

# Easy Steps



## **Unit 18742 (v5)**

**Produce a relational database solution  
for organisational use**

***with***

**Microsoft Access 2013**

- ☒ Easy to follow
- ☒ Step-by-step instructions
- ☒ Covers Unit Standard Criteria

*A Cheryl Price Publication*

## **Unit Standard 18742 (Version 5)**

### **Produce a relational database solution for organisational use - Access 2013**

This book covers the course outline for the following New Zealand Qualifications Authority Unit Standard:

Unit Standard 18742 (v5) - GENERIC COMPUTING (Level 3, Credit 6)  
Produce a relational database solution for organisational use

All topics in this Unit Standard are included in this book.

Retrievable exercise files are used with this book and listed on page xi. These are available as a free download from our web site at [www.cherylprice.co.nz](http://www.cherylprice.co.nz). Instructions for downloading the exercises are included on page xii.

This book has been written using Microsoft Access 2013 with Windows 8.1.

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# Introduction

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Welcome to Unit Standard 18742 v5 Produce a relational database solution for organisational use with Microsoft Access 2013.

This book has been written using Microsoft Access 2013 with Windows 8.1. (The Windows 7 operating system can be used. However screen shots will differ slightly from those shown in this book.)

## Retrievable Exercise Files

Some exercise files have been created for you to prevent time in keying in many exercises. You can then open these files and use the features of Access to manipulate and format text.

A list of these files is shown on page xi and instructions for downloading these files from our web site are included on page xii.

## What you will learn

In this course you will learn how to -

Produce a relational database solution for organisation use, ie

- Design a relational database for organisation use
- Create and operate a relational database for organisation use
- Test and evaluate the relational database.

## How you will learn

This book is divided into sections. Each section page lists the learning outcomes for that section. You will work through each section and do all exercises (or those instructed by your tutor).

Revision theory is included at the end of each section. Answers to the Revision questions are included in Section 9.

Our books include accumulation and consolidation of learning which carries across each section.

After you have completed the book your tutor will give you the actual Unit Standard Assessment.

## Word meaning boxes

Sometimes you will see a box at the left side of the page of a line that has dotted underlining. This box will contain information to help you understand the meaning of the underlined word (or how that word is formed). An example is shown below.

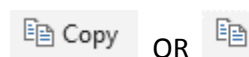
forecast  
= to  
calculate a  
future  
result

Data can therefore be altered to re-calculate budgets and to forecast results using different sales figures. Worksheets can be saved, opened and printed as required.

## Different Access buttons

Depending on the size of your Access screen, buttons on the ribbon may vary to those shown in this book. The icon with the word of that feature may show, or the icon only.

For example, the Copy button in the Clipboard group on the **HOME** tab may be displayed in either of the following ways.



OR



The Format Painter button can show as either -



OR



## Shortcut keys

Shortcut keys are indicated in the left margin, usually the first time they are used. An example follows.

Ctrl S

- 1 Click on the Save button  on the Quick Access Toolbar .
- 2 Type a file name for your document then click on Save.

## Glossary

Generally when a word(s) is first used that is a technical term or a word that you may not know that relates to an exercise, or a particular Access 2013 feature, a description is given. You will also see that such words are in **SMALL CAPS**.

These terms are listed on each section page, an example is shown below. Explanations are also included in the Glossary at the end of the book.



*In this section you will come across the following words highlighted in bold. This indicates that the word is included in the Glossary at the end of the book together with a description of that word.*

**AUTO NUMBER**  
**BACKSTAGE VIEW**  
**CONTEXTUAL TABS**  
**DATABASE**  
**DYNASET**  
**FIELD**

**FIELD NAME**  
**HIERARCHICAL MODEL**  
**MACROS**  
**OPERATORS**  
**PRIMARY KEY**  
**QUERIES**

**REPORT WIZARD**  
**SELECT QUERY**  
**SELECT QUERY WIZARD**  
**TABLE**  
**THEMES**



## Icons used in this book

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This book contains icons to help guide you in your learning.

The following list shows the icon and its meaning.



### **Learning Outcomes**

Learning Outcomes are displayed on the section page and describe what you will learn in that section.



### **EXERCISE 1**

These are the exercises that you are required to do. Often there will be an introduction sentence to tell you what you will be doing in that exercise.



These are notes for your information.



### **Revision**

---

This appears at the end of most sections and contains theory revision questions relating to features learnt in that section.

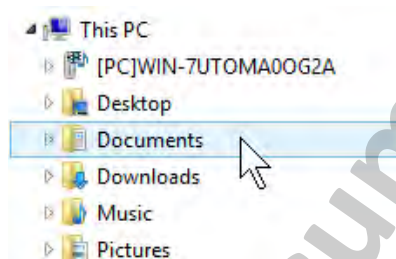
## Save Options

---

When a document is saved you will be requested to select the location, ie Computer then click on the Browse button and select the folder required. You can eliminate this procedure by selecting the location and saving directly to the Save dialog box and therefore bypass Backstage view.

For the purposes of this book we have used the Documents folder as the default folder. This means that files you open and save will be in your OneDrive (see next page for further information).

For the purposes of this book we have used the Documents folder within This PC as the default folder. This folder is shown below which is the shortcut for the actual path name of C:\Users\User Name\Documents. This means that files you open and save will be on your hard drive.



Use the following instructions to specify the Documents folder as the default file location:

- 1 Click on the **FILE** tab then click on **Options**.
- 2 Click on **Save** at the left.
- 3 Ensure that the Documents folder is displayed as the Default local file location as shown below.  

☒ Don't show the Backstage when opening or saving files  
☐ Show additional places for saving, even if sign-in may be required.  
☐ Save to Computer by default

Default local file location:
- 4 Also ensure that *Don't show the Backstage when opening or saving files* option displays a tick.
- 5 Remove the tick from the next option *Show additional places for saving, even if sign-in may be required*.
- 6 Click on OK.



If you wish to open and save files to OneDrive (ie the cloud) use instructions on the next page.

If you have Windows 8, or have updated to Windows 8.1 from Windows 8, SkyDrive may be displayed instead of OneDrive but is essentially the same.

---

# OneDrive

---

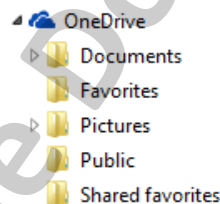
OneDrive is a cloud storage application from Microsoft. It is one of the major online file storage options competing with Dropbox and Google Drive.



Because files are stored “in the cloud” (in addition to your hard drive) it means that you can access those files from anywhere in the world because you will always have access to the OneDrive application and your files. You do however need an Internet connection for the files to be updated from your hard drive to OneDrive.



## Saving to OneDrive

OneDrive is automatically set up when Microsoft Office 2013 (ie Office 365) is installed on your computer. A OneDrive folder will be displayed on the Navigation Pane in Windows Explorer as below.



Files can be saved manually by clicking on the Save button  on the Quick Access Toolbar, specifying a name for your file then clicking on the  OneDrive icon (you may wish to double click on Documents and save to that folder).

## OneDrive as the Default File Location

Use the following instructions if you wish to specify OneDrive as your default file location.

- 1 Click on the **FILE** tab then click on **Options**.
- 2 Click on **Save** at the left.
- 3 Ensure that the C:\Users\User Name\OneDrive\Documents folder is displayed as the Default local file location as shown on the next page. (You may need to retype the location)
- 4 Also ensure that *Don't show the Backstage when opening or saving files* option displays a tick.

- 5 Remove the tick from the next option *Show additional places for saving, even if sign-in may be required.*

- ☒ Don't show the Backstage when opening or saving files  
☐ Show additional places for saving, even if sign-in may be required.  
☐ Save to Computer by default

Default local file location:

C:\Users\Cheryl\OneDrive\Documents

Browse...

- 6 Click on OK.

## OneDrive Website

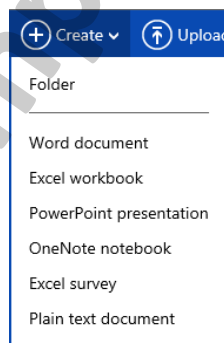
You can log in to the OneDrive website using your web browser with your login name and password.

The website is [www.OneDrive.live.com](http://www.OneDrive.live.com).



You can upload photos and use files and share files.

New files can be created through OneDrive by clicking on **Create** and selecting the program you wish to use, eg Word (web applications in OneDrive are slightly cut-down versions of Office 2013 programs).



## Sharing Files

From within Access 2013 you can save files to OneDrive (usually to the Documents folder) and then share those files. You can then click on the **FILE** tab, on **Share** and invite people to share files in OneDrive.

Alternatively, you can right click on a file in the OneDrive website (see above) and select Sharing.

Use Google in your web browser to search for additional information on OneDrive.

## Exercise Files used in this book

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(Instructions are included on the following page for downloading retrievable files from our web site at [www.cherylprice.co.nz](http://www.cherylprice.co.nz))

Names of files	
Blank Testing Form	Rivers Bookshop
Evaluation Report	Swanson and Swanson Orders end of Section 3
Harrington Vet Clinic Client Database	Swanson and Swanson Orders end of Section 4
Harrington Vet Information	Swanson and Swanson Orders end of Section 5
Products	Swanson and Swanson Orders end of Section 6






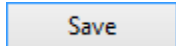

The Swanson and Swanson Orders end of section files are included for you to open at the beginning of Sections 4, 5, 6 and 7 to ensure that data etc has been entered correctly, formatted, and manipulated and that the Access objects are working properly.

## Downloading Exercise Files

The exercise files listed on the previous page can be downloaded from the Cheryl Price web site using the instructions below.



For the purposes of this book we have specified Exercise files to be downloaded to the Documents folder within This PC which is the shortcut for the actual pathname of C:\Users\User Name\Documents. This is where files will be opened from and saved to.

1	In the address bar of Internet Explorer, type: <b>www.cherylprice.co.nz</b>
2	Press Enter on the keyboard to display the Cheryl Price website.
3	Click in the Product Search box and type the number of this unit standard, as shown at the right. <div data-bbox="1021 672 1324 851"> </div>
4	Click on 
5	Click on <a href="#">US 18742</a>
6	Under the <b>Exercise Files</b> heading click on the underlined blue hyperlink, ie Book Exercise Files – V5 Access 2013 <a href="#">Free Download</a> The File Download dialog box will display.
7	<p>a Click on  <a href="#">Save as</a> then</p> <p>b Change file name to <i>US18742 v5 Access 2013 Book Exercise Files</i>.</p> <p>c Click on the Documents folder shown below.</p> <div data-bbox="606 1388 989 1579"> </div> <p> The Documents folder under This PC is the shortcut for C:\Users\User Name\Documents</p> <p>d Click on .</p>
8	<p>a Click on .</p> <p>b Right click on the zipped exercise file and select Extract All. Click on Extract. A folder will be created containing the exercise files.</p> <p>c Delete the Compressed (zipped) Folder.</p>

# NZQA Outcomes and Evidence Requirements

## Unit Standard 18742 (Version 5)

<b>Title</b>	<b>Produce a relational database solution for organisational use</b>		
<b>Level</b>	<b>4</b>	<b>Credits</b>	<b>8</b>

<b>Purpose</b>	People credited with this unit standard are able to design, create and operate, test and evaluate a relational database to provide a solution for organisation use.
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<b>Classification</b>	Computing > Generic Computing
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<b>Available grade</b>	Achieved
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<b>Entry information</b>	
<b>Recommended skills and knowledge</b>	Unit 2787, <i>Create and use a computer database to provide a solution for organisation use</i> , or demonstrate equivalent knowledge and skills.

### Explanatory notes

- 1 The database must comprise a minimum of three tables to hold data (each concerning a single subject or topic); relationships between required tables, records that incorporate necessary fields and formats (e.g. text, numeric, currency, memorandum, date/time, auto-number, yes/no); queries, and forms and reports to input and output information to and from multiple tables. For the purposes of assessment the database and organisation must be authentic.

- 2 Definitions

*End-user document* is a short description of the purpose of the database, and instructions on how to access and navigate the database. The end-user document must use consistent font and layout, be legible, and should either avoid the use of undefined jargon or acronyms, or provide a glossary for these. The document must be saved in a format that is accessible to users.

*Organisation* describes the context the relational database is designed to operate in (e.g. businesses, clubs, not for profit organisations). It does not define or limit the situations in which assessment evidence may be gathered.

*A relational database* contains data in records and fields that relate to other tables within the same database, or to tables in another database, or tables in other programs.

*Summaries* refer to totals that are printed in a report at the end of a group, or section, or the entire report. These may count records within the group or section, or calculate a total for a numeric field, as appropriate to the purpose.

- 3 The assessment context for this unit standard must be suitable to meet the criteria for level 4 in the NZQF Level Descriptors, which are available by searching for “level descriptors” at [www.nzqa.govt.nz](http://www.nzqa.govt.nz).
- 4 Legislation relevant to this unit standard includes but is not limited to the:  
Copyright Act 1994  
Copyright (New Technologies) Amendment Act 2008  
Health and Safety in Employment Act 1992,  
Privacy Act 1993;  
and any subsequent amendments.
- 5 An assessment resource to support computing unit standards (levels 1 to 4) can be found on the NZQA website at [www.nzqa.govt.nz/asm](http://www.nzqa.govt.nz/asm).  
A specific assessment resource for assessing against unit standard 18742; and ‘*The Computing Process - a clarification document*’ can be found on the NZQA website.

## **Outcomes and evidence requirements**

### **Outcome 1**

Design a relational database for organisation use.

#### **Evidence requirements**

- 1.1 Database tables are designed according to the requirements of the organisation and the attributes of the entity.  
  
Range fields.
- 1.2 The naming of objects within the design is completed using a systematic naming convention.
- 1.3 The database table design includes the selection of keys that enable both the unique identification of records, and relationships between tables, to be created.  
  
Range includes but is not limited to – primary key, candidate keys, foreign keys.
- 1.4 The design shows the interrelationships between tables using an entity relationship diagram.  
  
Range entity relationship diagram includes but is not limited to – entity, relationship(s), attribute(s).
- 1.5 The design includes concepts for the layout of the menu structure, forms and reports according to the needs of the organisation and capability of the database.



## **Outcome 2**

Create and operate a relational database for organisation use.

### **Evidence requirements**

- 2.1 Database tables are created to store data in accordance with the design.
- Range data may include but is not limited to – text, numbers, dates and times.
- 2.2 Relationships between tables of data are established in the database in accordance with the entity relationship diagram.
- Range relationships may include – one-to-one, one-to-many, many-to-many.
- 2.3 The database is queried to assemble data from multiple tables according to the needs of the organisation.
- Range including queries to – calculate results from existing data, select data, assemble data from multiple tables, summarise data.
- 2.4 Forms are created to facilitate data entry, and results of queries are displayed using data from multiple tables in accordance with the design.
- 2.5 Reports are created with title and column headings using data from multiple tables.
- Range a minimum of two reports that include – the sorting and grouping of data, summaries.

## **Outcome 3**

Test and evaluate the relational database.

### **Evidence requirements**

- 3.1 Testing verifies that the database meets the design and the requirements of the organisation.
- 3.2 An evaluation report is prepared that identifies strengths and limitations of the relational database and recommends improvements for future developments.
- 3.3 An end-user document is created to facilitate use of the database.

<b>Planned review date</b>	31 December 2016
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**Status information and last date for assessment for superseded versions**

<b>Process</b>	<b>Version</b>	<b>Date</b>	<b>Last Date for Assessment</b>
Registration	1	30 July 2002	31 December 2013
Revision	2	16 January 2003	31 December 2013
Revision	3	16 July 2004	31 December 2013
Review	4	19 March 2010	31 December 2015
Rollover and Revision	5	19 September 2013	N/A

<b>Consent and Moderation Requirements (CMR) reference</b>	0226
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

## Section

# 1

## What is a Database? Understanding Relational Databases



### Learning Outcomes

*At the end of this section you should be able to -*

- ☐ Understand what a database is
- ☐ Identify the different types of databases
- ☐ Describe a relational database
- ☐ Describe the structure of a table in a database
- ☐ Break data into logical fields
- ☐ Assign appropriate field names and table names
- ☐ Describe and identify a primary key
- ☐ Identify and explain different relationship types in a relational database
- ☐ Identify and describe queries, forms and reports
- ☐ Start Microsoft Access 2013
- ☐ Use Access Help
- ☐ Customise the setup in Access 2013
- ☐ Explore a relational database



*In this section you will come across the following words highlighted in bold. This indicates that the word is included in the Glossary at the end of the book together with a description of that word.*

**ALL ACCESS OBJECTS NAVIGATION PANE**  
**BACKSTAGE VIEW**  
**CANDIDATE KEY**  
**COLUMN**  
**DATABASE**  
**DESIGN VIEW**  
**FIELD NAMES**  
**FIELDS**  
**FIRST NORMAL FORM**  
**FLAT FILE DATABASE**  
**FOREIGN KEYS**

**FORMS**  
**JUNCTION TABLE**  
**MANY-TO-MANY RELATIONSHIP**  
**NORMALIZATION**  
**ONE-TO-MANY RELATIONSHIP**  
**ONE-TO-ONE RELATIONSHIP**  
**PRIMARY KEY**  
**QUERY**  
**QUICK ACCESS TOOLBAR**  
**RECORDS**  
**RELATIONAL DATABASE**

**RELATIONSHIPS**  
**REPORTS**  
**RESOLVING TABLE**  
**RIBBON**  
**ROW**  
**SECOND NORMAL FORM**  
**TABLE**  
**THIRD NORMAL FORM**  
**VALUE**

## What is a Database?

A **DATABASE** is a collection of information which is organised so that its contents can be easily accessed, managed, and updated. Databases are created and stored on a computer system and are used to search for and extract information as and when required.

Some examples of databases include:

- a list of employee details (employee ID, name, position, salary)
- a list of DVD movies available for hire in a movie rental store (title, actor's names, category)
- a list of CDs in a collection (name of CD, date of release, artist/band)
- a stock listing (product name, number in stock, supplier, type of product)
- a library catalogue (where all the books are categorised and then stored alphabetically within the category, making them easy to find)

Databases are designed to handle large amounts of data, and allow you to control the way data is organised and displayed. They have significant advantages over paper storage systems in terms of the office space used and the ease of access to data.



In this section, only small databases have been used to enable you to quickly see the results of queries, reports etc. Databases often contain thousands of records that are updated and added to regularly.

## Different Types of Databases

There are two main types of databases - Flat File Database and Relational.

### Flat File (Single Table)

In a **FLAT FILE DATABASE** all data is stored within one table. All data is accessed from this table.

Customer Code	Company Name	Phone	Fax	Contact Name	Grouping
ABC	ABC Tree Company	444 3567	444 3568	John Marshall	Small Business
SIM	Simpson Corporation	345 9879	345 9880	Kim Shaw	Corporation

### Relational (Multiple Tables)

Microsoft Access 2013 is a **RELATIONAL DATABASE** Management System (RDBMS).

This means that the data is stored in multiple tables, each on a very specific topic, that can be related to each other. The main benefit of a relational database over a flat file is that it eliminates data duplication, which saves storage space, and makes updating data faster and more accurate.

Duplication of data can occur when the same data is stored in more than one table. For example, a company that has many customers will need to keep data on each customer and on each order that their customers make. If a customer's details (eg name, address) need to be added to each order, every time an order is made, this not only wastes time but there is a chance the data could be copied incorrectly – each time data has to be repeated the chance of errors increases.

A relational database would get around this by keeping customer data and order data in separate tables that can be linked together (related), so a customer's details can be automatically linked to each order they make.

In another example, a company may keep details of their customers in one table, but because each customer may have more than one contact person, these contact details would be kept in a separate table.

### Main Customer Table

Customer Code	Company Name	Phone	Fax	Grouping Code
ABC	ABC Tree Company	444 3567	444 3568	SB
SIM	Simpson Corporation	345 9879	345 9880	CORP

### Customer Contact Table

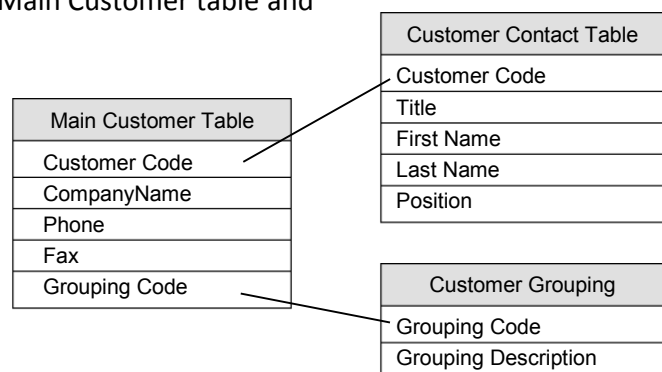
Customer Code	Title	First Name	Last Name	Position
ABC	Mr	John	Marshall	Manager
SIM	Ms	Kim	Shaw	General Manager
ABC	Miss	Jane	Adams	Secretary
SIM	Mr	Robert	Miller	Director

### Customer Grouping Table

Grouping Code	Grouping Description
SB	Small Business
CORP	Corporation
IND	Individual

The following diagram shows the links from the Main Customer Table to the Customer Contact table and Customer Grouping table. To have a link between each table there needs to be a common element, as shown below.

- The same Customer Code is used in the Main Customer table and in the Customer Contact table.
- The same Grouping Code is used in the Main Customer Table and in the Customer Grouping table.



Creating relationships between tables allows data to be extracted in a number of ways. The names and phone numbers of all customers could be required for a promotional call. Data from the Main Customer table and the Customer Contacts table would be collected and displayed in a **QUERY**.



A query is used to manipulate or present data stored in the database.

### Main Customer Table

Customer Code	Company Name	Phone	Fax	Grouping Code
ABC	ABC Tree Company	444 3567	444 3568	SB
SIM	Simpson Corporation	345 9879	345 9880	CORP

### Customer Contact Table

Customer Code	Title	First Name	Last Name	Position
ABC	Mr	John	Marshall	Manager
SIM	Ms	Kim	Shaw	General Manager
ABC	Miss	Jane	Adams	Secretary
SIM	Mr	Robert	Miller	Director

### Query

Customer Code	Title	First Name	Last Name	Position	Company Name	Phone
ABC	Mr	John	Marshall	Manager	ABC Tree Company	444 3567
SIM	Ms	Kim	Shaw	General Manager	Simpson Corporation	345 9879
ABC	Miss	Jane	Adams	Secretary	ABC Tree Company	444 3567
SIM	Mr	Robert	Miller	Director	Simpson Corporation	345 9879

Notice that relevant data from the Main Customer table (Company Name and Phone) has been matched to the relevant customer details of the Customer Contact table in the query.

### Advantages of a Relational Database

The first advantage of a relational database system is that it reduces the need for duplication of data.

For example, a wholesaling company might supply and deliver a number of products to a company called Forrest Traders Ltd.

- In a non-database environment, each sales order record would need to contain the customer's name and delivery address.
- In a database environment, the static data (name and address) can be stored once and accessed as many times as required.

This has significant advantages if a customer changes his/her address. In the non-database environment, the address would need to be changed for every order within the system. In a database environment the address would only need to be changed once.

Large amounts of data can be easily stored (reduced data duplication), extracted, manipulated and displayed. This becomes important if you have many customers. In a manual card based environment, the cards would usually be held in alphabetic sequence of customer name. If you wanted to target a sales campaign based on the geographic location of those customers, it would be a tedious task to re-sort those cards. A computer based relational database would achieve the same task quickly and easily.

In this book you will design and create a relational database using Microsoft Access 2013.

# Relational Database Management Systems



From this point, Access will be referred to without the version number (2013).

## What can be achieved with Microsoft Access

Microsoft Access can be used for a great variety of applications, including the following:

- Simple tasks such as maintaining telephone lists and directories.
- Creating and maintaining memberships of organisations such as sports clubs or professional associations.
- Controlling distribution sales.
- Stock control.
- Maintaining sales leads, customer feedback.
- Personnel records where both text based data and objects such as photographs are to be stored.



## Activities that can be handled by Microsoft Access

- Creation of stand-alone or related tables.
- Creation of forms that allow the easy input and editing of data in a table.
- Searching and displaying information in a variety of formats.
- Printing reports and mailing lists in a variety of sizes and formats.
- Including photographs, pictures, and charts as integrated components of the database.

## Structure of a Relational Database

Understanding the way a RDBMS stores data is the key to designing a relational database.

### Tables

The basic component of a database is the **TABLE**. The table stores the data contained within the database. A table is made up of **RECORDS** and **FIELDS**.

Each record is stored in a **Row**, while a field is stored in a **COLUMN**.

An individual item of data is known as a **VALUE**.

Customer ID	Customer Name	Street Address	Suburb	City	Postal Code	Phone Number	Fax Number
Adv1	Advanced Networking	260 Queen St.	Richmond	Nelson	7011	(03) 544 6600	(03) 544 6001
Bhj1	BHJ Institute	50 Stanhope Rd.	Ellerslie	Auckland	1050	(03) 525 6820	(03) 525 6821
Bus1	Business Systems Ltd.	10 Heather St.	Parnell	Auckland	1010	(09) 373 4728	(09) 373 4729
Bus2	Business Distributors Lt	20 Kent Terrace	Mt. Victoria	Wellington	6011	(04) 385 2477	(04) 385 2478
Har1	Harris Corporation	221 Hinemoa St.	Birkenhead	Auckland	0622	(09) 419 9786	(09) 419 9787
Pay1	Payment Solutions Ltd.	29 Nugent St.	Grafton	Auckland	1021	(09) 379 7688	(09) 376 7689
Ros1	Ross and Glover Ltd.	42 Douglas St.	Ponsonby	Auckland	1011	(09) 360 3455	(09) 360 3456

Field

Record

Value

## Records

A record is a single row in a database table containing all the information about a single item or subject, eg the company *Harris Corporation*.

Records are divided into fields.

## Fields

Fields store information that will be common to all of the records, eg *Customer Name*, *Street Address*, *Suburb*, etc. Field names identify each field.

## Values

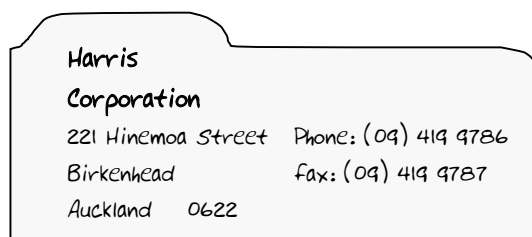
The values are stored where the row and columns intersect. Each single piece of data in the database is called a value, eg the street address of Harris Corporation.

## Storing Data

A database table stores data on a single subject, eg customer demographic information.

The data to be stored in the table is broken down into logical fields, as shown in the example below.

### Manual System



Harris  
Corporation  
221 Hinemoa Street Phone: (09) 419 9786  
Birkenhead Fax: (09) 419 9787  
Auckland 0622

### Database System

Cust ID	Customer Name	Street Address	Suburb	City	Post Code	Phone Number	Fax Number
Har1	Harris Corporation	221 Hinemoa Street	Birkenhead	Auckland	0622	(09) 419 9786	(09) 419 9787

Understanding how to break data into logical fields is essential in designing a database. By breaking up data into separate fields, data can then be grouped and manipulated into various forms to create information.

In the example above if you asked the question “what is the phone number of Harris Corporation?”, the answer in a database would be -

Customer Name	Phone
Harris Corporation	(09) 419 9786

A manual system would show all the data about the Harris Corporation, both significant and insignificant.



If the question was asked, “show me the names and fax numbers of all companies in the Auckland area”, the data displayed in a database would be -

Customer Name	City	Fax
Harris Corporation	Auckland	(09) 419 9787
Business Systems Ltd	Auckland	(09) 373 4728
Ross and Glover Ltd	Auckland	(09) 360 3456
BHJ Institute	Auckland	(09) 525 6821
Payment Solutions Ltd	Auckland	(09) 379 7689

In most cases the field that was searched, City, would not appear in the result as it is assumed that the same data (Auckland) will appear in the field and is not required to be displayed.



It is a good idea to break down addresses into multiple fields, eg street address, suburb, city, post code. This provides more flexibility when sorting or manipulating data.



### EXERCISE 1

- The data to be placed into various databases is shown below. The data needs to be organised into a database table. Circle which pieces of information go into fields for each database.

#### ***Quality Fish Distributors Database Data***

Pete's Fish and Chip Shop, 43 Ngarara Road, Waikanae, 5036, (04) 293 5350

The Hopper Fish Shop, 25 Hopper Street, Wellington, 5016, (04) 384 7388

Ralf's Fish N Chip Shop, 30 Wilsons Road, St Martins, Christchurch, 8011, (03) 348 8060

#### ***The Explorer Caravan Club Database Data***

Mark Graeme, 17 Compton Street, Northcote, Auckland, 0620, mark.graeme@hotmail.com

Bruce Harris, 22 Grove Street, Nelson, 7010, bruce.harris@clear.net.nz

Glenda Smith, 97 Bassett Road, Remuera, Auckland, 1010, gsmith@xtra.co.nz

Chris Freeman, 80 Argyle Avenue, Palmerston North, 4410, chris1000@hotmail.com

John Ellis, 88 Fields Parade, Browns Bay, Auckland, 0630, ellis@clear.net.nz

#### ***Car Rental Database Data***

XY3373, Ford Falcon, XR6, 2015, Auto, 23,000 Kms, Black, \$80 per day

RN288, Holden Commodore, VT SS, 2014, Auto, 58,000 Kms, Red, \$60 per day

ZT1220, Mazda 626 GLX, 2013, Auto, 69,000 Kms, Green, \$50 per day

*Answers shown at the end of this section.*

## Assigning Field Names

Once you have broken down the data into individual fields, each field needs to be given a name.

Field name

Customer ID	Customer Name	Street Address	Suburb	City	Postal Code	Phone Number	Fax Number
Adv1	Advanced Networking	260 Queen St.	Richmond	Nelson	7011	(03) 544 6600	(03) 544 6001
Bhj1	BHJ Institute	50 Stanhope Rd.	Ellerslie	Auckland	1050	(03) 525 6820	(03) 525 6821
Bus1	Business Systems Ltd.	10 Heather St.	Parnell	Auckland	1010	(09) 373 4728	(09) 373 4729
Bus2	Business Distributors Ltd.	20 Kent Terrace	Mt. Victoria	Wellington	6011	(04) 385 2477	(04) 385 2478
Har1	Harris Corporation	221 Hinemoa St.	Birkenhead	Auckland	0622	(09) 419 9786	(09) 419 9787
Pay1	Payment Solutions Ltd.	29 Nugent St.	Grafton	Auckland	1021	(09) 379 7688	(09) 376 7689
Ros1	Ross and Glover Ltd.	42 Douglas St.	Ponsonby	Auckland	1011	(09) 360 3455	(09) 360 3456

It is important to assign **FIELD NAMES** that clearly describe the data contained within the field. The name should not be long or over descriptive, and should be unique within the table.

Multi-word names can include spaces, but the words can also be indicated by starting each word with an upper case letter eg CustomerName. Underscores between words can also be used (Customer\_Name).

## Table Names

Once you have broken down data and assigned field names the data is then entered into the tables.

Customer ID	Customer Name	Street Address	Suburb	City	Postal Code	Phone Number	Fax Number
Adv1	Advanced Networking	260 Queen St.	Richmond	Nelson	7011	(03) 544 6600	(03) 544 6001
Bhj1	BHJ Institute	50 Stanhope Rd.	Ellerslie	Auckland	1050	(03) 525 6820	(03) 525 6821
Bus1	Business Systems Ltd.	10 Heather St.	Parnell	Auckland	1010	(09) 373 4728	(09) 373 4729
Bus2	Business Distributors Ltd.	20 Kent Terrace	Mt. Victoria	Wellington	6011	(04) 385 2477	(04) 385 2478
Har1	Harris Corporation	221 Hinemoa St.	Birkenhead	Auckland	0622	(09) 419 9786	(09) 419 9787
Pay1	Payment Solutions Ltd.	29 Nugent St.	Grafton	Auckland	1021	(09) 379 7688	(09) 376 7689
Ros1	Ross and Glover Ltd.	42 Douglas St.	Ponsonby	Auckland	1011	(09) 360 3455	(09) 360 3456

Each table is given a name. The name of each table should reflect the subject of the data contained within it, eg the above table would likely be saved with the name of *Customers*.



## EXERCISE 2

- The following tables have been created for various databases. Give each table an appropriate name (there may be more than one possible answer - give only one). The first table has been done for you.

### Quality Fish Distributors Database Data

Table Name: ..... Customers or Clients .....

ID	Company Name	Street	Suburb	City	Post Code	Phone Number
Hop1	The Hopper Fish Shop	25 Hopper St.		Wellington	5036	(04) 384 7388
Pet1	Pete's Fish and Chip Shop	43 Ngarara Rd.		Waikanae	5016	(04) 293 5350
Ral1	Ralf's Fish N Chip Shop	30 Wilsons Rd.	St Martins	Christchurch	8011	(03) 348 8060

### The Explorer Caravan Club Database Data

Table Name: .....

ID	First Name	Last Name	Street	Suburb	City	Post Code	Email Address
1	Mark	Graeme	17 Compton St.	Northcote	Auckland	0620	mark.graeme@hotmail.com
2	Bruce	Harris	22 Grove St.		Nelson	7010	bruce.harris@clear.net.nz
3	Glenda	Smith	97 Bassett Rd.	Remuera	Auckland	1010	gsmith@extra.co.nz
4	Chris	Freeman	80 Argyle Avenue		Palmerston North	4410	chris100@hotmail.com
5	John	Ellis	88 Fields Parade	Browns Bay	Auckland	0630	ellis@clear.net.nz

### Car Rental Database Data

Table Name: .....

Registration	Make	Model	Type	Year	Transmission	Mileage	Colour	Daily Rate
RN288	Holden	Commodore	VT SS	2014	Auto	58,000 Kms	Red	\$60.00
XY3373	Ford	Falcon	XR6	2015	Auto	23,00 Kms	Black	\$80.00
ZT1200	Mazda	626	GLX	2013	Auto	69,000 Kms	Green	\$50.00

Answers shown at the end of this section.

## Primary Key

Each record in a table needs to be unique, ie there must be some way of differentiating each record from all the other records stored in the table.

This is done by the creation of a **PRIMARY KEY**. A primary key is a field (or fields) in a table which uniquely identifies each record. Once the primary key has been set, Access ensures that each record remains unique by preventing any duplicates or null values (no data) being entered into the primary key field. Every table in an Access database should have a primary key.

You must take care when selecting which field to be the primary key. A name field is not a good choice as it may be duplicated in the table (eg, you may have more than one "Jones" in your table). Frequently a code or ID number is used to uniquely identify each record.

### Structure of the table

Primary Key

Field Name
Product ID
Product Name
Category

### Data within the table

Primary Key

Product ID	Product Name	Category
1	The Women's Weekly Magazine	MAG
2	Fun in the Pacific	NONFICT
3	John's Cruise	FICT
4	4 Wheel Extreme	MAG
5	Cheryl's Guide to Healthy Eating	NONFICT
6	Star Trek Explorer	FICT



### EXERCISE 3

- Circle the fields in the following tables that could be used as a primary key. Remember the field must have unique data to represent each record.

#### Quality Fish Distributors Database Data

ID	Company Name	Street	Suburb	City	Post Code	Phone Number
Hop1	The Hopper Fish Shop	25 Hopper St.		Wellington	5036	(04) 384 7388
Pet1	Pete's Fish and Chip Shop	43 Ngarara Rd.		Waikanae	5016	(04) 293 5350
Ral1	Ralf's Fish N Chip Shop	30 Wilsons Rd.	St Martins	Christchurch	8011	(03) 348 8060
*						

#### The Explorer Caravan Club Database Data

ID	First Name	Last Name	Street	Suburb	City	Post Code	Email Address
1	Mark	Graeme	17 Compton St.	Northcote	Auckland	0620	mark.graeme@hotmail.com
2	Bruce	Harris	22 Grove St.		Nelson	7010	bruce.harris@clear.net.nz
3	Glenda	Smith	97 Bassett Rd.	Remuera	Auckland	1010	gsmith@extra.co.nz
4	Chris	Freeman	80 Argyle Avenue		Palmerston North	4410	chris100@hotmail.com
5	John	Ellis	88 Fields Parade	Browns Bay	Auckland	0630	ellis@clear.net.nz

#### Car Rental Database Data

Registration	Make	Model	Type	Year	Transmission	Mileage	Colour	Daily Rate
RN288	Holden	Commodore	VT SS	2014	Auto	58,000 Kms	Red	\$60.00
XY3373	Ford	Falcon	XR6	2015	Auto	23,00 Kms	Black	\$80.00
ZT1200	Mazda	626	GLX	2013	Auto	69,000 Kms	Green	\$50.00

Answers shown at the end of this section.

## Normalization

For a relational database to work effectively it needs to be “normalized”. **NORMALIZATION** is a process of organising data to minimise data duplication in a relational database. This process identifies data duplication, ensures that each field in a table contains different data, and that fields in a table are directly related to the primary key.

There are five processes of normalization. In this book we will only look at the first three -

*First Normal Form (1NF)*

*Second Normal Form (2NF)*

*Third Normal Form (3NF)*

### First Normal Form (1NF)

The **FIRST NORMAL FORM** is a process used to ensure that each field/column is not duplicated. A customer table containing company details could only hold more than one contact person by inserting duplicate fields for each contact. For example, if a table contained three fields for contacts named Contact Name 1, Contact Name 2, and Contact Name 3, companies with only one contact would have two blank fields in their records: and you would not be able to store complete data for any company that had more than three contacts. The first part of normalization is to avoid this situation. The data is rearranged so that it is repeated when there is a second, third, or even fourth contact.

The second part of First Normal Form is to ensure that the table contains a unique identifier (primary key).

The table below demonstrates how First Normal Form works.

**Original Table**

Company ID	Company Name	Phone Number	Contact Name 1	Contact Name 2	Contact Name 3
1	Gibson Builders	(09) 448 1093	John Gibson	Mark Fraser	Ross Hay
2	Paint Galore	(09) 378 8388	Chris Morgan		
3	Adept Concrete	(09) 393 3221	Andrew Peterson	Don Morris	

**New Table**

Company ID	Company Name	Phone Number	Contact Name
1	Gibson Builders	(09) 448 1093	John Gibson
1	Gibson Builders	(09) 448 1093	Mark Fraser
1	Gibson Builders	(09) 448 1093	Ross Hay
2	Paint Galore	(09) 378 8388	Chris Morgan
3	Adept Concrete	(09) 393 3221	Andrew Peterson
3	Adept Concrete	(09) 393 3221	Don Morris

Gibson Builders now has three records, and Adept Concrete has two. In the new table you can see that each record contains only one kind of the same type of data, ie one Contact Name.



#### EXERCISE 4

- Identify which fields have the same type of data repeated. Then produce a table with the data normalised using First Normal Form. Use the same methods as shown above.

**Original Table**

Student ID	First Name	Last Name	Course 1	Course 2	Course 3
1	John	Marks	Basic Computing		
2	Rachael	Hart	Word Processing	Spreadsheets	
3	Fiona	Johnson	Basic Computing	Spreadsheets	Web Design

(Extra rows and columns have been left in the following table.)

**New Table**


## Second Normal Form (2NF)

The **SECOND NORMAL FORM** ensures that the First Normal Form has been fulfilled and that any non-primary key field relates to the primary key field in a table. This means that you must have completed the First Normal Form before moving onto the Second Normal Form stage. Second Normal Form process is to remove multiple records and place them in a separate table. Relationships between the tables are created using Primary and Foreign Keys (which will be explained later in this section).

The following example shows that the contact person does not rely on the order number, but the customer name, product and quantity are reliant on the primary key (ie OrderNum). In other words, the contact field is not directly relevant to the table so it is placed in another table.

### Example - Orders

Order Num	Customer Name	Contact	Product ID	Product	Quantity
1	Riverside Bookshop	Mary Douglas	C250	The Ultimate Italian Cookbook	5
2	Bookworm	Frank Hope	M500	Project Management	2
2	Bookworm	Frank Hope	F345	Yoga for Beginners	4
3	Riverside Bookshop	Mary Douglas	G395	Cottage Gardens	2
4	Bookworm	Frank Hope	H990	Balancing your Diet	3

### Example - Orders Split into two tables (Customer Details and Orders)

#### Customer

Customer Name	Contact
Riverside Bookshop	Mary Douglas
Bookworm	Frank Hope

#### Orders

Order Num	Customer Name	Product ID	Product	Quantity
1	Riverside Bookshop	C250	The Ultimate Italian Cookbook	5
2	Bookworm	M500	Project Management	2
2	Bookworm	F345	Yoga for Beginners	4
3	Riverside Bookshop	G395	Cottage Gardens	2
4	Bookworm	H990	Balancing your Diet	3