window shown in Figure 7.1a appears, and you should read carefully the sections named:

- Databases: What they are and how they work
- Tables: What they are and how they work
- Queries: What they are and how they work
- Forms: What they are and how they work
- Reports: What they are and how they work

Use the **Back** button to return to the window shown in the figure when you have finished reading a section. Within a section there are a few pages to read as indicated by the numbers that appear at the top left of the window once you enter a section.



Laboratory Handbook

Figure 7.1a – the introductory help material

Access 2007:

A welcome window will appear with the banner *Getting Started with Microsoft Office Access* across the top. Click on the question mark at the top right corner of the Access window and the Access Help window shown in Figure 7.1b appears, and you should read carefully the sections named:

- Getting started
- Database design
- Database basics
- Tables
- Queries
- Forms
- Reports

Figure 7.1b – the introductory help material



Use the **Back** button to return to the window shown in the figure when you have finished reading a section. Within a section there are a few pages to read as indicated by the numbers that appear at the top left of the window once you enter a section.

**Laboratory Handbook**

You should gather from reading this information that tables - more commonly called relations - within a database somehow divide up the data into “topics”. Queries on the other hand are used to retrieve data from the database (sometimes by combining data from different tables). Forms are used primarily to provide a simple way to enter data into the database since they can selectively display certain fields for which the database user must enter data. Reports, as the name implies, are used to create nicely formatted summaries of the data including graphs of various types for a report.

Hopefully this has given you an overview of the database application. We are going to focus on creating queries, forms and reports using a database with a single table in the rest of this lab.

Exercise 2 – the Athlete Database

Copy Exercise 2 (Lab_7(.mdb)) found in Support Files (Chapter 7) on the course website to a folder you create called, say, Lab7 in your own account or computer.

Open this database file - by double clicking on it, for example. The window shown in Figure 7.2a should appear for Access 2003/2002 and Figure 7.2b for Access 2007. Notice that the Tables tab is selected (if it’s not, click on it now) and that one table called ATHLETE exists in the database. In Access 2003/2002, click on the other tabs – Queries, Forms, etc. and you will see that no other objects exist in this database. In Access 2007, click on the little downward pointing triangle to the right of Tables tan, and click on the other tabs – Queries, Forms, etc. You’ll add some of these things shortly.



Figure 7.2a – The athlete database in Access 2003/2002

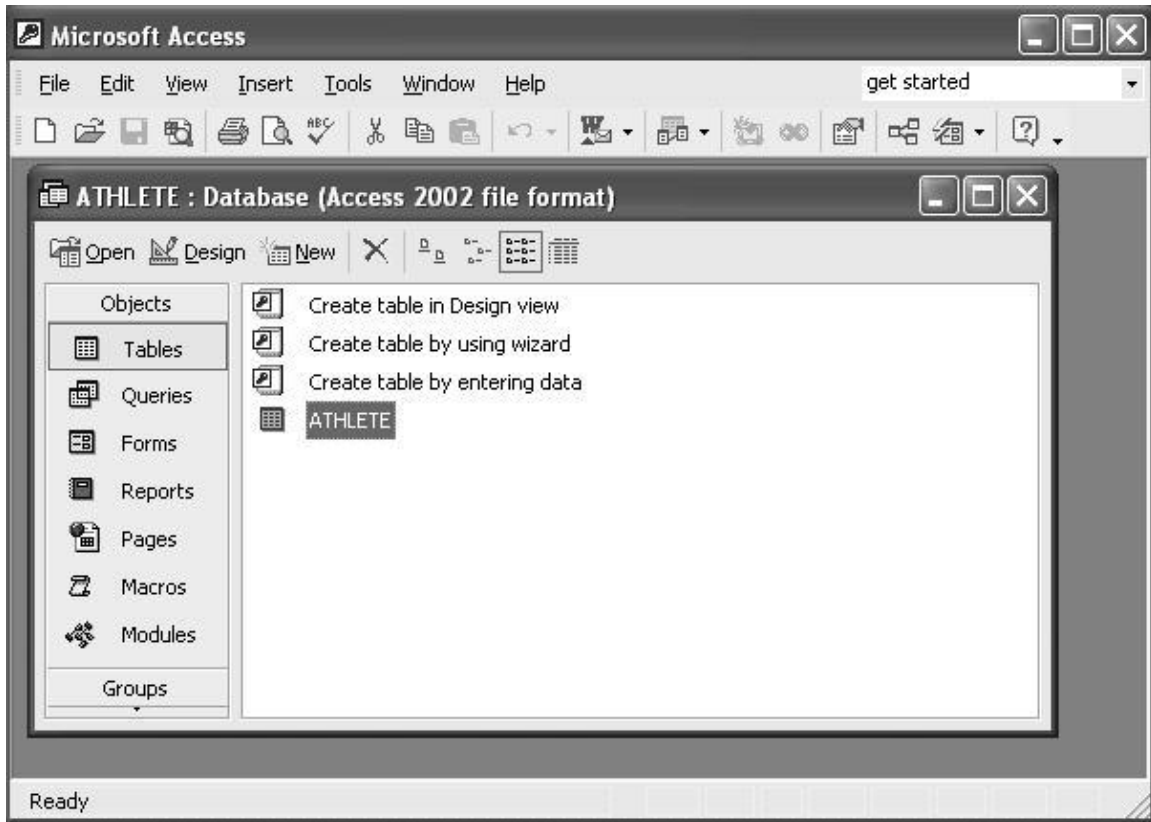
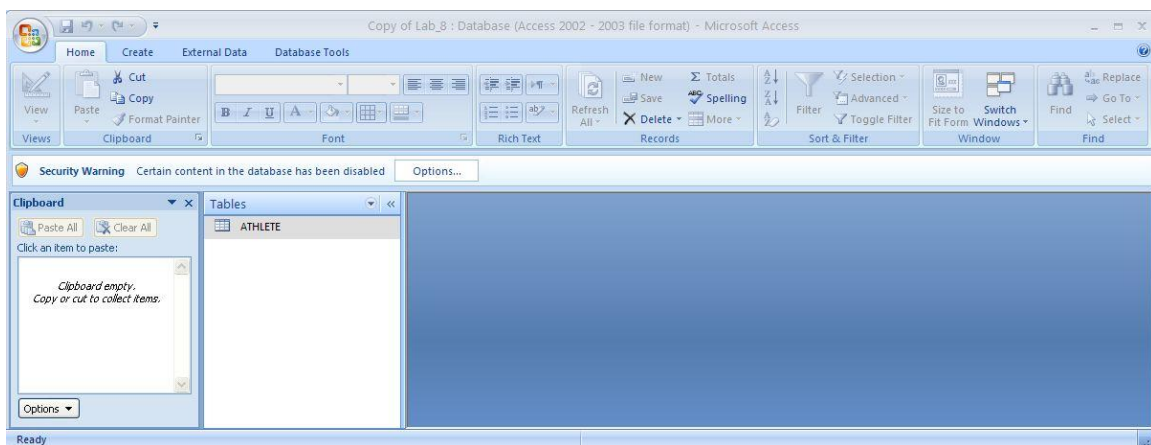


Figure 7.2b – The athlete database in Access 2007



**Laboratory Handbook**

Return to the Tables tab, and in Access 2003/2002 select the ATHLETE table and click on the Open button, or in Access 2007 double-click on the ATHLETE tab. You should see a table of data appear as shown partially in Figure 7.3. This table consists of 25 records (you can see that specified at the bottom of the window) and each record has 9 fields named ID, Name, Height, Weight, etc. This table is the raw data if you like. In general you or another user of the database would not want to add or delete data directly using this table. Although you could do so, it is not particularly convenient.

Figure 7.3 – the athlete table in the Athlete database

ID	Name	Height	Weight	Reach	Jump/Reach	Vertical	Agility	Ball Toss
1	Motchill, S	1.90	77.60	2.44	3.00	0.56	6.13	7.20
2	Pirrii, L	1.87	71.10	2.39	2.95	0.56	5.47	7.60
3	Striit, O	1.84	71.00	2.36	2.92	0.56	6.22	6.00
4	Disolits, N	1.83	66.10	2.38	3.00	0.62	5.52	8.00
5	Ofijoki, C	1.83	75.10	2.37	2.98	0.61	5.55	6.60
6	Sunis, I	1.82	75.80	2.37	2.84	0.47	5.82	6.80
7	Jecksin, L	1.81	68.50	2.31	3.03	0.72	5.22	7.80
8	MecRburts, Q	1.81	68.00	2.32	2.85	0.53	6.03	6.70
9	Bebiy, K	1.78	63.60	2.31	2.81	0.50	6.38	6.45
10	Bossun, K	1.77	72.00	2.31	2.81	0.50	5.96	8.25
11	Bruwnlii, T	1.80	66.50	2.33	2.93	0.60	6.06	7.40
12	Batchir, T	1.80	68.90	2.38	2.89	0.51	6.29	7.40

Click on the right pointing arrow at the bottom of the ATHLETE table window and observe that you can move down the list of records. It is possible to change the data in a field of any record and to add new records to this table.

To add a new record move to the very bottom of the table (you can do this by clicking on the button showing a right pointing arrow and an asterisk), click in the Name field and type a new last name (your own perhaps). Fill in the other fields as well and you'll have a complete new record.



Laboratory Handbook

To change data simply position the cursor in the field that you want to change, delete the existing value and type the new one. Try this with the new record you just added. You can also delete a record. Make sure the record you just added is selected (click on the far left so that the whole row is highlighted) and, in Access 2003/2002 choose **Edit/Delete record** from the command menu or in Access 2007, choose **Delete** in the **Records** group within the **Home** tab.

Access will ask you to confirm that you want to delete the record, and this illustrates an important feature of a database. Generally the changes you make are immediately made in the version of the database that is stored on the hard disk. Most other applications store changes in main memory without affecting the file that is stored on disk. If you quit most other applications without first choosing **File/Save** or **File/Save As** you would then be asked if you want to save the data, i.e. the changes you had made. You'll find that you can quit Access without being asked to save a file – and this is because the changes you make have already been made to the disk file.

Creating a Data Input Form

There are many ways to create a form. After you have followed the steps here you should experiment with the various methods that you will see in passing while doing it the way described here.

We would like a simply designed layout that will make data entry an easy task.

Access 2003/2002:

Click on the **Forms** tab and then the **New** button. A **New Form** panel will appear listing a few options available for creating a form. Choose **Design View** and, from the pull down list in the text box labeled **Choose the table or query ...**, choose the **Athlete** table (which is the only one available) and then click the **OK** button.

Access 2007:

Click on the **Tables** tab and then click on the **Forms** tab. Now click on the **Create** tab, and then click on **Blank Form** within the **Forms** group. Next, click on the **Create** tab again, and then click on **Form Design** within the **Forms** group.

The window and toolbar panel shown in Figure 7.4a should appear for Access 2003/2002 and Figure 7.4b for Access 2007. This is an empty form displayed in the **Design** view. The **Design** view is the mode that lets you design the appearance of the form using the various tools shown in the toolbox panel on the left in Figure 7.4a (Access 2003/2002) and in the ribbon above in Figure 7.4b (Access 2007). We'll create a two page form with tabs that let us switch between the pages. One page will contain the athlete's id, name, height and weight. The other page will contain the various performance measurements such as reach, jump/reach etc.



Figure 7.4a – the form design view in Access 2003/2002

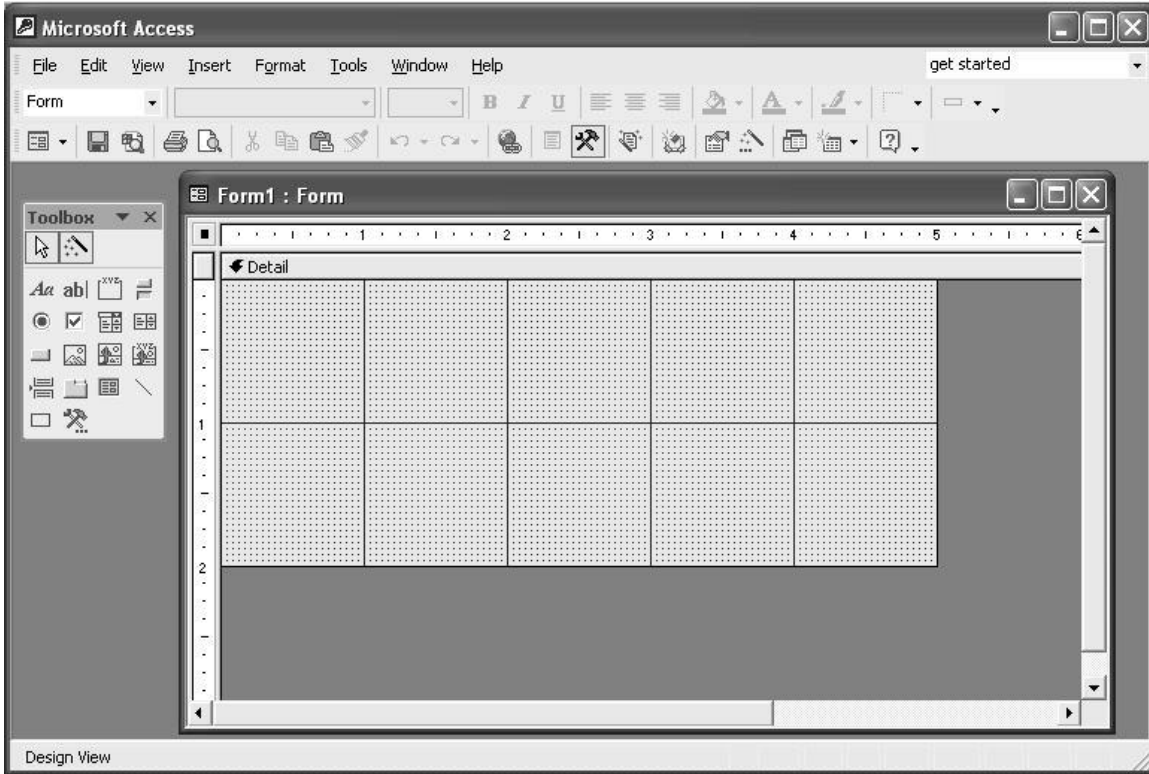
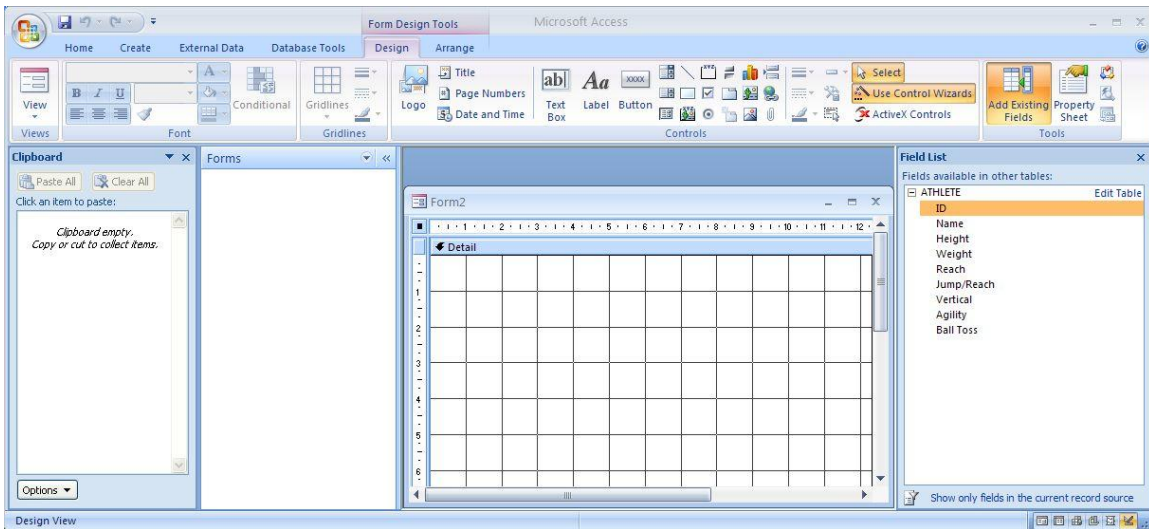


Figure 7.4b – the form design view in Access 2007





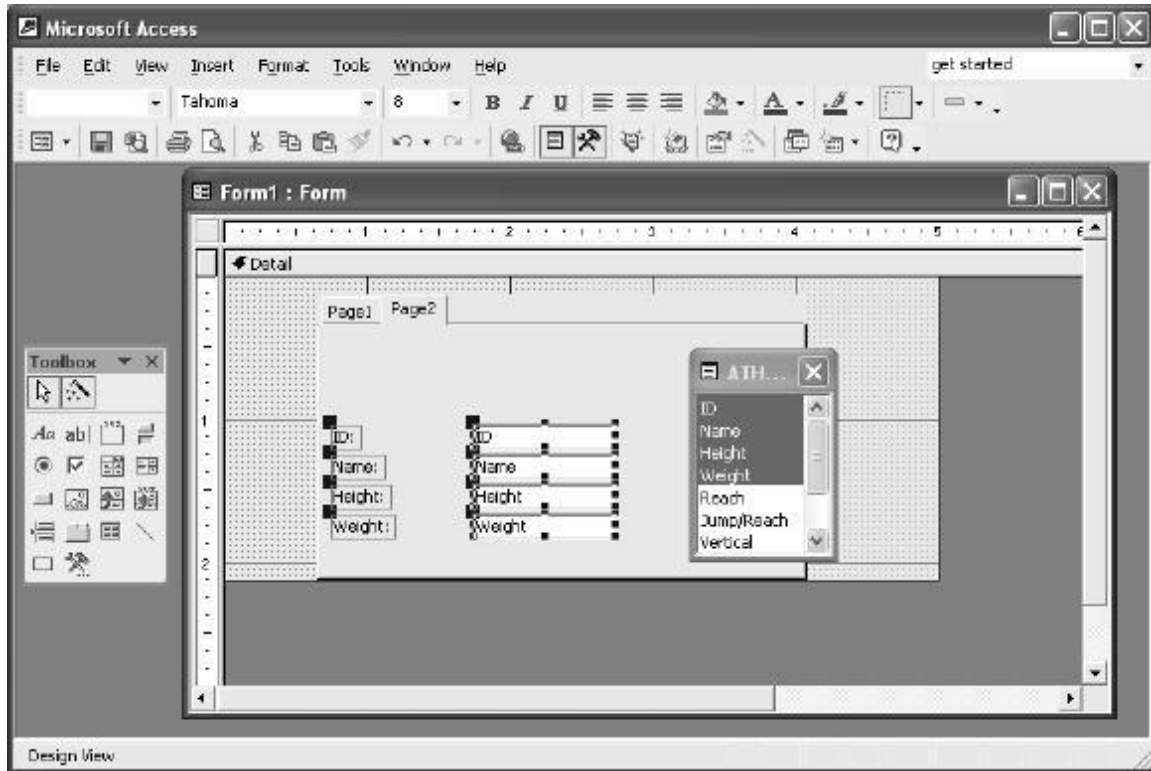
Roll the mouse over the objects displayed, for Access 2003/2002 in the Toolbox panel (on the far left in Figure 7.4a) or, for Access 2007, in the Controls group (along the top in Figure 7.4b), pausing at each one until a label appears that names the object. Amongst the objects you should find one called **Tab Control**. (It's a small icon that looks like two file folders with tabs.) Click on this object, move the mouse back into the form window (the mouse icon will be a cross with file folder and tabs) positioning it in the upper left corner of the window and click. This places two pages named **Page1** and **Page2** in the form window.

Take a moment to see that you can switch between the design view and the form view. In Access 2003/2002, click on **View** in the Access command menu and then select **Form View**. In Access 2007, click on **View** in the Views group at the extreme left end of the ribbon and then select **Form View**. You'll see the form window change – the background grid will disappear and the two blank pages with tabs will be left. Switch between the tabs by clicking on them. We have yet to add data to these pages, so return to the design view by clicking on **View/Design View** from the command menus or ribbon again.

To add data to these pages in Access 2003/2002 you need to select the **Field List** button from the toolbars. Roll the mouse over the various icons in the toolbars (not the Toolbox panel, but the toolbars just beneath the command menus) pausing at each one long enough to see its name appear. You should find the one called **Field List** next to the icon showing a hammer and wrench. When you click on this icon a small panel displaying all of the fields in the athletes table will appear. In Access 2007 the Field List is automatically displayed when the new **Blank Form** was created. You want to place the id, name, height, and weight fields on page 1. Make sure **Page1** is selected and then select these four fields by clicking on one of them and then holding the shift key down while you click on each of the other three. Release the shift key and then drag the selected fields onto page 1. You should end up with something like what is shown in Figure 7.5 for Access 2003/2002. The result for Access 2007 is the same, except that the surrounding layout will look like Figure 7.4b.



Laboratory Handbook

Figure 7.5 – adding fields to a page in the form design view

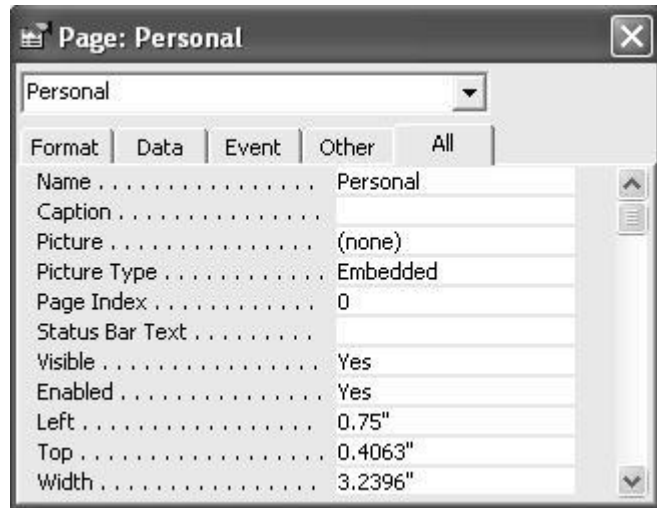
If you want to you can position and resize each of the field text boxes and the field names. Click on any one of the fields and square handles will appear around it. Carefully move the mouse around the selected field and you'll see it change into a hand in Access 2003/2003 or a four headed arrow in Access 2007 (you'll be able to drag the whole field to position it) or a double headed arrow (you'll be able to resize the box).

Select the **Page2** tab, then select the remaining fields (Reach, Jump/Reach etc) and drag them onto page 2. Position and resize them as you see fit.

Return to page 1 and double click on the tab itself. The window shown in Figure 7.6 appears, which allows you to change certain properties of the page. In this case we simply want to change the name of the page – so change **Page1** to **Personal** as shown in the figure. Return to **Page2** and change its name to **Measurements**.



Figure 7.6 – properties of the form page



This simple data entry form is finished – so use the **View/Form View** command to leave the design mode. You'll find that data from the athlete table is now displayed in the form. You can still edit the data values and add new records or delete records and all such changes will appear in the athletes table that we looked at previously. The only difference is that the interface by which we do such data entry tasks is a lot cleaner.

Click on the **x** button to close the form window and you'll be asked if you want to save the form and to give the form a name. A suitable name would be **DataEntry** for example.

Creating a Report

A report is quite simple to create – at least if you're satisfied with the design templates that are provided with Access. Sometimes a bit of design tweaking is required, as you'll see in the following.

Access 2003/2002:

Select the **Reports** tab in the athlete database window and then click the **New** button. This time choose **Report Wizard** rather than **Design View** as you did when creating a form, and also make sure the athlete table is selected before clicking the **OK** button.

Access 2007:

Select the **Reports** tab in the Navigation Pane. (The Navigation Pane is the same area where the Tables and Forms tabs are located.) Click on the **Create** tab and then click on **Report Wizard** within the Reports group.

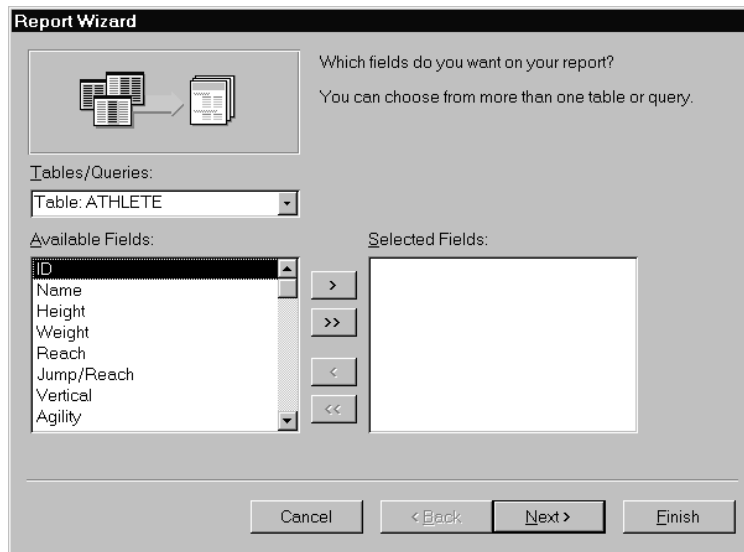
The window shown in Figure 7.7 will appear – the first in a series of steps that the Report Wizard will guide you through. This step allows you to select the fields that you want



Laboratory Handbook

displayed in the report. You can select a field in the Available Fields: list and click on the single arrow button to send it to the Selected Fields: list. If there were more tables in the database you could also select fields from different tables to include in the report. In this case we want all of the fields to be in the report so simply click on the double arrow button and you'll see that all fields are transferred to the Selected Fields: list.

Figure 7.7 – selecting fields for the report



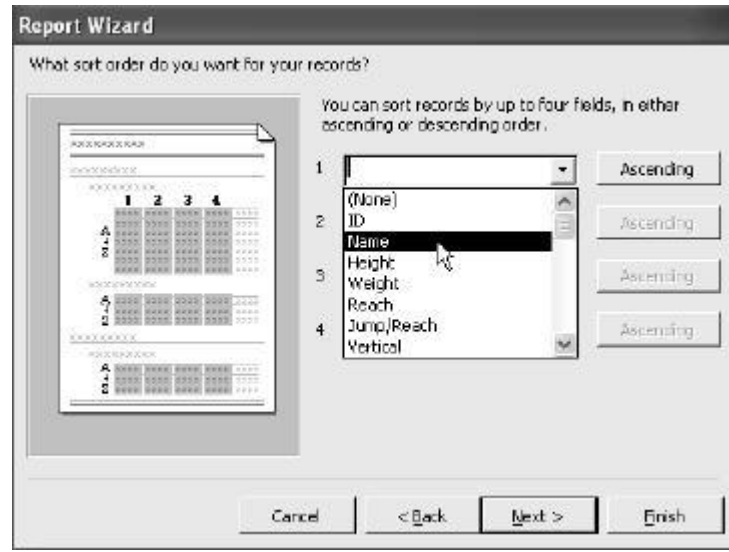
Clicking on the **Next** button will take you to a window that asks if you want any grouping. Grouping doesn't make much sense in the context of this database (we'll see its use later) so simply click on the **Next** button to carry on. The following step allows you to choose whether to sort the data according to some field. We'll sort it alphabetically by name but you'll see you could easily sort by some other field or combinations of fields.

Click on the pull down list arrow in the top text box and you'll see a list of the fields in the database (Figure 7.8). Simply select the **Name** field from this list. The button to the right of the text box indicates that the data will be sorted from A to Z (Ascending). Click on this button and you'll see it change to indicate Z to A (Descending). Set it back to A to Z (Ascending) and move on to the next stage. Notice that it doesn't make sense with the data in this database to perform a multilevel sort. We'll see a multilevel sort later.

The next panel allows you to choose how to layout the data. Experiment with the options available to see what they are, but select the **Tabular** layout before moving on. Notice also that the **Landscape** page could be chosen here if the data was particularly wide.



Figure 7.8 – choosing a field by which to sort the records for the report



In the next panel you can select the appearance of the title for the report. Examine each of the options and select the one you like before moving on to the final step in which you can actually specify the title for the report. A suitable title might be All Athlete Data. Finally click the Finish button.

However, you're not actually finished because when you look at the report you'll see that the column headings are too long to be properly displayed in some cases. You're going to have to fix that or your boss will think you're hopeless!

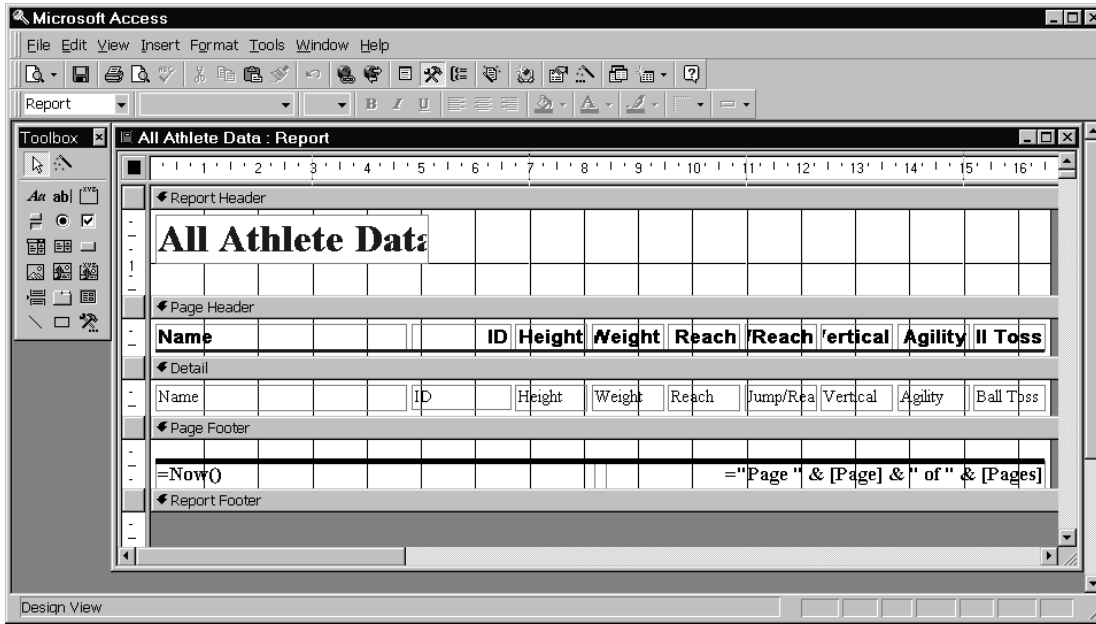
Adjusting the Report Design

In Access 2003/2002, use the View/Design View menu command to enter the design mode for the report. In Access 2007, click on Close Print Preview tab which leaves you in Design View. You should now have a window similar to that shown in Figure 7.9. Notice that the main window is divided into 5 parts labeled Report Header, Page Header, Detail, Page Footer and Report Footer. The Report Footer area is currently empty but the other areas each display elements of the report.



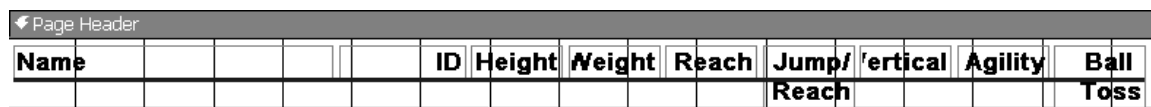
Laboratory Handbook

Figure 7.9 – the design mode for a report



Each of these elements can be edited since we're in design mode. For example, in the page header the column heading Jump/Reach is mostly obscured because the space allocated for it is too small. One way to fix this is to expand vertically the space given to it. To do this carefully move the mouse over the vertical ruler on the left edge of the window to position it just above the block indicating the start of the Detail section. The mouse shape should be a vertical double headed arrow with a horizontal line through it. You can now drag the boundary down in order to expand the area allocated to the page header. Once you've done this click on the Jump/Reach heading (handles will appear) and drag the lower edge of the text area down. Adjust the Ball Toss heading in the same way. You should obtain a result similar to Figure 7.10.

Figure 7.10 – adjusting the page header in the design of the report



You also need to adjust the space allocated to the other column headings in the page header – but these others will also require that the spaces allocated in the Detail section also be adjusted to match whatever you do to the headings. You need to make a little more horizontal space for the Weight and Vertical headings, so reduce the horizontal size of the ID heading and the ID area in the Detail section. Next move the Height heading to



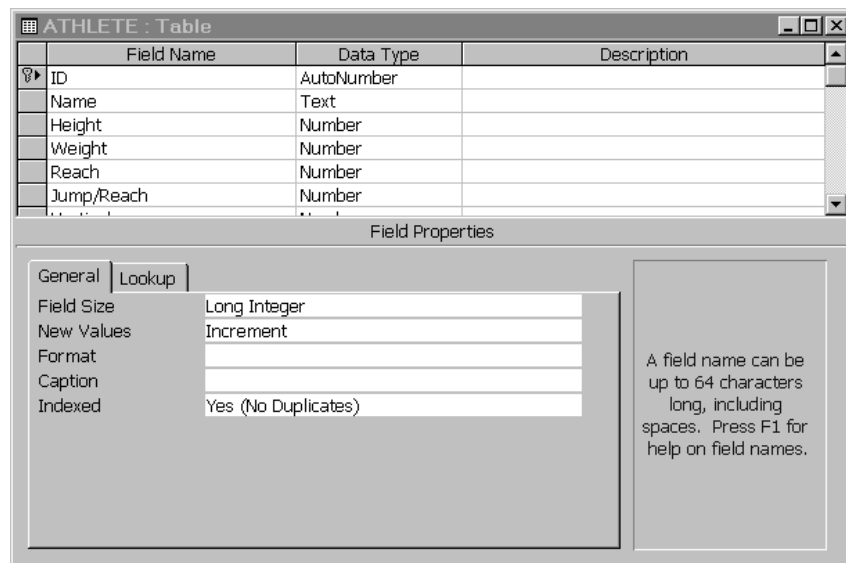
the left a bit, and also the Height area in the Detail section. Now you can expand the horizontal space for the Weight heading. Continue in the same manner in order to make space for the Vertical heading. In Access 2003/2002, return to the View/Layout Preview mode once you are satisfied. In Access 2007, select Layout Preview from View in Views group at the extreme left end of the ribbon.

You'll probably find that the report is still not quite right – there's a thick horizontal line that you have to move down a little way so that it properly separates the column heading from the data in the report. You should be able to do this yourself.

Adding A Field to the Database

You would like to add a new field to the database in which to record the number of training sessions an athlete has attended. The number of sessions will not exceed 5 and of course will be 0 initially. To add the field you need to access the athlete table in design mode. So first close any Form or Report windows that you might have open (saving things or not as appropriate) and then click on the Tables tab in the athlete : Database window in Access 2003/2002 or click the Tables tab in the Navigation Pane in Access 2007. The athlete table should be selected (it's the only one in this database). In Access 2003/2002, click on the Design button on the right of the window. In Access 2007, select Design View in View within the Views group. A window similar to the one shown in Figure 7.11 should appear.

Figure 7.11 – the table design window



In design mode we are able to change features of the original table from which the data we have so far been using originates. The fields and the data type of each field is listed in

**Laboratory Handbook**

the top part of this window. In the bottom part you can see the properties of the field that is currently selected –the ID field in the figure. Click on the far left of the row containing the Name field and observe the Field Properties area. Notice that the length of a name is restricted to, say, 100 characters as indicated by the Field Size property shown in the lower region of the window. Click on the data type Text in the Name field row and then on the pop-up list arrow that appears in the data type region for this field. You should see a pop-up list containing the possible data types that could be specified. Don't change the data type for this field – just examine them.

Scroll to the bottom of the list of fields and in the first empty row type the name **Sessions** for the new field that will contain the number of training sessions the athlete has attended. Then click in the **Data Type** column and select **Number** from the pop-up list. Since we know that the number of sessions must be between 0 and 5 we can specify some properties that will help us ensure that mistakes are not made when the actual data are entered for this new field.

In the **Field Properties** area check that the **Default Value** is 0 (it should be set to 0 by default). This means that whenever a new record is added to the table the value for **Sessions** is set to 0 by default. Next you would like to set a validation rule for the input. This rule will specify what the range of valid values for **Sessions** is. If the database user tries to enter any value outside the range they will see a warning message that prevents them from entering such a value. There are a number of ways in which you could enter the validation rule. You could specify each value that is permitted by typing:

1 or 2 or 3 or 4 or 5

or you could use an operator such as

<= 5

Either way is suitable in this instance, although clearly specifying a condition, as in the second approach, is of more general use. You should also set the **Decimal Places** property since you know there will not be any decimal figures in this field.

You have now finished defining the new field and you should return to the **Datasheet View** (using the View menu). You'll see that the table now contains a new column for the field **Sessions**, but the field does not have any data values as of yet.

To enter the data values you should return to the form that you created previously and add the new field **Sessions** to it. You'll need to enter design mode and place the **Sessions** field onto the **Personal** page of the form. You should end up with something like Figure 7.12. You'll find that it is quite easy to enter data into the **Sessions** field now. Make sure you deliberately enter some values that do not meet the validation rule



just to see what happens. Make sure that you end up with all athletes having attended 2 sessions except for Cirny, Ofijoki and Jecksin who attended 4.

Figure 7.12 – the Personal page of the data entry form

Field	Value
ID	7
Name	Jecksin, L
Sessions	4
Height	1.81
Weight	68.50

Calculating Values from the Data in a Table

Athletes are ranked by an index rating that is calculated from the values for height, weight, reach, vertical, agility and ball toss according to the following formula:

$$\text{Index rating} = \text{height}/\text{weight} * 100 + (\text{reach} - 2.24) / 10 + 2 * \text{vertical} \\ + \text{ball toss} / 7.5 - \text{agility} + 6$$

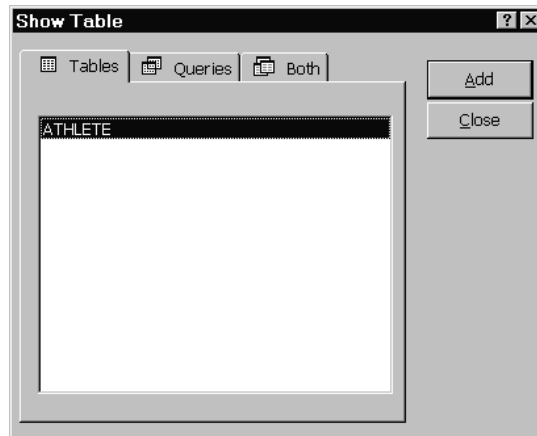
A calculated value such as this should be contained in a query. In this example we'll create a query that contains just the name of the athlete and the calculated value of the index rating. In general however, queries can be used for extracting data from the database, often for the purpose of analysing the data in some way, rather than just for calculating values. So don't be misled into thinking that this example we're about to do is the only purpose of queries.

In Access 2003/2002, click on the **Queries** tab in the athlete : Database window, then on the **New** button and select **Design View** by clicking the **OK** button. In Access 2007, click on the **Queries** tab in the Navigation Pane, then click on the **Create** tab and then click on the **Query Design** tab in the **Other** group. The **Show Table** window shown in Figure 7.13 will appear. This window allows you to select the tables and (other) queries from which the data used in the query you are now constructing are to come. There is

**Laboratory Handbook**

only the one source of data in this athlete database example – so simply select the athlete table and click the Add button.

Figure 7.13 – selecting the sources of data for the query

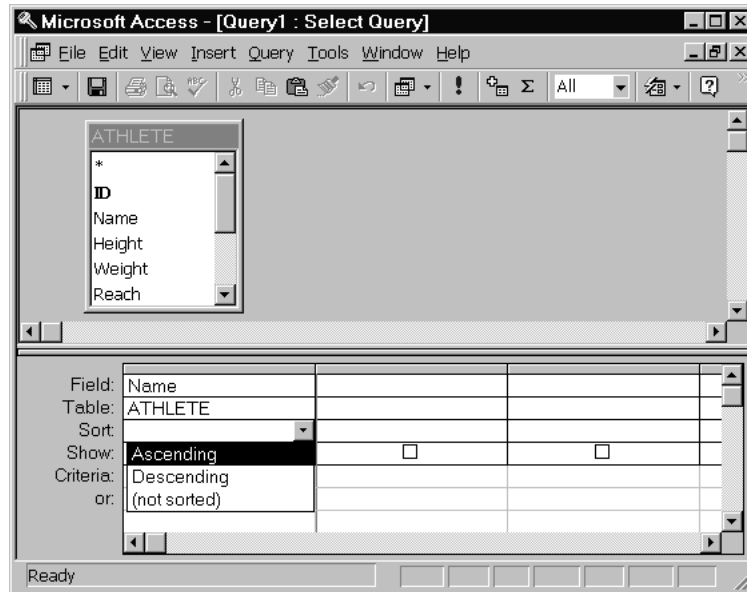


You should see the field list for the athlete table appear in the Query1 : Select Query (Query1) window. If you had other sources of data and were to select them the field lists for those sources would also appear in the Query 1 : Select Query (Query1) window. Close the Show Table window.

Let's first add the Name field to this query. You can do this by selecting the Name field from the small window for the athlete table in the upper portion of the query window (Figure 7.14) and dragging it to the first column in the row labeled Field: in the lower half of the window. Alternatively you can use the pop-up list activated by the down pointing arrow on the right of the first column for the Field: row or you could just double click on the Name field. Once you have entered the name field in this manner sort the query by ascending name (i.e. A to Z) by clicking in the Sort: row and choosing Ascending from the pop-up list.

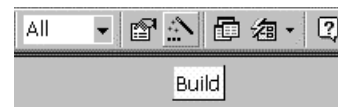


Figure 7.14 – the design mode window of a Select Query (showing the Name field added)



To add a calculated field to the query you need to construct the formula that will calculate the value, entering this formula into the next column of the Field: row. The query will then have two fields – the name and the calculated value.

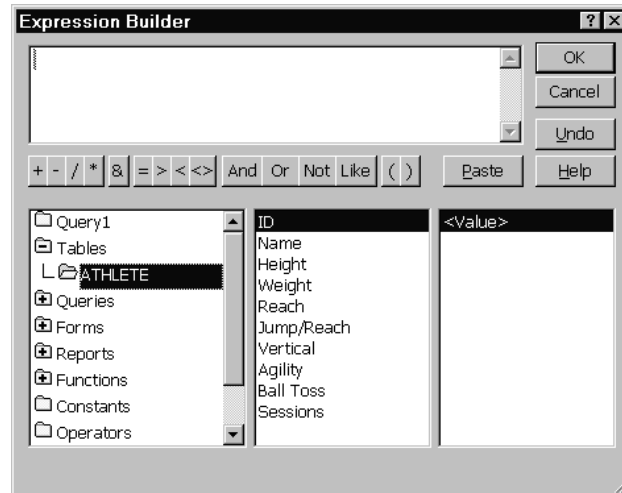
Click in the Field row to the right of the Name field you just added and then, in Access 2003/2002 roll the mouse over the build icon shown here and click. In Access 2007, click on the Builder icon in the Query Setup group.



This allows you to build a formula by clicking on the various components that the formula requires. The window shown in Figure 7.15 appears. Double click on the Tables and then click on the Athlete entry before what you see is the same as the figure.



Figure 7.15 – the Expression Builder window (showing the Athlete table opened)



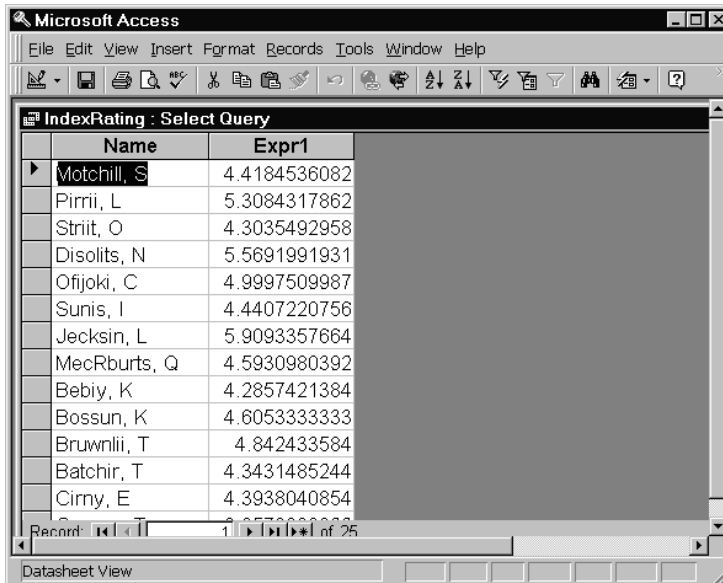
Select the Height field and click the Paste button, then click the / button (or type a /) for division, and then select the Weight field and click the Paste button. You have just started to build the formula. Continue either typing symbols or selecting and pasting fields until you have constructed the formula shown below, which gives the index rating.

$$[\text{ATHLETE}].[Height]/([\text{ATHLETE}].[Weight]*100+([\text{ATHLETE}].[Reach]-2.24)/10 \\ +2*[\text{ATHLETE}].[Vertical]+[\text{ATHLETE}].[Ball Toss]/7.5-[\text{ATHLETE}].[Agility]+6$$

Notice the parentheses (...) around (reach-2.24)/10. Without them you would have reach - 2.24/10 which is not what we want. Also observe that the table name ATHLETE! precedes each field name in the formula.

When you close the Select Query (Query1) window you will be asked if you want to save it (yes) and to give the query a name – IndexRating would be suitable. Open the query again and you should see the two columns shown in Figure 7.16 (except that yours will be sorted by Name). Your values in the Expr1 column should be the same as those shown here if you have constructed the formula correctly.

Figure 7.16 – the IndexRating query



Name	Expr1
Wotchill, S	4.4184536082
Pirrii, L	5.3084317862
Striit, O	4.3035492958
Disolits, N	5.5691991931
Ofijoki, C	4.9997509987
Sunis, I	4.4407220756
Jecksin, L	5.9093357664
MecRburts, Q	4.5930980392
Bebiy, K	4.2857421384
Bossun, K	4.6053333333
Bruwnlii, T	4.842433584
Batchir, T	4.3431485244
Cirny, E	4.3938040854

You have not finished with this formula yet, however. You realise that you should include the Sessions value that you added to the athlete table a moment ago. Each athlete is to receive an additional point to their index rating if they attended one or two sessions and 2 points if they attended 3 or more sessions. This will require an IIF function to select whether to add 1 or 2 to the index rating value. You will have to modify the formula for the IndexRating to include this additional term.

Begin to edit the formula by selecting Design View from the View menu, clicking in the Field row for Expr1 and clicking on the build button. Make sure you type a + symbol at the very end of the formula and then find the IIF function in the Functions/Built-In Functions/Program Flow group of functions. The arguments are very similar to what you encountered in Excel, so you should be able to construct the piece of the formula which will add 1 if the sessions value is 2 or less, or which will add 2 if the sessions field value is 3 or greater.

**Laboratory Handbook**

Creating a Report from a Query

Now that you have the Query results displaying only the athlete name and the index rating, create a report showing just these two values. The report should be nicely laid out and should be sorted by increasing value of the index rating. Figure 7.17 shows the first few entries as an example of the kind of report you might create. Notice that in addition to being sorted the values of the index rating are formatted to display only 2 decimal figures. A clue as to how you can do this is that you can select the Expr1 field in design mode and set its properties.

Figure 7.17 – a Report derived from the Index Rating Query

Athlete Name	Index Rating (includes Sessions)
Name: Crenne, T	Index: 4.86
Name: Ulsin, E	Index: 5.20
Name: Lendsduwn,	Index: 5.23
Name: Bebiy, K	Index: 5.29
Name: Striit, O	Index: 5.30