Databases: Queries and data analysis

The small print

Prerequisites

Time in the classroom is precious – it is an opportunity for you to interact with the workshop leader and other participants through questions and discussions and to share your experiences and concerns. To make the most of this time we sometimes ask you to carry out learning activities ahead of the workshop so that everyone comes into the class with the same basic knowledge. We keep this prior learning to a minimum and often make use of Lynda.com videos. Lynda.com videos can be accessed by University members anytime, anywhere, through a browser or app.

The workshop description will tell you if any prior learning is required. If you don't have an environment where you can do this learning, you can come along to one of our 'Lynda Labs'. These are scheduled every week, and are a quiet space where you can work through Lynda.com videos or other workshop resources.

If you turn up to a workshop without having done the prior learning, the workshop leader may suggest that you come back on another session.

Copyright

About the workshop designer

Pamela Stanworth has over a decade's experience working on databases with researchers and departments throughout the University. She brings a pragmatic approach to building projects that are effective, reliable and sustainable.

Pamela's roots are in engineering, with blue-chip industrial companies, technical consultancy and small businesses. Her commitment in teaching and consulting is to enable people to use appropriate technology in their work, efficiently and to a high standard.

Revision history

Version	Date	Author	Comments
1.0	September 2016	Pamela Stanworth	Created

About this workshop

This workshop will give you an insight into the variety of ways you can analyse data, once it is organised into a relational database. The data is stored in a series of tables, and you can set up calculations and queries to interrogate the data, and explore the trends and relationships.

What you will learn

We will work with queries, to extract selected data from a database, and find out how to create a range of logical criteria. Queries can be used for a variety of purposes, which we will explore.

We will compare ways for a database to carry out a range of calculations, in different contexts such as queries, forms and reports. We will see the use of some other kinds of queries for housekeeping and arranging the data into good order.

What you need to know

The ideas and techniques covered in this workshop will apply to a range of tools. We will demonstrate using *Access*, whose graphical interface is a good medium for learning in. However, the concepts will be the same, whatever relational database software you decide to use.

I will assume that you have already built your database, with tables and fields, and with joins between the tables to manage the one-to-many relationships in your data. This uses the ideas covered in the course "Databases – building a database".

I will assume that you are reasonably confident in using the tool you have chosen to use to create your database. If you don't have a preference, then I suggest you use *Access* to get started. With your chosen tool, you will need to be able to:

- Create and save a new document
- Insert and format text and data
- Create tables with fields
- Set up joins between tables
- Navigate the commands and menus, using Help as necessary

If you need to review these activities, Lynda.com is a great place to get guidance. Here are some relevant videos:

"Access 2013 Essential Training", choose some topics from chapters 1, 2 and 3.

The resources you need

Sample data and databases that you can use to experiment with will be available, but you may like to bring along your own.

Unless you have been told otherwise, there will be a computer available for you to use with *Access* installed.

You can bring along your own laptop with your preferred tool installed if you want to – just bear in mind that I am not an expert in every tool (although I am sure that between us we will be able to solve most issues!).

Using the database files for exercises

Access 2013 files for these exercises have been provided for you on a network drive. Your area of the drive is called the Home Drive H:

Please note that *Access* only trusts files if they have been saved in a "Trusted Location". The Home Drive H:, used for most IT Learning Centre courses, has been designated an Access Trusted Location. If you make copies of the files for these exercises, and save them on your own computer in a location that is not trusted, you may not be able to carry out all the activities described.

About the tools you can use

There are many applications that you can use to create a relational database, each having different strengths and applications. For example, the selection will depend on how many people are expected to use it (a handful of people, several dozen, thousands?) and how they will get access to it (saved locally or data viewed and contributed on-line? free software or paid-for?). You should also think about the devices that you and other users will be using (Windows, Mac, web browsers on a variety of devices?) and what features will be needed (design your own custom forms, produce charts?). Also what support will you need (courses from IT Learning Centre, videos online, existing expertise in your own team?).

The Database Chooser tool is designed to help you compare your software options, to select one that will suit your project. It is itself a database that runs in *Access*, and a copy is included with the student files for this workshop. The Chooser is currently in beta form, so we hope you will find it useful but if you have any problems using it – or have suggestions about improving it – please contact us using courses@it.ox.ac.uk.

Web App or Desktop Database?

Access 2013 can also be used to create a web app database: where users work on the data via a web browser. This would require communication using *Office 365* or *SharePoint 2013* (not currently available at Oxford University), and is not the subject of this course. We will work on a desktop database, which is saved locally on your computer or a network drive.

Learning Objectives

This workshop has the following learning objectives.

Learning Objective One – Creating a query

Learning Objective Two – A query with criteria

Learning Objective Three – Create some interesting kinds of query

Learning Objective Four – Create some housekeeping queries

Learning Objective Five – Calculations in a query

Learning Objective Six – Calculations on a form

Learning Objective Seven – Calculations on a report

Learning Objective Eight – Conditional formatting

Learning Objective Nine – Action queries

Study Videos

During the workshop, I will point you to a variety of resources that will help you in achieving these objectives.

Videos to support these topics are available from Lynda.com. Find the playlist for this course in the ITLC Portfolio: visit http://portfolio.it.ox.ac.uk and search for "queries playlist".

Watching these videos requires an Oxford University account with Lynda.com. Read about Lynda.com here: http://portfolio.it.ox.ac.uk/resource/lyndacom/lyndacom-welcome-about-these-videos-and-learning-resources

Learning Objective One – Creating a query

It is worth spending a few minutes exploring a database, before you start work, to understand what it contains and how its data is related. You will look around a database file, exploring its tables and queries and getting a feel for the value of using queries for exploring the data in tables.

In **Inventory.accdb**:

Create a query based on **tblAssets**, to display only a few of the fields. Then add in some fields from a related table, and examine the effect on the data displayed.

Experiment with adding, removing and rearranging fields in the query. Control the order by which the records are sorted (ascending or descending and by which field/s).

Learning Objective Two – A query with criteria

A query is used for selecting a limited amount of data from the database, and it can bring together data from two or more tables.

Create a select query based on a few fields from **tblAssets**, and look at the results. Try sorting the query results based on one or more fields.

Experiment with setting criteria in a query, to control which records are found. For example:

Show only "printers"

Change the criteria to display all assets which cost £200 or more

Display only laptops which cost over £350

Show all assets made by Watkins, Wilkinson or Wood Associates
(hint: use the * wildcard symbol)

Try out the use of criteria with Between, And, Or, Not, Is Null

Learning Objective Three – Create some interesting kinds of query

A parameter query is flexible and it can be re-used repeatedly with a variety of criteria.

Create a re-usable query where the user can ask for some details about assets (choose some interesting fields), but they can decide, when they run the query, to see only one Description of asset at a time.

Learning Objective Four – Create some housekeeping queries

As well as simple select queries, you can set up queries to help analyse your data in other ways, or to keep your data in good order.

Create a query that finds any duplicate entries in the table of assets.

Create a new query to find any assets which have not yet been assigned to any Department (DeptID).

Suppose you need to examine the money spent by each department on purchasing each type of asset. Create a select query to collect some suitable fields. Then create a crosstab query based on that, and explore whether one department spends notably more (or less) than the others, and whether more (or less) is spent on some kinds of asset than on others.
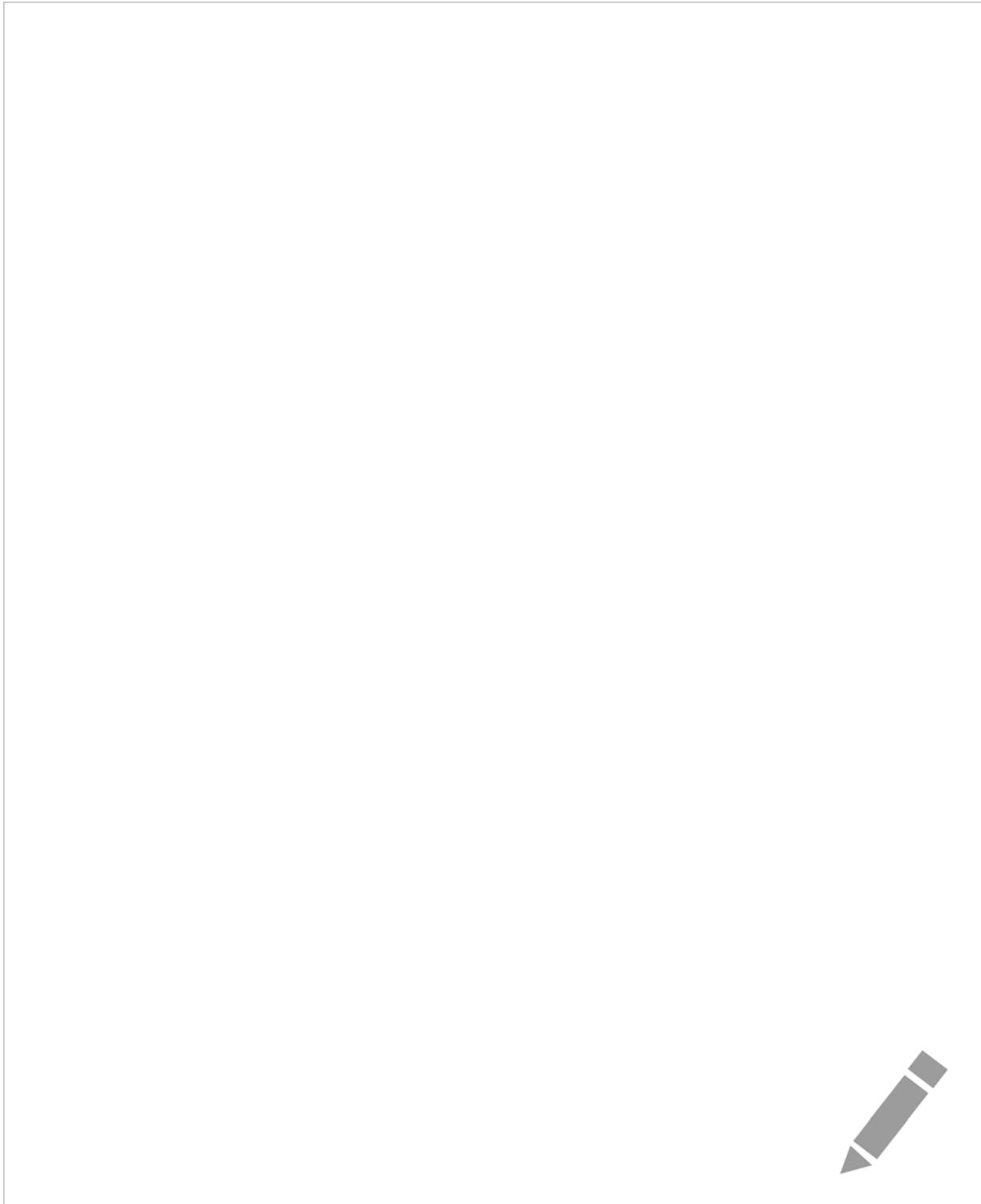
Learning Objective Five – Calculations in a query

Data is stored in tables in raw form: any calculations or post-processing can be carried out in a query.

Create a list of the assets, giving the depreciated value of each (we are told this is 1/3rd of the purchase price).

Add a calculation of how many days each asset was kept.

Show each asset's name as its make and model concatenated into one text.

Grouping records in a query: Create a list of the types of assets, counting how many of each type of asset has been purchased.

Learning Objective Six – Calculations on a form

Calculations can also be carried out on the fly, in a form.

On a form with asset details, add a calculation that shows the VAT payable on the purchase price (this is 20% of the price paid).

Add a calculated control which shows the head of department's name and phone number in this way: **Hacker Jim (72345)**.

Experiment with creating calculations by typing directly into a control or by using the Expression Builder.
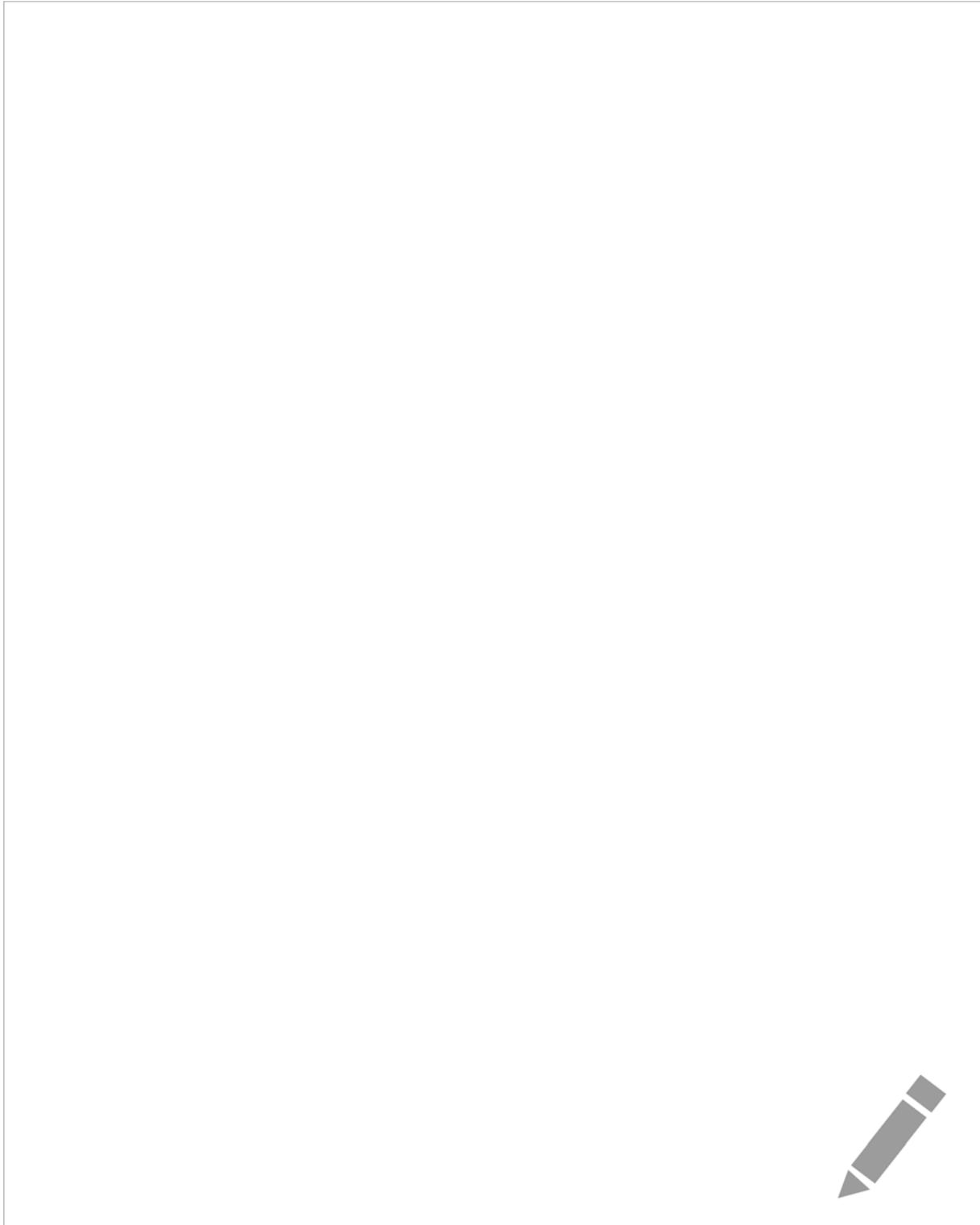
Learning Objective Seven – Calculations on a report

The wizard is an easy way to create a report, based on a table, which may contain calculations.

Create a report showing some details about the assets, including the average purchase price for each kind of asset (description), and the longest expected life in each group.

Run the report and examine the data, then format the calculated controls to make the results easier to understand.

Add a calculation that works out, for each asset, its (depreciated) estimated end date of each asset - use the **DateAcquired** and the **DepreciableLife**.

Add a summarising control, such as a calculation in the report footer that shows the total of the purchase prices.

In the report **rptAssetsByDepartment**, add a calculation to show the average purchase price spent by each department. Add another calculation which shows how many assets each department holds.

Learning Objective Eight – Conditional formatting

Conditional formatting is a way of managing the appearance of parts of a form, to draw attention to unusual or important values.

In a form, use the colour and appearance of a control to emphasise when its value is unusually low.

Format a date control so that it draws attention if a date after today's date is accidentally entered.

Learning Objective Nine – Action queries

Action queries make changes to the data (in tables) in an orderly and controlled way – you can design the action query, then whenever you run it you can be sure how the data is edited

In the database **New Dentists.accdb,** set up procedures to do the following changes automatically (and save any queries for future reference):

In **tblStaffContactInfo**, all the Odd-job Men are now to be known as Senior Administrative Supervisors

In **tblAppointment**, remove all records for appointments which were not kept

For those patients who go to school, make a list of the patient's name, their school and a contact phone number at the school

Some additional people are listed in **tblMorePeople**; append them to **tblPatient**

Further information

Getting extra help

Clinics

The IT Learning Centre offers bookable clinics where you can get pre- or post-course advice.

About Lynda.com

Lynda.com is free to all members of the University. Visit courses.it.ox.ac.uk/lynda and sign in with your Single Sign-On (SSO) credentials. Some courses recommend pre- and/or post-course playlists of Lynda.com videos to support your learning. You can watch these anywhere, anytime, and even download them on to a tablet or smartphone for off-line viewing.

If you need a quiet place to work through playlists away from distractions, the IT Learning Centre offers frequent Lynda Labs that you can book onto.

About the ITLC Portfolio online

Many of the resources used on the IT Learning Centre courses and workshops are made available as Open Educational Resources (OER) via our Portfolio website at portfolio.it.ox.ac.uk.

About the IT Learning Centre

The IT Learning Centre delivers over 100 IT-related classroom-based courses, and gives you access to thousands of on-line course through Lynda.com.

Our team of teachers have backgrounds in academia, research, business and education and are supported by other experts from around the University and beyond.

Our courses are open to all members of the University at a small charge. Where resources allow, we can deliver closed courses to departments and colleges, which can be more cost effective than signing up individually. We can also customize courses to suit your needs.

Our fully-equipped suite of seven teaching and training rooms are available for hire for your own events and courses.

For more information, contact us at courses@it.ox.ac.uk

About IT Customer Services

The IT Learning Centre is part of the Customer Services Group. The group provides the main user support services for the department, assisting all staff and students within the University as well as retired staff and other users of University IT services. It supports all the services offered by IT Services plus general IT support queries from any user, working in collaboration with local IT support units.

The Customer Services Group also offers a data back-up service; an online shop; and a PC maintenance scheme. Customer Services is further responsible for desktop computing services – for staff and in public/shared areas – throughout UAS and the Bodleian Libraries.

Databases:
Queries and data analysis

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Your safety and comfort are important

Where is the fire exit?

Please tell us if anything doesn't work

The toilets are along the corridor outside the teaching rooms

The rest area has vending machines and a water cooler

Resources for your learning

Activities for you to practice today
In the course handbook
Work at your own pace!
Be selective

Video playlists with today's topics in Lynda.com

Follow-up work
Continue with exercises after the session
Bookable Course Clinics later

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Road map for "Databases - Queries and data analysis"

Queries to pick out interesting data

parameters

Calculations in Queries, Forms &Reports

calculations

setting criteria

Crosstabs & other useful queries

Conditional formatting

summaries

Action queries

Getting Started

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Getting started with Access

Start Access
Use a desktop icon or Start menu etc.

Access version 2013 in teaching rooms
Enabling active content?
(see appendix in the course book)

Security Warning   Some active content has been disabled. Click for more details.   Enable Content   ✕

Today, the exercise files are in
Home Drive H:

Creating a Query

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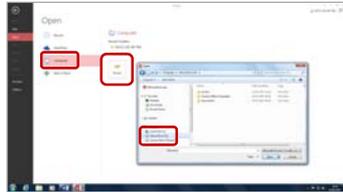
A select query collects data from tables

Combine data from one or more related tables

Sort records
Select only some fields
Select only some records
Apply criteria
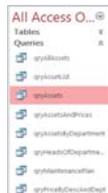
Creating a query in Design View

Choose a table
Choose some fields
Wildcard * represents all fields

Give the query a name
Query names begin with qry
No spaces

Query results

Results are presented in Datasheet View

Only selected fields and selected records are shown
Beware: editing the data here is changing the source data in the tables

When query is run, Access presents the latest values from the tables

Query Design View

Switch between Design and Datasheet Views

Diagram shows tables, fields and joins
Design grid lists the selected fields

Close and save the query

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A query based on two tables

In Query Design View
Add all the tables needed for this enquiry

Joins show any relationships which had been set up previously

Any record which appears in both tables will be shown in the results dataset

Changing a query design

sorting ~ priority from left to right

rearrange or resize columns

Show/Hide field

Queries for Selecting Data

Query criteria

Limit the records included in the results

Enter a value under one field
All records which exactly match will be included

AND - 2 or more criteria in the same row must all be satisfied

OR - 2 or more criteria on separate rows permits any one to be satisfied

Expressions in criteria

Exact match

Comparisons using   > < >= <= **Between**

Wildcard symbols   * ? #

Not

Is Null

Databases - Queries and data analysis

Look at Learning Objectives One and Two

Restart at 10:15

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More Queries

Parameter queries

A more flexible query

The user sets different criteria to be applied each time

In Criteria, type prompt text
in [square brackets]

Using wildcards in parameter criteria
Like [Which subject]&"*"

Mistakes in criteria may appear as parameter queries ☹

Top or bottom values

Selecting top or bottom few from query results
.

Sort data first

Choose:
Ascending or descending
A top or bottom range
Counting or percent

Return:	5
	5
	25
	100
	5%
	25%
	All
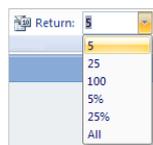
Some special types of query

Create, using the Query Wizard

| | 12 Personnel | 1012 | KL809890543 | George | H | Carter |
| | 13 Personnel | 1021 | KL809890543 | George | | Carter |

Find duplicates

AssetDescription	DeptName
slicer	Maintenance
PC	Security
laptop	Security
printer	
scanner	
laptop	
laptop	
scanner	
scanner	Service Engineers
scanner	Service Engineers
bar code reader	Service Engineers
laptop	Service Engineers

Find unmatched

Crosstab queries

Used to examine a many-to-many relationship

Collect records required, using a select query
Run the Crosstab wizard
Choose row and column headings
Choose a field for the Value, and a calculation function

Surname	Introduct	Pass Plus	Special	Standard	Test	Total Of L
Batchelor		5	6			2	13
Jones	1	13	2		1	17
Smith	1	6	1	2	1	11
Milly Smith		6		2		14

Calculation columns in a query

Add further columns to query design grid

Expressions using + - * / ^ **And Or Not ( )**
Text concatenation using &

Label text before the colon :   ▦ Property Sheet
Formats in the Property Sheet

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Grouping records in a query "Totals"

Summarising calculations over all records

Show the Totals row

Group by one field

Choose an aggregate functions for every column

Field:	CompanyName	PurchaseOrderNumbe
Table:	tblCustomers	tblOrders
Total:	Group By	Count
Sort:		
Show:	☑	☑
Criteria:		

Company Name	Count
Fluted Crystal Ltd	2
HiroToko Enterprises	4
Jennie's Jellies	2
Roses Potteries	4
Stitch in Time Ltd	1

Databases - Queries and data analysis

Look at Learning Objectives Three, Four and Five

Restart at 11:10

If you want to continue with the Exercises, you could …

Copy the Exercise files to a memory stick

Download the files (and more) from
the IT Learning Portfolio at
http://portfolio.it.ox.ac.uk

"Step by step" instructions

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Calculations on Forms and Reports

Calculated controls on a form or report

Unbound text control
Insert it in the Detail
Type or build an expression in the Control Source
= field values functions + - * / ^ ( ) &

Appearance
Format it
Add a label in the header

The calculated result is *not* stored

Summary calculations on a report

May have set up summary options in the wizard
If the data is grouped

Or add simple summary functions
Select a field in the Detail
SUM, AVG, COUNT, MAX etc

Conditional formatting

Object appearance changes, depending on its value

Set a rule
Set several rules

Compare values
Or show a gradient bar

Action Queries

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"Update Values" query

Replaces some data values with new text/numbers
First make a select query
Change it to an Update Query
In the Update To row, enter a new value
Run the Query
All selected records are edited

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Running action queries

Action queries can be saved
  Special icons show in the Navigation Pane
Run a query from the Navigation Pane
  Check warnings about altering/removing data
Changes are made every time you run an action query

Make Table ~ Append Records ~ Update Values ~ Delete Records

"Make-Table" query

Useful for archiving or re-structuring
  Create a Select Query to collect the fields and records as required
  Change it into a make-table query
Data is copied to the new table

"Delete Records" query

Selected records are deleted
First build a Select Query to select only the intended records
  Convert it to a Delete Query
  Run the delete query

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"Append Records" query

+!
Append

Selected records from the current query are appended to an existing table
Select query collects the fields and records as required (from one or more tables)

Convert to an append query
Confirm the field names do match
Nominate the target table - in this database or another

Think about the primary key

More About Databases

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Other related courses

Next steps:
Databases: Building a database
Databases: User-friendly database design

- see the schedule online

Lynda.com videos about databases and other topics

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If you want to continue with the Exercises, you could …

Copy the Exercise files to a memory stick

Download the files (and more) from
the IT Learning Portfolio at
http://portfolio.it.ox.ac.uk

"Step by step" instructions

Databases - Queries and data analysis

Look at Learning Objectives Six to Nine

Finish at 12:15

Follow-up
Bookable Clinics
help@it.ox.ac.uk