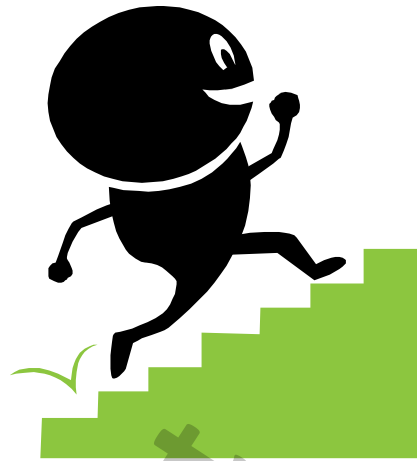


Easy Steps



Unit 18742 (V5)

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

with

Microsoft Access 2010

- ☒ 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 2010

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

Unit Standard 18742 - COMPUTING (Level 4, Credit 8)

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. These are available for free download from our web site at www.cherylprice.co.nz. Instructions for downloading are included on the next page.

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CODE: CP18742V5A2010-0814

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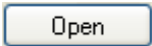

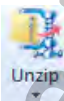



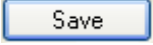
1	In your web browser, type: www.cherylprice.co.nz
2	Press Enter on the keyboard to display the Cheryl Price website.
3	Click in the Product Search box and type the number of this unit standard, as shown at the right. <div data-bbox="1077 465 1380 645" data-label="Image"> </div>
4	Click on  Search
5	Click on US 18742
6	Under the Exercise Files heading click on the underlined blue hyperlink, ie Book Exercise Files – V5 Access 2010 Free Download The File Download dialog box will display.
7	If you have Winzip use the following instructions otherwise move to step 8.
	a Click on  Open .
	b Click on the  of the  Unzip button.
	c If My Documents folder is not displayed click on Set default unzip folder at the bottom of the list. Ensure My Documents is selected then click on Select Folder.
	d Click on the  of the  Unzip button and click on the My Documents folder. The files will be unzipped.
8	Click on  Save as then click on the Documents folder shown at the right. Click on  Save <div data-bbox="1042 1608 1345 1731" data-label="Image"> </div>
9	Click on Open Folder which will display My Documents folder. Right click on the zipped exercise file and select Extract All. Click on Extract. A folder will be created containing the exercise files.

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Sample Document

Unit Standard 18742 (Version 5)

Title	Produce a relational database solution for organisational use		
Level	4	Credits	8

Purpose	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.
----------------	---

Classification	Computing > Generic Computing
-----------------------	-------------------------------

Available grade	Achieved
------------------------	----------

Entry information	
Recommended skills and knowledge	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.

- 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.
- 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.

Planned review date	31 December 2016
----------------------------	------------------

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
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

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

Exercise Files used in this book

(Instructions are at the front of this book for downloading retrievable files from our web site.)

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

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 2010
- ☐ Use Access Help
- ☐ Customise the setup in Access 2010
- ☐ Explore a relational database

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.

Note 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 need to be updated regularly.

Different Types of Databases

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

Flat File (Single Table)

All data is stored within one table/area. All data is accessed from this table/area.

CustomerCode	CompanyName	Phone	Fax	ContactName	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 2010 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

CustomerCode	CompanyName	Phone	Fax	GroupingCode
ABC	ABC Tree Company	444 3567	444 3568	SB
SIM	Simpson Corporation	345 9879	345 9880	CORP

Customer Contact Table

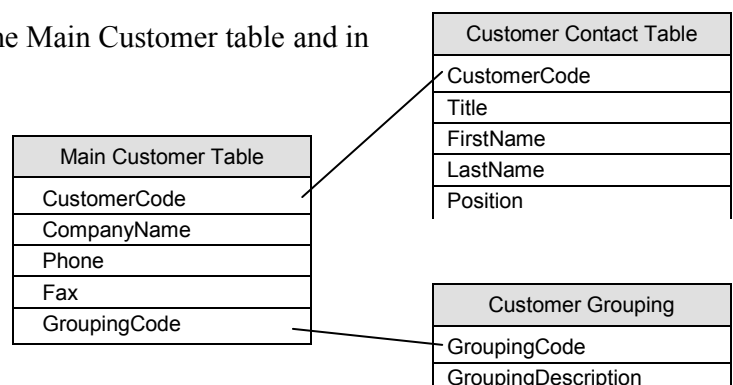
CustomerCode	Title	FirstName	LastName	Position
ABC	Mr	John	Marshall	Manager
SIM	Ms	Kim	Shaw	General Manager
ABC	Miss	Jane	Adams	Secretary
SIM	Mr	Robert	Miller	Director

Customer Grouping Table

GroupingCode	GroupingDescription
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*.

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

Main Customer Table

CustomerCode	CompanyName	Phone	Fax	GroupingCode
ABC	ABC Tree Company	444 3567	444 3568	SB
SIM	Simpson Corporation	345 9879	345 9880	CORP

Customer Contact Table

CustomerCode	Title	FirstName	LastName	Position
ABC	Mr	John	Marshall	Manager
SIM	Ms	Kim	Shaw	General Manager
ABC	Miss	Jane	Adams	Secretary
SIM	Mr	Robert	Miller	Director

Query

CustomerCode	Title	FirstName	LastName	Position	CompanyName	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 2010.

Relational Database Management Systems

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 most 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.

	CustID	CustomerName	StreetAddress	Suburb	City	PostCode	PhoneNumber	FaxNumber
	Adv1	Advanced Networking	260 Queen Street	Richmond	Nelson	7011	(03) 544 6600	(03) 544 6001
	Bhj1	BHJ Institute	50 Stanhope Road	Ellerslie	Auckland	1050	(09) 525 6820	(09) 525 6821
	Bus1	Business Systems Ltd	10 Heather Street	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
Record	Har1	Harris Corporation	221 Hinemoa Street	Birkenhead	Auckland	0622	(09) 419 9786	(09) 419 9787
	Pay1	Payment Solutions Ltd	29 Nugent Street	Grafton	Auckland	1021	(09) 379 7688	(09) 379 7689
	Ros1	Ross and Glover Ltd	42 Douglas Street	Ponsonby	Auckland	1011	(09) 360 3455	(09) 360 3456

Field

Value

Records

A record is a single row in a database table containing all of 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 *CustomerName*, *StreetAddress*, *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

CustID	CustomerName	StreetAddress	Suburb	City	PostCode	PhoneNumber	FaxNumber
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 -

CustomerName	Phone
Harris Corporation	(09) 419 9786

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

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

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

CustomerName	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.

Note 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, 2002, Auto, 23,000 Kms, Black, \$80 per day

RN288, Holden Commodore, VT SS, 2001, Auto, 58,000 Kms, Red, \$60 per day

ZT1220, Mazda 626 GLX, 2000, 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.

	CustID	CustomerName	StreetAddress	Suburb	City	PostCode	PhoneNumber	FaxNumber
	Adv1	Advanced Networking	260 Queen Street	Richmond	Nelson	7011	(03) 544 6600	(03) 544 6001
	Bhj1	BHJ Institute	50 Stanhope Road	Ellerslie	Auckland	1050	(09) 525 6820	(09) 525 6821
	Bus1	Business Systems Ltd	10 Heather Street	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 Street	Birkenhead	Auckland	0622	(09) 419 9786	(09) 419 9787
	Pay1	Payment Solutions Ltd	29 Nugent Street	Grafton	Auckland	1021	(09) 379 7688	(09) 379 7689
	Ros1	Ross and Glover Ltd	42 Douglas Street	Ponsonby	Auckland	1011	(09) 360 3455	(09) 360 3456

Field naming conventions (rules) have been used with no spaces in field names. Each field name should be unique to avoid confusion.

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. Spaces should not be included within field names as this can cause problems when creating queries. Uppercase can be used to identify individual words within a field name, eg CustomerName. Underscores between words can also be used. Examples of appropriate and inappropriate field names are shown below.

Inappropriate Field Names

Customer's Name
Street Delivery Address
City Delivery Address
Phone Number
Paragraph describing product

Appropriate Field Names

CustomerName
DeliveryStreet
Delivery_City
PhoneNumber
Product_Description

Exercise 2

- Complete the following table inserting appropriate field names. The first example has been done for you.

Inappropriate Field Names	Appropriate Field Names
Quantity in Stock	QuantityInStock
Date of birth	
Date they joined the club	
Shipping Company Used	
Category of Product	
Email address	
Status of Membership	
Unit Price	
Credit Card Number	
Method of Payment	
Name of Publisher	
Serial Number	

Answers shown at the end of this section.

Table Names

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

	CustID	CustomerName	StreetAddress	Suburb	City	PostCode	PhoneNumber	FaxNumber
	Adv1	Advanced Networking	260 Queen Street	Richmond	Nelson	7011	(03) 544 6600	(03) 544 6001
	Bhj1	BHJ Institute	50 Stanhope Road	Ellerslie	Auckland	1050	(09) 525 6820	(09) 525 6821
	Bus1	Business Systems Ltd	10 Heather Street	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 Street	Birkenhead	Auckland	0622	(09) 419 9786	(09) 419 9787
	Pay1	Payment Solutions Ltd	29 Nugent Street	Grafton	Auckland	1021	(09) 379 7688	(09) 379 7689
	Ros1	Ross and Glover Ltd	42 Douglas Street	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.

It is good practice to follow naming conventions for database objects. In this book the name of each table will start with the characters **tbl**. This will allow tables to be easily distinguished from other database objects.

Exercise 3

- The following tables have been created for various databases. Give each table an appropriate name using the naming convention mentioned above (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: *tblCustomers or
tblClients*

	ID	CompanyName	Street	Suburb	City	PostCode	PhoneNumber
	Hop1	The Hopper Fish Shop	25 Hopper Street		Wellington	5036	(04) 384 7388
	Pet1	Pete's Fish and Chip Shop	43 Ngarara Road		Waikanae	5016	(04) 293 5350
	Ral1	Ralf's Fish N Chip Shop	30 Wilsons Road	St Martins	Christchurch	8011	(03) 348 8060

The Explorer Caravan Club Database Data

Table Name:

	ID	FirstName	LastName	Street	Suburb	City	PostCode	EmailAddress
	1	Mark	Graeme	17 Compton Street	Northcote	Auckland	0620	mark.graeme@hotmail.com
	2	Bruce	Harris	22 Grove Street		Nelson	7010	bruce.harris@clear.net.nz
	3	Glenda	Smith	97 Bassett Road	Remuera	Auckland	1010	gsmith@xtra.co.nz
	4	Chris	Freeman	80 Argyle Avenue		Palmerston North	4410	chris1000@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	DayRate
	RN288	Holden	Commodore	VT SS	2001	Auto	58,000 Kms	Red	\$60.00
	XY3373	Ford	Falcon	XR6	2002	Auto	23,000 Kms	Black	\$80.00
	ZT1200	Mazda	626	GLX	2000	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 make the primary key. A name is not a good primary key 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.

Data within a table

Product ID	Product Name	Category
1	The Womens Weekly Magazine	MAG
2	Fun 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

Structure of the table

Field Name
ProductID
ProductName
CategoryID
UnitPrice

Exercise 4

- 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	CompanyName	Street	Suburb	City	PostCode	PhoneNumber
Hop1	The Hopper Fish Shop	25 Hopper Street		Wellington	5036	(04) 384 7388
Pet1	Pete's Fish and Chip Shop	43 Ngarara Road		Waikanae	5016	(04) 293 5350
Ral1	Ralf's Fish N Chip Shop	30 Wilsons Road	St Martins	Christchurch	8011	(03) 348 8060

The Explorer Caravan Club Database Data

ID	FirstName	LastName	Street	Suburb	City	PostCode	EmailAddress
1	Mark	Graeme	17 Compton Street	Northcote	Auckland	0620	mark.graeme@hotmail.com
2	Bruce	Harris	22 Grove Street		Nelson	7010	bruce.harris@clear.net.nz
3	Glenda	Smith	97 Bassett Road	Remuera	Auckland	1010	gsmith@xtra.co.nz
4	Chris	Freeman	80 Argyle Avenue		Palmerston North	4410	chris1000@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	DayRate
RN288	Holden	Commodore	VT SS	2001	Auto	58,000 Kms	Red	\$60.00
XY3373	Ford	Falcon	XR6	2002	Auto	23,000 Kms	Black	\$80.00
ZT1200	Mazda	626	GLX	2000	Auto	69,000 Kms	Green	\$50.00

Answers shown at the end of this section.

Normalization

For a relational database to work effectively you need to perform “normalization”. This 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 dependent upon 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/columns for each contact. The first part of normalization is to avoid duplicating fields/columns. The data is rearranged so that it is repeated when there is a second contact or third contact person.

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

The table shown below demonstrates how First Normal Form works.

Original Table

CompanyID	CompanyName	PhoneNumber	ContactName1	ContactName2	ContactName3
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

CompanyID	CompanyName	PhoneNumber	ContactName
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

Notice that 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 ContactName.

Exercise 5

- 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 on the previous page.

Original Table

StudentID	FirstName	LastName	Course1	Course2	Course3
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.

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 - tblOrders

OrderNum	CustomerName	Contact	ProductID	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)

tblCustomer

CustomerName	Contact
Riverside Bookshop	Mary Douglas
Bookworm	Frank Hope

tblOrders

OrderNum	CustomerName	ProductID	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