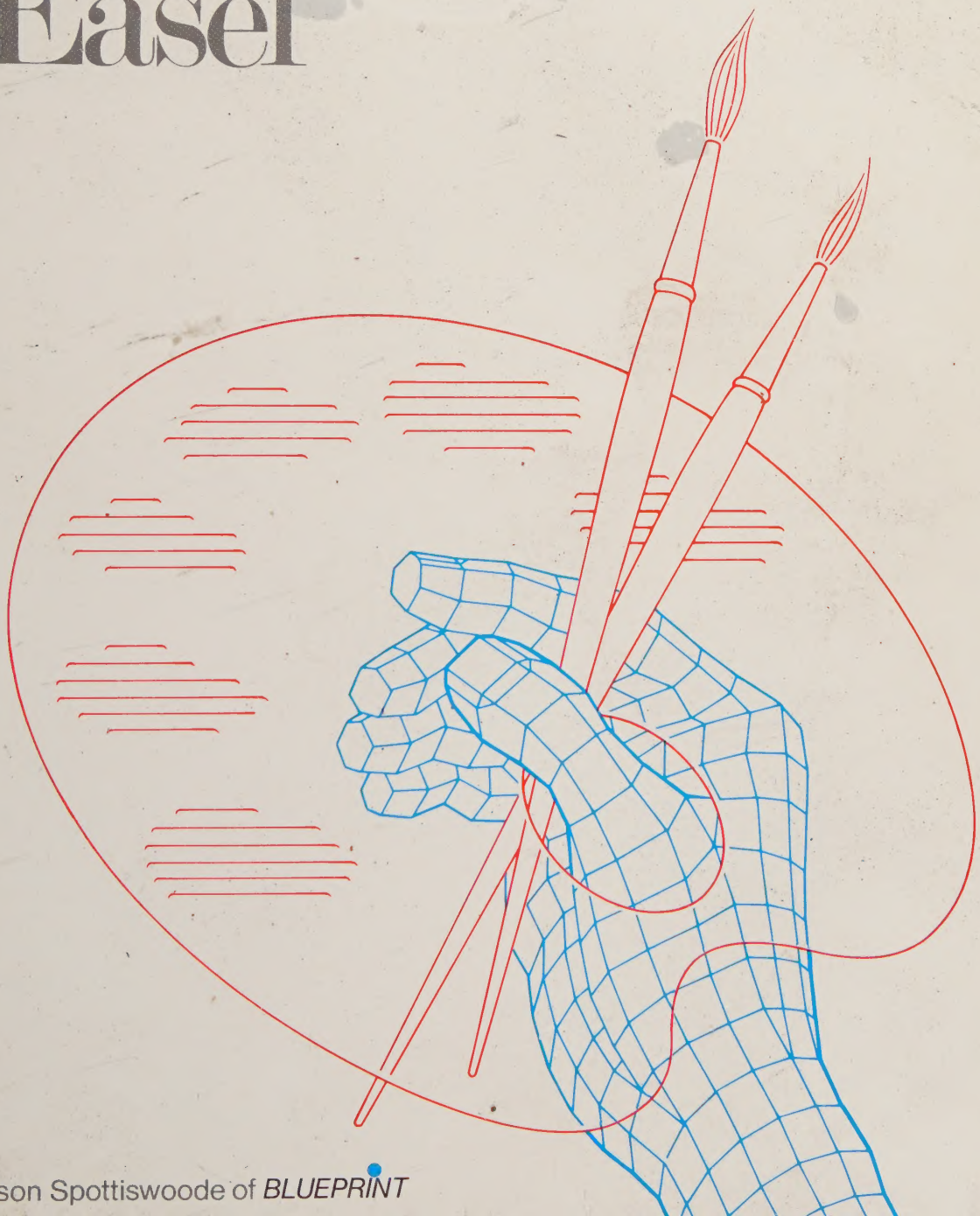
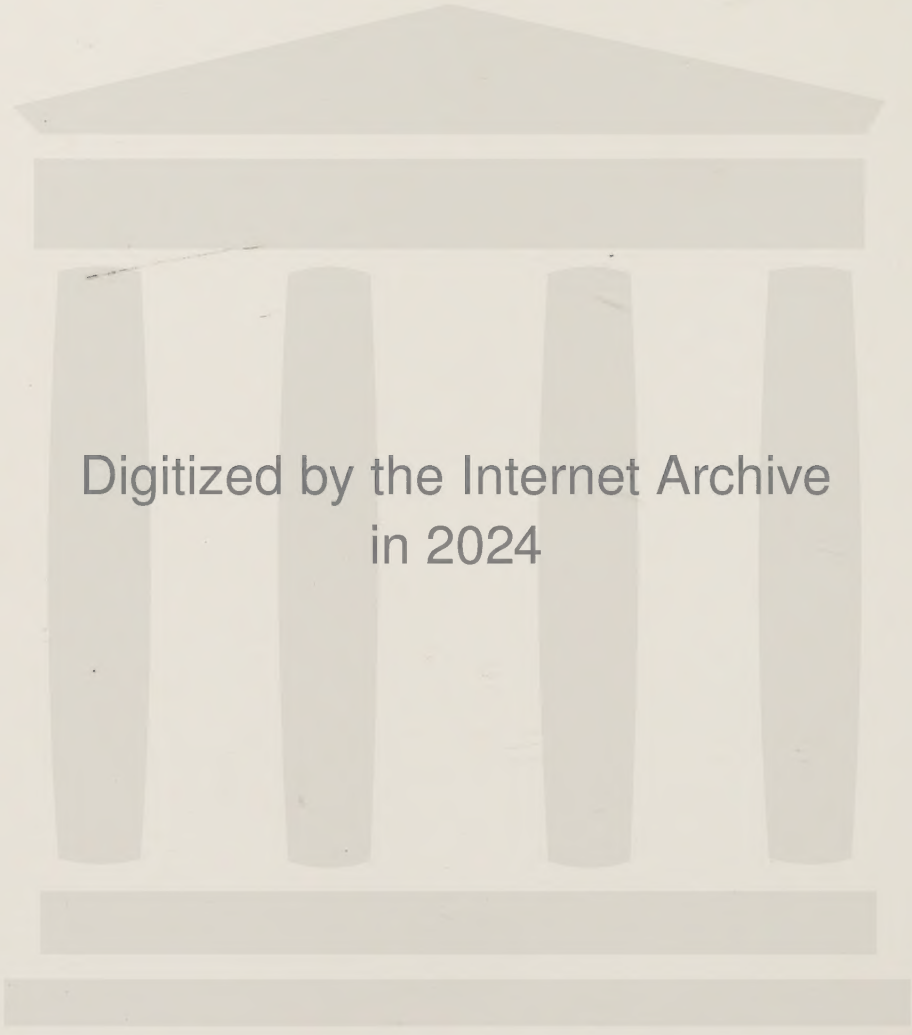
QL Easel



Alison Spottiswoode of *BLUEPRINT*


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QL Easel

a *BLUEPRINT* handbook

Alison Spottiswoode

Century Communications Ltd.

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The EASEL handbook

The EASEL Handbook is a excellent straightforward guide for people who are unfamiliar with the use of computer graphics. The book explains not only how to use the QL, but also how best to exploit the potential of computer graphics.

Written without jargon, the book explains how to use EASEL quickly, effectively and confidently. In addition to teaching the basic principles it includes:

- Step-by-Step Instructions
- Which Graph to use
- How to Avoid making Simple Mistakes
- Points to Remember
- Quick Reference Section
- Business Tips
- Graph-drawing Techniques
- Advice on Printers

The author has had extensive practical experience with Micro-computers and has written an amusing, informative guide to graphics and EASEL.

About the Author

Alison Spottiswoode is a director of Spottiswoode & Spottiswoode, a company specialising in the design of Microcomputer software for business people who have no experience of computers. She worked for IBM writing software before reading Natural Sciences at Cambridge University. Alison worked in Marketing for Shell U.K. Oil in London, Derbyshire and Watford before starting up in business with her sister.

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Finally, grateful thanks are due to the publisher, Richard Brockbank, for his many words of wisdom and to the editor, Oscar Turnill, who INSERTed, ERASEd and only occasionally ZAPped with kindly ferocity.

Note: All the graphs in this book have been drawn with EASEL and printed directly from the computer using an *Epson* FX-80 printer.

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Preface

You've got EASEL – now you need a book to take you to the limit of its capabilities, without jargon or tears. Most of us are bewildered by lists of numbers; graphs make them instantly comprehensible. Yet drawing graphs has always been a tedious labour.

Not any longer. At the touch of a few keys, EASEL will do all the hard work for you: this book will explain what those keys are.

But this is more, much more, than just another computer instruction book. Crammed with ideas, the book shows how very useful a graph can be - at work, at home and at school, in fact useful in everything from football analysis to controlling food bills.

Whether you're familiar with graphs or not, you'll find this book an invaluable source of inspiration. Not only are there plenty of interesting examples, we also show how best to fulfil the potential of a graph by wise choice of design, colour and shape.

The first three chapters give a step by step guide to using EASEL to produce clear and understandable graphs. No jargon; all instructions are clear and precise. The next two chapters tackle the design of graphs themselves – how best to convey your message. Chapters 6 – 9 employ a host of practical examples, including some interesting graph-drawing tricks and more advanced features of EASEL. Finally we tell you what to do when you've finished the graph.

The EASEL handbook not only explains how EASEL works but also what to do when it doesn't. A detailed appendix gives lists of error messages and how to correct each mistake.

The book is designed for quick reference. A brief description of all EASEL's commands is given in an appendix, and alongside the detailed instructions in every chapter are drawings of the keys you need to press. All the EASEL commands are clearly identified in small capitals throughout the text.

The examples frequently draw on the experiences of the Blake family, whom you may have already met in the other QL handbooks in this series. Mr Blake is the a production manager of a small soft toy factory, and has recently embarked on a fanatical health drive. Mrs Blake is doing well with her own business – importing jewellery from Thailand. Miranda (their daughter) and Nigel (the actor) are back from their honeymoon in Crete, and the Blake twins, Chris and Paula, are just starting to take some interest in school work. You'll discover more about them as you progress through the book.

You'll enjoy the clear and intelligent tone of the book – by the end the magic of EASEL will be yours to command.



This is Joyce Blake. Joyce is Harold's wife. She is also setting up her own business, Jada Jewellery. Joyce is thrilled. Harold isn't sure.



This is Harold Blake. Harold is Joyce's husband. He is production manager of a soft-toy company, Tees Toys. He is two gin-and-tonics a day overweight.



This is Miranda Blake. She is Joyce and Harold's daughter. She is a solicitor. She is also Nigel Wooten's fiancée, for reasons which escape everyone.



This is Nigel Wooten. Nigel is Miranda's fiancé. Nigel is an actor. He thinks he is the next Olivier. This is open to debate.



This is Chris Blake and this is Paula Blake. They are Harold and Joyce's twins. Chris likes Toyah. Paula prefers Boy George. Otherwise, there is not much difference between them.

Cartoons by Derek Alder of the *Sunday Times*

CHAPTER 1

First Steps

Away with the pencil. Discard that rubber. Burn your dog-eared graph paper. No more slaving with ruler and set square – EASEL, the versatile graphics package from Psion, has taken the boredom out of graph-drawing. With EASEL you can draw graphs in a fraction of the normal time. Then if it's wrong, no need to tear it up and start all over again. You can recall the original graph and make the necessary changes on the screen.

EASEL is exceptionally easy to use. There are no strange symbols, and EASEL keeps any lists of numbers well out of sight. It's also very flexible. You can change colours, erase mistakes and re-shape the graph with impressive ease.

People who have never used a computer often worry that pressing the wrong key will destroy program and machine. It won't. The worst that can happen is that you will lose the graph you were creating and have to draw it again. Simple precautions – like not pulling the plug – can easily prevent that.

If, initially, you're not entirely at home with the QL, EASEL or computers generally, our advice is to take it slowly. It's easy to find your way through the book, so you can always return to any points that aren't quite clear.

THE QL

The slim Sinclair keyboard holds a sophisticated computer. It is a powerful machine, waiting to do work, and obey instructions. Software is the program of instructions that, with your help, tells the computer what to do. The software is recorded on the Sinclair cartridge, rather like the music on an audio cassette.

The main difference is that you can switch off a recorder at any time without harming the tape. If you pull out the plug on a computer without recording the graphs you've created, they'll be lost.

The Keyboard

The keyboard is shown below, with an explanation of what all the keys do. All of them will be explained in detail in this book.



[↵]	**ENTER** Tells EASEL that you've finished typing text or a number
[ESC]	**ESCAPE** key. Very important for keeping you on course by going back to the previous step
[CTRL]	**CTRL** is the *control* key. Used for deleting text in association with other keys
[ALT]	Ignore. Has no function in EASEL
[CAPS LOCK]	LOCKS keys into capital letters when you press it the first time. Press it again to restore lower case letters
[TAB]	**TABULATE** key. Moves on to next cell on graph
	Arrow keys
[↑] [↓]	move cursor/crosswires up/down
[←] [→]	move cursor/crosswires left/right
	Function keys
[F1]	The HELP key
[F2]	Switches PROMPTS on/off
[F3]	The COMMAND key
[F4]	DELETE – erases various parts of the graph
[F5]	INSERT – inserts a new cell into the graph

MICRODRIVE CARTRIDGE

The cartridge is the black rectangular object that you insert into the Microdrive.

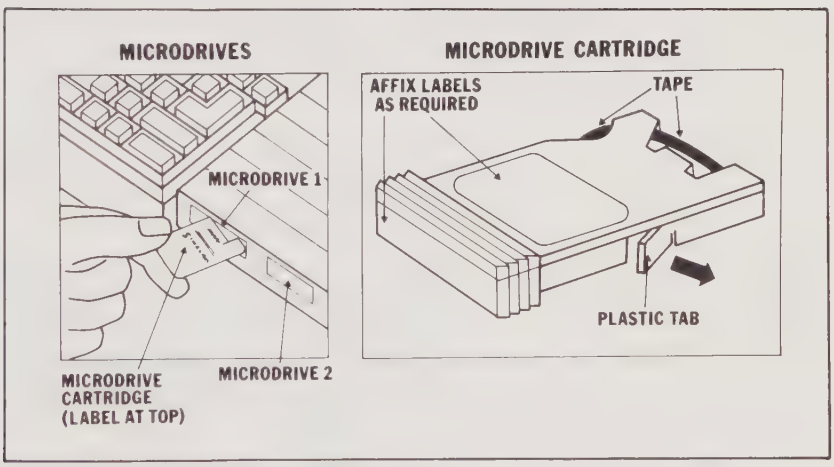
The Microdrive cartridge is very similar to a cassette tape, but it has been designed to run on the QL computer. One of your cartridges holds the EASEL program – it is in the special pack with ABACUS, ARCHIVE and QUILL. You will need several blank cartridges to record your graphs – like cassette tapes you can always re-record them later.

There is a small rectangle on one side of the cartridge for the label (see diagram) . It is important to keep this label up to date so you can see at a glance what is on the cartridge. When you place the cartridge in the Microdrive this label will be on the top face.

Labelling Cartridges

The label on a Microdrive cartridge is small. It is useful to label the cartridges with a number, and keep a separate record of what is on each cartridge in a book. Keep a separate page for each cartridge, and as you add or delete files write the changes into the book.

Look at the difference between your EASEL cartridge and a new cartridge. The small projection along one side is missing on the EASEL program cartridge. This is a neat safety device. Once this projection has been removed the computer will not add to or erase anything from that cartridge; it will only read information from it. This means that neither you nor anyone else can accidentally erase your EASEL program, or do anything to harm it by pressing the wrong keys.



COPYING PROGRAM CARTRIDGE

Before using EASEL for the first time you *must* make a copy of the program for safe keeping. This is vital. Microdrive cartridges don't last for ever, and can be damaged – quite apart from the normal hazards of wear and tear the dog could chew the cartridge or a child could pull out the tape. Tripping over a power cable and breaking the power supply could damage the program cartridge. In all these events you would lose EASEL.

To take a copy of the EASEL program you need to follow certain procedures. Follow the instructions below to the letter; it doesn't matter if you don't understand them. The process employs a

computer language known as SuperBASIC. Afterwards you can forget all about it – you won't use it in EASEL.

1 Switch the computer on
Ensure that the power cable is connected and power on (the yellow light on the left of the QL confirms this) , and press the switch at the back right-hand side of the computer. Don't insert any Microdrive cartridges into the machine just yet. After a few moments the screen will display the message:

```
F1.....Monitor
F2.....TV

c 1983 Sinclair Research Ltd.
```

Note: If you are using a TV you may need to tune it to the right channel for the QL. If you have enough channels, you can keep one of the spare ones permanently tuned for the QL.

F1 or F2 2 Press **F1** if you have a special computer monitor
F2 if you have a domestic TV

The computer will first check that you don't have a program cartridge in the left-hand drive, and as you don't you are presented with the QL screen (a blank white/red screen on a monitor or a blank white screen on a TV). The cursor blinks at the bottom of the screen, waiting for your next move

3 Place the EASEL cartridge in the right-hand drive

4 Place a new blank cartridge in the left-hand drive

5 Type `lrun mdv2_clone`

Note: this is the letter 'l' not the number '1'. Note also the blank space between '`lrun`' and '`mdv2`' (press the **SPACE BAR**) and the underscore '_' (**SHIFT** + hyphen key) before '`clone`'. Translated, you are asking the computer to load and run a Basic program called '`clone`' from the second (right-hand) Microdrive cartridge

↵ 6 Press **ENTER**
The Microdrives whirr into action. The QL responds:

```
Format mdv1 -- type space to continue
```

Note: 'Format' is a computer term which means to mark the Microdrive cartridge in such a way that the QL can find its way quickly around the tape. Be warned – the process of marking the cartridge erases anything that was previously on that tape. But for the moment we assume that you are using a blank tape anyway.

SPACE 7 Press **SPACE BAR**
The Microdrives whirr again, 'formatting' the cartridge in the left-hand drive. The EASEL program cartridge is then copied file by file onto the new cartridge and various messages appear

on the screen, such as `Copying BOOT`. These tell you the copy is being done. The process takes a few minutes, and once it is finished the red light by the Microdrives turns off. When the copy of EASEL is finished, the red cursor blinks again cheerily at the bottom of the screen

Note: The computer will not allow you to reformat the EASEL program cartridge since it has been protected by the breaking of its projection. This is an essential safety device which stops you from accidentally erasing EASEL.

8 When the copy has been made, *remove the original EASEL program cartridge* (from the right-hand drive) and store it with your master ABACUS, ARCHIVE and QUILL Microdrive cartridges. Take your new working *copy* of EASEL out of the left-hand drive, and label the cover so that you know what is on that cartridge.

Note: From now on always use your *copy* of EASEL, not the original. This ensures that if anything does go wrong you still have an unscarred original program cartridge.

At some later point, when you have checked that your new copy of EASEL works and your printer is installed correctly, remove the tab on the left of the cartridge. This will protect the cartridge, preventing anyone overwriting your copy of EASEL.

9 Switch the computer off, or press the black button on the right-hand side of the QL.

START UP EASEL

You are now ready to use EASEL. You will need your working copy of EASEL and a blank cartridge.

1 Switch the computer on.
After a few moments the screen will display the message:

```
F1.....Monitor
F2.....TV

c 1983 Sinclair Research Ltd.
```

Note: A domestic television is designed to show TV pictures, but can also be used with the QL. A monitor has been specifically designed to work with a computer, and so can show clearly 80 characters across the screen. A domestic television may show 80 but works more satisfactorily with 64 characters. The appearance of EASEL's display will vary slightly depending on the type of screen you are using, but the screen contains exactly the same information.

2 Insert your copy of the EASEL cartridge in the left-hand Microdrive

F1 or F2 3 Press the top function key F1 if you have a monitor
the second function key F2 if you are using a TV screen

Look at the diagram of the keyboard if you are not sure which key to press. Pressing F1 tells the QL to use 80 columns to display its information, while pressing F2 instructs it to use a 64-character-width display.

After a few seconds the screen will clear, and show the message:

```
Loading QL EASEL
   copyright
   PSION LTD.

   c 1984
```

The screen clears again and displays a further message giving the VERSION number of your EASEL program ('VERSION' means which 'edition' of the program you have – see the EASELSPEAK appendix) .

Press any key to continue. (If you don't do this EASEL will start anyway within a few seconds.)

THE SCREEN

At the moment you are in EASEL's first screen where you can start to plot your numbers. Look at the screen. If the definition of your picture is not very good, try adjusting your television controls such as 'colour' and 'brightness'. Often the best settings for using the QL are not the same as the best ones for watching television.

Notice that the screen is divided into three areas:

Control area

The oblong box at the top of the screen is the CONTROL AREA. It's there to remind you how to do what you want to do next. These are all the different things you can now do:

- Obtain Help by pressing F1
- Turn off the prompts by pressing F2
- Type in numbers
- Move the crosswires using the arrow keys
- Type in text (you must type a quote mark first)
- Type in formulae
- Display the commands by pressing F3
- escape by pressing the ESC key

The diagram below shows the screen, and explains what each part of the graph is called. It's important to know your way round a graph – what the title, the cell labels and axis names are – refer back to this diagram if in doubt.

CONTROL AREA
Contains prompts and tells you what you can do

STATUS AREA
General information about the way the graph will be drawn

DISPLAY AREA
Displays your graph

CROSSWIRE
Shows where the next number will be plotted, or text written

INPUT LINE
A blinking red rectangle showing where what you type will be displayed

CELL
Box in which numbers are displayed graphically

TITLE
Describes what the graph is all about

AXIS NAME
One on each axis to explain what the axis represents

CELL LABEL
One for each cell to identify the number in each cell

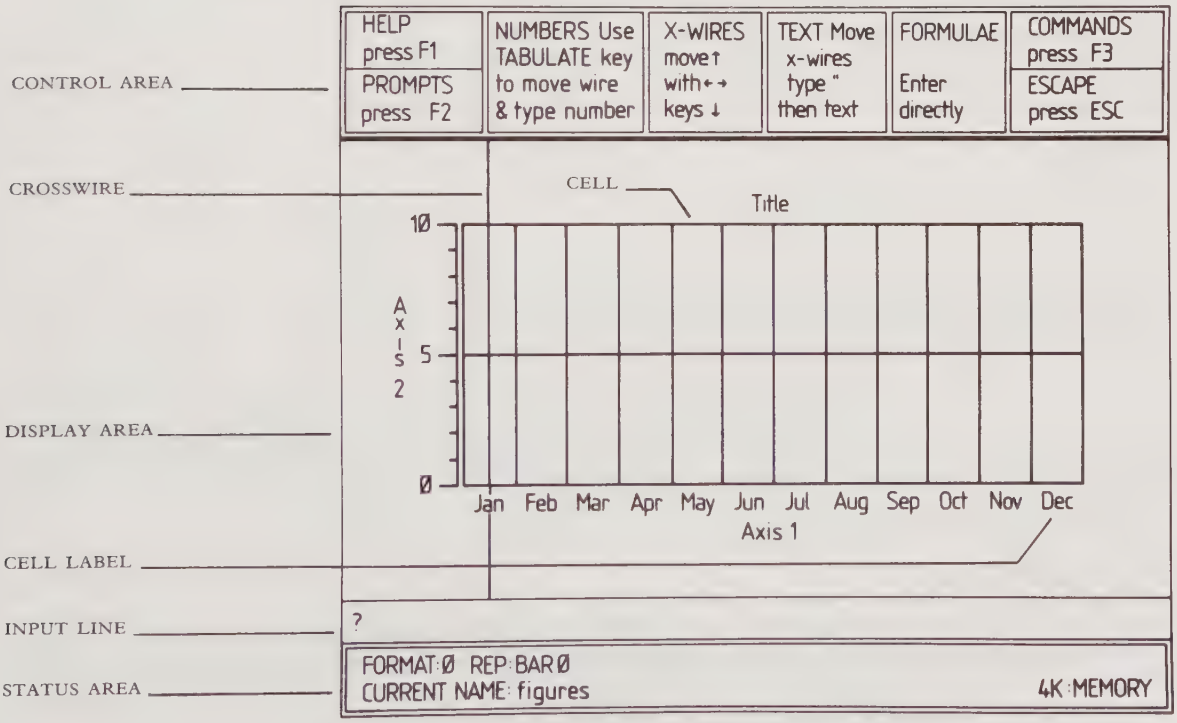


Figure 1.2 – The screen display

Display area

The middle of the screen is the DISPLAY AREA, in which there is a red grid with white text around it. This is where your numbers will be plotted.

Status area

The information at the bottom of the screen is the STATUS AREA. It tells you what is happening. The various bits of information are:

- The top line – This line of the STATUS AREA is very important: it is called the INPUT LINE. At the moment it shows a '?'. Everything you type into the computer will be displayed on the input line until you press the ENTER key. It will also show EASEL's requests for information after you use a command. The flashing red rectangle is at the beginning of the line, waiting for you to do something
- `Format` – This tells you what type of graph EASEL is going to display your numbers on. At the moment it will display your numbers on `Format 0`, which is a red grid with vertical bars
- `Rep` – This is the 'representation' EASEL will use to display your numbers – which bar or line? It now says '`BAR 0`' which means EASEL will use bar `0`, a red bar, to display your numbers
- `Current name` – This tells you the name of the set of numbers which EASEL is currently displaying. EASEL has given the numbers the name '`figures`' for the moment
- `Memory` – This shows how much of the QL's memory is available to store your graph data. At the moment you have 8 units: this will decrease if you create lots of numbers on a graph

In addition to these pieces of information, error messages will be displayed in the STATUS AREA if you make a mistake.

USING THE FUNCTION KEYS

The keys at the left of the keyboard are called the 'Function keys'. They're labelled F1, F2, F3, F4 and F5. Each has a very specific function, and they are useful for all sorts of things. Here is a quick guide to what they do.

F1: The Help key

You can ask EASEL for help at any time by pressing F1. Press it now. The screen changes and text appears explaining what you can do. At the end there's a list of further topics you can ask for information on.

You only need enter enough letters to distinguish the next topic you want from the rest. In this HELP SCREEN you can ask for further help on '`formulae`' and '`Function_keys`', among other things. To get help on function keys, just

Fu 1 Type Fu
This is enough to distinguish 'function keys' from 'formulae' and all the other topics

↵ 2 Press ENTER
The screen clears and a list of the function keys appears. To select more information, type in name of the function key you want. To get more information on HELP, for instance:

F1 3 Press F1

↵ 4 Press ENTER
The screen clears again and EASEL displays more information on HELP

Other choices give you other lists. Have a foray into the HELP screens if you like. Don't worry if you don't understand everything – it will make sense as you read through the book.

You can return to your original grid in one of two ways:

either

Press the ESC key. This returns you immediately to the place where you originally requested help

or

Press ENTER. This returns you to the previous HELP SCREEN, telling you about the function keys. Each time you press ENTER you are returned to the previous HELP SCREEN, until you reach the original grid

You can press the HELP key at *any* time, without fear of losing your current work. The HELP SCREEN that appears will always relate to what you are doing. If, for example, you press HELP while you are using the KILL command, the information that appears will be about that command. When you finish, press ESCAPE, and EASEL will take you back to the exact place you were before pressing the HELP key.

F2: Turning the prompts on and off

As you become more familiar with EASEL, you may not need to be prompted as to what to do next. You can temporarily erase the CONTROL AREA by pressing F2. Press it now.

The screen clears and the grid is re-drawn, taking up both the CONTROL AREA and the DISPLAY AREA. Press F2 again, and the prompts reappear. You can use this key at any time, whatever you are doing – it won't affect your graph except to enlarge it, which you may well prefer once you are thoroughly familiar with EASEL.

F3: The commands

Pressing the F3 key will display the commands which enable you to do all kinds of things. Press F3. The CONTROL AREA shows

'Commands' and a whole list of words. These will be explained later in the book.

F4: Delete

A powerful key this – it will erase all kinds of bits of the graph if you use it properly. More of this anon.

F5: Insert

You use F5 to insert new cells into the grid.

Return to this chapter for reference whenever you feel the need. The significance of all that has been said in this chapter should become clear as you progress through the book.

CHAPTER 2

Plotting the Numbers

It's extremely easy to transform a list of boring, unintelligible numbers into vivid charts using EASEL. This chapter explains how. It covers the following:

- Plotting a set of numbers
- Changing and deleting numbers
- Changing between bar, line and pie charts
- The EASEL commands:

RENAME	– to rename a set of numbers
CHANGE	– to change to bar, line or pie
VIEW	– to redraw a graph
ZAP	– to erase a whole graph
QUIT	– to exit from EASEL

Points to remember

- *Don't* hold down a key on the keyboard for more than a split second. Otherwise the QL will repeat that key press, with some potentially bewildering results.
- The ESC or ESCAPE key can be a tremendous help, especially in rectifying mistakes. If you make an error while you're typing something in, press ESC and EASEL will cancel that input, allowing you to start again.

- If at any point EASEL isn't taking numbers from you, try pressing the ESC key. Later in this chapter you will start using commands, when a 'command menu' will appear in the CONTROL AREA. While it's there, it is impossible to enter numbers or text. The ESC key is the solution: press it to dispense with the command menu.
- If you have to stop mid-way through this chapter and want to save what you've done, turn to Chapter 10.
- There are a few unexpected things that could happen if you don't follow this chapter exactly. By the end of it, though, you should know how to handle every eventuality. Meanwhile, if you do get into a tangle at any stage, you can start again with a new graph grid. To see how to do this, turn to the section on the ZAP command.
- If you're really stuck, and you have tried pressing all the keys on the keyboard to no avail, there is a last resort – the so-called 'warm boot'. This is not – as you might suppose – a wellie by the fire, but quaint computerese meaning 'to re-start the QL when nothing else will work'.

  To do a 'warm boot', press the black button at the right-hand side of the QL. You will lose all the numbers you've plotted, but EASEL will still work just as well. Press F2 to re-start EASEL.

INTRODUCTION

Think of graphs as consisting of two separate parts, the *skeleton* and the *numbers*. You can completely change the numbers without affecting the skeleton, and totally alter the skeleton without any effect on the numbers.

The NUMBERS are the bars or lines which represent the numbers you type into the computer.

The SKELETON is everything except the numbers – i.e. the title, the axes, the background graph paper, the graph key and all text.

Example: Lawrence Lizard's sales

To learn how to plot a set of numbers, follow Harold Blake's first efforts with EASEL.

Harold is the production manager at Tees Toys, a soft toy manufacturer. He hopes to divert his boss's attention from the appalling sales of Lawrence Lizard, Harold's brainchild, by impressing him with a graph. The sales over the last twelve months are shown below:

LAWRENCE LIZARDS SALES

Jan	10
Feb	180
Mar	310
Apr	320
May	230
Jun	260
Jul	-20 (including returned lizards)
Aug	210
Sep	180
Oct	135
Nov	120
Dec	90

Total: 2025

ENTERING NUMBERS

When you enter numbers, EASEL draws bars corresponding to each number in what are known as cells – the rectangles on your screen. EASEL initially provides a grid with twelve cells labelled 'Jan' to 'Dec'. There is a vertical line in the first cell – this is the 'crosswire'. It will move on to the next cell automatically as you start to plot your numbers. Remember that you *must* use the numbers '1' and '0' – not, as you might do on a typewriter, lower-case 'l' and capital 'O': to the computer these are quite distinct characters.

To draw a graph of the monthly sales of Lawrence Lizard:

10 1 Type 10
The number 10 appears on the input line as you type (remember, if you make a mistake, press the ESC key to try again)

↵ 2 Press ENTER
EASEL draws a red bar reaching up to the 10 mark on the vertical axis. This bar represents the number you just entered. The crosswire moves on to the next cell ready for your next number

180 3 Type 180

↵ 4 Press ENTER
EASEL redraws the grid on a scale of 0 – 200 with a second red bar in the next cell reaching up to the 180 mark. The crosswire moves on to the next cell

310 5 Type 310

↵ 6 Press ENTER
EASEL redraws the graph with a new scale from 0 – 400 and draws a third red bar reaching up to the 310 mark. The crosswire moves on to the next cell

7 Enter the remaining numbers in the same way until you reach the last number, 90

Note what happens whenever you enter a number which falls outside the range of numbers already drawn: the graph appears to contract as EASEL adjusts the scale to cope with the number. Note, too, what happens when more Lawrence Lizards come back than go out (for a minus quantity, use the hyphen '-' key, top right, followed by the figures).

ALTERING YOUR GRAPH

Expanding the size of the graph

Now try expanding the size of your graph by turning off the CONTROL AREA. When you become familiar with EASEL you may find that you don't need the CONTROL AREA at all to guide you.

F2 Press F2 (turn off prompts)
The screen clears, and EASEL re-draws the graph so that it occupies all the screen except the STATUS AREA.

Your graph should now look like the one below. Look at the STATUS AREA: it shows that you are using `Format 0` (a vertical cluster bar chart), representing your numbers with `BAR 0` (a red bar), and the name of the current set of numbers is '`figures`'. Don't worry if this doesn't mean much to you just yet – all will become clear.

To restore the CONTROL AREA to the screen, press F2 again – you'll find the prompts useful as you proceed.

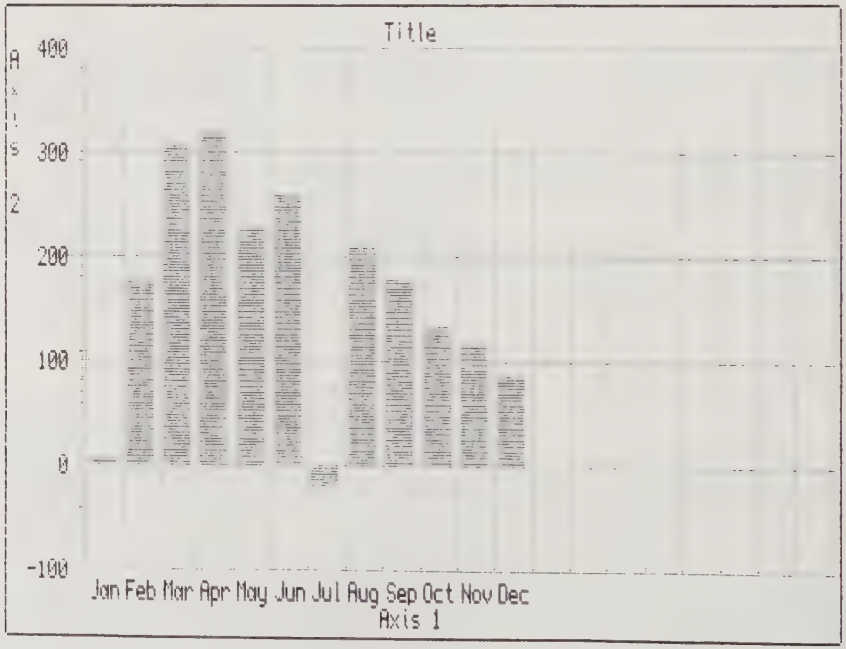


Figure 2.1 – Larry Lizard's sales – Stage 1

Adding more numbers

EASEL provided twelve cells initially. Notice that after you typed in Lawrence Lizard's sales for December, EASEL created eight new cells on the end of the grid which do not have cell labels. The crosswire is now in the first of the new cells waiting for you to enter another number.

Lawrence Lizard's sales for the whole year were 2025. Harold decides to add this to his graph. To do this:

2025 1 Type 2025

↵ 2 Press **ENTER**
EASEL draws the graph again with a new vertical scale of 0 – 2500 and the crosswire moves on to the next cell. The other bars on the chart are dwarfed into insignificance

Moving the crosswires

The 'crosswires' are the two lines, one horizontal (not yet visible) and one vertical, which appear on the graph and move around the DISPLAY AREA to indicate where your numbers or text will appear. You can draw bars in any cell you want by moving the vertical crosswire to that cell. The crosswires are moved with the following keys:

TAB one cell to the right

SHIFT TAB one cell to the left

◀ one character to left
▶ one character to right
▲ one character up
▼ one character down

Try moving the crosswires around using these keys – you'll soon see the difference between a cell and a character. You'll find that if you hold a key down the crosswires will begin to move very quickly in the direction specified. If you type in a number when the crosswires are anywhere in a cell, EASEL will draw a bar of that number in that cell.

Erasing a number

The **F4** key is EASEL's answer to a blackboard duster. It will erase all kinds of things: here you use it to erase a number.

Harold decides to get rid of Larry Lizard's total sales from the graph and restore it to its former glory:

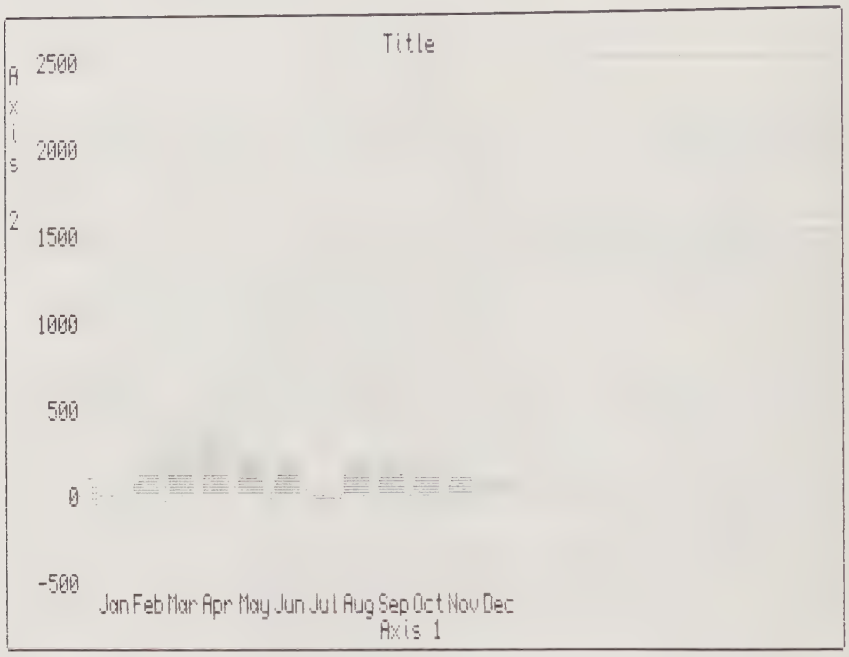
1 Move the crosswires back on to the last bar, representing the year's total

F4 2 Press **F4**
The tall bar is erased from the graph, leaving the eight empty cells still available

RESTORING YOUR GRAPH: VIEW

Sometimes you'll find that your graph looks a bit cramped. There may be a vast expanse of blank grid while the graph is squashed into a corner. To expand it back to its proper size, use the VIEW command.

Harold's graph now looks like Figure 2.2 – somewhat unimpressive.



To show his graph in full size, re-scale the graph:

F3 1 Press **F3** (COMMANDS)
EASEL displays the COMMAND MENU in the CONTROL AREA, and writes '`command>`' on the input line. Choose the VIEW command:

V 2 Press `V` (VIEW)
This tells EASEL that you want it to redraw your graph. EASEL responds '`View all figures`' – it's asking whether you want to display all sets of figures which you have set up so far. In this case, you have only created one set, so confirm that you want to display that set:

↵ 3 Press **ENTER**
EASEL responds '`with Format 0`' – it's asking whether you want to use the same type of graph as before. We do, in fact, want to use the same one, but let's have a look at the 'Formats' available

? 4 Press ?
asking EASEL to display the 'Formats' available

↵ 5 Press **ENTER**
EASEL draws eight different types of graph in miniature on the screen. The first three (Formats 0 – 2) are all vertical bar charts, the fourth (Format 3) is a line chart. On the second line the first three (Formats 4 – 6) are horizontal bar charts; the last forms more slowly and is a pie chart (Format 7). Not only are the types of graph different, the backgrounds and colours of the cell labels are different. Notice that Format 0 is two sets of vertical bars, one green and one red. Later we shall change this. EASEL is still expecting you to use Format 0

↵ 6 Press **ENTER**
EASEL redraws Larry Lizard's sales for Jan – Dec. It has reappraised the scale and eliminated the empty cells.

Note: EASEL won't actually get rid of an empty cell when you use the VIEW command unless it neither has a cell label nor contains a number. Chapter 4 will cover how to delete a cell label.

CHANGING NUMBERS

To change a number you've already plotted simply move the crosswires to the cell in which you want the number changed and enter the new number.

Harold decides that the July sales, when a major retailer returned 100 Lizards complaining that their tongues were too loosely attached, look a bit discouraging. He decides to move 60 of the sales in June into July's sales for cosmetic effect.

To change the June figure:

ESC 1 Press **ESC**
This gets rid of the command menu to allow you to enter another number

SHIFT TAB 2 Move the crosswire to the cell labelled 'Jun' using the **SHIFT** and **TAB** keys together

200 3 Type 200

↵ 4 Press **ENTER**
EASEL redraws the graph, replacing the bar representing 260 by one representing 200. The crosswire moves on to the July bar.

To change the July figure:

40 1 Type 40

↵ 2 Press **ENTER**
EASEL replaces the bar representing -20 by one representing 40.

EASEL doesn't redraw the graph, but will do so when you VIEW or RENAME the set of numbers.

NAMING THE SET OF FIGURES

The name of the set of numbers you are plotting is displayed in the bottom left-hand side of the STATUS AREA. Look at the status area: at the moment it says '`Current Name: figures`'. EASEL has chosen a name for your numbers, and that name is '`figures`'. Hardly a name to take the world by storm, so let's change it. The name of a set of figures is shown in the Graph Key, so you really want an understandable name which is appropriate to your graph – '`figures`' is not very helpful for future reference.

To change the name of a set of figures, use the RENAME command. Rename the numbers you are currently plotting as 'larrysales' as follows:

F3 1 Press **F3**
EASEL displays the commands at the top of the screen

-R 2 Press R
EASEL responds '`Rename figures`' on the input line. To confirm that you do want to rename '`figures`'

↵ 3 Press **ENTER**
EASEL responds '`Rename figures as`' on the input line

LARRYSALES 4 Type LARRYSALES
to rename '`figures`' as '`larrysales`'

↵ 5 Press **ENTER**
EASEL redraws the graph, recognising that you have got rid of the negative number and adjusted the scale. Look at the STATUS AREA. The name of the current set of figures has changed to '`larrysales`'

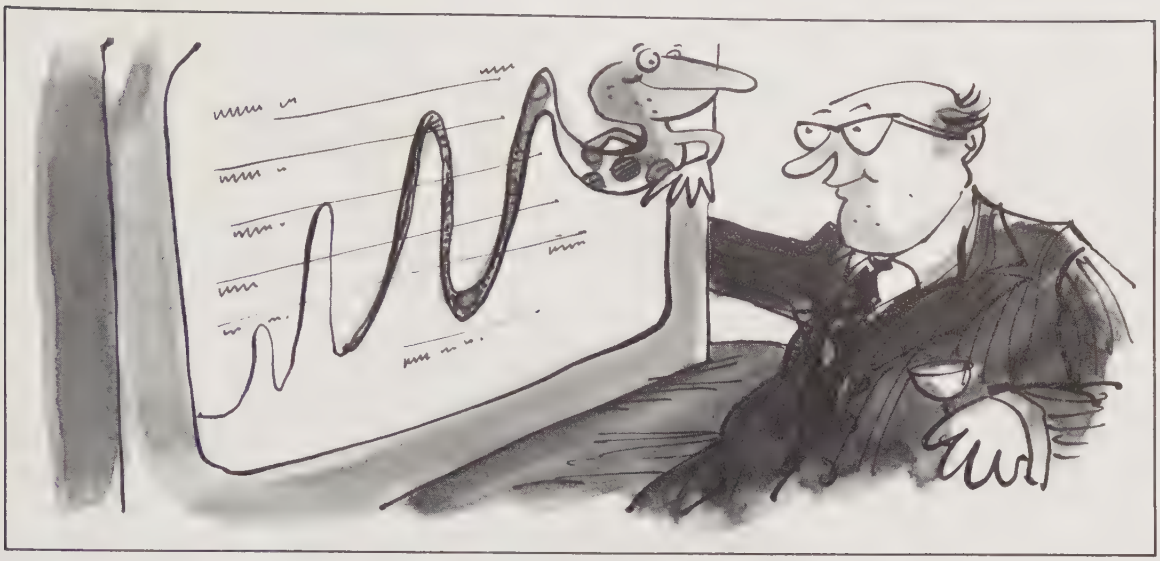
You can rename your set of numbers as often as you like using the RENAME command. However, you must follow EASEL's rules about the name you give to a set of numbers. These are as follows (they are similar to the rules for file names):

- The name must start with a letter of the alphabet
- The name can contain only letters or numbers
- The name can be a maximum of 13 characters long
- The name cannot contain blank spaces

CHANGING THE COLOUR OF BARS

Unless you tell EASEL otherwise it will draw a bar chart with red bars to represent your numbers. You use the CHANGE command to choose another colour bar.

Harold feels that green is more suitable for a pet lizard, so changes the bar colour to green. To do this:



C 1 Press C (CHANGE)
EASEL responds 'Change' on the input line and displays the choices available to you in the CONTROL AREA.

B 2 Press B (BAR)
EASEL responds 'Change to BAR ?'. To see what bars EASEL has designed:

↵ 3 Press ENTER
The Microdrive whirrs, and EASEL draws the 16 types of bar it has designed on the screen. The box cursor encloses the first bar, the now-familiar red bar numbered 0. You can choose any of the bars – to select the green bar numbered 2:

◗ ◗ 4 Press the ◗ key twice
The box cursor moves on to the green bar

↵ 5 Press ENTER
EASEL redraws Lawrence Lizard's sales in garish green. Note that the STATUS AREA now shows that the Representation is BAR 2: nothing else has changed.

Note: You are still using Format 0, but changing the colour of bar from red to green also changes Format 0 from its original combination of red and green bars to green and green bars. Generally speaking, every time you change something on a particular format, the basic EASEL format changes permanently, or until you re-start EASEL.

TRANSFORMING TO A PIE CHART

Not only can you change the colour of the bar, you can transform a set of numbers into a line graph or a pie chart. EASEL makes light work of this task, which would take an age with pen and paper.

Harold decides to see how his numbers look on a pie chart. To make this transformation:

C 1 Press C (CHANGE)
EASEL responds 'Change' on the input line

F 2 Press F (FORMAT)
EASEL asks 'to Format ?' on the input line, asking what type of graph you want to use. To look at the formats EASEL provides:

↵ 3 Press ENTER
EASEL draws 8 different types of graph on the screen

Note: Notice that Format 0 has changed. It used to have two sets of bars, one green and one red: now it has two green sets of bars. This is as a result of the change of bar colour from red to green you did in the last section. Whenever you use the CHANGE command on a set of figures, EASEL alters the basic format it has defined to accommodate your new design.

7 4 Type 7
to choose Format 7, the pie chart

↵ 5 Press ENTER
This tells EASEL that you want to draw a pie chart. EASEL draws a multicoloured pie chart showing 'larrysales'. Look at the STATUS AREA. It now shows Format as 7 and Rep as PIE.

The chart is shown in Figure 2.3.

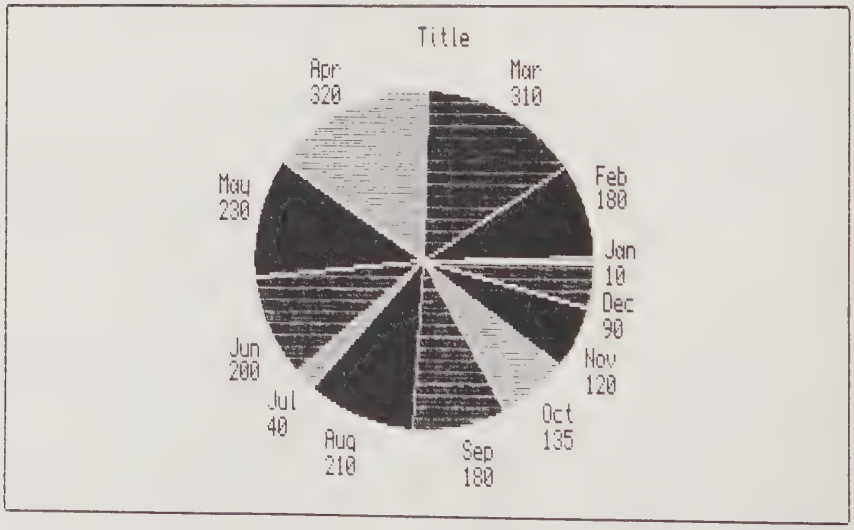


Figure 2.3 – Larry Lizard's sales – Stage 3

Changing back to a bar chart

This is not a helpful way of showing Lawrence Lizard's sales. As you can see, it's very difficult to tell what the changes in sales over

the year have been.

Change back to the bar chart, Format 0:

C 1 Press C (CHANGE)

F 2 Press F (FORMAT)
Note: The only options available to you in a pie chart are to change the text, the segment colour or the Format

0 3 Press 0
to choose Format 0. This is a short cut, avoiding drawing out all the Formats again

↵ 4 Press ENTER
EASEL re-draws Lawrence Lizard's sales as a green bar chart

Note: It's very easy to CHANGE between formats on EASEL. If you wish, try out a few more different ones. Make sure you return to Format 0 before you proceed further.

TRANSFORMING TO A LINE GRAPH

It's just as easy to change between bar charts and line charts. There are two ways of changing to a line chart: in both cases the magic ingredient is the CHANGE command, but with two different options: FORMAT and LINE.

Harold wants to show Lawrence Lizard's sales on a line graph rather than a bar chart, to show the trend in sales. There are two ways in which you can do this.

Method 1

First we shall CHANGE the representation to a particular LINE, but keep Format 0.

To perform the transformation:

F3 1 Press F3 (COMMANDS)

C 2 Press C (CHANGE)
EASEL responds 'Change' on the input line

L 3 Press L (LINE)
This tells EASEL you want to change to a line graph. EASEL responds 'Change to LINE ?' on the input line. To see what types of lines EASEL has in store, ask it to display the lines available:

↵ 4 Press ENTER
The Microdrive buzzes with activity. EASEL draws the 16 types of line which are available on the screen. Choose line 5, a thick green line:

↓ 5 Move the box cursor on to line 5 with the ↓ key

↵ 6 Press ENTER
EASEL redraws Lawrence Lizard's sales, which now could easily be mistaken for a relief of Snowdonia. Notice that the STATUS AREA has changed. The Representation is now LINE 5 (it was BAR 2).

Method 2

Now try changing to a line-graph format. Remember, EASEL Format 3 is a line graph. It has a different skeleton – the colour of the colour grid and cell labels differs from Format 0.

To draw Lawrence Lizard's sales on Format 3:

C 1 Press C (CHANGE)

F 2 Press F (FORMAT)

↵ 3 Press ENTER
EASEL displays the formats again on the screen. Notice that Format 0 has changed: it now has a thick green line and green bars. This is because you've changed the original red bars to a green line on Format 0. Choose the EASEL line graph format:

3 4 Press 3

↵ 5 Press ENTER
EASEL redraws Lawrence Lizard's sales on a white grid, using a thin white line (LINE 0)

The resulting line graph shown in Figure 2.4 highlights all too clearly the depressing failure of Lawrence to capture the imagination of Marston-on-Tees schoolchildren.

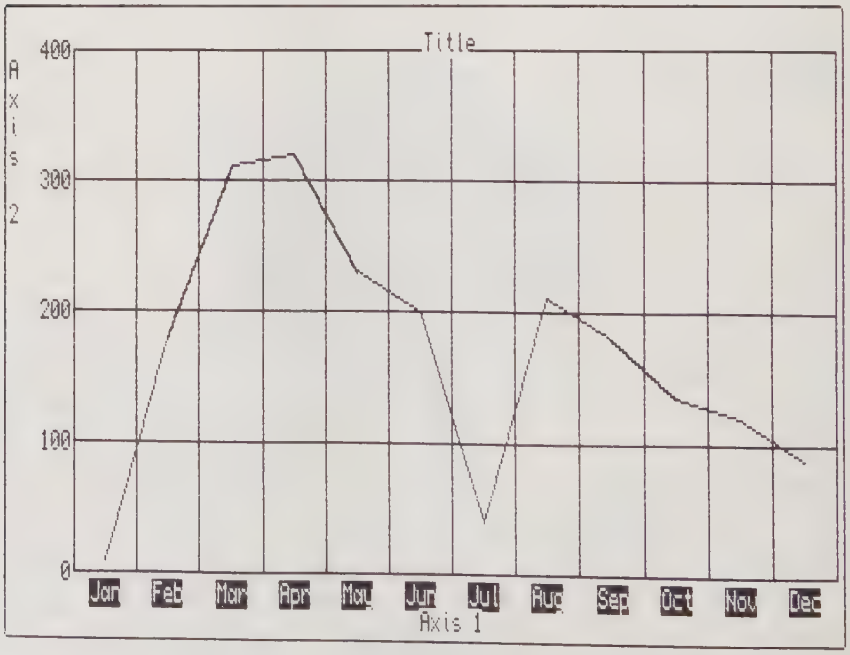


Figure 2.4 – Larry Lizard's sales – Stage 4

The CHANGE command has five other choices which allow you great flexibility to change any aspect of your graph. Later in the next two chapters you will see how to use the options of the CHANGE command to change all kinds of things about the graph.

ERASING AN UNWANTED GRAPH: ZAP

To erase everything that you have done, use the ZAP command. If, however, you want to save what you've done, or print it out on your printer, turn to Chapter 10. The ZAP command always returns you to Format 0 from whichever format you were using.

Harold decides that even his cleverest graph is not going to placate his boss – it shows much more lucidly than the mere figures how disastrous Lawrence's sales have been. Sadly he must erase it. Perhaps he should instead recommend a change of name from Lawrence to Larry as the remedy.

To get rid of his graph use the ZAP command:



1 Press Z (ZAP)
EASEL responds 'zap' on the input line. It asks you to press **ENTER** to get rid of all data, or else press **ESC** (to return to where you were before)



2 Press **ENTER**
EASEL redraws the graph exactly as if Larrysales had never existed

The ZAP command erases everything about the graph you have drawn: the title, the numbers, everything. It doesn't, however, erase changes that you've made to the basic EASEL formats. Format 0 is still a thick green line and green bars. To revert to red and green bars, you must either CHANGE the representation from LINE 5 back to BAR 0 or re-start EASEL.

EXITING EASEL

If you've had enough of EASEL for the moment, you can exit from it using the QUIT command.

Harold is late for his round of golf, so leaves EASEL in a hurry.



1 Press **F3** (COMMANDS)



2 Press Q (QUIT)
EASEL asks you to press **ENTER** to confirm you really want to leave it, or press **ESC** to stay with EASEL



3 Press **ENTER**
The screen clears, returning you to the screen showing the choice of **F1** for monitor or **F2** for a TV

CHAPTER 3

Plotting several sets of numbers

You may well want to create more than one set of numbers. This chapter explains how to cope with several sets of numbers on one graph skeleton. It covers the following:

- Plotting several sets of numbers
- Inserting numbers
- Changing between different types of graph
- Using formulae and functions
- The EASEL commands:

NEWDATA	– to create a new set of numbers
OLDDATA	– to recall an old set of numbers
VIEW	– to see more than one set of numbers on one graph
KILL	– to erase a set of figures

Points to remember

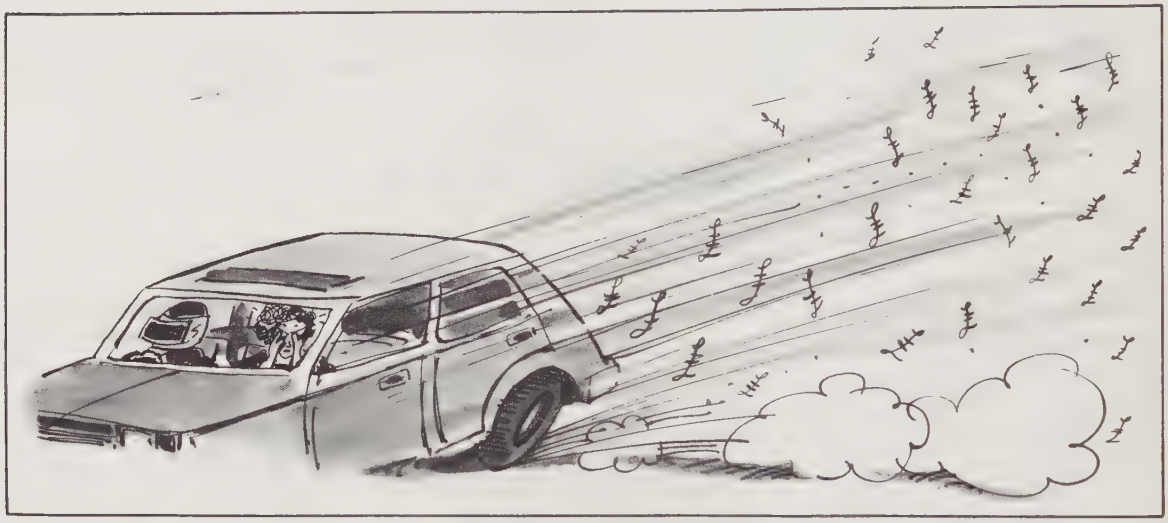
- *Don't* hold down a key on the keyboard for more than a split second, or else the QL will repeat that key press, which can wreak havoc.
- Don't forget the ESCape key is a means of cancelling a mistake on the input line, and of getting rid of the commands menu.
- This chapter is more complex than the last; if you don't follow the text you may get lost and the 'warm boot' may well come in handy. If you're really stuck, press that black RESET button at the right-hand side of the QL and start again.

INTRODUCTION

In order to see the complete picture and to examine the relationship between two or more sets of numbers, it's helpful to display them together on one graph. This is easily done with EASEL. There are various ways of combining different sets on one graph – perhaps as two lines on one grid or maybe as clusters of bars.

Example: The Renault 5

Joyce Blake wants to show her car's petrol consumption on a graph, to prove to her daughter Miranda how the car metamorphoses from 'elegant energy-saver' to 'galloping gas-guzzler' when Miranda borrows it.



Joyce and Miranda record the miles travelled between fill-ups, and how many litres of petrol they bought on occasions when either one or the other used it exclusively. Here are their results (M denotes Miranda, J denotes Joyce):

Miles driven and litres bought in the Renault 5

Month bought	Miles	Litres	
Jan	70.5	9	(M)
Feb	141.9	16	(J)
Mar	135.6	16	(J)
Apr	89.4	11	(M)
May	168.3	18	(J)
Jun	86.8	11	(M)
Jul	206.0	24	(J)
Aug	178.2	20	(J)

Joyce decides to try out Format 1 this time:

F3 1 Press **F3** (COMMANDS)

C 2 Press **C** (CHANGE)

F 3 Press F (FORMAT)

1 4 Press 1
EASEL redraws the grid (now white), with red cell labels on a white background. What is more, the STATUS AREA shows that the `Rep` is now `BAR 2` (it used to be `BAR 0`), and that the `Format` is `1`

Now type in the miles the Renault has travelled between each fill-up in the same way you typed in Lawrence Lizard's sales (use the full stop on the keyboard for the decimal point). Remember to press the ESC key to erase the commands menu first.

Giving the numbers a name

The set of numbers is still called '`figures`'. This is no use to Joyce, so rename them before you do anything else:

F3 1 Press F3 (COMMANDS)

R 2 Press R (RENAME)
EASEL responds '`Rename figures`'

↵ 3 Press ENTER
EASEL responds '`Rename figures as`'

`miles` 4 Type `miles`

↵ 5 Press ENTER

Your graph should now look like the one in Figure 3.1.

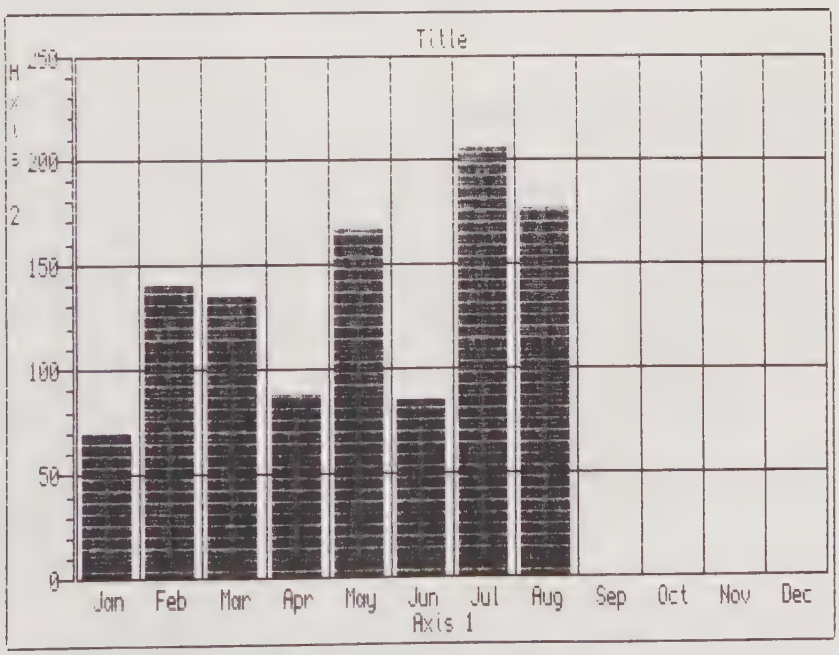


Figure 3.1 – Miles the Renault has travelled

PLOTTING A NEW SET OF NUMBERS

You can show more than one set of numbers on one graph with EASEL. First, however, you plot each set separately. To clear the graph to make way for a new set of numbers, use the NEWDATA command. Your old set of numbers won't be lost, so don't worry – they are saved under their name, which in this case is 'miles'.

Clear the screen to make way for Joyce's petrol purchases:

F3 1 Press **F3** (COMMANDS)

N 2 Press N (NEWDATA)
This tells EASEL that you want to draw a new set of numbers. EASEL responds 'Newdata' on the input line, and asks you to enter the name of the new set in the CONTROL AREA

litres 3 Type litres

↵ 4 Press **ENTER**
EASEL draws an empty grid in which you can plot your numbers. The QL stores Joyce's 'miles', and you can call them back easily, as you will see later. Look at the STATUS AREA: the current set of numbers are called 'litres'. In addition, EASEL has changed the Rep from BAR 2 to BAR 3, white bars, to distinguish them from the last set

Now plot the petrol purchases on the graph.

Note: You could carry on drawing new sets of numbers indefinitely, using the NEWDATA command. EASEL provides a different bar for each set, and you should provide a different name.

INSERTING A NUMBER

Once you have drawn a graph, you may need to insert another number in it: the crucial key is **F5**.

Miranda finds another receipt which shows that she bought another 20 litres of petrol in late March, fuelling 163.4 miles of driving. Joyce wants to insert the extra litres bought between March and April. To do this:

SHIFT TAB 1 Move the crosswires back to the March figure using the **SHIFT** and **TAB** key

F5 2 Press **F5** (INSERT)
EASEL redraws the graph, opening up a blank cell to the right of March, between March and April. The crosswire appears in the empty cell, waiting for your number

20 3 Type 20

↵ 4 Press **ENTER**
EASEL draws a bar in the empty cell, but does not add a label. If you want to add a label to an inserted cell you must use the EDIT

LABELS command (see next chapter)

Your bar chart showing the litres Miranda and Joyce bought should look like the one in Figure 3.2.

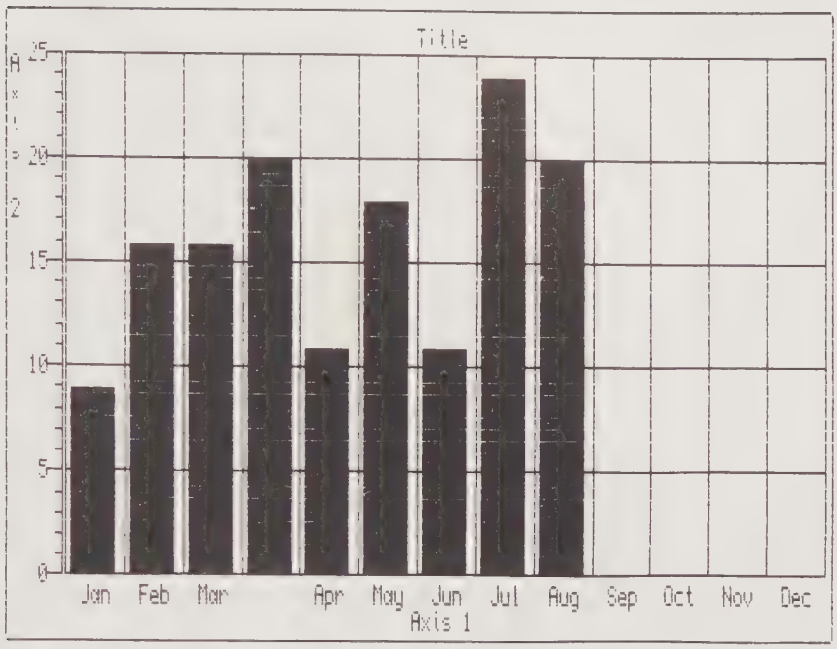


Figure 3.2 – Litres purchased for Renault 5

RECALLING A SET OF NUMBERS

You can operate on only one set of numbers at a time – the one shown as '`Current Name`' in the STATUS AREA. You can display more than one set of numbers at a time, but it's definitely a case of 'look but don't touch' with numbers which aren't in the current set.

To recall a set of numbers to make them the current set, use the OLDDATA command.

Changing the current set

Joyce needs to change the set of numbers to show the number of miles that Miranda drove after her fill-up in late March.

To re-display '`miles`':

F3 1 Press F3 (COMMANDS)

0 2 Press 0 (OLDDATA)
This tells EASEL that you want to resurrect a set of numbers which you've already plotted. EASEL responds '`Olddata`

litres' on the input line ('litres' is actually the current set) and asks you for the name of the set of numbers you want to display

miles 3 Type miles

↵ 4 Press **ENTER**
The graph showing the petrol bought disappears from the screen (EASEL stores the numbers as 'litres'). EASEL displays the miles the Renault has travelled between fill-ups again on the screen. Notice that the new cell you inserted between March and April in the last set of numbers hasn't gone away. It's here, in the 'miles', ready for the number of miles Miranda drove in late March. Generally, *any* new cell you create will remain for *all* sets of figures plotted (unless erased by the powerful **F4** key in each set individually)

ESC 1 Press **ESC**
This erases the command menu and returns you to the original screen, so you can enter numbers again

TAB 2 Move the crosswires to the empty cell using the **TAB** key

163.4 3 Type 163.4

↵ 4 Press **ENTER**
EASEL draws a bar representing the number 163.4 in the empty cell

Note: When you RENAME a set of numbers, EASEL will automatically make the set you RENAME the current set. This means that you can also re-display a set of numbers which are not the current set by re-naming them.

COMBINING SETS OF NUMBERS ON A GRAPH

You will often want to see an overall picture, showing two or three sets of numbers on one graph. It is extremely simple to do this on EASEL. The steps are:

- Plot each set of numbers separately
- Call each a different name
- Combine as many or as few sets as you wish with the VIEW command, using the most suitable type of graph (see Chapter 5 for how to choose the best one)

Viewing all the sets

Joyce wants to display both the number of miles she has driven, and the number of litres she has bought. To do this, use the VIEW command:

F3 1 Press **F3** (COMMANDS)

V 2 Press V (VIEW)
This tells EASEL that you want to see more than one set of numbers on one graph. EASEL responds 'View all Figures' on the input line. It is asking you to confirm that you want to display all the sets of numbers you have so far plotted i.e. 'miles' and 'litres'. To confirm,

↵ 3 Press ENTER
EASEL responds 'with Format 1' on the input line – asking you whether you want to use the same format again. You do, so:

1 4 Press 1

↵ 5 Press ENTER
to tell EASEL that you want to show your figures on Format 1. EASEL draws a vertical stacked bar chart showing the number of miles Joyce's car travelled and how much petrol it consumed (Figure 3.3)

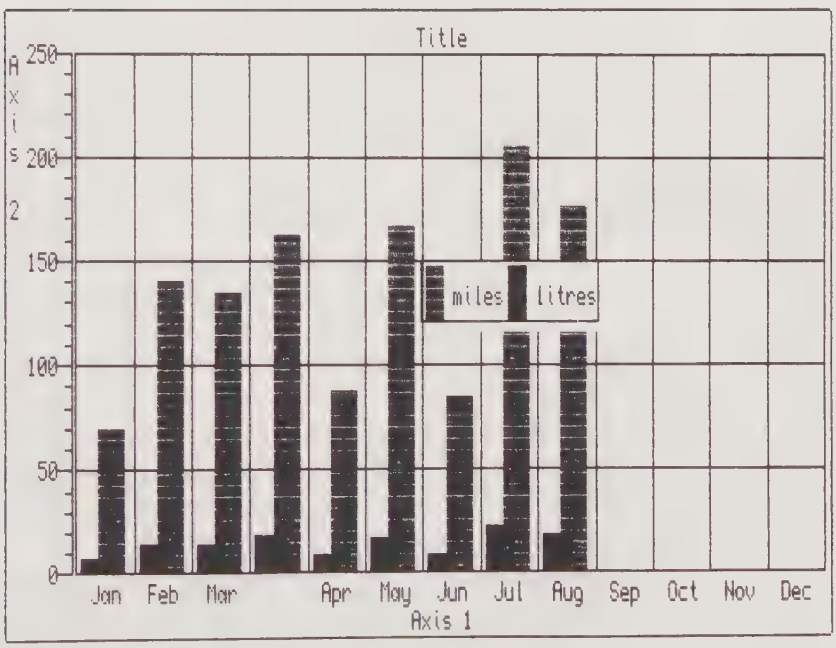


Figure 3.3 – Miles and Litres on one graph

NEW NUMBERS WITH FORMULAE AND FUNCTIONS

EASEL allows you to manipulate sets of numbers, using mathematical formulae (or functions) to create a new set, or combining several old sets of numbers.

You can create a new set of numbers using a FORMULA to perform a FUNCTION on an old set of numbers.

A FORMULA consists of two parts separated by an '=' sign.

- Everything to the *right* of the '=' must be numbers, mathematical functions (+, -, * etc) or names of sets of numbers you've already plotted.
- To the *left* of the '=' sign you should have one word, which is a new name for the set of numbers you're going to create from everything on the right.

A FUNCTION is anything done to one number to make it into another number. For example it might multiply the first number by 100 or add 2 to it. The function can operate on a *whole set* of numbers. Multiplying 1, 2, 3, 6.... by 100 produces a set: 100, 200, 300, 600. Using functions is not difficult: simply type them in. EASEL will draw the new set of numbers automatically on the graph.

Note: EASEL also provides some mathematical functions such as tan, cos and square root. These can be applied to one set of numbers to create another set. Functions are most commonly of use in line graphs – you will find further examples and a full explanation of functions in Chapter 7.

Changing one set to create another

Joyce uses two formulae to calculate her Renault's fuel consumption. First convert the litres to gallons (Joyce doesn't understand miles per litre!):

ESC

1 Press **ESC** (to clear COMMANDS)

```
galls =
litres/4.54609
```

2 Type `galls = litres / 4.54609`
This will create a new set of numbers called 'galls'. Each number in the set corresponds to a number in the set 'litres' divided by 4.54609

Note: You can only type in formulae when the commands are not displayed in the CONTROL AREA. Remember to press the **ESC** key if the commands are displayed, before attempting to type in a formula.

↵

3 Press **ENTER**
This tells EASEL that you've finished typing in the formula. EASEL draws a new set of numbers showing the number of gallons Joyce has purchased on each fill up. Look at the STATUS AREA: it shows that the set of figures currently displayed are called 'galls'

Note: If you can't see the new set of bars, they probably aren't there: you typed the formula incorrectly. If this is the case, type it in again – it should work.

Combining existing sets of numbers

Another way of creating a new set of numbers is to combine existing sets of numbers in a formula – another example of EASEL's power and simplicity.

To plot the miles the Renault has achieved per gallon:

```
mpg =
miles / galls
```

1 Type `mpg = miles / galls`
This will create a new set of numbers called '`mpg`', the numbers corresponding to the 'miles' travelled divided by the 'galls' of petrol bought for each fill-up

↵ 2 Press **ENTER**
EASEL calculates the Renault's mpg between fill-ups and displays them on the screen. You can see that Joyce's suspicion that Miranda is using up more petrol (the Jan, Apr and Jun figures) is not without substance (Figure 3.4)

Note: EASEL doesn't automatically give you a zero on the bar chart. To see the proper length of the bar, you must do some engineering. In this case, put a zero into the cell marked '`Sep`'. EASEL redraws the graph showing the full height of the bars. Another way to get around this problem is to create another dummy set of numbers consisting only of the figure `0`. Then you include this set of numbers when you VIEW the graph.

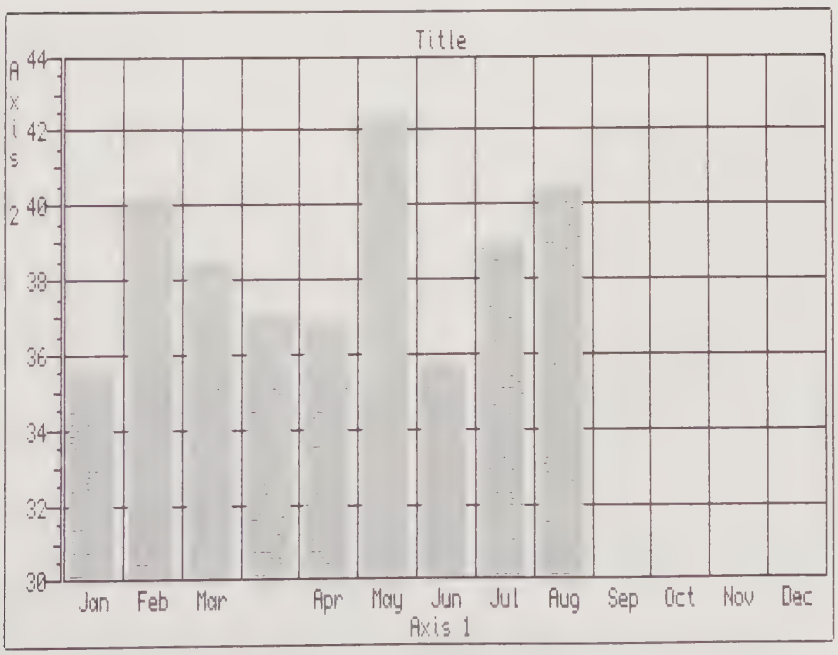


Figure 3.4 – The differing miles per gallon

DESTROYING A SET OF NUMBERS

You may want to get rid of a set of numbers entirely, while retaining all the rest of the graph you have created. To get rid of a set of numbers, use the KILL command. You can KILL a set irrespective of whether it is currently displayed or not: that set will be erased from the system but nothing else will change.

In a fit of pique against decimalisation, Joyce decides she really doesn't need to know the number of 'litres' she bought – she only used them because the local garage has forgotten what a gallon is. To destroy the litres:

F3 1 Press **F3** (COMMANDS)

K 2 Press K (KILL)
This tells EASEL that you want to blitz a set of numbers. EASEL responds 'Kill mpg?', asking whether the current set is for the axe. You want to kill 'litres':

litres 3 Type litres

↵ 4 Press **ENTER**
EASEL erases the set of numbers showing the litres of petrol Joyce bought for the Renault. It then displays the remaining sets together on the graph

KILLing a set of numbers destroys them forever – once killed the 'litres' cannot be retrieved. However, the miles, gallons, and mpg are not affected and the graph skeleton remains perfectly intact.

CHAPTER 4

The Skeleton

The titles, axis labels, and any annotations you add – in fact, everything other than the numbers themselves – are collectively referred to as the skeleton.

Chapters 2 and 3 dealt with the numbers and Chapters 5 & 6 will help you design your graph. This chapter explains how to set up the graph skeleton on EASEL. The following features of EASEL are covered:

- Entering and positioning the title and annotations
- Altering text using the line editor
- Erasing parts of the skeleton you don't want
- The EASEL commands:

EDIT TEXT	– alters title and annotations
EDIT AXIS	– alters axis names
EDIT LABELS	– alters cell labels
EDIT KEY	– moves the graph key
CHANGE GRAPH PAPER	– background colour and grid markings
CHANGE AXIS	– style and colour of axes and markings
CHANGE TEXT	– selects colour of text

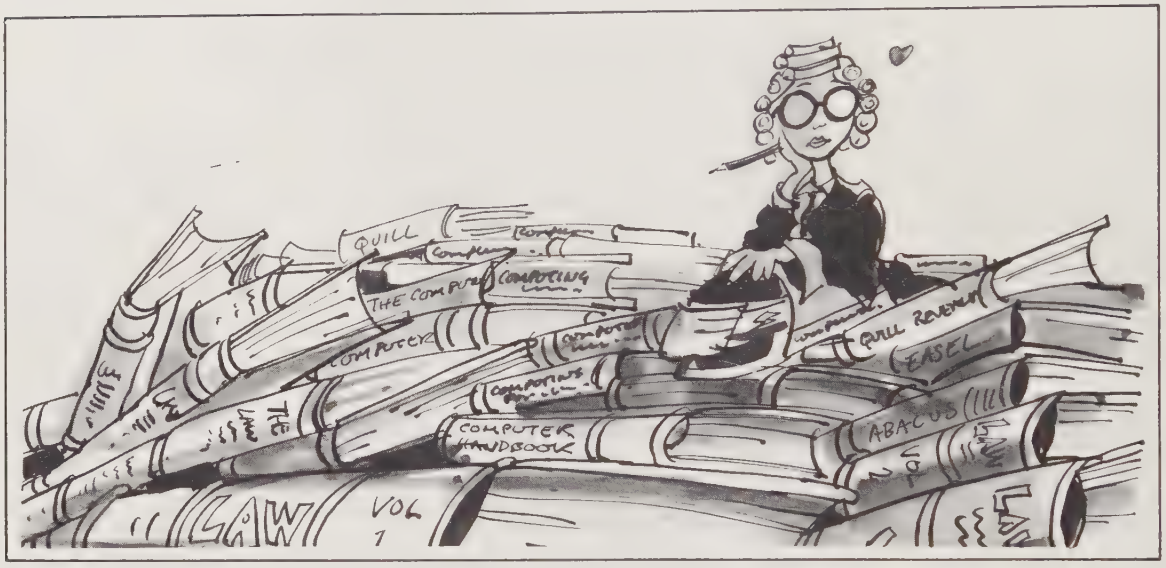
Points to remember

- If the QL isn't accepting text you type in, try pressing the ESC key. You can only enter text when the command menu is *not* displayed in the CONTROL AREA. The ESC key will erase the command menu.
- A cell label identifies the number plotted in that cell and only appears on an axis. Any other type of label you add to the graph is referred to as an annotation or title.
- Don't hold down any key for longer than a fraction of a second – the computer will think you want to repeat that key press. This can have some very confusing results!

INTRODUCTION

EASEL treats the numbers and the skeleton as independent parts of the graph. You can change the skeleton without affecting the numbers at all and vice versa. You can display any one or more sets of numbers – the skeleton will remain intact on the screen. You can even change from a bar chart to a line graph: the skeleton does not change.

To familiarise yourself with constructing the skeleton on EASEL, follow Miranda Blake, a young solicitor in her first attempts with EASEL.



Example: Fees and Salaries

Miranda Blake draws a bar chart to illustrate her improving success over her years as a solicitor. Her fees earned and her salary over the last five years are shown below.

YEAR	FEES EARNED (£ 000'S)	SALARY EARNED (£ 000'S)
'79	12	5
'80	20	7
'81	25	8
'82	34	9
'83	41	11

Plot these two groups of numbers on two separate bar charts and call one '`fee`' and the other '`salary`'. Then use the VIEW command and Format 1 to display both sets on one graph. Refer back to the previous chapter if you are unsure how to do this.

For the moment you will have the wrong axis labels, but the bar chart you've constructed looks like figure 4.1.

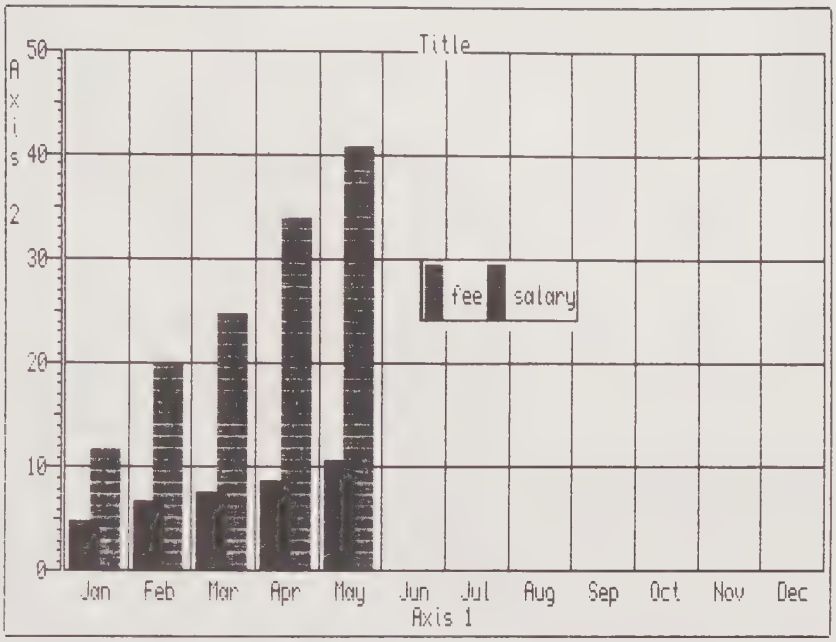


Figure 4.1 – Miranda's fees compared with salary – Stage 1

ALTERING TEXT

Before we start adding any text to the graph, let's see how to correct typing mistakes. At some stage you will want to alter text; the title, the annotations or the labels. The scribe with his pen and paper cannot correct mistakes easily: all you need to do on the computer is press a few keys.

You can alter any text *only* while it is on the input line at the bottom of the screen. Text will appear there

either: when you are typing in text for the first time. (Remember that you can always erase the whole of the text you are entering by pressing the ESC key here.)

or: when you have used the EDIT command (see later sections) to alter text already on the graph.

The Line Editor

Text on the input line is altered using the 'line editor', which is identical to that used in QUILL, ARCHIVE and ABACUS. It works as follows:

KEY	Cursor moves
◀	One character to the left
▶	One character to the right
▲	To the beginning of the line
▼	To the end of the line
SHIFT ◀	One word to the left
SHIFT ▶	One word to the right
CTRL ◀	Delete one characer to the left
CTRL ▶	Delete character under cursor
CTRL ▲	Delete all text to the left
CTRL ▼	Delete all text to right and character under cursor

THE TITLE

The title is a crucial part of your graph and it's best to put it at the top of the graph. EASEL treats the title as ordinary text.

Miranda wants a title for her chart – '`Miranda's success`'. Try out the line editor as you add this to the chart:

' 1 Type a quote mark, ' (you could have pressed " instead)
This tells EASEL that you are about to type in some text. EASEL displays the crosswire on the screen to indicate where it will write text. Don't worry if it's not yet in the right place – you can move the title immediately after it's entered. EASEL writes '`TEXT:`' on the input line. Now make some (intentional) typing mistakes.

`Mirasnda's suceess` 2 Type `Mirasnda's suceess`

Now correct the mistakes:

◀ 1 Move the cursor using the ◀ cursor key back to the 'n' in '`Mirasnda`'

CTRL ◀ 2 Press CTRL and the ◀ cursor key together
EASEL deletes the 's' in '`Mirasnda`'

▶ 3 Move the cursor using the ▶ cursor key to the first 'e' in '`suceess`'

C 4 Press `C`
EASEL adds a 'c' before the first 'e' in '`suceess`'

CTRL ▶ 5 Press CTRL and the ▶ cursor key together
EASEL deletes the extra `e`. The text should now read '`Miranda's success`'

↵ 6 Press ENTER
This tells EASEL that the text is now correct and you want to add it to the graph. Now move the text to a position just below EASEL's inspired title 'Title' (if you didn't want to move the text you would simply proceed to step 8):

7 Move the crosswire using the cursor keys.
The text will follow the crosswire. When the title is in the correct position

↵ 8 Press ENTER
This tells EASEL that the text is in the correct position

ERASING PARTS OF THE SKELETON

You can erase any text on the graph by using the EDIT command and the F4 key (remember you used the same key to delete numbers in Chapter 2). Axis labels, titles, annotations or the entire graph key – any of these can be erased from the screen. You cannot retrieve them, once erased, so use the command with care.

The principle is the same whether you want to delete ordinary Text, Axis Names, Cell Labels or the Graph Key. To delete any of them, choose the appropriate option of the EDIT command then press the F4 key.

Deleting text

EASEL treats both the annotations and the titles as ordinary text. To delete them from the graph, choose the TEXT option of the EDIT command.

Miranda wants to get rid of 'Title' from her graph. To erase it:

F3 1 Press F3 (COMMANDS)

E 2 Press E (EDIT)

T 3 Press T (TEXT)
EASEL asks you to move the crosswire near to the text you want to edit, so move the crosswire using the arrow keys near to the text 'Title'

↵ 4 Press ENTER
The crosswire attach themselves to the beginning of the nearest text, in this case 'Title', and the text appears on the input line

F4 4 Press F4
'Title', thankfully, disappears from the screen

AXIS NAMES

When you start a new graph the horizontal (or x-axis) name is initially 'Axis 1' and the vertical (or y-axis) name is 'Axis 2'. To replace these mundane names with your own, use the EDIT AXIS command.

Renaming the Horizontal axis

Miranda wants to name her horizontal axis 'years of practice'. Add this to your chart thus:

E — 1 Press E (EDIT)
This tells EASEL that you want to edit some text. EASEL displays the editing choices available at the top of the screen

A — 2 Press A (AXIS)
EASEL responds 'edit axis name' and offers the choice of changing the vertical (V) or the horizontal (H) axis name

H — 3 Press H (HORIZONTAL)
EASEL displays the current horizontal axis name, 'axis 1', on the input line

CTRL ← — 4 Hold down the CTRL key, press the ← cursor key to erase 'Axis 1'

years of practice — 5 Type years of practice

↵ — 6 Press ENTER
EASEL writes 'years of practice' under the horizontal axis and on the input line. Miranda wants to move the horizontal axis label to the right of the graph

→ — 7 Move the text to the right using the → key. When it's in the correct position:

↵ — 8 Press ENTER
The text disappears from the input line

Renaming the Vertical Axis

Miranda's vertical axis name is 'pounds thousands'. To add this to the chart:

E — 1 Press E (EDIT)

A — 2 Press A (AXIS)

V — 3 Press V (VERTICAL)
This tells EASEL that you want to change the vertical axis name. 'Axis 2' appears on the input line

CTRL ← — 4 Press CTRL and the ← key together to erase this

pounds thousands — 5 Type pounds thousands

↵ 6 Press ENTER
You don't want to move it, so:

↵ 7 Press ENTER

Changing axis names

To change an existing axis title follow exactly the same sequence. Miranda reckons the title she has just entered is too long. To change it:

E 1 Press E (EDIT)

A 2 Press A (AXIS)
EASEL asks for 'v' or 'h'

V 3 Press V (VERTICAL)
The existing vertical axis title appears on the input line – 'pounds thousands'. To shorten it to '£ 000's':

CTRL ◆ 6 Press CTRL and the ◆ key together
This deletes all the text on the input line. The vertical axis name on the graph disappears simultaneously

£ 000's 7 Type £ 000's

↵ 8 Press ENTER

↵ 9 Press ENTER
This tells EASEL that you have finished changing the axis name. The text disappears from the input line

Miranda's graph now looks like figure 4.2.

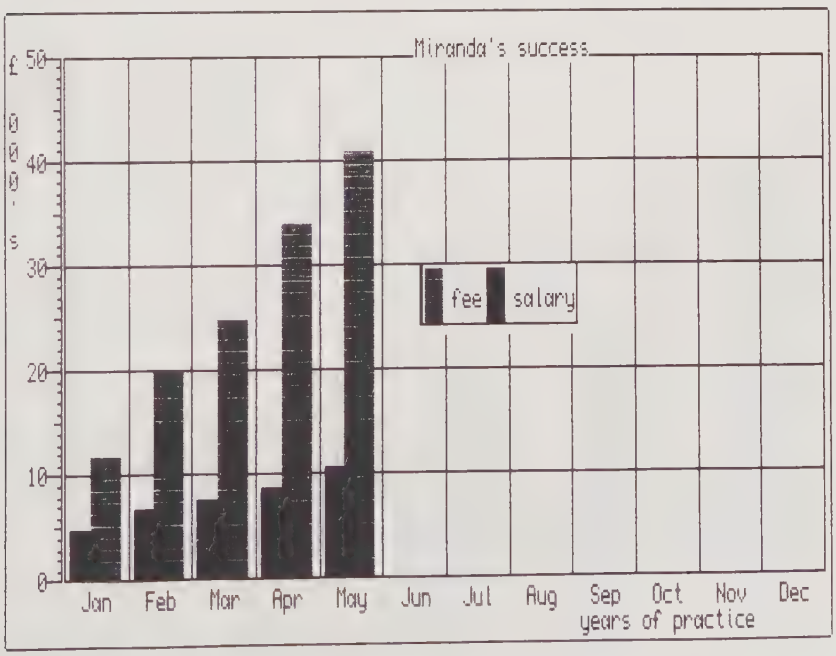


Figure 4.2 – Miranda's fees compared with salary – Stage 2

SETTING UP THE CELL LABELS

The cell labels are ranged along the horizontal axis, describing what is displayed in each cell. EASEL initially shows them as the months of the year. To change them, use the EDIT LABELS command.

Miranda's chart needs cell labels of '79, '80, '81, '82, and '83. To change the labels, which are currently Jan, Feb, etc:

[ESC] 1 Press **ESC**

2 Position the crosswire on the label you want to change, 'Jan'

[F3] 3 Press **F4** (COMMANDS)

[E] 3 Press E (EDIT)

[L] 5 Press L (LABELS)
This tells EASEL that you want to change the cell labels. EASEL displays your chosen cell label 'Jan' on the input line

[CTRL] [◆] 6 Press **CTRL** (hold it down) then press the ◆ key
EASEL erases 'Jan'

'79 7 Type '79
The first cell label on the screen is altered simultaneously

[↵] 8 Press **ENTER**
This tells EASEL that you have now decided on the cell label

Repeat this process, replacing the labels Feb, Mar, Apr, May with '80, '81, '82, '83. Remember to press **ESC** each time

You cannot actually move the cell label because it identifies the number in the cell. You can only change or delete a cell label.

Note: EASEL never displays more than the first few characters of cell labels on the graph. So two cells with long names that are actually different but which have the same first few letters might appear to have the same label on the graph. However, when you use the EDIT LABELS command to change cell labels all the letters of the label are displayed on the input line.

DELETING CELL LABELS

EASEL will only erase cells if there is no value in the cell *and* there is no cell label.

Miranda wants to delete the empty cells from the graph. There aren't any numbers in these cells, so all she needs to do is delete the cell labels Jun -- Dec.

Removing the labels

[ESC] 1 Press **ESC**

2 Move the crosswire on to 'Jun'

[F3] 3 Press **F3** (COMMANDS)

E 4 Press E (EDIT)
EASEL displays the available editing options. Choose the appropriate one, in this case:

L 5 Press L (LABELS)
EASEL displays your chosen label 'Jun' on the input line

F4 6 Press F4
EASEL erases 'Jun' from the graph. The crosswire moves on to the next cell and EASEL displays the next label on the input line 'Jul'

F4 7 Repeat step 6 to erase the cell labels Jul to Dec

ESC 8 Press ESC to return to the command menu

Deleting the cells

EASEL doesn't erase the empty cells until you use the VIEW command. The time is now ripe, so:

V 1 Press V (VIEW)
EASEL writes 'all figures' on the input line, asking whether you want to display all the sets of figures you have typed in

↵ 2 Press ENTER
This tells EASEL that you want to display both sets of numbers you've created. EASEL asks 'Format ?'

0 ↵ 3 Press 0 then ENTER
to choose Format 0 to display your figures. EASEL redraws the graph, with only the five cells which contain numbers (Figure 4.3)

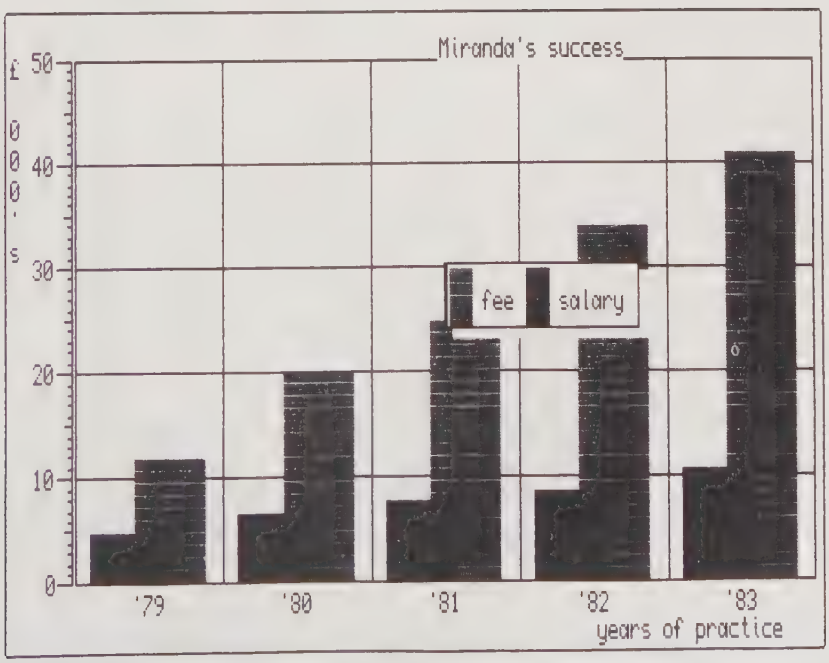


Figure 4.3 – Miranda's fees compared with salary – Stage 3

DELETING THE GRAPH KEY

The graph key is the box containing the names of the sets of numbers displayed on the graph. Like everything else, it can be deleted with the F4 key.

On Miranda's chart the graph key obscures the graph underneath it so she decides to delete it. Choose the KEY option of the EDIT command to delete the graph key.

[E] 1 Press E (EDIT)

[K] 2 Press K (GRAPH KEY)
EASEL redraws the graph showing only the graph key outline

[F4] 3 Press F4
EASEL redraws the graph, the graph key nowhere to be seen

Retrieving the graph key

Although we said you couldn't retrieve anything once you'd deleted it, you can in fact retrieve the graph key – by selecting the KEY option of the EDIT command again.

Miranda decides that she really does need a graph key to show which set of figures represent what. She wants to re-display the graph key, and move it to a less obtrusive position on the graph. To do this:

[E] 1 Press E (EDIT)

[K] 2 Press K (GRAPH KEY)
EASEL draws the key outline on the graph

[↓] [↑] [→] [←] 3 Move the outline to a more convenient position using the cursor arrow keys

[↵] 4 Press ENTER
EASEL restores the graph key, in the new position on the graph

Note: Apart from moving it or removing it, the only other change you can make to the graph key is to change the colour of its text. The colour of the text in the graph key is always the colour that you last chose when you used the CHANGE TEXT command (see next section).

COSMETIC ALTERATIONS TO THE SKELETON

So far we've dealt with adding, altering and erasing text on the graph. You can also improve the graph's appearance by changing the colours of various parts of the skeleton, or erasing them altogether.

Here are all the things that can be changed:

- The text can be horizontal or vertical

- You can change the colour of the text
- The colour of the axes can be altered
- You can leave the axes off the graph altogether
- The background to the graph can be changed

The CHANGE command will alter all of these features. Once changed, the new style of feature will apply until you change it again. For instance, once you change the colour of text from blue to red, all new text you add or old text you change will be red.

Note: You cannot change either the axes or the graph paper on a pie chart – pie charts don't have axes or a background graph paper.

Changing the text appearance

Miranda is getting somewhat fed up with the white text that is all over the graph. She wants to add a comment by one of the bars, before doing so she decides to change the text style from white and horizontal to vertical green-on-red. To do this:



1 Press C (CHANGE)



2 Press T (TEXT)
The Microdrives whirr, and a completely new screen appears. This is the text design screen.

On the right there is 'Psion' written several times in white, the present style of text. On the left are the design choices. The first choice, 'Text ink', is highlighted. To change the text colour,



3 Press ENTER
EASEL is now ready to change the text colour. A box appears around the first colour in the palette, white. To select green:



4 Press the ◆ key
The box moves to green, and the text on the right changes from white to green



5 Press ENTER
to tell EASEL you want green text. EASEL highlights the next design choice 'Text paper'



6 Press ENTER
to tell EASEL that you want to change the background colour



7 Move the box to the red square



8 Press ENTER
EASEL highlights 'Transparent ?'. Choosing this option switches between having a background to the text and having no background and vice versa. You have just chosen a red background to the text. You want to keep this so:



9 Press the ◆ key
EASEL highlights the next choice 'Direction ?'. Choosing this switches the text from horizontal to vertical or vice versa

↵ 10 Press **ENTER**
To switch to vertical text. The text on the right of the screen changes to vertical rather than horizontal. EASEL highlights the final line '`satisfied`'. If you are satisfied:

↵ 11 Press **ENTER**
EASEL redraws Miranda's graph. The only text change that has occurred is in the graph key – the colour is now green-on-red

Changing the axis

Miranda decides to erase the axis lines to increase the impact of her chart. To do this:

F3 1 Press **F3** (COMMANDS)

C 2 Press C (CHANGE)

A 3 Press A (AXIS)
EASEL responds '`Change to AXIS ?`' on the input line. To see the axes that EASEL has already designed,

↵ 4 Press **ENTER**
EASEL displays the 10 axes it has designed. You can see that EASEL has already put together most of the possible combinations – later we will show you how to design others if you want. Miranda wants no axis lines or numbers, so

5 Move the box cursor to number 6, which is without axis markings or axis numbers

↵ 6 Press **ENTER**
EASEL redraws the graph without axis markings or numbers

Changing the graph paper

To complete the picture, Miranda decides to get rid of the white grid, replacing it with a black background.

To do this, use another option of the CHANGE command:

C 1 Press C (CHANGE)

G 2 Press G (GRAPH PAPER)
EASEL writes '`Change to GRAPH PAPER ?`' on the input line. To see what graph paper EASEL has designed:

↵ 3 Press **ENTER**
EASEL displays its 7 choices of graph paper on the screen

4 Move the box cursor to graph paper 5, which is all black so you can't see it

↵ 5 Press **ENTER**
EASEL redraws Miranda's graph without any background grid of colour

Note: EASEL's basic format is being changed as you change each feature of the skeleton on the screen. Have a look at the eight formats: Format 1 has been changed to reflect the changes you've just done: now it has no axis and no background.

ANNOTATIONS

To add more information to the graph, use an annotation. This is a piece of text other the title, axis names or cell labels, and you can place it anywhere on the graph.

You add annotations in exactly the same way as the title – simply preface the text with a quotation mark.

Miranda wants to point out her success last year. She adds an annotation in her vertical red-on-green text style above the bar showing fees earned last year. To do this:

ESC 1 Press **ESC** (escape)
To get rid of the command menu

" 2 Press ' (or ")
this tells EASEL to expect text. The crosswire appears on the graph and EASEL responds 'TEXT:' on the input line

`clever girl` 3 Type `clever girl`
This text appears on the input line and on the graph, down the vertical crosswire, starting at the intersection of the crosswires. It is in plain white as yet

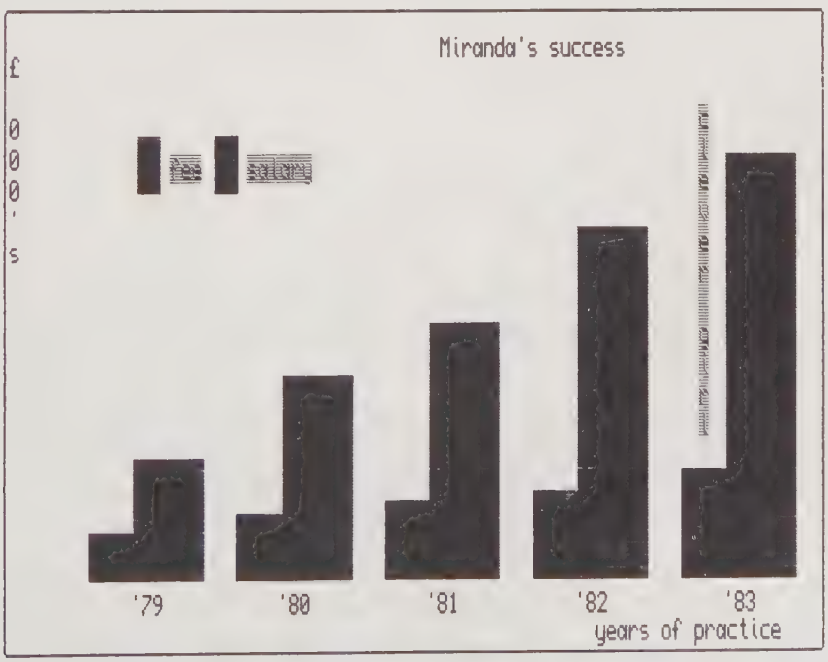


Figure 4.4 – Miranda's fees compared with salary – Stage 4

4 Press **ENTER**
This tells EASEL that you've finished writing the text

5 Move the text to a position beside the last bar on the screen by moving the crosswires using the arrow keys

6 Press **ENTER**
'`clever girl`' disappears from the input line. It changes to green-on-red, Miranda'a chosen style

If you've been following this chapter exactly, your graph should look like the one in figure 4.4.

You can either ZAP this graph or SAVE it. To do the former, turn to the section in Chapter 2 on ZAP. To do the latter, turn to Chapter 10 – the section dealing with the SAVE command.

CHAPTER 5

Choosing a graph type

You have some numbers you want to plot on a graph, and you have EASEL to plot them for you. But which type of graph to use? How about one of these pie charts? Or a set of bars, or perhaps draw a few lines here and there?

This chapter will guide you to the right decision. It explains each type of graph in detail, and tells you how to choose the best one for your purpose. The aim here is to improve your understanding of graphs: there are no instructions for using EASEL. The different types of graph which EASEL provides – the 'Formats' – are discussed.

You can draw essentially three types of graphs on EASEL. EASEL provides eight 'Formats' to choose from, but they are only variations of these three basic types.

To decide which type to use, first decide what question you are trying to answer about your numbers and then relate it to one of the following:

BAR CHART

This type of graph will tell you how many there are or how large each number you show on the graph is. You can show several sets of numbers together on a bar chart in one of two ways:

Cluster bar chart – this shows the bars next to each other, clustered in each cell. Such a chart answers both the question 'how many / how large are they?' and 'how does each set compare with the other?'

Stacked bar chart – this shows the bars one on top of the other. This kind of bar chart answers both the questions 'how many / how large are they?' and 'how is each value made up?'

LINE GRAPH

This type of graph answers the question 'what is the trend in the numbers?'. Again there are two types of graph you can draw:

Simple line graph – this consists of a line or several lines across the graph. It answers the question 'what are changes / trends in a set of numbers?'

Infilled line graph – this has the space between the line and the horizontal axis filled with colour. It should be used to answer the question 'how many / how large are they?' and 'what are the changes / trends in a set of numbers?'

PIE CHART

This type of chart answers the question 'What portion is each number of the whole?'

Do you want to examine a trend (line graph) or look at proportions (pie chart)? It's extremely easy to switch from one type of graph to another on EASEL (see chapters 2 and 3) so don't worry if you make the wrong choice first time. It's best to try out the various types yourself to clarify the differences between them in your own mind.

THE BAR CHART

Answers question: How many / how large are they?

A bar chart consists of a row or stack of blocks whose lengths represent the number you are interested in. The number of goals scored by first division football teams could, for example, be shown on a bar chart as in Figure 5.1.

A bar chart is easy to follow because we can easily understand the idea that something tall represents a large number and something short a small number. A bar chart shows comparisons between numbers very clearly.

Note: EASEL does not automatically give the true size of the bar, as it doesn't always include zero on the vertical axis. You may need to manipulate the graph so that EASEL includes zero (see Chapter 3).

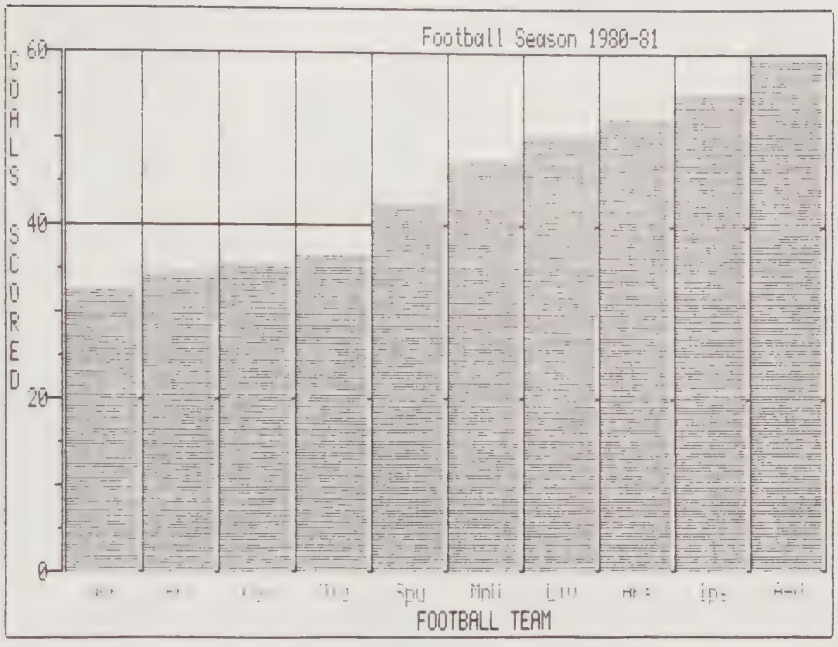


Figure 5.1 – A Simple bar chart

Vertical and Horizontal bar charts

EASEL can display bar charts either vertically or horizontally. The choice between the two is largely a question of aesthetics, and personal preference. However, there are some general guiding principles to consider:

- Constraints imposed by text: if the cell labels are long, or if you wish to write text associated with the bars, you may find that easily readable horizontal text will only fit in using a horizontal bar chart. For example, to allow gushing, rude or sarcastic comments about the performance of ten salespersons your bar chart should be horizontal.
- Nature of the subject matter: sometimes the subject will lend itself to horizontal or vertical display. Heights of the tallest buildings in the world (as in Figure 5.2) would best be shown vertically (unless they happened to lie across the San Andreas fault): conversely you would draw the lengths of warships horizontally.
- Showing passage of time: an odd quirk of human nature is that people think of time as progressing from left to right. When comparing values which vary over a period of time display the chart vertically, ie. with time divisions on your horizontal axis (although a line graph is normally superior for illustrating changes over time).

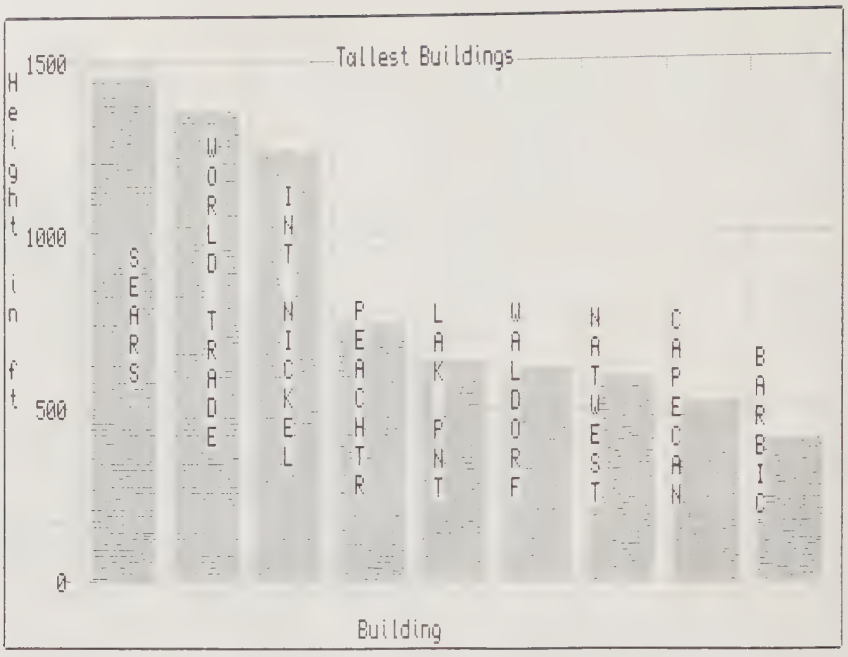


Figure 5.2 – A Vertical bar chart

Two or more sets of figures can be shown on a bar chart using either a cluster bar chart or a stacked bar chart.

Cluster bar charts

Answers question: How does it compare?

If you want to compare one set of figures directly with another, use a cluster bar chart. For instance the graph in Figure 5.3 shows the

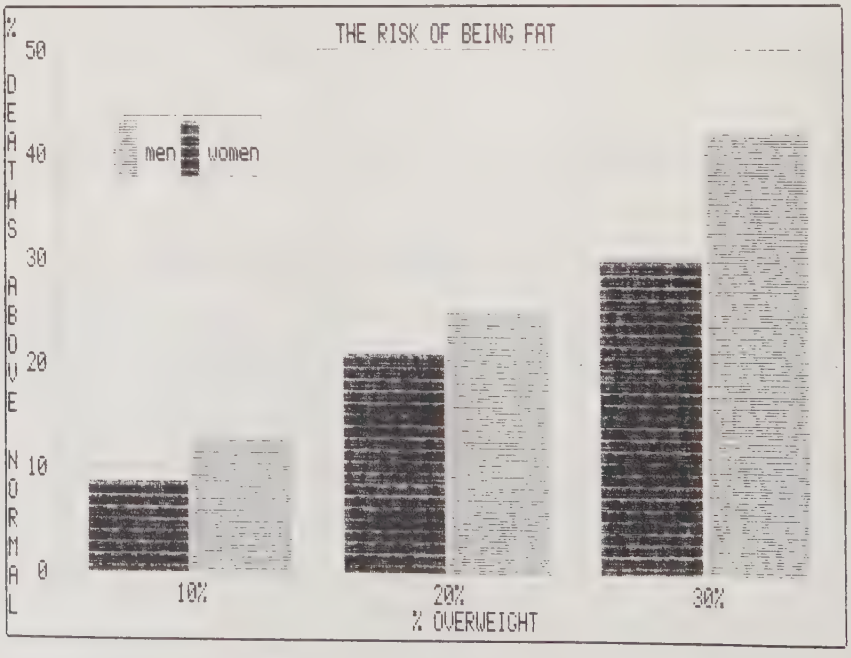


Figure 5.3 – A Cluster bar chart

extra risk men run by being overweight compared to women, and compared to people who are not overweight.

The sets of figures compared must be related in some way. There is no point in comparing Brazil's inflation rate in particular years with the number of rabbits seen on the Wiltshire Downs during that time.

However, you may want to compare sets of figures which are related but have quite different values. You may wish to compare the girth of 45-year-old bank managers (measured in inches between 25 and 60) with beer consumed since the age of 18 (measured in thousands of pints). Obviously the latter will dwarf the former. You can resolve this imbalance by *scaling* (see Chapter 7) one set using EASEL as in Figure 5.4.

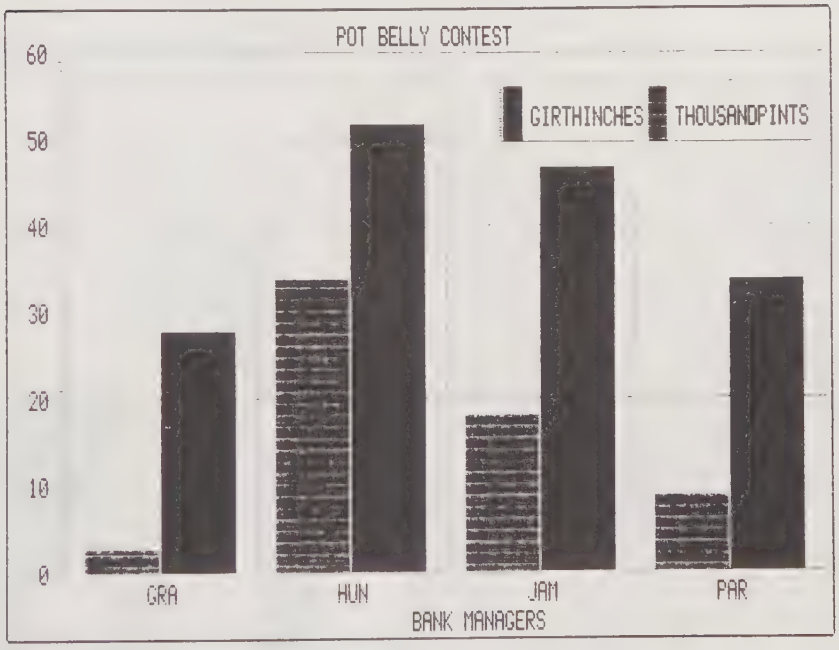


Figure 5.4 – A Scaled Cluster bar chart

EASEL Formats

In EASEL's terms, 'Format' means the design of the graph. EASEL provides eight basic designs to choose from, which should be familiar by now. You can also change these in various ways.

For bar charts, EASEL provides the Formats listed below. You use overlapping bars – the front bars partially obscure the bars behind – (Formats 1 and 5) when one set of numbers is more important than all the others: perhaps your own sales performance. Make the important set the 'top of the pile'. Otherwise show the bars side by side (Formats 0 and 4).

FORMAT	TYPE OF GRAPH
0	Vertical cluster bars, side by side
1	Vertical cluster bars, partially superimposed
4	Horizontal cluster bars, side by side
5	Horizontal cluster bars, partially superimposed

The Stacked bar chart

Answers question: How is it made up?

A stacked bar chart is an ordinary bar chart which illustrates how each bar is split between relevant categories. For instance the numbers of passes and fails of driving test hopefuls can be shown on a stacked bar chart (Figure 5.5).

This type of bar chart is most suitable for displaying sets of figures which are similar in magnitude, since if the numbers vary widely in value the smaller set will make no impact on the graph.

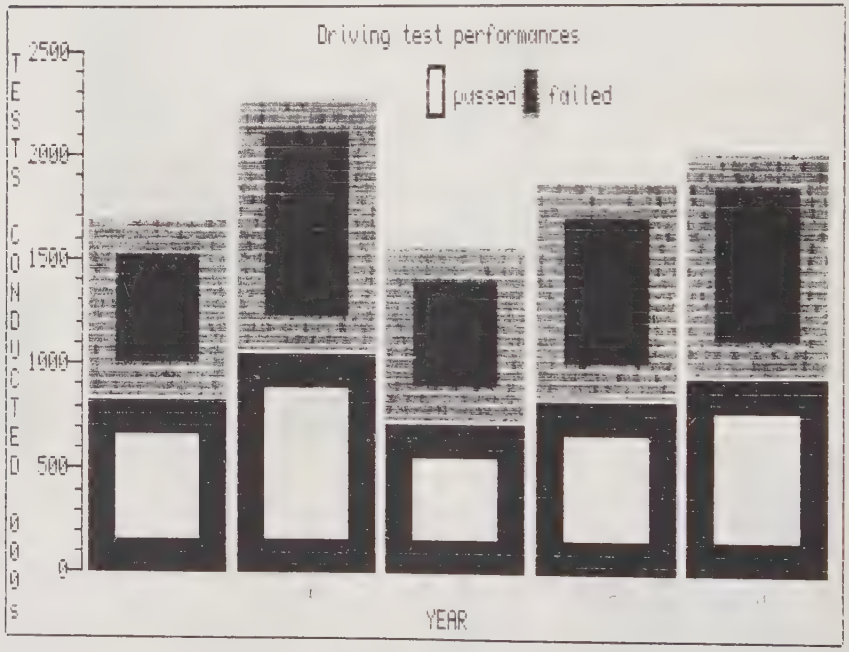


Figure 5.5 – A Stacked bar chart

EASEL Formats

You can draw stacked bar charts either horizontally or vertically on EASEL. Note that EASEL will always draw the first set of numbers you plotted at the bottom of the stack, then the second, then the third etc. You cannot alter this except by starting again and changing the order in which you plot the sets.

FORMAT	TYPE OF GRAPH
2	Stacked bar chart, vertical
6	Stacked bar chart, horizontal

THE LINE GRAPH

Answers question: How is it going?

A line graph demonstrates changes in or trends of a set of numbers. The example in Figure 5.6 shows the increase in the price of petrol over the period 1940–1980.

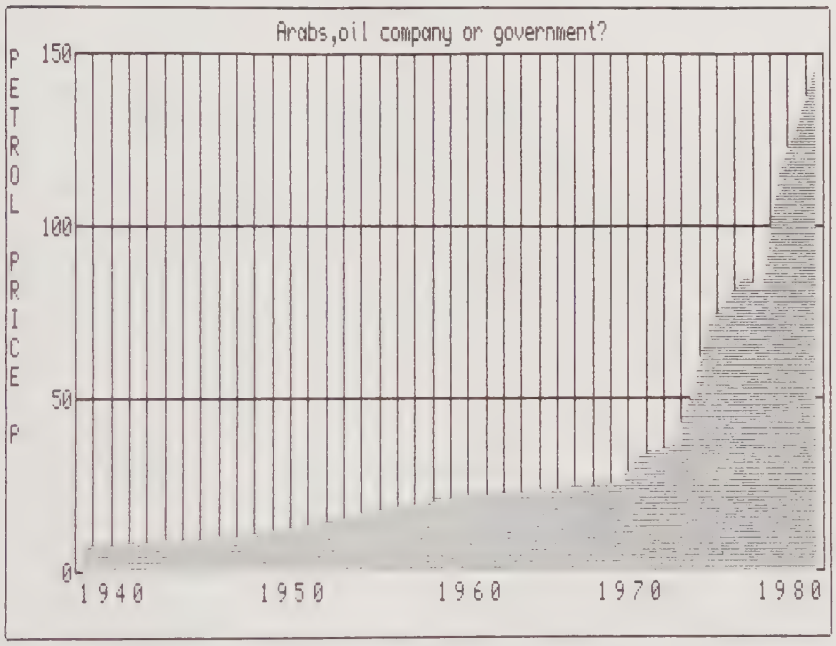


Figure 5.6 – A Line graph

A line graph is a very flexible and potentially sophisticated method of displaying information, since it can plot many numbers at once, thus showing subtle variations and intricate detail. Chapter 7 illustrates how to exploit this potential with EASEL.

Use regularly stepped axes

Make the bottom axis something that increases in regular or equal steps. In this case it's time, increasing in steps of a year. The two ludicrous graphs shown illustrate the dangers of ignoring this golden rule.

The `Bodyweight` graph in Figure 5.7 shows a line connecting weights of kangaroos, crocodiles and brown hares. This is a nonsense, as in reality there is no progression from hares to crocodiles etc. Line graphs really only show progressions.

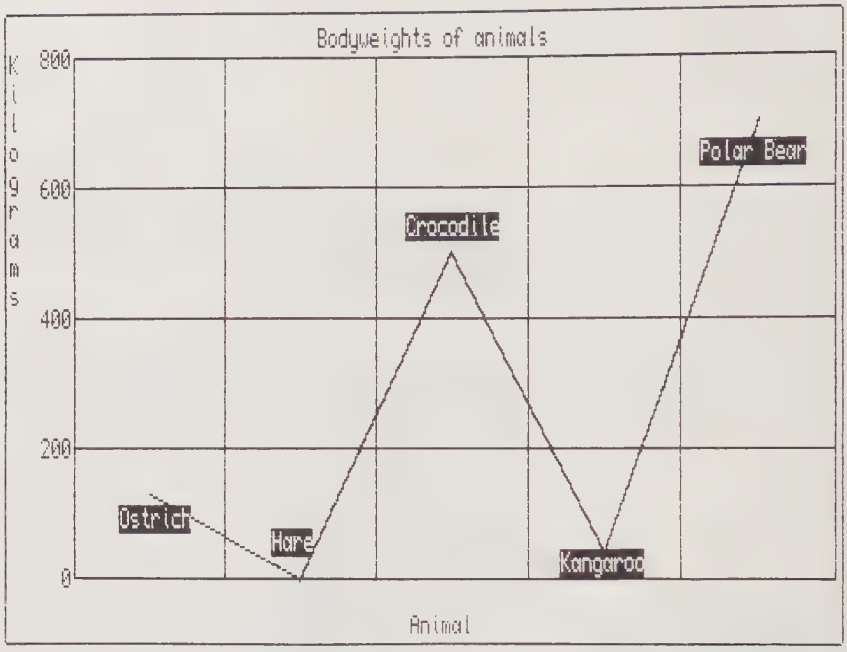


Figure 5.7 – A Nonsensical graph

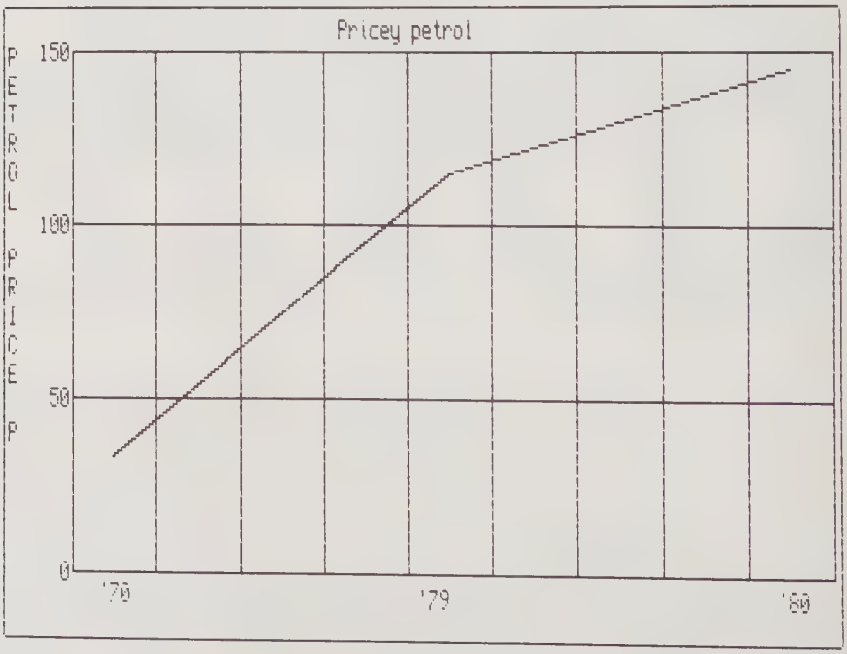


Figure 5.8 – A Misleading graph

The `Pricypetrol` graph in Figure 5.8 apparently illustrates that the galloping inflation shuddered to a halt in 1980. Not so! Look again. The bottom axis is not going up in regular steps and we have 1970–1979 compared with 1979–1980. No wonder the latter looks so small!

You do not have to use time along the horizontal axis; it could be weight, age, volume etc., but again the measurements must vary regularly in 'steps', which can be any units, from left to right across the (horizontal) x-axis.

Is zero on the axis?

EASEL provides two main options for drawing a line graph – either a simple line drawn from left to right showing changes up and down, or an 'infilled line', where the space between the line and the x-axis is shaded.

The important difference between the two is that the infilled line should always include 0 but the simple line may not. You may have to manipulate EASEL to include zero on an infilled line graph, as it does not do so automatically. This can have a great impact on the graph – you can tell two starkly contrasting stories depending upon whether you use an infilled line or a simple line graph. The graph in Figure 5.9 shows the *Financial Times* index rocketing up during the period January to March 1984 whereas the graph in Figure 5.10 shows only a modest rise during the same period.

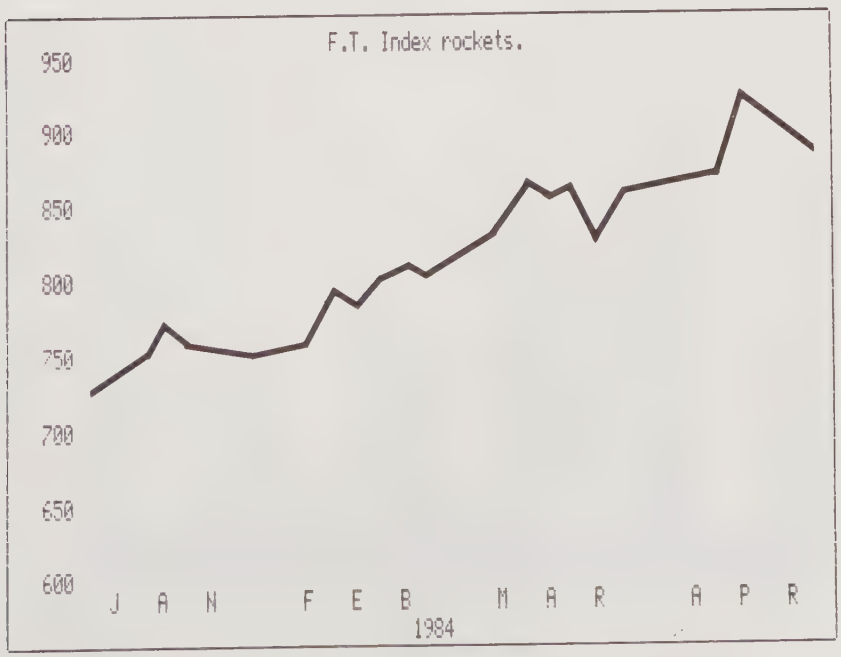


Figure 5.9 – A Dramatic increase

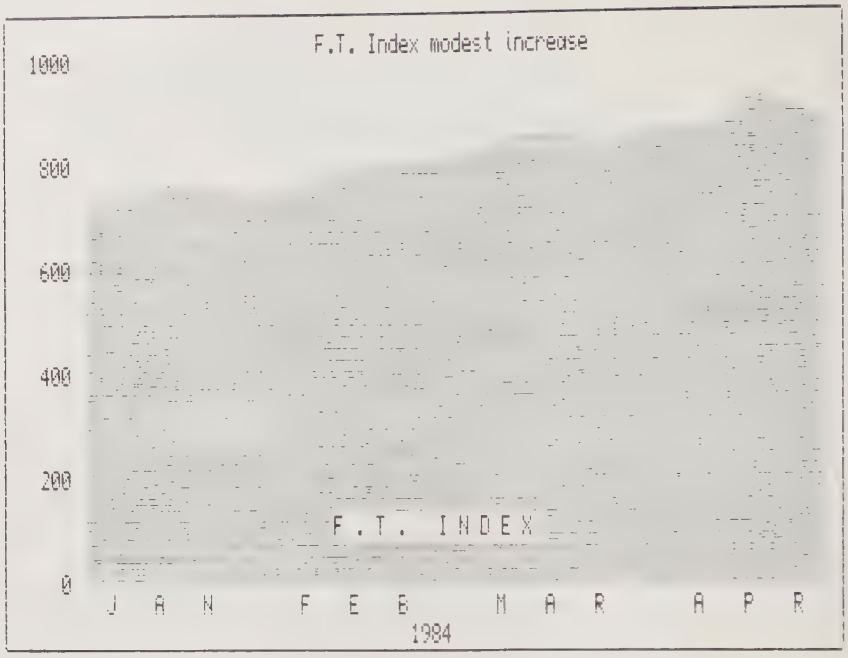


Figure 5.10 – The same increase – not so dramatic

Have a look at some graphs in the financial pages of your newspaper and examine the axes carefully. You'll be surprised how much the starting point (often chosen to produce dramatic effect as well as for economy of space) affects the impact of the graphs.

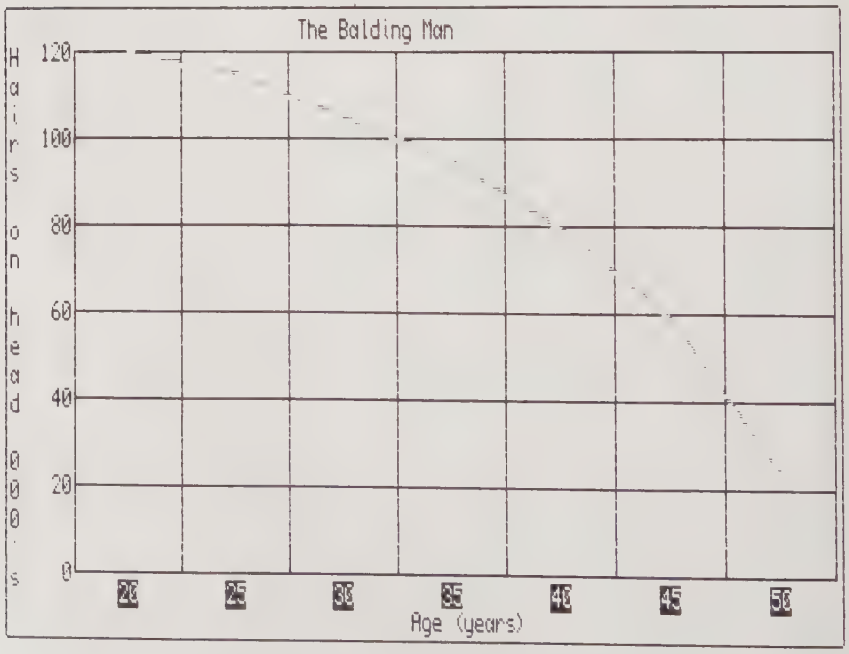


Figure 5.11 – A simple line graph

The Simple line

Answers question: What are changes / trends?

Use a simple line graph when it is not the size of the numbers that is important but the *changes* in the size. The example in Figure 5.11 shows the gradual reduction in the number of hairs on the head of a man as he ages from 20 to 60. Only a professor of biology would get excited by the actual number, but the change might well be alarming to the owner of the head.

EASEL Formats

EASEL provides only one format to draw line graphs, Format 3. This automatically provides a new line for each set of numbers, the first of which is a simple line, the second an infilled line and so on. You can change the lines EASEL provides if you wish using the CHANGE command (see Chapter 8).

The Infilled line

Answers question: How large/many?
and What are changes/trends?

On an infilled line graph the height of the line represents the size of the number, since the (vertical) y-axis includes zero. Hence if you want to show the size of your numbers, as well as the changes or trends, use an infilled line graph.

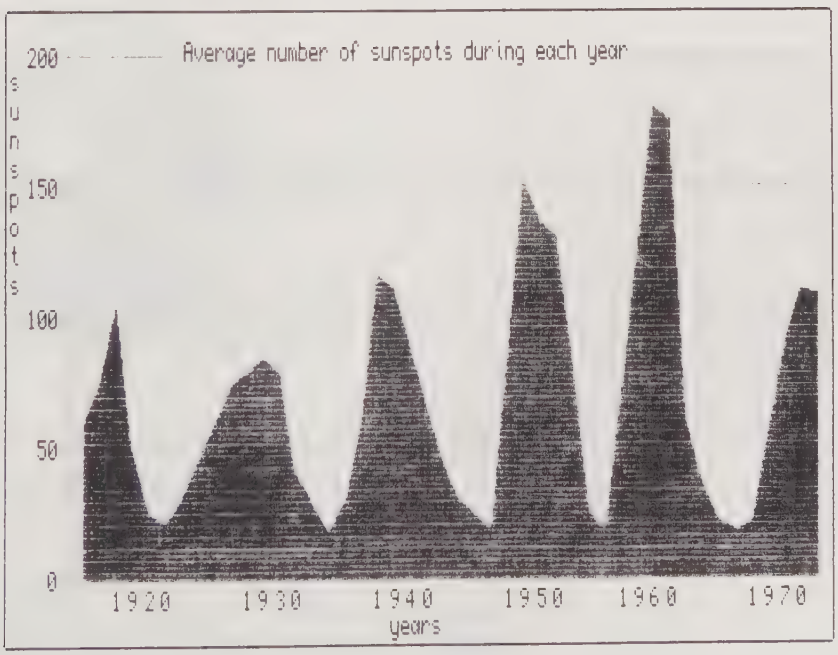


Figure 5.12 – An infilled line graph

Note: EASEL doesn't automatically provide a zero on the vertical axis: you must artificially create one if EASEL does not include it.

These graphs are best for displaying sets of figures where the changes are reasonably large compared with the numbers themselves, otherwise only a spirit level will trace the variations.

THE PIE CHART

Answers question: What portion of the whole is it?

Think of a pie chart as a pie or cake which can be cut into slices. It shows what is the proportion of each number to the whole or total. Use a pie chart to show percentages (proportions of 100) or fractions (proportions of 1).

EASEL always draws the pie as a perfect circle of a constant size. This means that it says nothing about the size of the whole pie. The pie in Figure 5.13, showing the most common causes of death in Britain, could have been based on 10,000 deaths or 10,000,000. We do not know. All that the pie chart shows is the proportion to one another of the various causes.

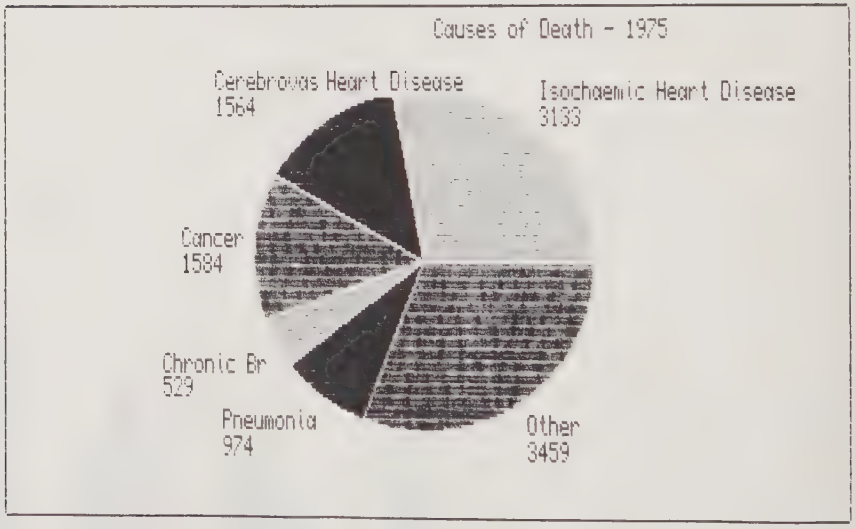


Figure 5.13 – A Pie chart

Many people find pie charts the easiest to understand. Do not, however, use them too freely, as they can confuse as well as enlighten. Bear in mind the following disadvantages:

- They are relatively inflexible

- There should not be too many slices in one pie
- They cannot show more than one group of figures at a time
- A practical point – EASEL draws pie graphs quite slowly, so they can take a fairly long time to construct. You may find it easier to plot your numbers initially on a bar or line graph, then change to a pie chart when all the numbers are correctly entered.

EASEL Formats

To draw a pie chart on EASEL use Format 7. This produces a multi-coloured pie chart out of the set of numbers whose name you type in. If you type in the names of more than one set of figures, EASEL will disregard all names except the first.

Once you've chosen Format 7, EASEL remains locked into pie charts until you move on to another Format. Neither the size nor the shape can be tampered with. The only change you can make to the basic pie chart is to change the colour of the segments.

CHAPTER 6

Graph design: The Skeleton

This chapter explains the techniques of good graph design and how to avoid some common mistakes.

A bar chart, a pie chart, a line graph or what? That is the first and most important decision (see Chapter 5). But it is not the only one – there is more to graph design than knowing what type of graph to use.

Poor design can destroy a graph. The graph in Figure 6.1 was recently published in a well-known national journal. It serves as an outstanding example of a bar chart rendered almost unintelligible by bad design. 'Cumulative analysis of new car sales trends. Jan–Feb 1984 and Jan–Feb 1983 compared in percentage terms': what exactly does this mean? Have you noticed that the bars to the right are actually negative *numbers?*

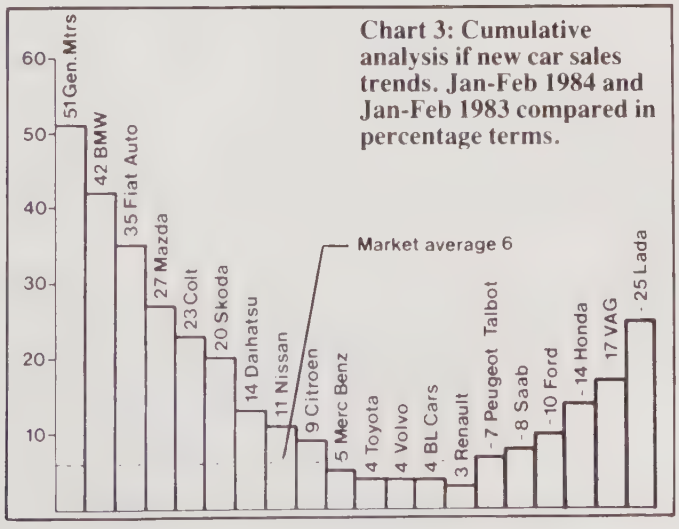


Figure 6.1 – A badly designed graph

THE PARTS OF THE SKELETON

The Main Title

The main title is a vital component of the graph. It should describe not only what the graph shows but also its implication. Make sure it's clear, concise and above all, interesting, so that your audience (if any) is attentive.

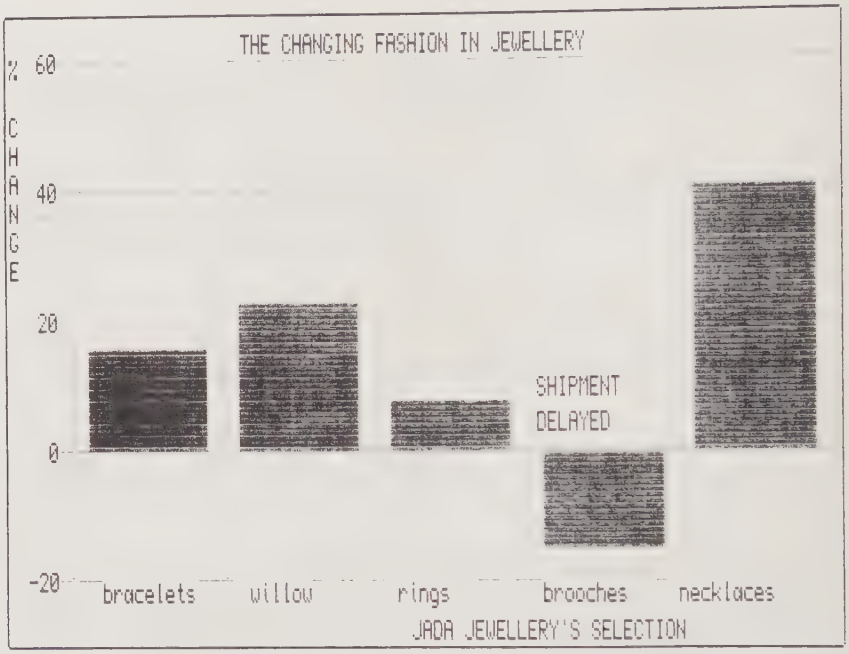


Figure 6.2 – A well-designed graph
Jada Jewellery's sales trends

This is not a good title:

```
'The sales of Jada Jewellery items in percentage
terms based on pounds sterling in 1984 compared
with 1983'
```

Instead try something like:

```
'Jada Jewellery's improving sales'
```

Although normally found at the top of the graph, the title can go anywhere.

Avoid unnecessary repetition in titles. A main title which simply combines the two axis names is exceptionally boring:

Title:

```
'Number of shops selling Tees Toys over the years'
```

x-axis name:

```
'Number of shops selling Tees Toys'
```

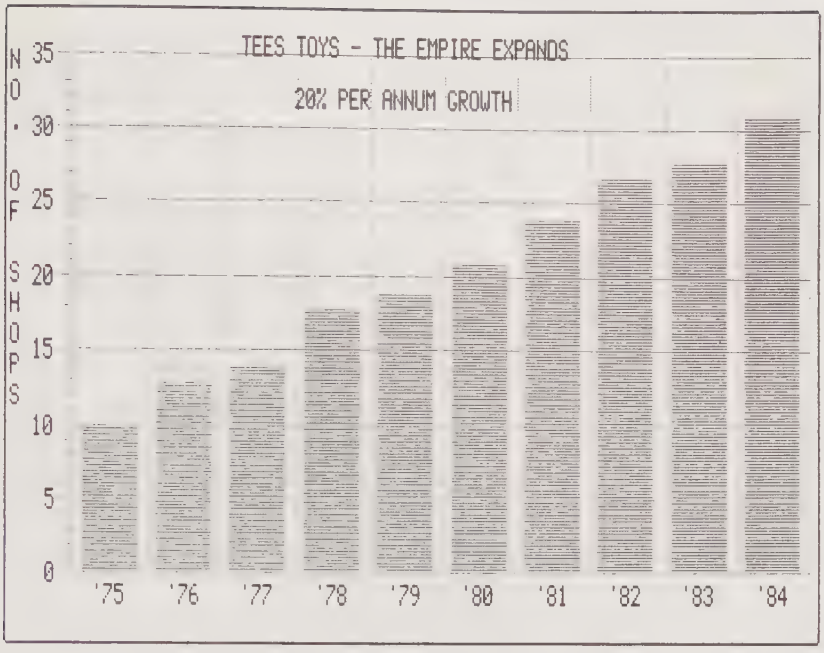


Figure 6.3 – A well-designed graph Tees Toys outlets

y-axis name:
'Years'

There are two ways of avoiding this problem:

- Omit an axis name: the axis labels '75, '76, '77 ...' are obviously years, and the axis name 'year' only clutters the graph.
- Make the title more interesting, highlighting the important feature or implication of the graph rather than simply stating what is plotted against what. A better title is:

  'Tees Toys: the Empire Expands'

  However, always bear in mind for whom the graph is intended. If it is purely for yourself, then titles are not so important. If it is for others, then it's up to you to judge what is the most appropriate title. Harold's 'Empire Expands' title may be fine for his boss, but it isn't really suitable for official publications.

Axis names

There are two axes – horizontal and vertical – and each is normally given a name. These names must describe, briefly, what each axis represents. Don't indulge in wordy descriptions – if these are absolutely necessary, include them in a subtitle or annotations.

Avoid long axis names like:

'Sales expressed in percentage terms based on thousands of pounds sterling'

when '%' would do.

Annotations

Annotations are miscellaneous pieces of text superimposed on to the graph. Use them sparingly (not more than one or two) and position them so as not to interfere with the graph itself. There are two types of annotations:

- Additional information about the whole graph

  Include this in a subtitle directly below the main title. The 20% per annum growth in the number of outlets appears as a sub-title in Figure 6.3

- Text describing individual values shown on the graph

  Position text referring to one part of the graph close to the value(s) to which it refers. Be careful not to interfere with the graph: don't let the text overrun on to the bars or lines. Jada Jewellery is Joyce Blake's own business; Jada's appalling sales of brooches were entirely due to a delay in shipment of the goods from Thailand, a point made by the annotation 'shipment delayed' on the graph.

Note: When adding annotations to a pie chart, make sure that the text is either completely inside a portion or completely outside it.

GENERAL DESIGN

Number of values (bar and pie charts only)

A bar chart or pie chart looks best when displaying only a few figures: say less than ten. Showing too many is confusing to the onlooker and the graph loses its impact.

Number of sets (bar and line graphs)

Restrict the number of different groups of figures you display on one graph. It is advisable not to combine more than three groups, otherwise the graph will be very difficult to understand.

Colour

Use colour prudently. Don't use more colours than absolutely necessary, otherwise the graph will look gaudy and again lose its impact. Use the same colour for related sets of figures or text and different colours to emphasise differences. If you're going to print your graph on paper, this is not so important – you may want to use all the different colours in order to make the graph more interesting when it's in various shades of grey on paper.

Graph paper

The background graph paper should be as unobtrusive as possible. Usually the least noticeable choice is black with thin white lines.

CHAPTER 7

Bar Charts

In this chapter we explore some of the ways that a QL user may find bar charts useful, with examples relevant to business, home, education and leisure.

This chapter covers the following:

- Designing your own bars
- Highlighting bars
- Designing your own graph background and axes
- Using formulae with bar charts
- The EASEL command:

  HIGHLIGHT
- Graph drawing techniques:
  - Scaling a set of figures
  - Efficiency index

Four main examples are given. Each example covers either a more advanced feature of EASEL or a special graph-drawing technique:

Leisure

Example: – The race to win
Type: – Horizontal cluster bar
Features: – Designing your own bar

Business

Example: – Diligence of Tees Toymakers
Type: – Vertical cluster bar
Features: – Highlighting negative values
– Efficiency indices
– Using formulae
– Scaling a set of figures

At home

Example: – Joyce's expanding wardrobe
Type: – Vertical stacked bar
Features: – Designing the axis lines
– Designing a new graph background

Education

Example: – The twins' exam successes
Type: – Vertical cluster bar
Features: – Highlighting particular values

INTRODUCTION

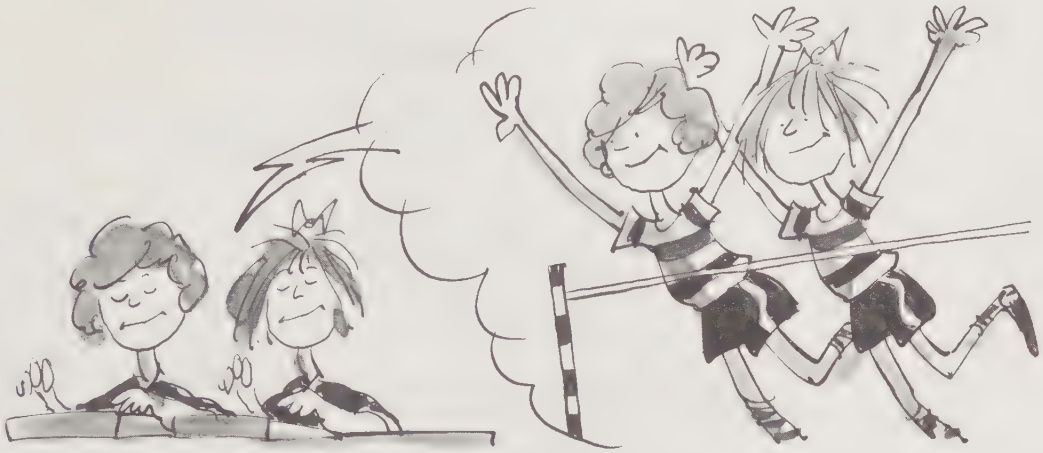
Bar Charts are simple to understand and give an immediate idea of the size of a number. They are often used for illustration at school or in the media, to show anything from rainfall of different countries to the calorie content of various foods.

When you first enter EASEL, it will create a bar chart with red bars unless you tell it otherwise, so simply type in and enter numbers as soon as you enter EASEL to draw such a chart. If you want to return to this position after you've been in EASEL for a while you may have changed the red bar to something else; in this case the only way to get to this position is to re-start again.

LEISURE

Example: The race to win

Chris and Paula challenge each other to a race to decide the computer game champion. Choosing their seven favourite computer games, they use a bar chart to show their progress towards the magic ten wins of a game which will secure superiority.



The Great Race

We join the battle with the score at two all. The number of wins are as follows:

GAME	CHRIS	PAULA
HULK	2	7
PACMAN	6	10
DONKEY KONG	10	6
CHESS	6	8
BLUE MAX	10	5
COMPUTER WAR	8	10
THE LONE RAIDER	7	3

Chris and Paula start plotting these figures on Format `0`, the one EASEL automatically provides. They decide to change the colour of bar.

Choose a different colour bar:

F3 1 Press **F3** (COMMANDS)
EASEL displays the commands at the top of the screen

C 2 Press `C` (CHANGE)
EASEL responds '`Change`'

B 3 Press `B` (BAR)
This tells EASEL you want to change the bar. EASEL responds '`Change to Bar ?`'

Now you have three ways of choosing another colour bar.

- If you know the number of the bar type you want, simply enter that number. Paula decides to try `BAR 4`:

4 4 Press `4`
to choose `BAR` type `4`

↵ 5 Press ENTER
EASEL will draw the numbers as black bars with a white border. Paula decides she doesn't like this

- If you don't know the number of the bar type you want, ask EASEL to show you those it has designed:

↵ 4 Press ENTER
EASEL draws its choices on the screen. Paula much prefers `BAR 5`, white with a red border. To choose this:

TAB 5 Move the box cursor using the TAB key to the bar numbered 5

↵ 6 Press ENTER
EASEL redraws the grid, and will use your chosen bar to show this set of numbers

- If you want to use a bar which EASEL does not provide, you can design your own bar colour, border colour and border thickness. See 'Feature' below.

When Paula has finished plotting her wins, Chris sits down to the task. He draws a fresh grid to plot his wins, calling the set of numbers '`Chris`' with the NEWDATA command. He doesn't like any of the bars EASEL provides, so designs his own.

FEATURE: Designing your own bars

EASEL has designed 16 different bars. Choose the one you want by specifying its number. If you want to use a different bar here is how to design your own.

Chris decides he wants a black bar with a thick green border. To design such a bar follow the steps 1 – 3 above to employ the CHANGE command, then:

↵ 4 Press ENTER
EASEL draws its bar choices on the screen, labelled `0 -- 15`

↑ 5 Press the ↑ key once
The box cursor moves to the box containing a ?

↵ 6 Press ENTER
to tell EASEL that you want to design your own bar

EASEL allows you to specify the colour of all the bars, their border colour and border thickness. EASEL now displays these options and a palette of colours on the left of the screen. On the right is a picture of a bar which will show how the design is going. '`Fill colour`' is already highlighted.

To choose a black bar with a thick green border, first:

↵ 1 Press ENTER
This tells EASEL that you want to choose the bar colour. A box cursor appears around the first colour in the palette (white)

2 Press the ▶ key twice
The box cursor moves to the black box. Notice that the colour of the bar on the right changes as you step through each colour in the palette. The bar is now black

3 Press ENTER
This tells EASEL that you want a black bar colour. The next option, 'Border colour', is now highlighted. To choose the border colour:

4 Press ENTER
A box again appears around the first colour in the palette. Choose a green border colour:

5 Press the ◀ key once
The box cursor moves across to the green box

6 Press ENTER
Now 'Border thickness', the next option, is highlighted

7 Press ENTER
EASEL asks you to enter a number between 0 and 100. If you entered 0, the border would have no thickness (so wouldn't appear). If you entered 100, the border would take up the whole bar. To choose a fairly thick border:

40 8 Type 40
EASEL draws a black bar with a fairly thick green border on the right of the screen

9 Press ENTER
The last option is now highlighted 'Satisfied'. To tell EASEL that you're satisfied with the design:

10 Press ENTER
EASEL now displays all of Chris's victories using a black bar with a thick green border. It also adds this bar design to its array of bar designs. The new bar design is numbered 16.

Note: You can always move between options using the ▲ and ▼ keys. If at any stage you aren't happy with the design, go back to the option you want to change with the ▲ key. Then repeat the above process.

Chris constructs a bar chart showing the number of games he has so far won, and calls the set of figures 'Chris'. He adds a title, axis names and changes the cell labels from the months of the year to the names of the games.

The twins combine the sets of figures 'Paula' and 'Chris' using the VIEW command. They want EASEL to display their figures as a horizontal cluster bar chart, so ask for Format 4.

EASEL draws the chart shown in Figure 7.1. As each game is won, they change the graph until all the games are decided – Paula wins by a whisker.

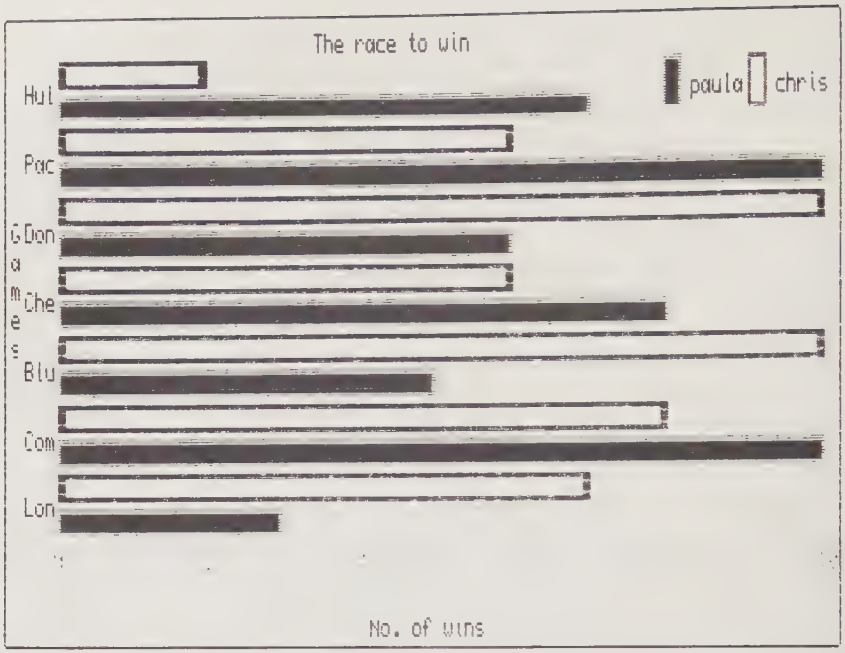


Figure 7.1 – A Horizontal bar chart

Further suggestions for bar charts in leisure

- Performance of first division football teams

  Plot the wins, losses and draws of selected teams to see a direct comparison beween them. This applies equally to any sport

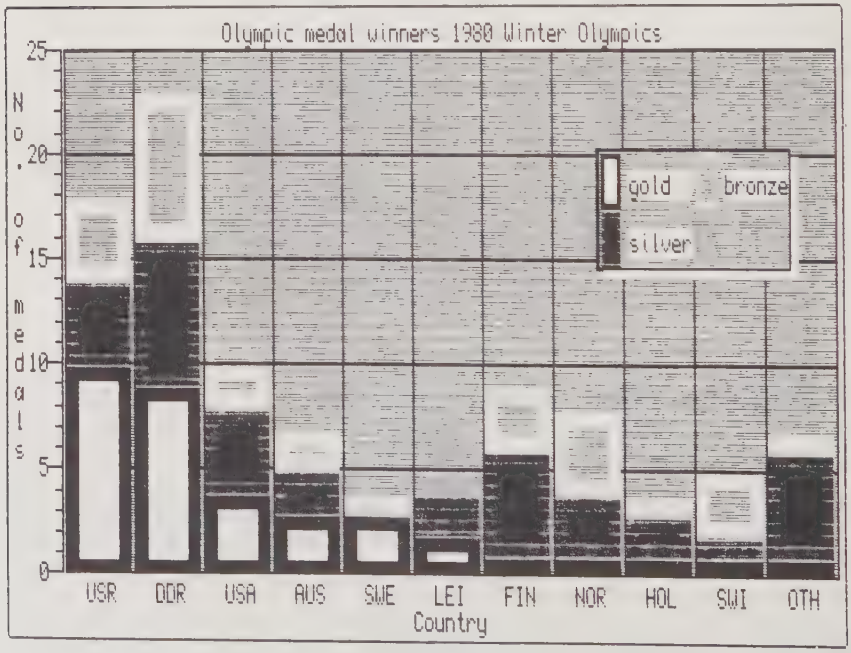


Figure 7.2 – A further example

involving two sides, or indeed to chess, bridge, darts or whatever interests you

- Olympic medals gained

  A bar chart can illustrate very neatly the number of medals won by each country in the Olympics. A stacked bar chart in such instances shows how the total number is split between gold, silver and bronze medals.

- Scores achieved in a decathlon
  The points scored by an athlete in each of the ten sports of a decathlon can be shown on a bar chart. You could use a cluster bar chart to compare the points of different athletes.

BUSINESS

Example: Diligence of Tees Toymakers

Intending to award a bonus to the most productive staff members, Harold Blake uses a bar chart to compare the performance of his seven toymakers. He has drawn up a table of the number of toys each employee has made over the last four weeks and the number of hours each has worked:

NAME	TOYS MADE	HOURS WORKED
Bernie	380	170
Tony	340	145
Colin	310	140
Maureen	290	150
Bert	210	140
Sylvia	280	135
Fred	190	120
TOTALS	2000	1000

First of all, Harold changes the labels from the months of the year to the names of the toymakers. He also substitutes his own axis names and title for those EASEL provides.

He draws a bar chart showing the toys each toymaker has produced and calls the numbers '`toysmade`' (see below).

Using the NEWDATA command, Harold draws a new bar chart on the same skeleton, to show the number of hours each toymaker worked, calling the set of numbers 'hours'.

Harold VIEWS the two sets of figures on one cluster bar chart (Format 1), shown in Figure 7.4.

Unfortunately it doesn't really tell him what he wants to know: who are his best and worst toymakers? To find out, he uses an efficiency index.

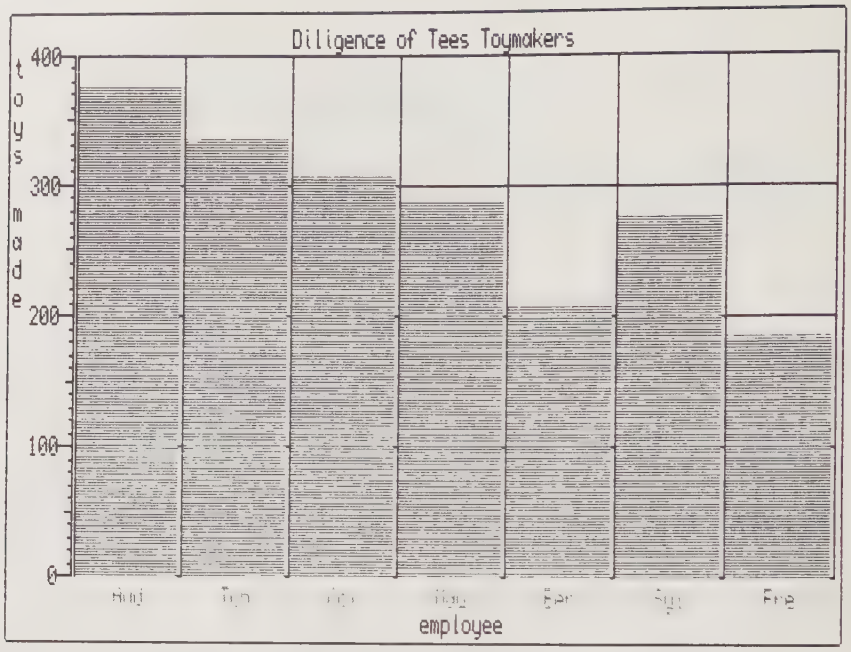


Figure 7.3 – Toys each toymaker produced

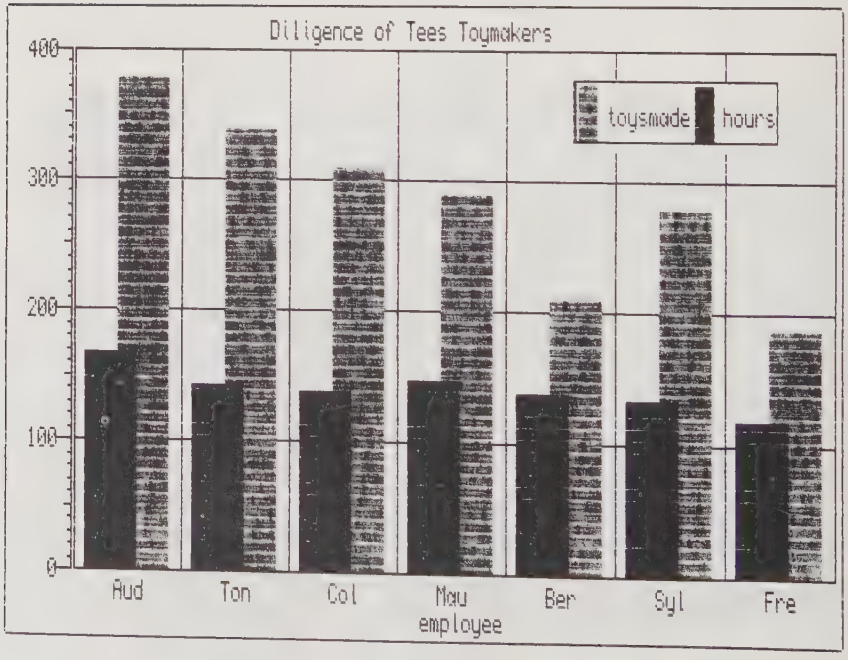


Figure 7.4 – Toys produced and hours worked

FEATURE: Efficiency indices

An 'efficiency index' can compare the efficiency of all kinds of things: the petrol sales of garages, the profitability of investment, the productivity of people or factories etc.

The formula

$$\text{employee eff. index} = \frac{\text{employee productivity}}{\text{average productivity}} - 1$$

where

$$\text{average productivity} = \frac{\text{total number of toys made}}{\text{total hours worked}}$$

gives a measure of efficiency. If the employee is average, the value will be 0, if above average it will be positive, if below it will be negative. In other words, employees with a positive efficiency index are effective workers: conversely those with a negative efficiency index are less so.

Harold Blake works out the efficiency index of each toymaker in the following way:

EASEL can do these calculations using Harold's figures 'toysmade' and 'hours'. First plot the employees' productivity on EASEL:

```
emplprod =
toysmade/hours
```

1 Type `emplprod = toysmade / hours`
i.e. each employee's productivity is the number of toys made divided by the hours worked



2 Press **ENTER**
EASEL draws a bar chart showing each employee's productivity, calling the set of figures 'emplprod'

Note: When you create a new set of figures, whether by a formula or by the NEWDATA command, EASEL chooses a new bar to draw the resulting set of numbers.

To work out the employee efficiency index, you need to know the average productivity. From the table you can see that 2000 toys were made in 1000 hours, so the average productivity was 2 toys per hour. To plot the efficiency indices for each toymaker:

```
empleff =
(emplprod/2)-1
```

1 Type `empleff = (emplprod / 2) - 1`



2 Press **ENTER**
EASEL draws each employee's efficiency indices, calling the set of figures 'empleff'

Look at Harold's new graph in Figure 7.5 to check that yours is right.

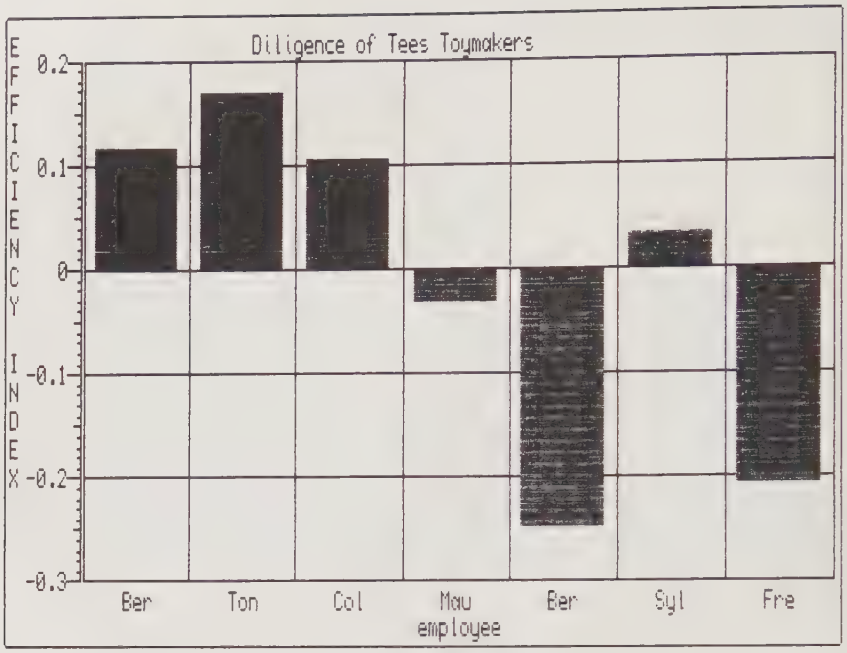


Figure 7.5 – The toymakers' efficiency

FEATURE: Highlighting Negative values

Harold wants to highlight the negative efficiency indices, to emphasise that these workers aren't pulling their weight.

To highlight all negative values, use an option of the HIGHLIGHT command,thus:

F3 1 Press **F3** (COMMANDS)

H 2 Press H (HIGHLIGHT)
EASEL responds 'Highlight'. EASEL asks you to choose whether to highlight a particular value (press 'V') or all negative values (press 'N')

N 3 Press N (NEGATIVE values)
Now you must choose what type of bar you want to highlight the negative values. EASEL displays its array of bar designs. You can either choose one of these, or design your own as described in the last example

Harold highlights the poor performers using bar number 2, a green bar. The less diligent of the workforce are much in evidence as the toymakers' efficiencies re-appear on the screen.

Harold hasn't quite finished with EASEL. He wants to know not just which workers are the most efficient, but which have done the most hours. Thus he must display both the efficiency index and the hours worked for each employee. However, the numbers in one set are much larger than in the other. If they were displayed together on one graph, the efficiency indices would be dwarfed into insignificance.

FEATURE: Scaling a set of numbers

In a situation like this, where two sets of numbers are quite different in magnitude, scale one set so that the numbers are similar and can be sensibly displayed on one graph.

Harold's two sets of figures are the efficiency indices, ranging from –0.3 to +0.2; and the hours worked, ranging from 120 to 2700.

To display both of these on one graph, scale down the hours worked by dividing the entire set by 1000. EASEL will do this for you:

```
hours=hours/1000
```

1 Type `hours = hours / 1000`
This divides every number in 'hours' by 1000. EASEL redraws the graph to show the new set of numbers. Because the new numbers have the same name as the old, the new 'hours' are displayed in the same colour bars as the old 'hours'.

Harold now uses the VIEW command to see both '`hours`' and '`empleff`' on one graph using format 1, with the result shown below. Bert, the dour veteran, hasn't been too efficient but has made up for it by working long hours. However, Fred, the cockney motor-cycling enthusiast, has been both grossly inefficient and has had plenty of days 'sick'. You can see from the graph in Figure 7.6 that it's the suave Tony who gets the biggest bonus.

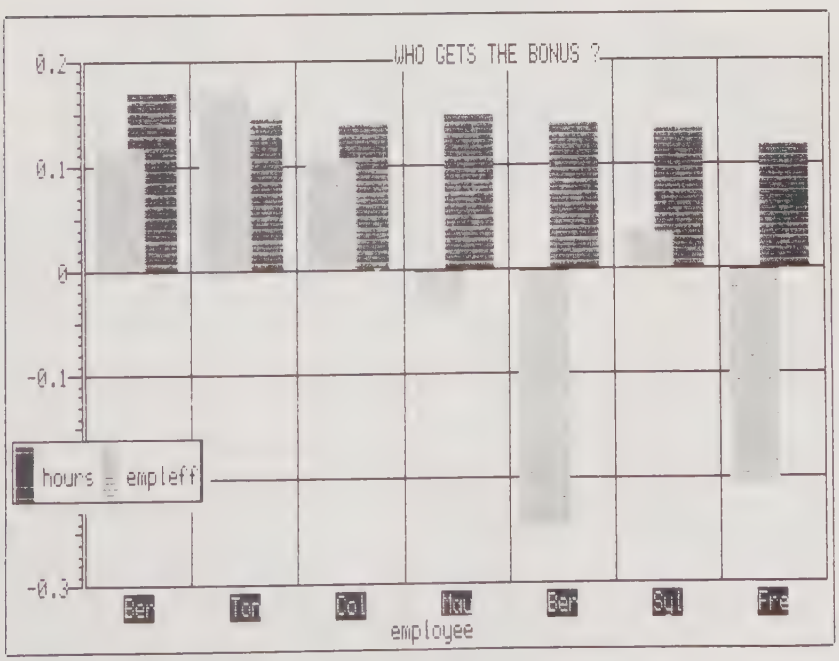


Figure 7.6 – Who gets the bonus?

Further bar charts in business

- Age profile of employees

  A bar chart can be used to show the age profile of a company by plotting the number of employees in the age ranges: under 20, 20–30, 30–40, 40–50, 50 and above.

- Sales of products

  You can use a bar chart to illustrate the sales of various types of product, either in terms of money or numbers. For instance a Leyland garage could show the numbers of Metros, Maestros, Montegas and Rovers sold in a year on a bar chart as in Figure 7.7.

- Employees' days sick

  The number of days that particular employees go sick one year compared to another year would be well suited to display on a cluster bar chart. Annotations offering some explanation as to the reasons for the variations would be interesting.

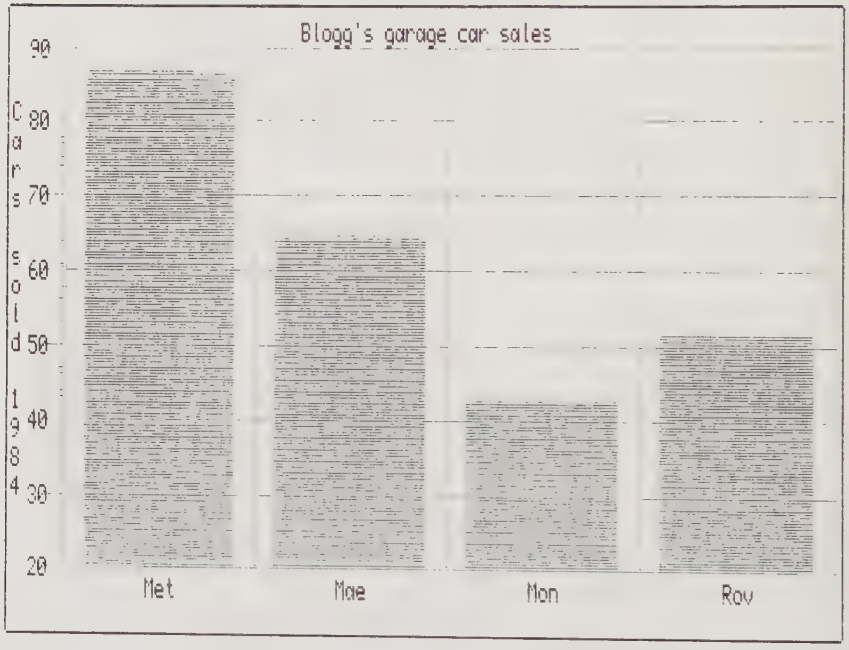


Figure 7.7 – A further example

AT HOME

Example: Joyce's expanding wardrobe

Harold is fed up. The wardrobe is full to bursting with Joyce's clothes, half of which she never wears, and his shirts and suits are often impossible to find.

To prove his point, he counts the items of clothing each member of the family has in the following categories:

CLOTHING	Harold	Jocye	Twins
Shoes	6	21	16
Skirts/Trousers	12	27	15
Shirts/Blouses	15	33	23
Dress/Suits	4	28	16

Harold draws a bar chart showing the number of shoes each of them has, cleverly calling the set of numbers '`shoes`'. He then draws a bar chart of each of the other categories of clothing in turn, calling the sets of figures '`bloushir`', '`trouskir`' and '`dressuit`'.

He is keen to emphasise Joyce's proliferation of clothes, so draws a stacked bar chart of the number of items. He VIEWS all four sets of figures using Format 2: EASEL draws the chart in Figure 7.8.

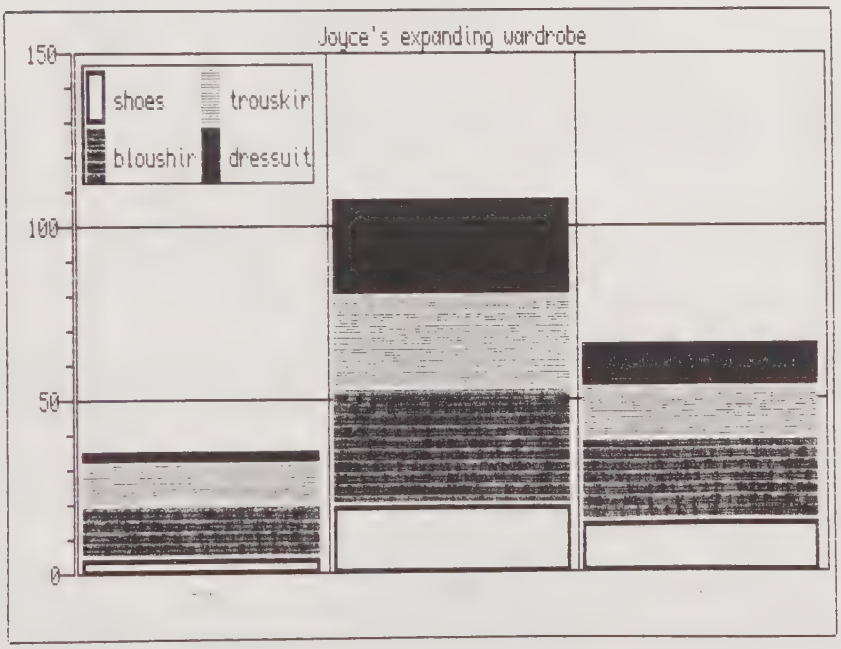


Figure 7.8 – The Blake family collection – Stage 1

FEATURE: Designing your own axes

Harold wants to design his own axis – choose the colour of the numbers and the axis markings. To do this:

F3 1 Press **F3** (COMMANDS)

C 2 Press **C** (CHANGE)

[A] 3 Press A (AXIS)
This tells EASEL that you want to change the appearance of the axis. EASEL responds 'Change to AXIS ?'. First ask EASEL to display its designs:

[↵] 4 Press ENTER
EASEL draws its 10 designs, labelled 0 -- 9, on the screen

Harold decides to have a go at designing his own axis, rather than choose any of EASEL's. To do this:

[♦] 1 Press the ♦ key once
This selects the axis with a question mark by it

[↵] 2 Press ENTER
EASEL displays the choices which allow you to design your own axis. The first choice is highlighted 'Axis colour'. To choose the axis colour:

[↵] 3 Press ENTER
Move the box cursor to the green box:

[♦] 4 Press the ♦ key once
The axis markings are drawn in green. The next choice is highlighted – 'Axis line drawn?'. EASEL is asking whether you actually want the axis markings at all. If you choose this, EASEL will not draw the axis line. Each time you make this choice, EASEL swiches from drawing the axis lines to not drawing them. You want to keep the axis line drawn, so move on to the next option:

[▼] 5 Press the ▼ key once.
EASEL highlights 'Label colour'. It is asking whether you want to change the colour of the axis numbers. You do, so

[↵] 6 Press ENTER
EASEL highlights the white box from the palette. To select red:

[♦] 7 Press the ♦ key once

[↵] 8 Press ENTER
The numbers on the axis change from white to red. EASEL highlights 'satisfied'. You are, so

[↵] 9 Press ENTER
EASEL redraws your graph with a green axis with red numbers on it

EASEL remembers each new axis design, and shows it alongside those axes it provides. Next time you look at the axis designs there will be another one – a green axis with red numbers, design number 10. This new axis will be lost when you switch off EASEL, but if you save the graph you're working on EASEL will remember the axis you used with that graph.

FEATURE: Designing a new graph background

Harold decides to alter the chart still further, by changing the background for the chart. Just as the CHANGE command altered the axis markings, it will alter the background graph paper.

C 1 Press C (CHANGE)

G 2 Press G (GRAPH paper)
This tells EASEL that you want to change the graph paper. EASEL responds 'Change to GRAPH PAPER ?' on the input line. To see what graph papers EASEL has designed

↵ 3 Press ENTER
EASEL displays the 7 graph papers it has designed, labelled 0 -- 6

Harold again wants something different – a plain white background. To design this:

♦ 1 Press the ♦ key once.
The box cursor moves to the box with a ? in it

↵ 2 Press ENTER
EASEL displays the choices on the left of the screen and the graph paper on the right. The first choice 'Paper colour' is highlighted. To adjust this:

↵ 3 Press ENTER
A box appears around the first colour in the palette, white. Just the one Harold wants, so all you need do is:

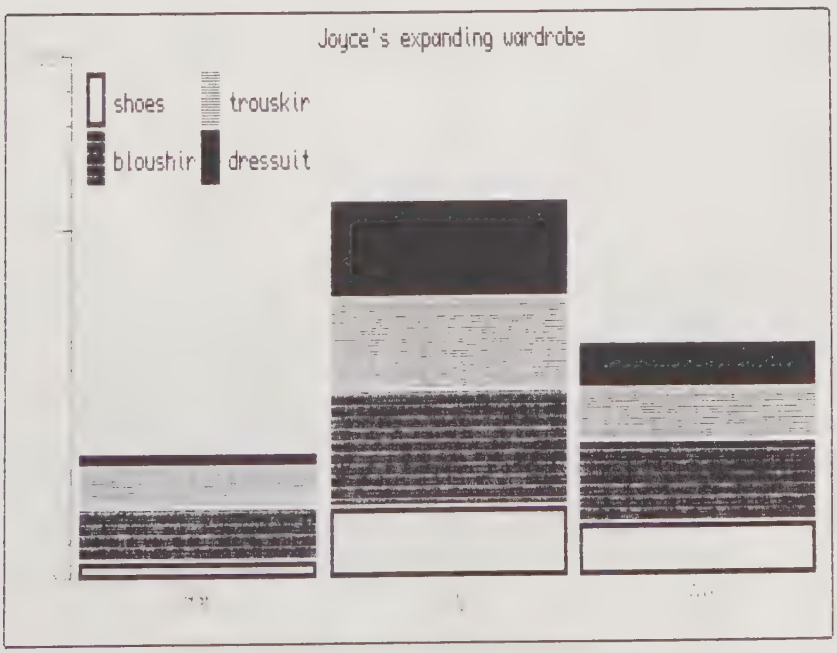


Figure 7.9 – The Blake family collection – Stage 2

4 Press **ENTER**
EASEL highlights the next choice '`Grid colour`'

5 Press **ENTER**
A box appears round the white box in the palette of colours. Again, this is what you want, so:

6 Press **ENTER**
EASEL draws a completely white graph paper on the right of the screen, and highlights the next line '`Satisfied`'. You are, so

7 Press **ENTER**
EASEL redraws the graph with plain white graph paper. It adds a plain white background to its list of choices, (background graph paper number 7)

Harold is pretty proud of his graph (Figure 7.9), and shows it to Joyce. She thinks it rather garish, but agrees that perhaps she ought to give away some of her more ancient garments and not replace them.

Further suggestions for bar charts in the home

- Hours spent on household chores

  People sometimes wonder what housewives do all day – a bar chart can empasise that housework is time-consuming. This applies equally to hours spent watching various types of TV programmes,performing various tasks at work, playing sports, or doing homework.

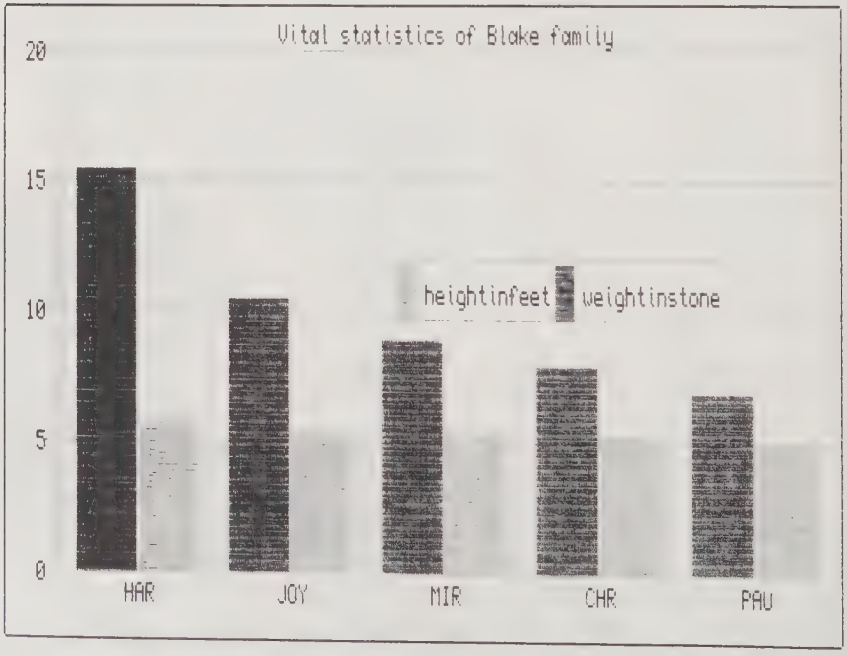


Figure 7.10 – A further example

- Domestic budget expenditure

  A bar chart shows comparisons between various expenditures very clearly. It can display the breakdown of any budget – domestic, darts club or sales promotion, the principle still stands.

- The heights and weights of the family – quantities

  The vital statistics of members of the family can be compared using a bar chart (figure 7.10).

EDUCATION

Example: The twins' exam successes

Joyce has promised to give the twins extra pocket money if they improve on last year's test results – 50p for a mark over 70 and £1 for a mark over 80. Joyce appears to have quietly forgotten the deal, so they construct a bar chart illustrating how much they are owed.

The twins draw a bar chart of Paula's exam results and call the set of figures '`Paulamarks`'. Then they draw another bar chart showing Chris' results, calling the figures '`Chrismarks`' (Figure 7.11).

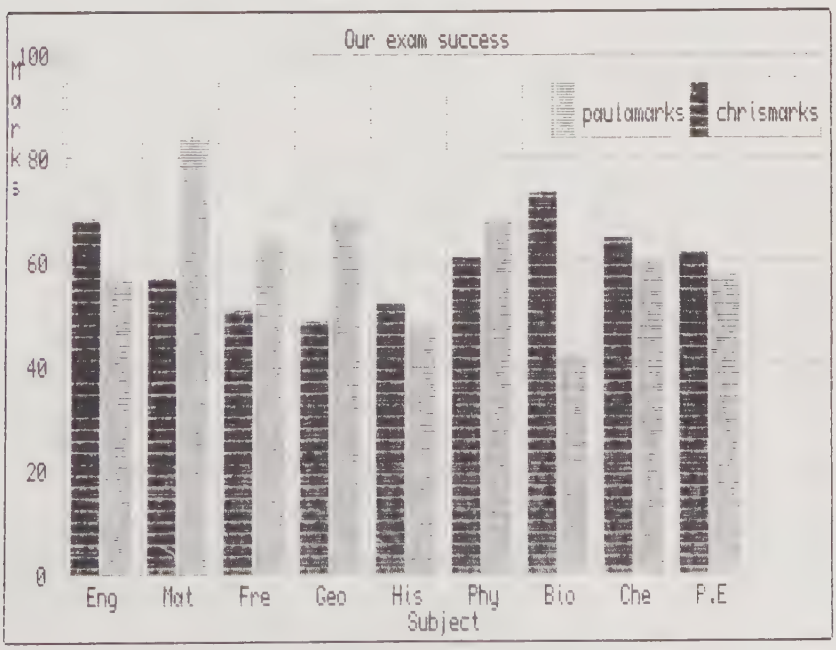


Figure 7.11 – The twins' results – Stage 1

Their results this year were:

SUBJECT	PAULA	CHRIS
ENGLISH	58	69
MATHS	84	57
FRENCH	65	51
GEOGRAPHY	69	49
HISTORY	48	52
PHYSICS	68	61
BIOLOGY	42	74
CHEMISTRY	60	65
P.E.	58	62

Paula has earned herself £1 for her excellent Maths mark, and Chris has got 50p for his aptitude in Biology. The twins highlight their successes with a special bar. Paula puts a thick white border around the red bar in the set '`Paulamarks`'. Chris puts a thin white border around the green bar showing his Biology exam success in '`Chrismarks`'.

FEATURE: Highlighting particular values

To emphasise particular bars, use the HIGHLIGHT command:

F3 1 Press **F3** (COMMANDS)

H 2 Press `H` (HIGHLIGHT)
This tells EASEL that you want to highlight some values on the graph. EASEL asks you to choose whether you want to emphasise particular values (press '`V`') or all negative values (press '`N`')

V 3 Press `V`
EASEL writes '`Highlight a value`' on the input line, and asks you to indicate which bar you want to highlight

TAB 4 Move the crosswire to the bar you want to highlight using the **TAB** key

↵ 5 Press **ENTER**
EASEL displays all the bars it has designed. Either choose one of these or design your own bar to highlight that value

The twins highlight their money-making results in their specially-designed bars.

Chris and Paula VIEW their results on a cluster bar chart (format `0`), combining the two sets of exam results on one graph. Here is the graph which the twins present to their mother, who is so impressed she pays up on the spot.

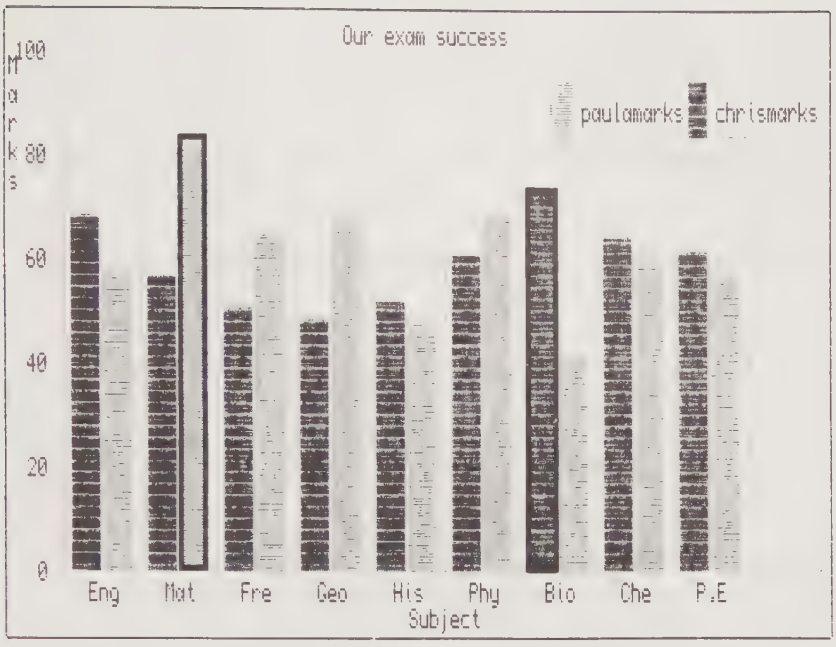


Figure 7.12 – The twins' results – Stage 2

Further suggestions in education

- Children with green eyes

  The number of children in a class with blue, green, hazel etc eyes would be well represented by a bar chart. Any such categorisation of children can be illustrated on a bar chart.

- Rainfall in city

  The numbers of inches of rain falling each month during the year in a country is an ideal subject for display on EASEL.

- Dinosaur height

  You can transport yourself to prehistoric times and draw a bar chart of the heights of different species of dinosaurs compared to the height of a man.

CHAPTER 8

The Line Graph

Line graphs are powerful tools in business and leisure, at school and at home. This chapter shows how to make the best of line graphs on EASEL, drawing from examples in all these areas.

The chapter covers:

- Choosing EASEL's line graph format
- Changing the type of line
- Designing your own line
- Functions and formulae on EASEL
- Using CELL and CELLMAX to good advantage
- The EASEL command:

  CHANGE LINE
- The graph-drawing techniques:
  - effective use of annotations
  - 'Z' charts
  - compensating for inflation
  - creating many points automatically

These are contained within the following examples:

Leisure

Example: – Training for the marathon
Features: – Changing to a different line
– Effective use of annotations

Business

Example: – Jada Jewellery's sales success
Features: – Business tool: The Z chart
– Designing your own line

Home

Example: – Controlling grocery expenditure
Feature: – Eliminating spurious influences
e.g inflation

Education

Example: – Explaining trigonometric functions
Features: – Functions
Plotting many data points using CELL
Using CELL and CELLMAX

INTRODUCTION

Line graphs show changes and trends in a set of figures. They frequently appear in text books, newspapers and journals to illustrate the fluctuations of the stock market, the rise in London crime, the explosion of venereal disease in California, or the Law of Gravity, or to correlate smoking and lung cancer.

To draw a line chart on EASEL, use Format 3. EASEL will provide a new line of its choice for each new set of numbers you plot. It's quite simple to change to any other of EASEL's variety of different lines.

When you initially plot your numbers, EASEL draws a thin white line (for a normal line) or a white block (for an infilled line). This doesn't mean it will always draw your numbers in white – when you VIEW the graph, EASEL shows the true colours of the lines it has chosen.

You can, if you wish, adapt any of the bar chart formats to include a line as well as (or indeed instead of) bars. You do this by CHANGEing the BAR representation (which EASEL automatically provides) to a LINE representation, just as you did in Chapter 2.

You draw a line graph in exactly the same way as you drew a bar chart. The only difference is that EASEL joins up each number with a line instead of drawing blocks to represent your numbers. You add, erase and change numbers in the same way.

To jog your memory, here is a quick summary of the basics:

- To plot number – type in the number
- To change a number – move crosswires to the point you want to change, then type in new number
- To delete a number – move crosswires to point you want to delete then press F4
- To insert a number – move crosswires to left of point to insert then press F5 and type in extra number


Harold's Slimathlon

LEISURE

Example: Training for the marathon

Harold Blake, continuing his health and fitness drive, is training for the Marston-on-Tees marathon, although he is not convinced that he will actually take part. For each of the twenty days prior to the race, he has set himself targets of distances to run.

Every five days he must time himself to ensure improving fitness, and his progress so far is shown below.

DAY	Target (miles)	Achieved miles)	Target mins)	Achieved mins)
1	4	4	40	55
2	5	5		
3	7	6		
4	8	6		
5	8	8	100	120
6	9	6		
7	10	4		
8	11	5		
9	12	6		
10	12	7	90	108
11	13	3		
12	14	9		
13	15	10		
14	16	3		
15	16	7	80	99
16	17	12		
17	17	7		
18	13			
19	8			
20	5			

Harold wants to chart his progress towards his goals on a line graph.

To draw a line graph with EASEL, change to Format 3, the line graph format (otherwise EASEL will draw a bar chart). To do this:

F3 1 Press F3 (COMMANDS)

C 2 Press C (CHANGE)

F 3 Press F (FORMAT)

D 4 Press 3
EASEL redraws the grid. Format 0 had a red grid with white cell labels: now the grid is white and the cell labels are black-on-white. You can CHANGE these later if you want to

Harold plots the target distance per day, calling this set of figures '`target`'. As Harold enters his numbers, EASEL draws a thin white line which will transform into a red line when VIEWed. Then he uses the NEWDATA command to plot the distances he has achieved, calling this set of numbers '`achieved`' – EASEL draws a white block following the line.

He uses the VIEW command to see the '`target`' and '`achieved`' distances combined (on format 3). The graph EASEL draws is a little confusing (see figure 8.1).

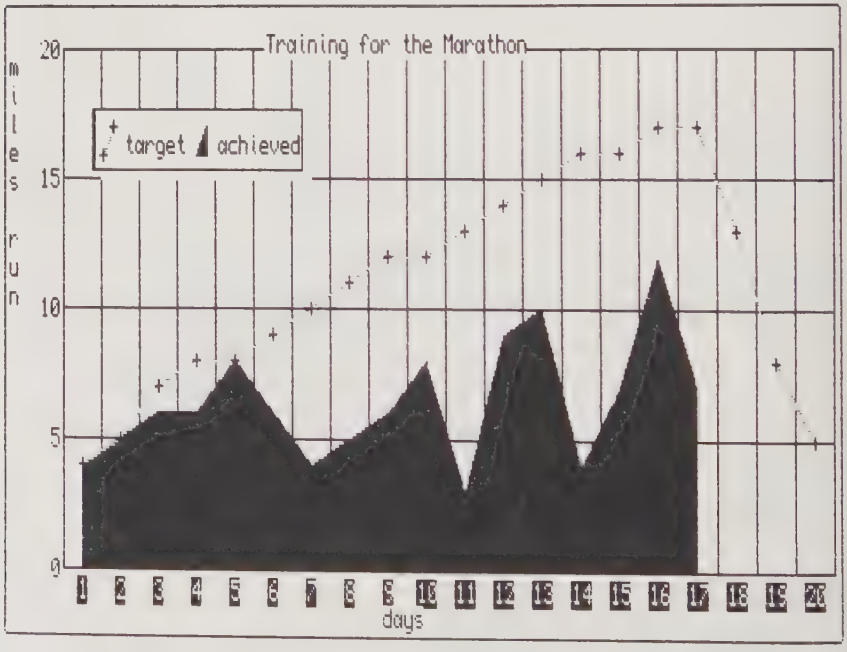


Figure 8.1 – Harold's progress – Stage 1

FEATURE: Changing to a different line

The first step Harold takes to improve the graph is to CHANGE the cumbersome infilled red line which represents 'achieved' to a complementary green line.

Note: When you VIEW a set of numbers, the 'Current Name' is always the set of numbers you displayed immediately prior to VIEWing. In this case, it is 'achieved', so any CHANGES Harold does will affect the distances he 'achieved' rather than the 'targets'.

You can change the Representation (see the STATUS AREA) to a LINE, whether you are using a line or a bar chart format. To do this:

F3 1 Press **F3** (COMMANDS)

C 2 Press C (CHANGE)

L 3 Press L (LINE)

Now you can choose the type of line you want in one of three ways. Whatever line you choose will represent the current set of numbers.

- If you know the number of the type of line you want, (which you won't if you haven't used EASEL very much) simply type it in at this stage. For instance, to select Harold's choice of a green line with crosses at each point (EASEL line 10):

10 4 Type 10

↵ 5 Press **ENTER**
EASEL will draw all your numbers as a continuous green line with crosses at each point, until you use the CHANGE command again or plot a new set of numbers

- If you don't know what lines EASEL provides, you can ask EASEL to display its various line designs:

↵ 4 Press **ENTER**
EASEL draws its choices of line on the screen

↓ 5 Move the box cursor to the line of your choice using the ↓ key

↵ 6 Press **ENTER**

- You can also design your own line instead of using any of EASEL's choices:

↵ 4 Press **ENTER**
EASEL displays its choices

↑ 5 Press the ↑ key
The box cursor moves to the triangle with a ? in it

↵ 6 Press **ENTER**
EASEL displays the line design screen

Now you can design your own line (explained in detail in the next example).

Once you've chosen the appropriate line, EASEL redraws your graph, showing this new line.

FEATURE: Effective use of annotations

Annotations are part of the skeleton of the graph. They remain unchanged by anything you do to the numbers, so position them with care or they may interfere with the graph itself.

Harold writes each target time by the appropriate point on the 'target' line. He positions the times so that it is quite clear to which point each refers, and uses white to match the 'target' line.

Then he decides to write the times he actually achieved each fifth day. First he uses the OLDDATA command to display the distances 'achieved'. The annotations showing target times remain, although the line showing target distances disappears. He changes the text colour to green, matching the 'achieved' line. Then he writes the times he achieved by the appropriate points, well away from the target times.

Harold VIEWS the two sets of figures '`target`' and '`achieved`' again. This time the result looks much better (see Figure 8.2) but reveals painfully clearly Harold's poor progress in his quest for health.

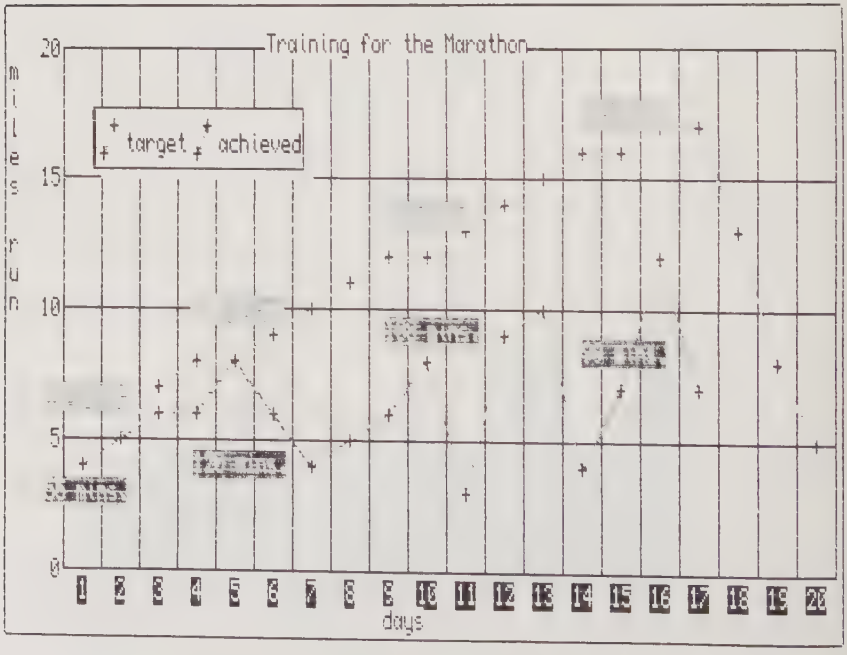


Figure 8.2 – Harold's progress – Stage 2

Further suggestions

- Popularity of sport

  Times,values,customs – all are changing, and with them the popularities of the various sporting activities. A line graph could illustrate the recent upsurge in windsurfing, decline in popularity of football as a spectator sport etc.

- Charting a swimmer's progress

  A line graph will show a swimmer's progress towards a target time for 100 metres over a period of weeks. This type of graph is applicable to any similar targetting – plot the best achievement each day over a period (Figure 8.3).

- Slimmers' weight chart over Christmas

  A slimmer's club would show the weights of its members over Christmas on a line graph to encourage members not to over eat.

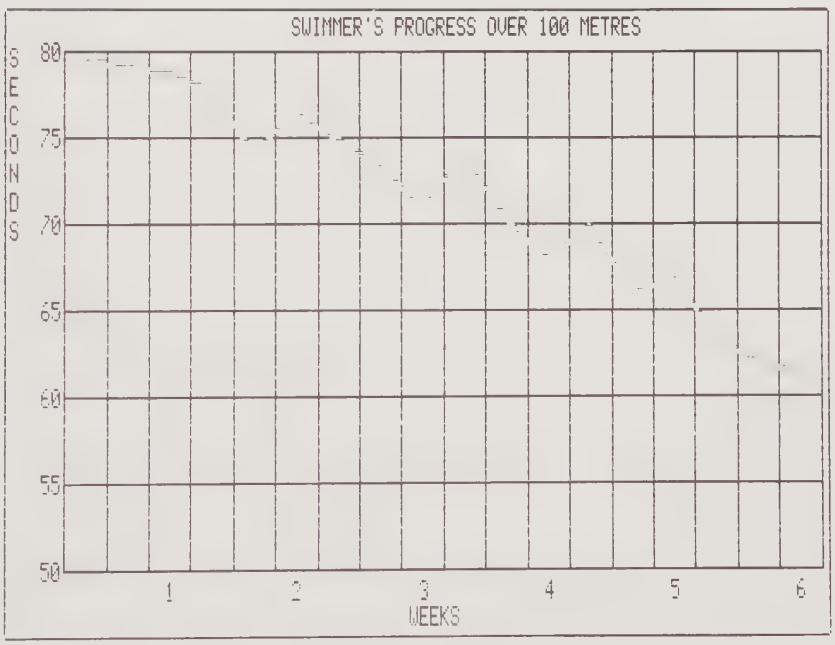


Figure 8.3 – A further example

BUSINESS

Example: Jada Jewellery's sales success

Joyce Blake has just completed her second year's trading with Jada Jewellery. Shown below are her sales over the period August 1982 – July 1984.

MONTH 82/83	SALES £000's
AUG	10
SEP	14
OCT	15
NOV	28
DEC	25
JAN	8
FEB	11
MAR	18
APR	17
MAY	14
JUN	12
JUL	10

MONTH 83/84	Monthly sales	Cumulative sales	Moving annual average
AUG	14	14	186
SEP	16	30	188
OCT	19	49	192
NOV	24	73	188
DEC	22	95	185
JAN	14	105	191
FEB	16	125	196
MAR	22	147	200
APR	23	170	206
MAY	18	188	210
JUN	17	205	215
JUL	15	220	220

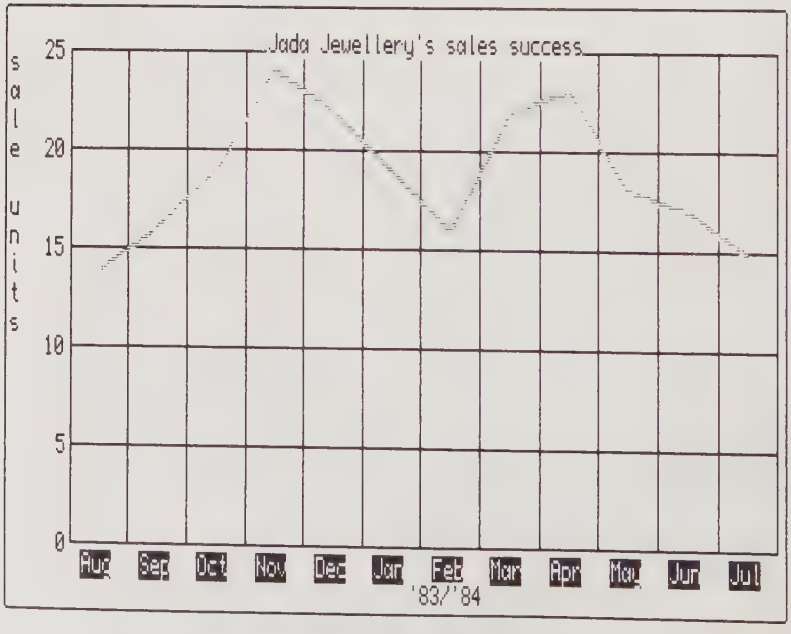


Figure 8.4 – Jada Jewellery's fluctuating sales

Nigel, Joyce's actor son-in-law, is helping Joyce with her business in his frequent 'resting' periods. He draws a line graph for her showing the sales from August 1983 to July 1984 (Figure 8.4).

As you can see, the graph is somewhat difficult to interpret because the seasonal variations are so large. Nigel's father suggests he should draw a 'Z chart' to show the real trend in sales.

FEATURE: Business tool – the Z chart

Any organisation involved in sales must keep track of how sales are going. Often sales trends are obscured by seasonal variations – a Z chart is designed to show both the actual sales and the underlying trends. Three lines are drawn:

- The monthly sales through the year
- The cumulative sales through the year
- The moving average annual sales: these are the sales over the previous twelve months. For example, the moving annual average sales up to 31 July 1984 are the total sales over the period 1 August 1983 to 31 July 1984. This figure eliminates seasonal variations and hence shows the overall trend in sales.

It will soon become clear why it is called a 'Z' chart.

Nigel plots two more sets of figures, one showing the cumulative sales (called '`cumsales`') and one the moving annual total (called '`annsales`') for August 1983 – July 1984. He uses a green line

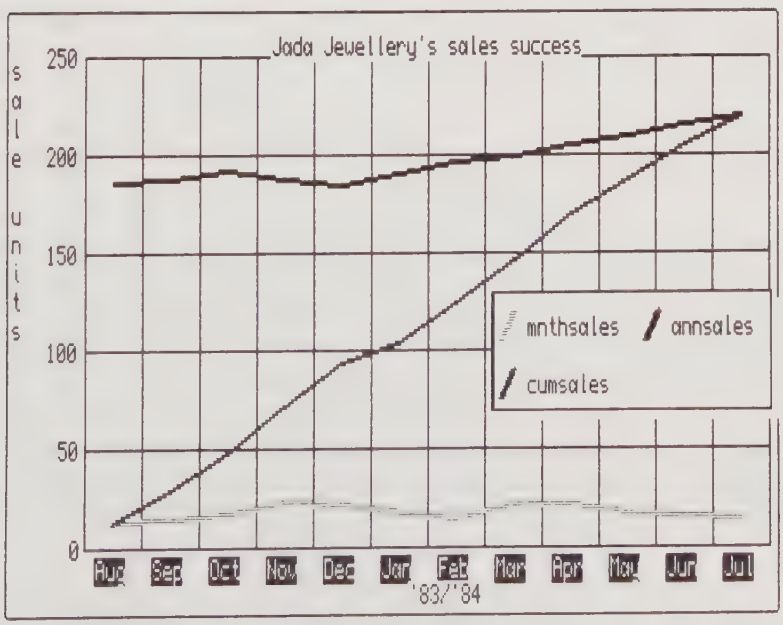


Figure 8.5 – A 'Z' chart

(EASEL line 1) for all three sets of numbers, then combines all three lines on one graph using the VIEW command and Format 3 again. The resulting graph forms a rather wobbly Z on the screen.

The combination of these three lines always produces a 'Z' on the graph. The bottom line shows monthly sales, the top the sales trend after the removal of all seasonal variations.

Interpreting the graph, you can see that overall sales are improving despite the recent apparent dip.

Nigel wants to emphasise the moving average, most important of the lines since it shows that the trend is improving. He thinks a red line with red points will have the appropriate dramatic effect. However, EASEL does not provide such a line, so Nigel designs his own line for 'annsales'. The annual sales were the last set of numbers he plotted, so are now the 'Current Name' and therefore will be affected by the CHANGE.

FEATURE: Designing your own line

EASEL doesn't provide all types of line, but it does allow you to design your own. You can choose the colour of the line, whether to use a symbol to mark each point (if so in what colour) and whether to use an infilled line or simple line.

Note: Remember, if you want to change an existing set of numbers to a new representation, they must be the 'Current Name'. Use the OLDDATA command to recall them if necessary.

To design your own line, use the CHANGE command. Nigel's line design is created as follows:

F3 1 Press **F3** (COMMANDS)

C 2 Press C (CHANGE)

L 3 Press L (LINE)

↵ 4 Press **ENTER**
EASEL draws its choices of lines

↓ 5 Press the ↓ cursor key
the box cursor moves to the triangle with a '?' in it

↵ 6 Press **ENTER**
The Microdrives whirr, and the line-design screen appears. On the right is the line which is currently displaying the current numbers. On the left is the list of design choices and a palette of colours. The first design choice is highlighted 'Line colour'. To select the line colour:

↵ 7 Press **ENTER**
A box appears around the first colour box, white. To select red instead:

8 Press the ▶ key
The line on the right changes to red

9 Press ENTER
The next choice is highlighted 'Symbols on ?'. Each time you choose this option, the crosses which can mark each point switch from on to off (and vice versa). Nigel wants crosses at each point, but at present doesn't have them, so

10 Press ENTER
EASEL provides crosses at each end of the line and highlights 'Symbol colour'. To change the symbol colour:

11 Press ENTER
Again the box surrounds the white box. To select red symbols, repeat steps 8 and 9. The line is now red with red crosses, and EASEL highlights the next choice 'Line filled ?'. If you choose this, the simple line will change to an infilled line (and vice versa). Nigel doesn't want an infilled line, so

12 Press the ▼ key
to skip over this option. EASEL highlights the next design choice 'Line thickness'. To change the thickness of the line:

13 Press ENTER
EASEL now expects a number between 0 and 100 (if you choose a larger number EASEL will draw a very thin line). For a thick line, enter 100, for a thin line enter 0. Nigel wants a reasonably thick line

70 14 Type 70

15 Press ENTER
EASEL draws a fairly thick line on the right, and highlights the final line 'Satisfied'. If you aren't, step back to the option you want to change with the arrow keys. If you are satisfied:

16 Press ENTER
The Microdrive whirrs, and the graph is drawn exactly as you left it, but with your new design of line

Once you've designed your line, EASEL will let it represent all subsequent numbers you work on – that is, until you use the CHANGE command again or plot another set of numbers. EASEL saves your new line alongside its own as line number 16. You can use it for any set of numbers you subsequently; when you leave EASEL, the line description will be lost.

Nigel VIEWS the graph again, and the improving sales are very much in evidence. Joyce is very pleased with his efforts, and offers him a permanent position in the company. However, Nigel's artistic aspirations prevent him from accepting the offer.

Note that the printed graph shown in Figure 8.6 does not show the new cumulative sales line very clearly – red is stunning on the screen, but unimpressive when you print it out.

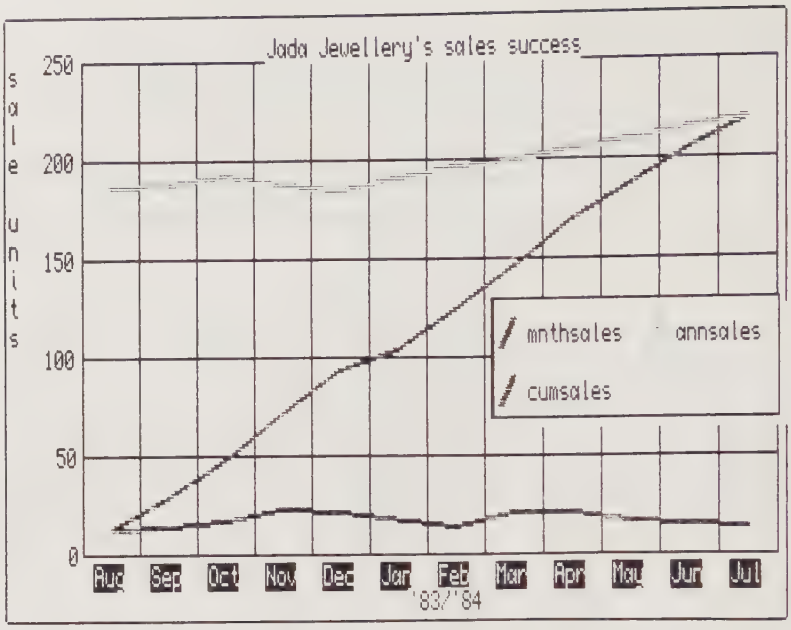


Figure 8.6 – Nigel's redesigned graph

Note: It is much easier to hold the monthly sales in ABACUS and calculate the moving annual sales and cumulative sales on the spreadsheet. The three sets of figures can then be passed over to EASEL to plot as explained in Chapter 11.

Further suggestions for line graphs in business

- Value of personal assets

  Line graphs can show fluctuations in the value of your personal assets over a period of time, or the value of the stock market FT index, the price of hi-fi, seasonal variations in the price of beef – the list is endless.

- Company profits/reserves

  The changes in company profits can be shown on a line graph, as can company reserves, turnover, sales, costs, etc.

- Discounts related to volume

  Often the size of the discount available to a customer will depend upon the size of his purchase. Here a salesperson can use a line graph as an aide memoire when quoting discounts to a customer (Figure 8.7). Applies similarly to rebates, credit terms etc.

- Maximising profits

  A line graph can be used to show expected sales for different unit prices (hence different profit margins), and the total profit (expected sales x profit margin) can be plotted. The unit price is then fixed to coincide with the maximum total profit achievable.

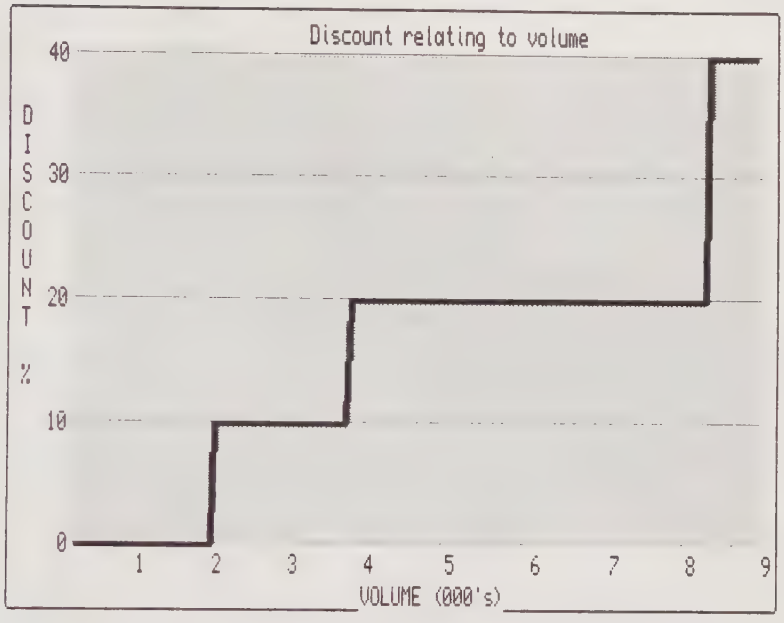


Figure 8.7 – A further example

AT HOME

Example: Controlling the domestic budget

Joyce Blake is worried. Harold's new 'healthy' diet, consisting entirely of exotic and expensive dishes, appears to have caused a substantial rise in the household's grocery budget.

She has kept a record of how much they have spent on food in the last few months: this is shown below.

MONTH	GROCERY EXPENDITURE
JAN	£60.51
FEB	£64.79
MAR	£67.68
APR	£63.35

MAY	£69.15
JUN	£65.47
JUL	£80.45
AUG	£92.62
SEP	£86.37
OCT	£84.80
NOV	£92.98
DEC	£106.75

Joyce draws a line graph of the above numbers, on Format 3 (Figure 8.8).

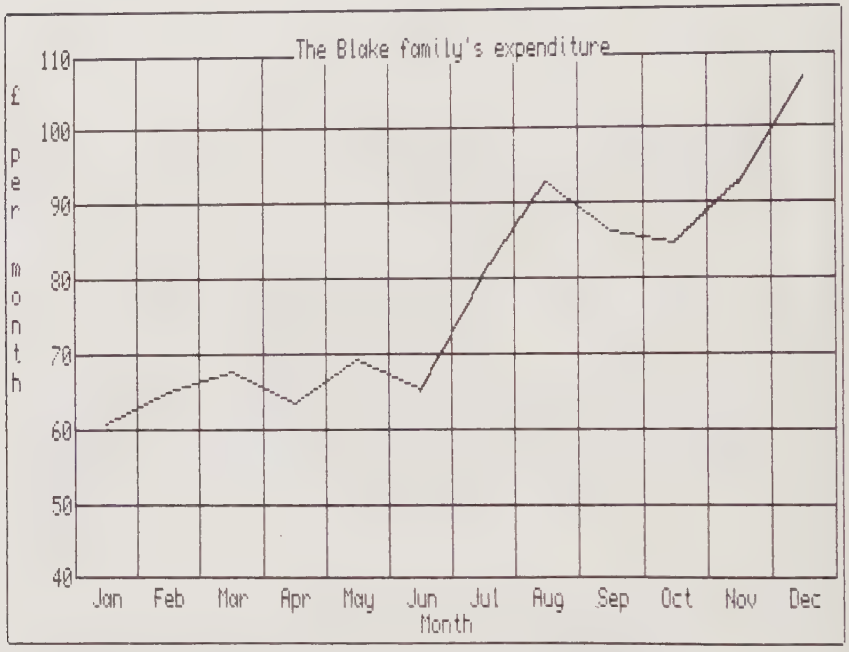


Figure 8.8 – The Blake family's expenditure

Knowing that Harold will wave her protestations aside with a nonchalant 'It's just inflation', Joyce eliminates its effect from the graph.

FEATURE: Eliminating spurious effects such as inflation

To eliminate effects, such as inflation, which are irrelevant to *trends* (as distinct from the actual *amounts*) shown on a graph, scale a set of figures down or up by the amount of the irrelevant effect.

For example, to exclude the 6% annual inflation, (i.e. 0.5% monthly inflation) from the grocery budget, use the formula:

```
Expenditure excluding inflation = actual expenditure
                                  ------------------
                                  (1 + (0.005 * n))
```

where n is the month number.

Joyce scales her monthly expenditure on groceries down by the amount of inflation, 6% per year, by typing the following formula:

```
exclinf = monthexp / (1 + (0.005 * cell))
```

This formula deploys the 'CELL' function. This can be highly useful for formulae or functions. It returns the number of each slot – 1, 2, 3 . . . – starting at the left slot. In the example above 'CELL' produces the number of each month, which is 1 for January, 2 for February, etc.

The effect of applying this formula is to eliminate the effects of inflation on the Blakes' grocery budget.

Even when the effect of inflation is removed it is clear that Blake grocery expenditure is on the increase. Joyce VIEWs the expenditure both with and without inflation effects on Format 3 (shown in Figure 8.9). Harold is somewhat horrified by his extravagance and vows to limit his visits to Wholemeal's Health Foods.

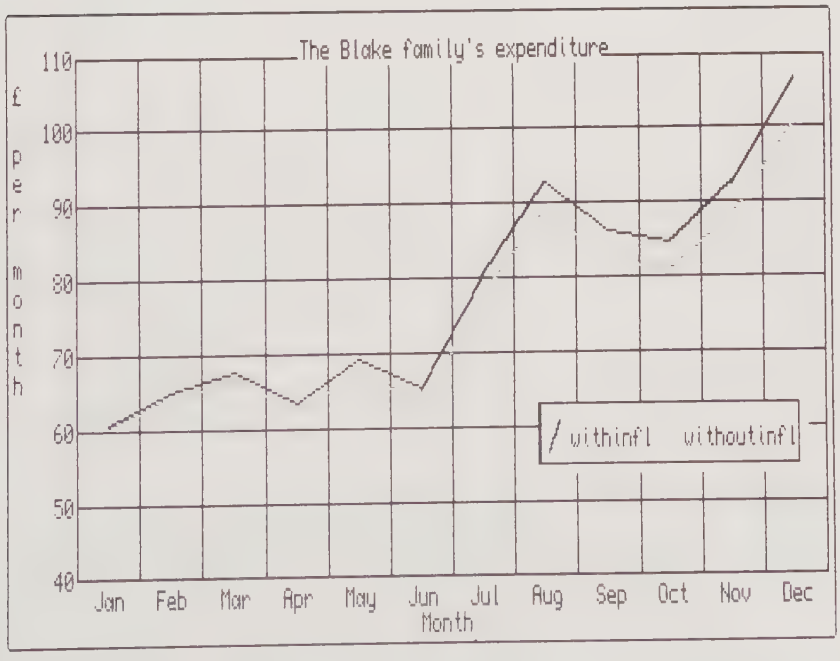


Figure 8.9 The effect of inflation

Further suggestions for line graphs at home

- Baby's growth

  The development of a baby can be followed using a line graph, to show its increase in weight or height or food intake and compare it to normal growth. Similarly you can plot the amount of food recommended for a puppy or kitten over the first weeks of its life for reference when feeding.

- Controlling energy uptake

  The cost of energy is a constant source of annoyance to any user. A line graph will clearly illustrate the pattern of usage of gas, electricity, coal etc. over time. You may then be able to ascertain what exactly is consuming energy at such a tremendous rate (it won't be the computer).

- Showing mortgage repayments

  The potential home buyer can quickly appreciate the punitive effects of taking a higher mortgage by plotting monthly repayments against the size of the mortgage.

- The increasing divorce rate

  The extent to which divorces have become more common over the last twenty years is well illustrated by the graph shown in Figure 8.10.

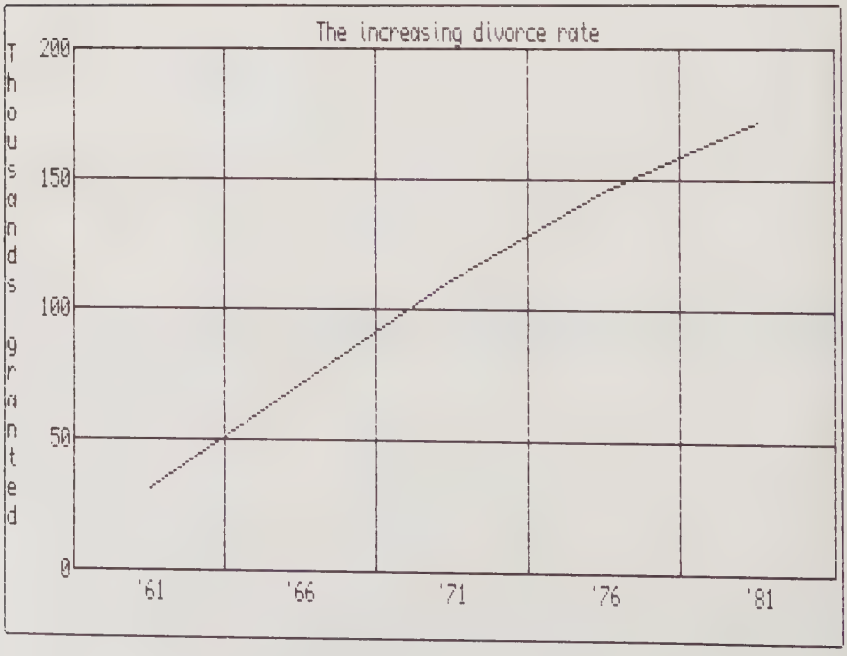


Figure 8.10 – A further example

EDUCATION

Example: Explaining SIN and COS functions

Harold Blake, keen as ever to further his children's knowledge, has been watching the TV programme 'Teach the Children'. He's convinced the twins should be learning pure maths before it's too late, so constructs a line graph on EASEL to explain trigonometrical functions to them.

FEATURE: Functions

A mathematical function converts one set of numbers to another, converting each number in turn by use of the function. For instance, applying the square root function, SQR to a set of numbers 9, 16, 25 produces the set of numbers 3, 4, 5. Technically speaking,

```
newset = funct (oldset)
```

where the *function* '`funct`' *operates* on the *argument* '`oldset`' and *returns* the values '`newset`'.

If this sounds rather technical, don't give up – the results can be very impressive. All you need to do to produce a very pretty graph is to follow the instructions.

The quick reference section at the end of this book provides a list of functions available on EASEL.

Harold knows he can illustrate the trigonometrical functions cosine and sine by using the EASEL functions COS and SIN. (The *argument* of any of these functions must be in radians rather than degrees.)

You can use the CELL function again to generate a range of values of the trigonometrical functions rather than typing them all in. To draw a complete sine curve on the twelve cells available:

`sincurve`

1 Type `sincurve = SIN(2 * PI() * cell / 12)`

↵

2 Press **ENTER**
EASEL draws a crude sine curve over the twelve cells (Figure 8.11)

Note: You must *not* leave a space between the EASEL function and the bracket immediately after the function, in the above example `SIN` and `PI`. However, you don't need to put EASEL functions in capital letters: they are in capitals above to emphasise their role.

Harold wants to draw a much smoother curve over many more cells. First he must construct a grid with a large number of slots.

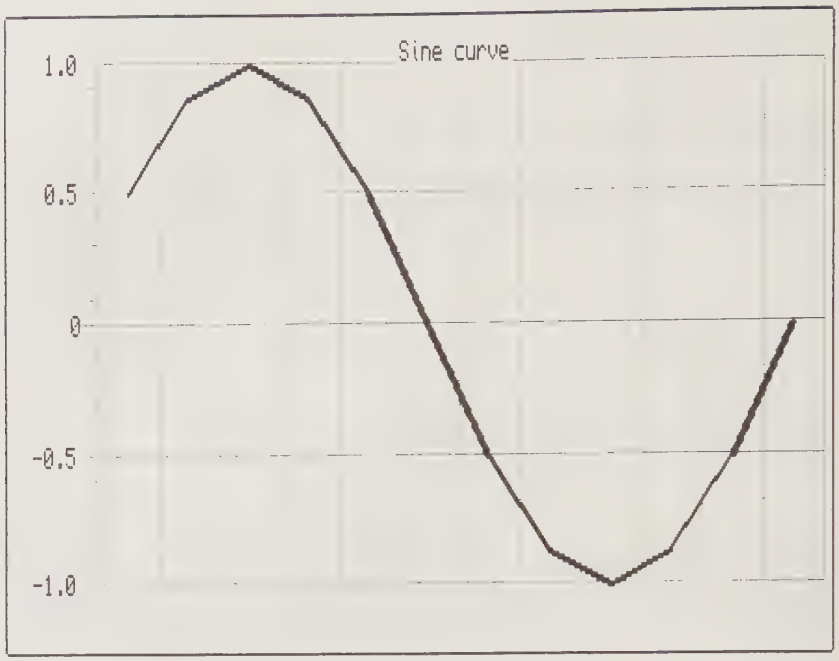


Figure 8.11 – A crude sine curve

FEATURE: Plotting many data points using CELL

You can plot a large number of points without effort by using CELL in a formula. CELL provides a value only for cells which already exist, so first set up a grid with many cells.

The easiest way is to hold down the **TAB** key so that the crosswires move rapidly across the screen and new slots are created in quick succession. To find out how many slots you have on the grid, type in the simple formula:

```
Number = CELLMAX
```

EASEL will draw a straight line, and the top number on the grid will be the number of cells you have created.

Harold does this until he has a grid with 100 slots.

FEATURE: Using CELL and CELLMAX

CELLMAX will give the number of cells on the graph when used in a formula. CELL, as we have said, gives the number of each cell, starting at 1 for the first cell, 2 for the second cell, 54 for the 54th cell etc.

Harold draws a smooth complete sine curve on his grid using CELL and CELLMAX. To do this:

1 Type `sinecurve = sin(2 * pi() * cell / cellmax)`

↵ 2 Press ENTER
After a short pause as EASEL works out all those values for you, the line snakes its way across the screen. EASEL draws a lovely smooth sine curve on the screen (Figure 8.12)

The corresponding formula for a cosine curve is:

```
coscurve = cos(2 * pi() * cell / cellmax)
```

Harold plots a cosine curve function on his grid using the above formula, and changes the type of line to a thin green line (EASEL line 1). He then combines the two trigonometrical functions '`sinecurve`' and '`coscurve`' on one graph using the VIEW command and format 3.

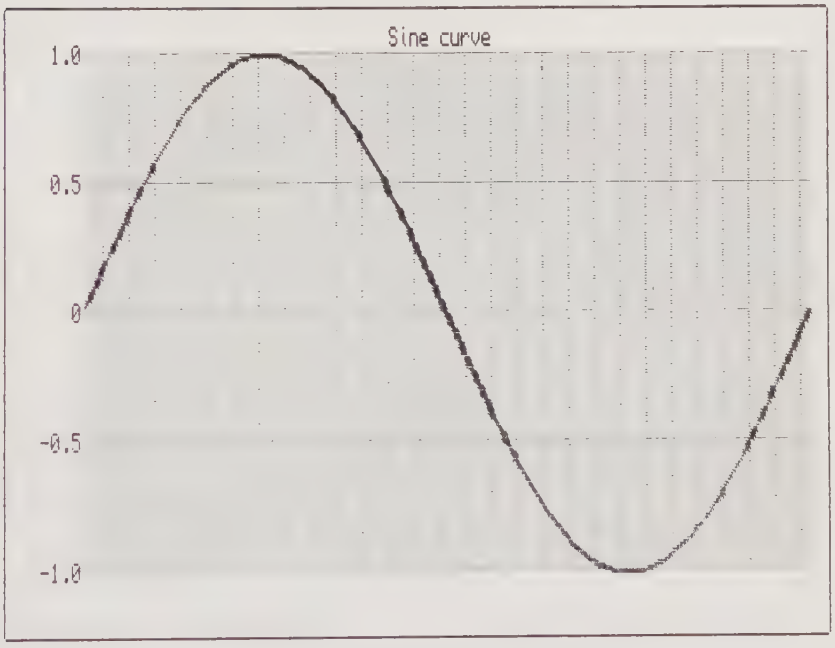


Figure 8.12 – Smoothly curved line graph

Harold proudly shows it to Paula and Chris, who remark that it is very pretty but unfortunately don't understand a word of his lengthy explanation. Undeterred, Harold resolves to save the graph and try again next year – perhaps the children are just a little too young at 12 for trigonometrical functions.

Further suggestions for line graphs in eductaion

- Popularity of school dinners

  The waxing or waning popularity of school dinners could be illustrated on a line graph. Plot the number of children eating

school dinners and the number who bring their own over a period of a few months.

- Length of day

  An experiment to measure the changing length of the day during the year would be summarised on a line graph (Figure 8.13). Many scientific experiments are elucidated with a line graph.

- Progress of child in maths over his school career

  A child's progress can be charted on a line graph, showing his position in the class over his school career.

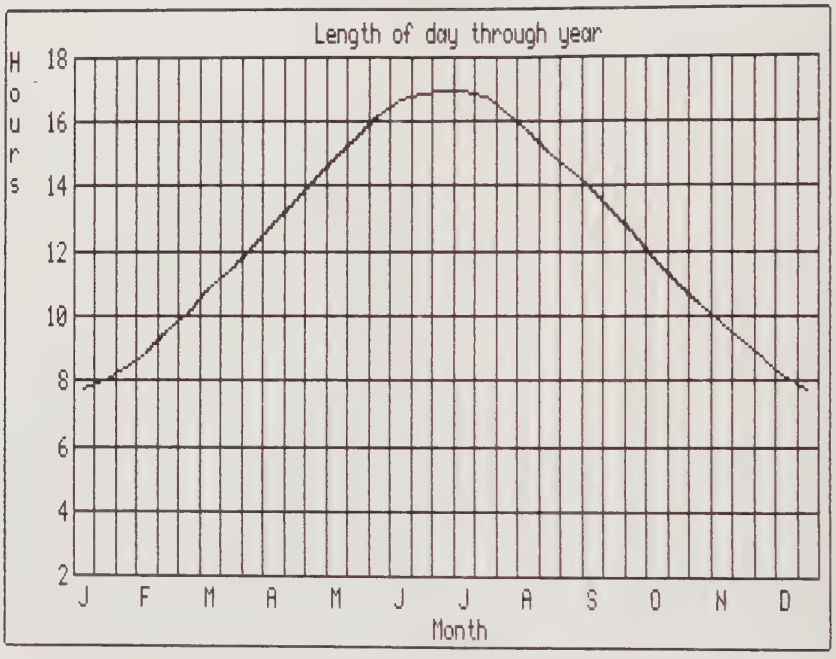


Figure 8.13 – A further example

CHAPTER 9

Pie Charts

This chapter explains how to create a pie chart on EASEL, and gives lots of ideas as to the use of pie charts in everyday life.

The chapter covers:

- Choosing the EASEL pie chart format
- Inserting, deleting and changing numbers in the pie
- Changing the segment colours
- Changing the segment labels
- Highlighting a particular segment
- Pie chart techniques:
  - Comparing two pie charts
  - Using pie charts in conjunction with bar charts
- The EASEL commands:

HIGHLIGHT	– to highlight a segment
CHANGE SEGMENT	– changes the colour of a segment
EDIT LABELS	– changing labels on a pie chart
F4	– delete segment
F5	– insert segment

Here we explore some of the everyday uses of a pie chart at home, in business, in leisure and in education. A specific example in each area is discussed in detail, and further ideas for their use are suggested. The first example gives a simple guide to constructing a pie chart on EASEL.

At home

Example: – The children request a rise
Features: – Drawing a pie chart
– entering the numbers
– deleting a segment
– changing segment labels
– changing the size of a segment
– inserting a new segment
– changing segment colours

Education

Example: – Choosing the best school
Feature: – Comparing two pie charts

Business

Example: – Market shares of cuddly-toy makers
Feature: – Changing segment colours
– Highlighting particular segments

Leisure

Example: – Foreign holidays are just as cheap
Feature: – Pie charts used with bar charts

Points to remember

- You can only show one group of figures at a time on a pie chart
- Pie charts are drawn much more slowly than bar charts or line graphs on EASEL. You may want to type in your numbers on a bar chart and, when they are all correct, CHANGE to a pie chart as described in the next section
- Don't show too many numbers on one chart, otherwise it will be cluttered and lose its impact. Try not to include more than eight portions per chart, grouping the less important portions under the label 'others' if necessary

INTRODUCTION

Pie charts are the least commonly used of the three types of chart, and the least complex. Pie charts are a simple means of displaying information; they are also relatively inflexible. They show proportions of the whole (or 'slices of the cake'). They can show such information as a company's share of the market, budget expenditure, proportion of women and men working in an organisation, etc.

Whereas it's easy to mix bars and lines on one graph if you so wish, a pie chart is always on its own, and cannot be combined with other types of chart. It is something of an 'odd-man-out' on EASEL. The only way you can draw one is to CHANGE to Format 7, a pie chart. The only way to revert to a bar or line representation is to CHANGE format again.

Pie charts look quite different from both bar charts and line graphs, but they are equally easy to plot on EASEL. However, each time you plot a new number on an existing pie chart, EASEL has to redraw the pie. Drawing pie charts from scratch on EASEL can therefore be time-consuming, so it is a good idea to first plot your set of numbers on a line or bar chart, then CHANGE to Format 7, to see your numbers displayed as a pie chart.

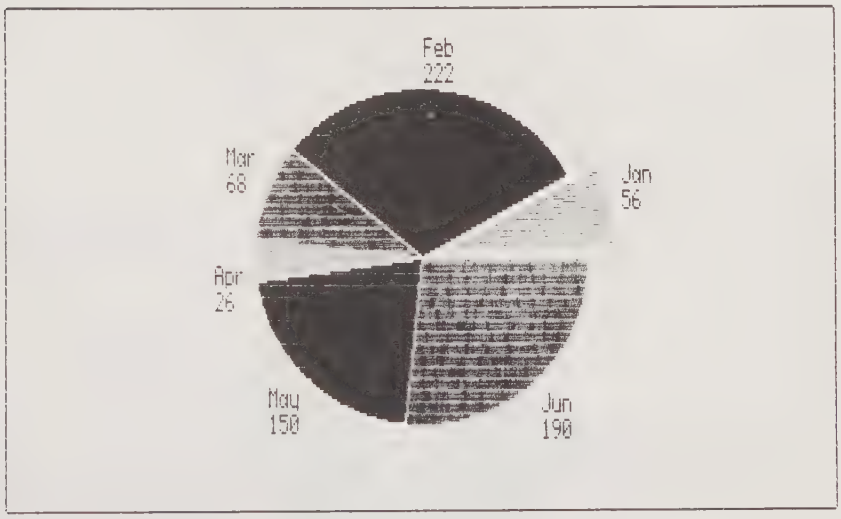


Figure 9.1 – A typical pie chart

AT HOME

Example: The twins ask for more pocket money

Chris and Paula are up in arms. Because of Joyce Blake's new business, they now take the bus to school and pay for it out of their own pockets. 'The NSPCC might be very interested . . .' they mutter darkly. Mum's reply is that they are spending too much on sweets. They construct a pie chart of their expenditure to make the point that they spend very little on such luxuries.

Last month's expenditure was as follows:

Expenditure	Amount
Sweets	£4.91
Records	£2.24
Bus	£3.20
Comics/mags	£2.40
Toys	£3.10
Other	£0.15
Total	£16.00

DRAWING A PIE CHART

First the twins switch to the pie chart format:

F3 1 Press **F3** (COMMANDS)

C 2 Press C (CHANGE)

F 3 Press F (FORMAT)

7 4 Press 7
EASEL draws a red circle on the screen, with a label 'Jan' on the right. The STATUS AREA changes to show that the Format is now 7 and the Rep is PIE

ESC 5 Press **ESC** (**ESCAPE**)
This erases the command menu

Entering the numbers

Each time you enter a number, EASEL redraws the pie chart to incorporate the new segment. The first number takes up the whole of the pie. Each subsequent number splits the circle into more and more portions. Each is proportional to the total of all the numbers you have entered so far. The size of existing portions therefore decreases as new numbers are added.

To plot the twins' pocket money expenditures:

4.91 1 Type 4.91

↵ 2 Press **ENTER**
EASEL draws the red circle again, this time with the number 4.91 underneath the label 'Jan'. To enter another number in another segment:

TAB 3 Press **TAB**
'Feb' appears in the bottom left-hand corner. The **TAB** key works just as it did in bar charts: it takes you onto the next 'cell', only in this case you don't see the cell until you enter a number. The **TAB** key will change the label shown in the left-hand corner, as will **SHIFT** and **TAB**. Try pressing them a few times, and then return to 'Feb'

2.24 4 Type `2.24`

↵ 5 Press **ENTER**
EASEL redraws the circle, now with a yellow segment occupying about a third of the circle, labelled '`Feb`' and `2.24`. '`Jan`' is again highlighted – EASEL always goes back to the first label when it redraws the circle. To get on to '`Mar`':

TAB TAB 6 Press **TAB** twice
'`Mar`' appears highlighted in the left-hand corner

3.20 7 Type `3.20`

↵ 8 Press **ENTER**
EASEL redraws the circle, this time with three segments in the proportions of the numbers you've entered

TAB TAB TAB 9 Press **TAB** three times
'`Apr`' appears in the bottom left-hand corner

10 Enter the remaining three numbers in the same way, the result is shown in Figure 9.2

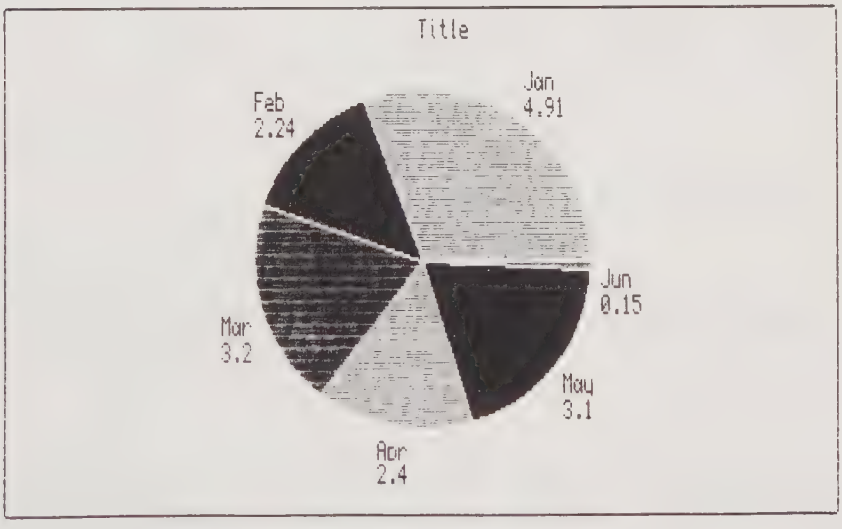


Figure 9.2 – The twins' expenditure – Stage 1

Deleting a segment

To delete a segment in a pie chart, use that destructive **F4** key. The highlight box acts like the vertical crosswire on a grid: the highlight box marks the segment just as the crosswire marks the cell which **F4** will delete.

The twins decide that the 'other' bit they included to make the total equal to four weeks' pocket money isn't really necessary and makes the chart look crowded. To delete it:

TAB 1 Move the highlight box to 'Jun' with the **TAB** key

F4 2 Press **F4**
EASEL redraws the circle, without the little segment marked 'Jun'

Changing segment labels

You can change segment labels in just the same way as you changed cell labels, using the EDIT command. The highlight box is the equivalent of the vertical crosswire on a grid. The label it highlights will appear on the input line ready for your alterations.

Chris and Paula reckon cell labels of 'Jan', 'Feb' etc. are somewhat misleading as descriptions of sweets, records etc. To change them to something more meaningful:

F3 1 Press **F3** (COMMANDS)

E 2 Press E (EDIT)

L 3 Press L (LABELS)
EASEL writes 'Edit label: Jan' on the input line

4 Change 'Jan' to 'sweets' using the line editor

↵ 5 Press **ENTER**
EASEL replaces 'Jan' with 'sweets' on the pie chart

ESC 6 Press **ESC** (**ESCAPE**)
EASEL returns you to the number entry screen

TAB 7 Press **TAB**
The highlight box moves on to the next label 'Feb'.

8 Replace the remaining labels 'Feb' to 'May' with the appropriate labels by repeating steps 1 – 6 for each label.

The twins' pie chart at this stage is shown in Figure 9.3

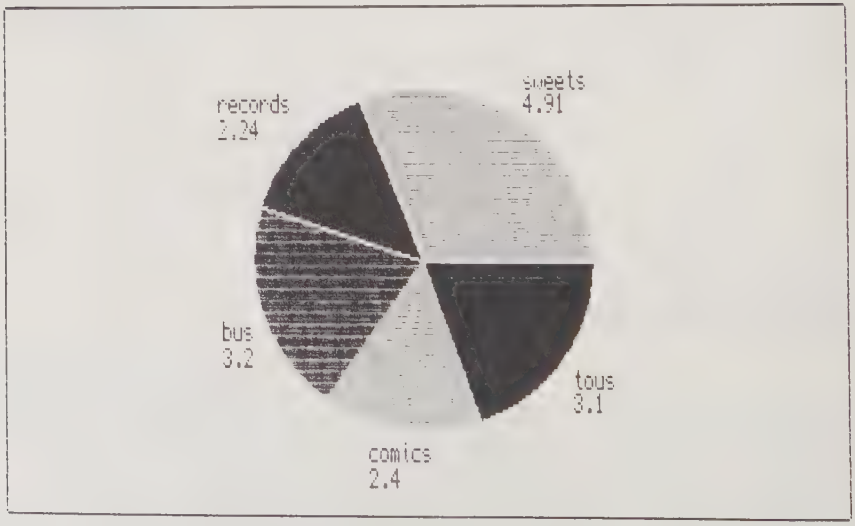


Figure 9.3 – The twins' expenditure – Stage 2

Changing the size of segments

You can change the size of a segment very easily: simply move the highlighting box to the label of the relevant segment and type in a new number.

Chris and Paula decide that 'sweets' still looks rather a large proportion of their outlay, so split it into two categories – 'sweets' and 'drinks/crisps'. First change 'sweets' from 4.91 to 2.56:

1 If it isn't already there, move the highlight box to 'sweets'

2.56 2 Type 2.56

↵ 3 Press ENTER
EASEL redraws the pie chart, with segments reflecting the smaller size of the twins' 'sweets' extravagance

Inserting a new segment

Just as you inserted new cells in the graph grid with F5, so you can add new segments in the pie chart using F5. When you insert a segment the colours of the existing segments are liable to change.

To add a segment showing Chris and Paula's expenditure on drinks and crisps:

1 Move the highlight box to 'sweets' if it isn't already there. EASEL will insert the new segment in the next position anticlockwise from the highlighted label

F5 2 Press F5
A highlighted box appears in the left-hand corner of the display area, saying 'unnamed'

2.35 3 Type 2.35

↵ 4 Press ENTER
EASEL redraws the pie with a new segment between 'sweets' and 'records'. Notice that the colours of the existing segments from 'records' onwards have changed so that you still don't have any two colours side by side

Now add a title to the pie chart, and name the unnamed segment:

1 Change 'Title' to read 'The twins need a rise', with the EDIT TEXT command. Move the title to the left, away from the pie, so that it doesn't interfere with the segment labels

2 Change 'unnamed' to 'drink/crisp' using the EDIT LABELS command (EASEL will actually only write 'drink/cris' on the chart)

The final pie chart looks like the one shown in Figure 9.4, and is enough to persuade Mrs. Blake that either a lift to school or a redistribution of her new-found wealth is appropriate.

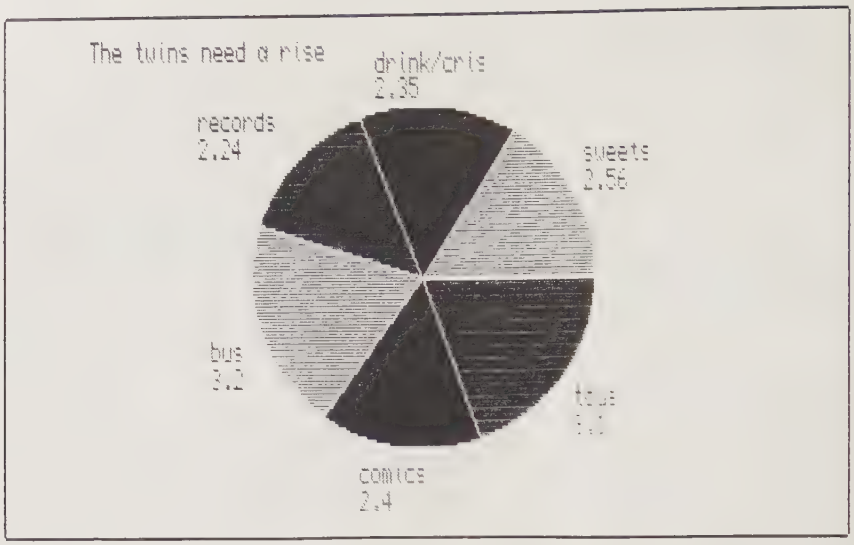


Figure 9.4 – The twins' expenditure – Stage 3

You should now be able to apply the techniques learned in this section to any other pie charts you wish to draw. The remaining examples are not intended to be worked through, but illustrate further specialities of pie charts.

Further suggestions for pie charts at home

- Various television programs watched

  A pie chart would be ideal for showing what type of programs the family watch most on television. It can also illustrate how people divide their time between sets of activities.

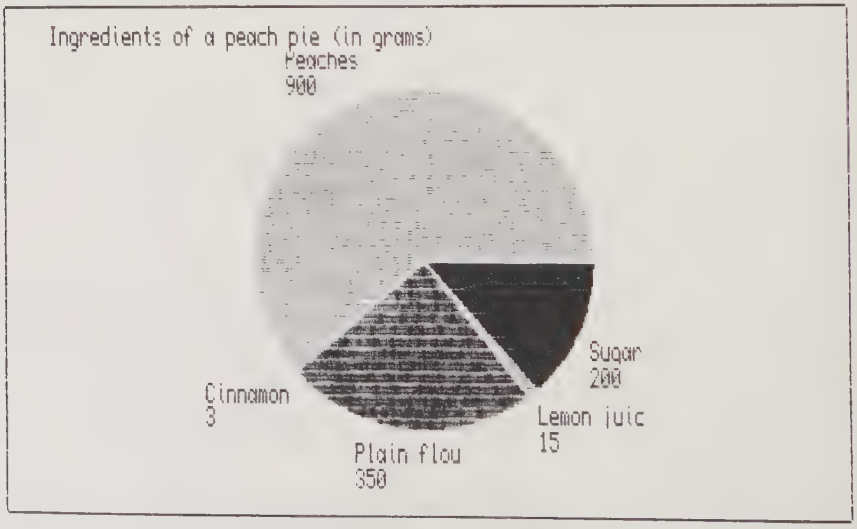


Figure 9.5 – A peach pie

- Budget expenditure

  The way that a budget is spent, whether for the WI, golf club or oil company, can be shown on a pie chart, just as Chris and Paula showed their various pocket-money expenditures.

- Ingredients in a peach pie

  A pie chart would aptly show what goes into a peach pie – how much flour, fruit, sugar etc (Figure 9.5).

EDUCATION

Example: Choosing the best school

Joyce and Harold Blake have some friends who are moving to the area who want to know which local school would be best for their children. They are interested only in the 'O' level results achieved by the school, since both children are, apparently, very intelligent.

Chris and Paula, to show they aren't so stupid either, draw two pie charts to look at each school's results.

GRADE	MARSTON	TEES
A	12	8
B	25	12
C	20	13
D	13	30
E	11	25
F	19	12

The twins draw a pie chart of Marston Bank High School's results, calling the set of numbers '`marsbank`'. Then they use the NEWDATA command and plot the Tees Comprehensive results. They want to compare the two pie charts they've drawn.

FEATURE: Comparing two pie charts

EASEL draws pie charts in only one size – no indication of the magnitude of the whole is given. However, it is often useful to compare the slices of two associated pie charts. EASEL will show only one pie chart at a time, so the best way to compare charts is to print them on paper.

If you don't have a printer you can compare pie charts by displaying them in quick succession using the VIEW command:

F3 1 Press **F3** (COMMANDS)

V 2 Press V (VIEW)

`marsbank` 3 Type the name of the first set of figures, in this case '`marsbank`'

↵ 4 Press **ENTER**
EASEL responds '`View marsbank with format 7`'

↵ 5 Press **ENTER**
EASEL draws a pie chart showing the set of numbers 'marsbank'.

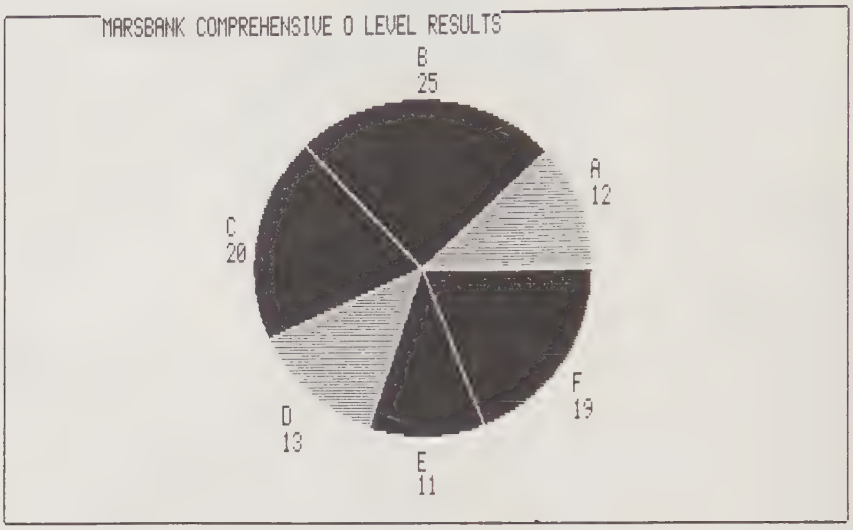


Figure 9.6 – Our first pie chart

When you have studied this chart, VIEW the second set, the Tees Comprehensive results, by typing in quick succession:

V 1 Press V (VIEW)

teeshigh 2 Type teeshigh

↵ 3 Press **ENTER**

↵ 4 Press **ENTER**

EASEL displays the Tees Comprehensive results:

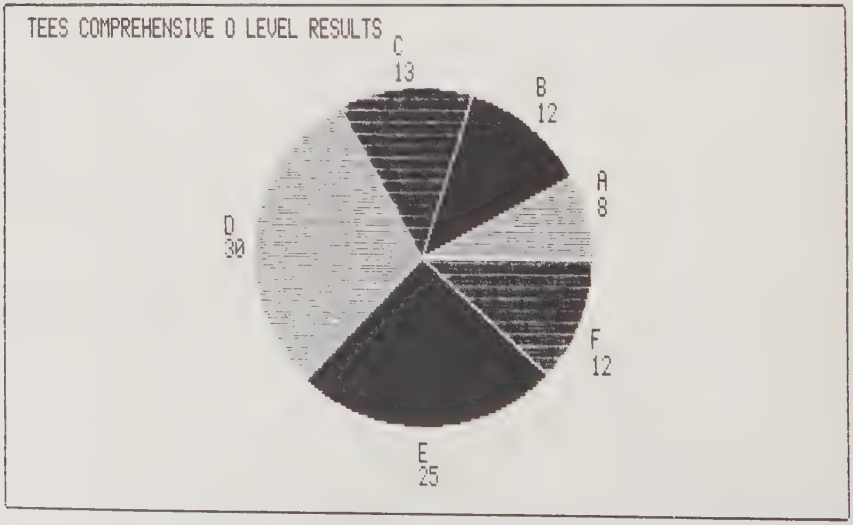


Figure 9.7 – Our second pie chart

You should be able to remember the first set well enough to compare the two – if not, VIEW the first set again in a similar manner.

Note: Bear in mind that pie charts are not very subtle, and small variations in proportions won't be obvious when comparing pie charts. The best way to compare similar numbers is to use a bar chart.

Further suggestions for pie charts in education

- Uses of a country's land

  Pie charts have many applications in geography, e.g. to show the proportions of arable, pasture, forest land in a country (Figure 9.8). Or the major exports of a country, or the population in cities, towns and country or the distribution of wealth.

- How children get to school

  A pie chart can illustrate how many children arrive at school by bus, train, car, bicycle, hang-glider, pony etc.

- Growth of seedlings

  The proportion of seedlings which achieve various heights in a biology experiment can be shown on a pie chart, and the proportions compared between different growing environments.

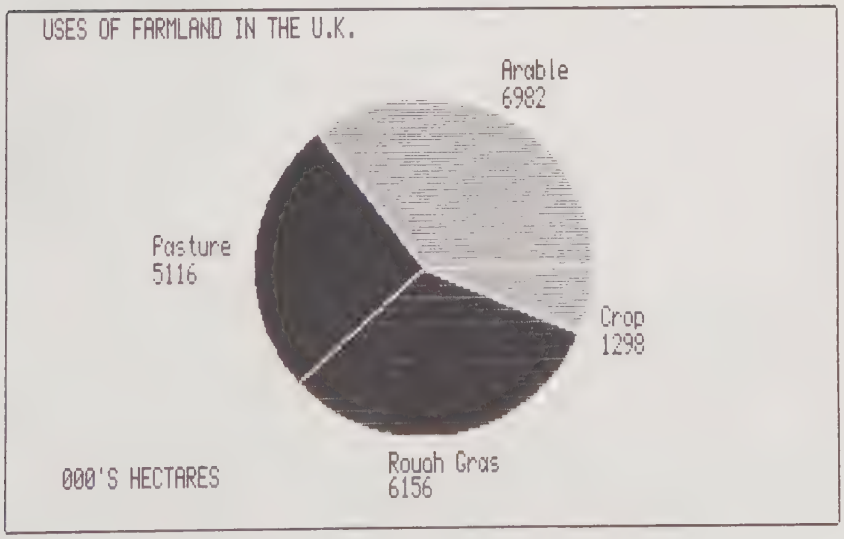


Figure 9.8 – A further example

BUSINESS

Example: Market shares of cuddly-toys makers

In another attempt to impress his boss, Harold Blake illustrates the market-share figures of cuddly-toys manufacturers using a pie chart.

He estimates the figures for the eight major distributors of cuddly-toys in the Marston-on Tees area:

COMPANY	MARKET SHARE
Tees Toys	27% (cuddlies only)
Games Centre	7% (all toys)
Toys Inc.	9% (all toys)
Cuddles	31% (cuddlies only)
Novelty News	4% (all toys)
Just Toys	12% (all toys)
Toys Galore	10% (cuddlies only)

Harold draws a pie chart on EASEL to reflect these market shares. The result is shown in Figure 9.9

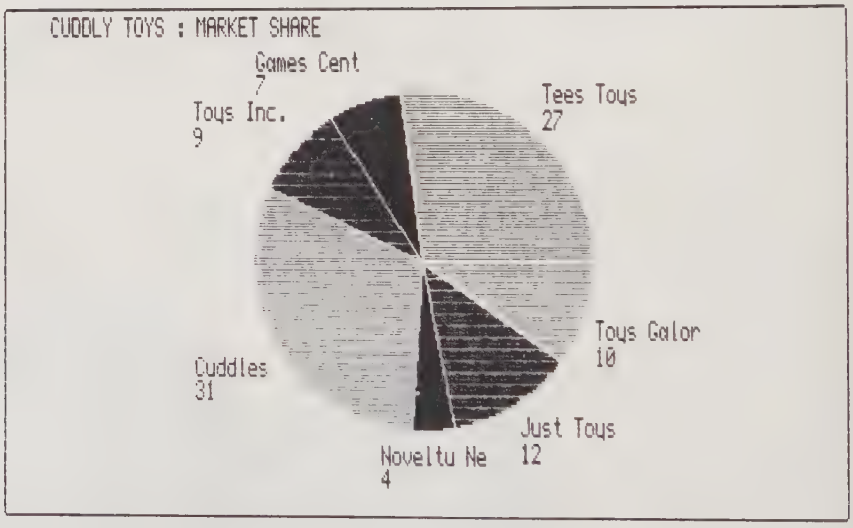


Figure 9.9 – A pie chart showing market shares

There are two types of toy manufacturer: those which produce only cuddly-toys and those who produce other kinds of toys as well. Harold wants the former to be in red and the latter in green.

FEATURE: Changing segment colours

When you draw a pie chart, EASEL makes it a multicoloured one. You may want to change the colours of some segments to categorise certain groups or associate related segments.

To change the colours, use the CHANGE SEGMENT command:

1 Move the highlight box on to the label of the segment whose colour you want to change

F3 2 Press **F3** (COMMANDS)

C 3 Type C (CHANGE)

S 4 Type S (SEGMENT)
EASEL responds 'Change SEGMENT colour' and accesses the Microdrive. It displays the four colours available on the top left-hand corner of the DISPLAY AREA

↑ 5 Press the ↑ key once to move the surrounding box from white to red

↵ 6 Press **ENTER**
EASEL redraws the pie with the segment changed from white to red

Harold repeats this procedure so that all the manufacturers who only produce cuddly-toys are distinct from those who produce all kinds of toys.

Note: When you change the segment colour, the basic EASEL pie chart, Format 7, is also changed in the same way. When Harold has finished changing the chart so that it is all red and green, the basic format is also all red and green.

FEATURE: Highlighting particular segments

To highlight a portion of a pie chart you use the HIGHLIGHT command to detach the appropriate segment from the rest of the circle.

Harold wants to emphasise his estimate of Tees Toys' share of the cuddly-toys market. Do this as follows:

F3 1 Press **F3** (COMMANDS)

H 2 Press H (HIGHLIGHT)
EASEL responds 'Highlight a value' on the input line

3 Move the highlight box to the label of the segment you want to detach, in this case 'Tees Toys'

↵ 4 Press **ENTER**
EASEL redraws the pie, with the Tees Toys segment slightly detached from the rest of the pie (as shown in Figure 9.10)

Harold shows the pie chart to his boss, who is terribly impressed with the pie chart but a little dubious as to the accuracy of Harold's estimates. 'Perhaps just a little optimistic,' he cautions.

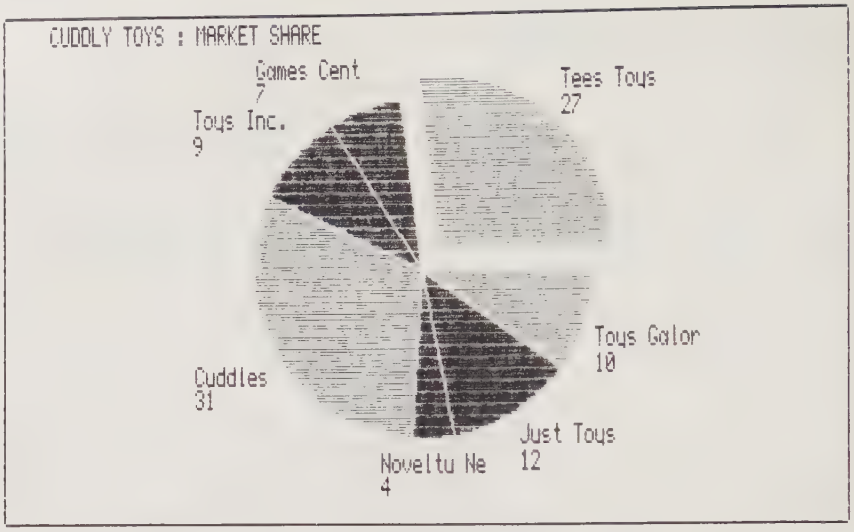


Figure 9.10 – A highlighted segment

Further suggestions for pie charts in business

- Proportions of manual/white collar workers
  To show types of employees in an organistion, a pie chart can be used. Other categories are men/women, age ranges or salary bands
- Business areas

  A pie chart can show the geographical areas in which business is conducted in terms of turnover.
- Sources of profits

  The profit from sales of various products can be shown on a pie chart, to show how the total profit was made



Miranda and Nigel discover the Lakes

- Oil products from crude oil

  What proportion of a barrel of crude oil is used in making each oil product is an ideal subject for a pie chart (see Figure 9.11)

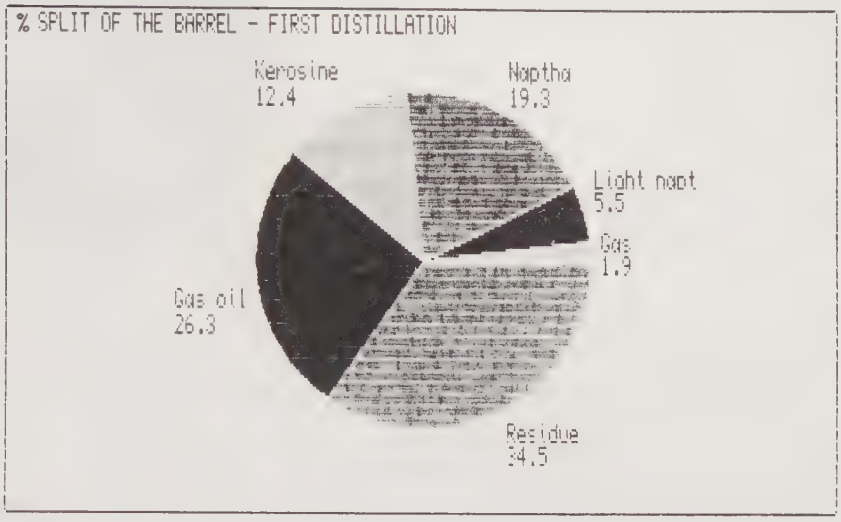


Figure 9.11 – A further example

LEISURE

Example: Weekends in Paris and the Lakes

Nigel and Miranda have just returned from their first holiday since their honeymoon: a weekend in the Lakes, where they 'retraced the paths Wordsworth once walked', according to Nigel. They are astounded to find it cost almost as much as the Parisian weekend last year. To find out why, they summarise what they spent on each as shown below:

NIGEL AND MIRANDA'S WEEKENDS AWAY

EXPENDITURE	LAKES (£)	PARIS (£)
HOTEL	85	50
TRAVEL	45	90
GIFTS	10	18
FOOD	40	44
DRINKS	36	31
ENTERTAINMENT	22	41
TOTAL	238	274

Miranda, custodian of the pair's finances, draws pie charts of each set of costs calling the first set of costs '`Lakes`' and the second set '`Paris`'. The two pie charts are shown in Figures 9.12 and 9.13.

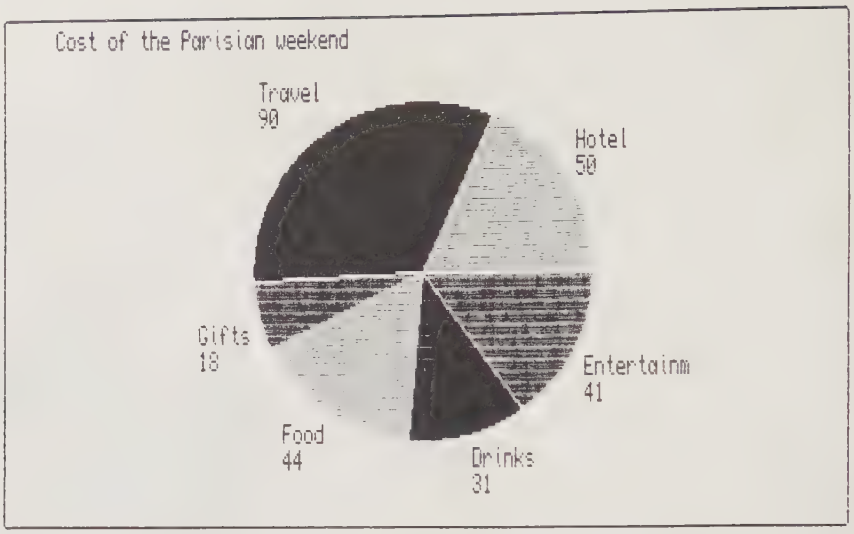


Figure 9.12 – The basic pie charts – Paris weekend

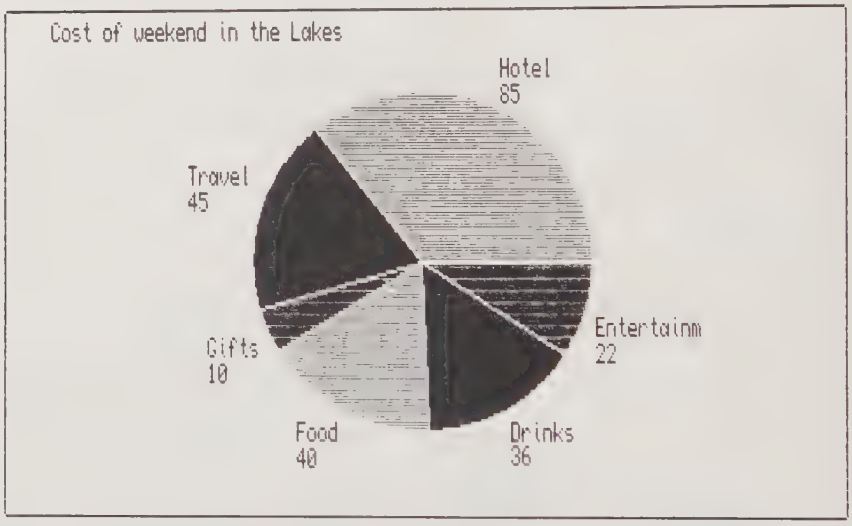


Figure 9.13 – The basic pie charts – Lakes weekend

She compares them as described earlier in this chapter. Although the travel to the Lakes was cheaper than to Paris, the hotel was much more expensive. To see how much difference this made in cash terms she wants to show '`Paris`' and '`Lakes`' on one bar chart.

FEATURE: Combining pie charts and bar charts

EASEL can give two different pictures of the same set of numbers by plotting them on a pie chart and a bar chart. You can use either a cluster bar chart or a stacked bar chart in conjunction with a pie chart. The former is very easy to do on EASEL, the latter more difficult.

If you only have one set of numbers to display, you should use *either* a pie chart *or* a bar chart, whichever is most suitable.

Pie charts + Cluster bar charts

Use these together to show:

- Pie chart – the proportions of each total (e.g. the total cost of the weekend)
- Bar chart – compares each portion directly (e.g. the cost of the two hotels)

To draw a cluster bar chart of the information shown on several pie charts, simply use the VIEW command. Miranda displays 'Paris' and 'Lakes' on a cluster bar chart:

F3 1 Press F3 (COMMANDS)

V 2 Press V (VIEW)
Type the names of the sets of numbers you want to show

`Paris, Lakes` 3 Type `Paris, Lakes`

↵ 4 Press ENTER
EASEL responds '`View Paris, Lakes with Format 7`'. You want to change from pie chart (which is format 7) to cluster bar chart (which is format 1), so

1 5 Press 1

↵ 6 Press ENTER
EASEL draws the costs in Paris and the Lakes as a cluster bar chart

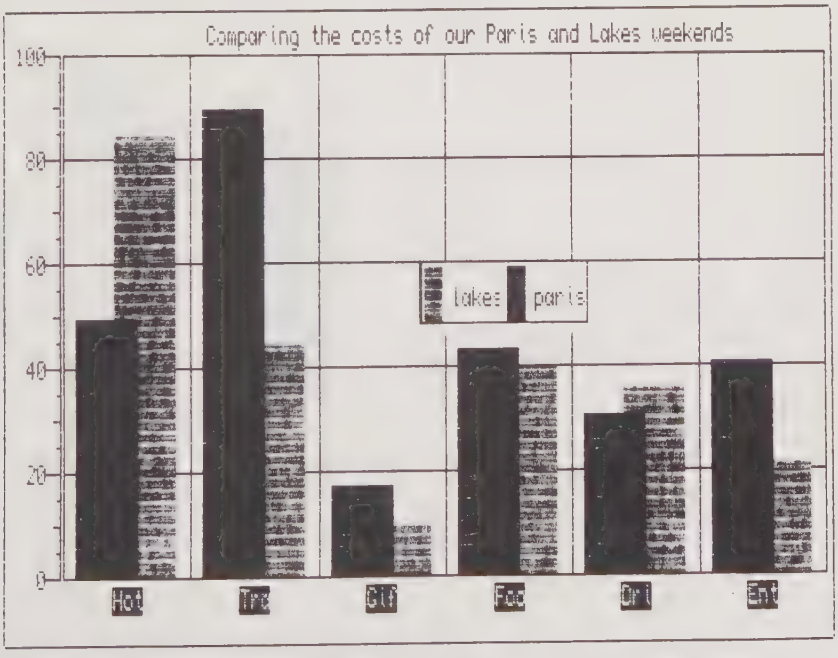


Figure 9.14 – Cluster bar chart – Paris and the Lakes

Pie charts + Stacked bar charts

Use these together to show:

- Pie charts – The proportions of the totals
- Bar chart – To compare the totals and portions

  To draw the appropriate stacked bar chart you must reorganise your numbers into different sets of figures from those used to draw the pie graphs.

Instead of drawing two sets of five numbers, Miranda must draw five sets of two numbers before displaying all the numbers on one stacked bar chart.

1 She draws 'Hotel' on a bar chart, the first bar showing the cost of the Paris hotel, the second the Lakes hotel

2 She draws four more bar charts, calling the figures '`travel`', '`food`', '`presents`', and '`entertainments`', each with the cost in Paris first and the cost in the Lakes second

3 She uses the VIEW command to display all the figures on a stacked bar chart, using Format 2 (instead of 1 above). The costs of the weekend in Paris and those in the Lakes are drawn on the screen as shown in Figure 9.15.

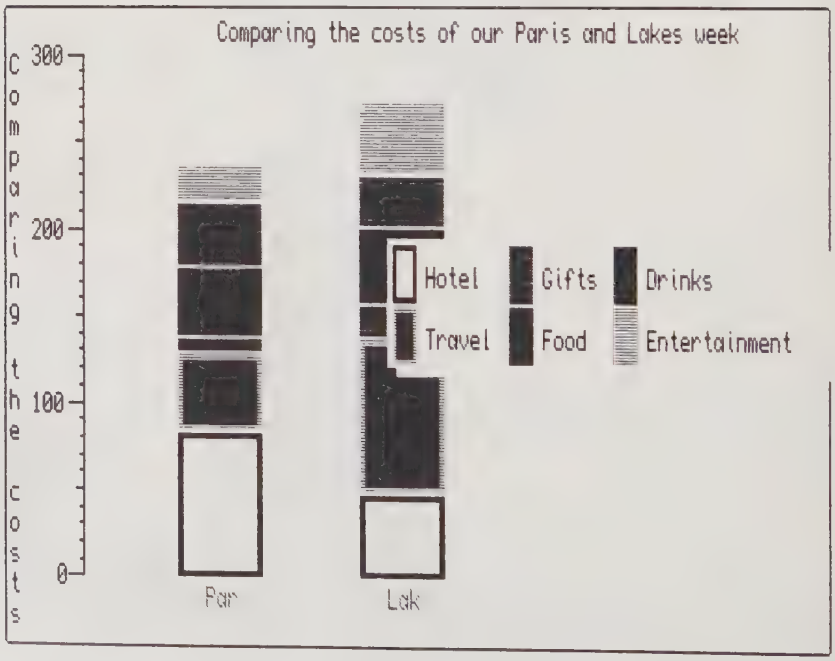


Figure 9.15 – The Stacked bar chart – Paris and the Lakes

Further suggestions for pie charts in leisure

- Olympic medals won by different countries

  Another way of showing this information as well as the bar chart (see Chapter 7) is on a pie chart (Figure 9.16)

- Members of the golf club

  A pie chart can be used to show the proportions of full, associate and social members of a club

- Popularity of sports

  A pie chart will illustrate the relative popularity of various sports by showing the numbers of people participating in each one

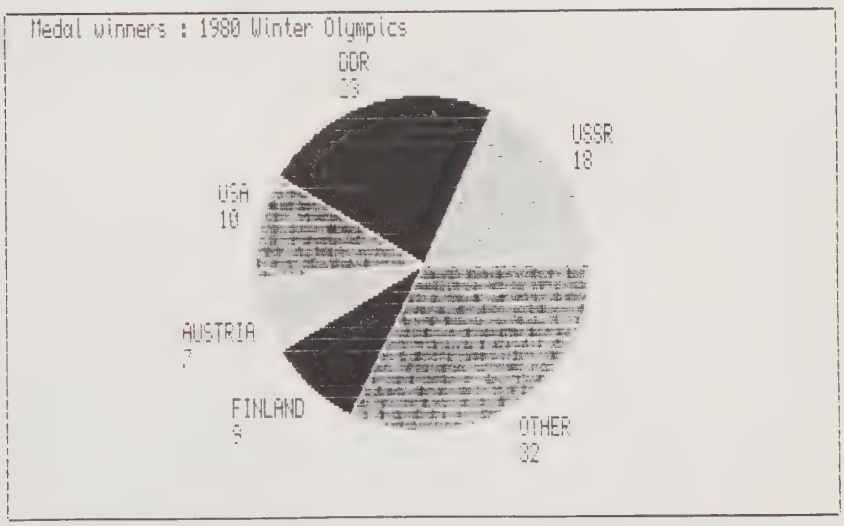


Figure 9.16 – A further example

CHAPTER 10

It's perfect – Now what?

This chapter explains what to do when your graph needs to be saved. It covers:

- Preparing a Microdrive for storing graphs
- Saving your graph on a Microdrive
- Mishaps which result in loss of your graph
- Recalling a saved graph
- Erasing previously saved graphs
- Taking copies of graphs you've saved
- Taking copies of your graph – printing and photography
- The EASEL commands:

FILES FORMAT	– Prepares a Microdrive for storing your graph
SAVE	– Saves your graph
LOAD	– Recalls a graph already saved
FILES BACKUP	– Takes a copy of a graph
FILES DELETE	– Erases a saved graph
PRINT	– Prints a graph

Points to remember

- You must prepare a Microdrive before attemping to save anything on it (this is called 'formatting' a Microdrive – nothing at all to do with the EASEL graph 'formats').
- A complete graph is called a 'file' for the purposes of the Microdrive. This is related to the other packages on the QL, which also save files on Microdrives.

- A graph is viewed by EASEL as a totality. All the sets of numbers, the title, the axis names, the type of representation etc are stored together. When you recall a saved graph, it can be treated exactly as if you had just created it.

INTRODUCTION

While you're working on your graph it is stored in temporary memory. It will be lost when you leave EASEL, or when the power is cut off. To keep the graph permanently, you must save what is on the screen on a Microcartridge.

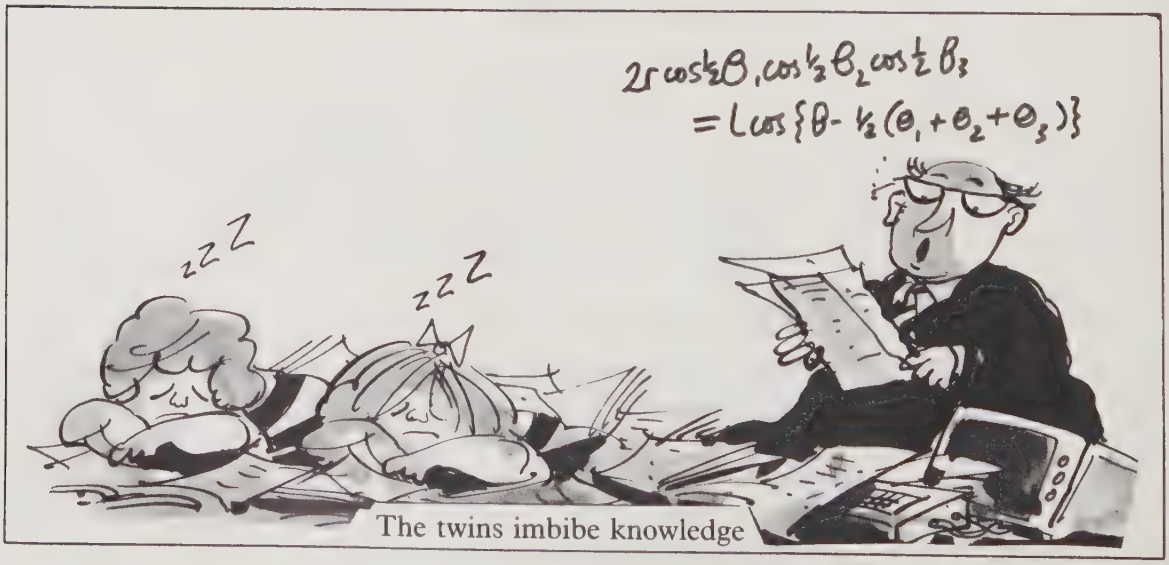
Whether or not you've finished the graph, you may want to store the graph and come back to it later. Perhaps it's *Coronation Street* in two minutes, and EASEL must take second place. You don't want to lose the graph, but you can't print it out right now.

The time has come to save the graph.

EASEL calls a complete graph a FILE. This is a common word in computerese, and can refer to anything from a collection of incomprehensible computer language to a line graph showing stock market fluctuations. It is simply a collection of information which the computer stores, and will recognise in the future by the name you give the file. If you remember this, and substitute the word 'graph' for 'file' wherever it's mentioned, you should avoid confusion.

Example: The lesson continues

In Chapter 8 Harold drew a visually impressive but unenlightening graph showing how cosine and sine functions behave. If you recall, Chris and Paula were politely non-commital, and Harold decided to save the graph for the twins' teenage years. The graph is shown in Figure 10.1.



The twins imbibe knowledge

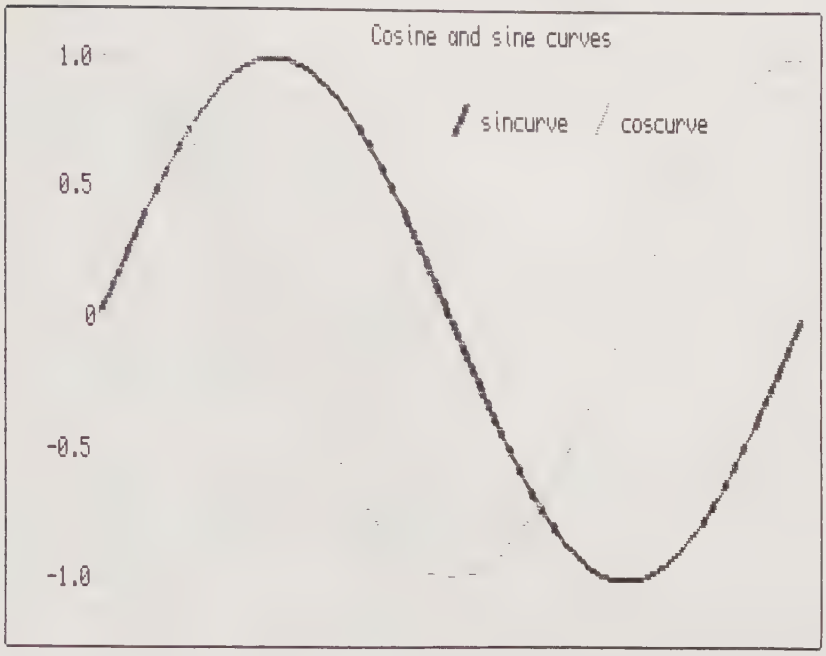


Figure 10.1 – The trigonometry graph

Preparing a Microcartridge

Before a Microcartridge can store your graphs, it must be given a name and marked so that the QL will recognise it. EASEL calls this process 'formatting'. This process does not affect the graph you're working on, but will erase any files already stored on the Microcartridge.

Note: If your cartridge is already 'formatted', skip this section and go on to 'saving your graph'.

You can give the cartridge any name, with the following provisos:

- It must not be more than 8 characters long
- It must include only numbers or letters of the alphabet
- It must start with a letter of the alphabet
- It must not contain blank spaces, but can include underscores '_' instead

Harold already has EASEL running in the left-hand Microdrive, so first prepares a new cartridge in the right-hand Microdrive to save his graph. To do this:

F3 1 Press F3 (COMMANDS)

F 2 Press F (FILES)
The Microdrive whirrs, and EASEL responds 'Files:' on the input line, and displays its choices in the CONTROL AREA

F 3 Press F (FORMAT)
EASEL responds 'Files: Format mdv2_ '. It assumes you want to prepare the right-hand drive, MDV2, rather than the left, which contains the EASEL Microcartridge. It's waiting for you to give the Microcartridge (not your graph) a name

Note: Only proceed if you have a new blank cartridge in the right-hand Microdrive, or an old one you want to wipe clean.

harold 4 Type harold

↵ 5 Press ENTER
The Microdrives whirr, and the right-hand Microdrive is formatted. Now it's ready for you to save graphs

Choosing a file name

You must give the graph a name when you save it, which can be anything you like as long as you follow these rules:

- It must not be more than 8 characters long
- It must include only numbers or letters of the alphabet
- It must start with a leter of the alphabet
- It must not contain blank spaces, but can include underscores '_' instead

EASEL will only be able to find your graph in the future if you input the name you gave it – so give the graph a unique name that you'll remember. If you use the same name as a graph already saved on the Microcartridge, the graph you save will replace the graph already there, so it's advisable to check what's already on the cartridge before saving.

Saving the file

EASEL stores all kinds of files on the cartridge – ABACUS files, QUILL files, export files (see next chapter). EASEL identifies files which are graphs by adding '_grf' to the end of the name you give your graph. When you look at the list of files on a cartridge, you'll always know which are graphs, because they have '_grf' as a postscript.

EASEL will only save exactly what is displayed on the screen – no more and no less.

Harold wants to store his graph, pending his next discourse on the subject of trigonometrical functions. To do this he first VIEWS the graph to display it on the screen. Then:

F3 1 Press F3 (COMMANDS)

S 2 Press S (SAVE)
EASEL responds 'Save' on the input line, and asks you to enter the name of the graph, or ? to see a list of the files already on the cartridge

cosine 3 Type `cosine`
or the name of the graph you want to save

↵ 4 Press **ENTER**
The Microdrives whirr, and EASEL saves the graph on the right-hand Microcartridge

Checking the directory

To check that the graph has been saved properly, or to see what names of files are already on the Microdrive, look at the directory of the drive. One way of doing this is to use the SAVE command:

S 1 Press `S` (SAVE)

? 2 Press `?`
EASEL responds '`Save dir_mdv2`' on the input line. To confirm you want to see what files are on cartridge 2 (by seeing a list of the file names in the directory):

↵ 3 Press **ENTER**
EASEL '`accesses Microdrive`' to see what files are on it. Then a list of the files on the right-hand cartridge appears. Harold's graph is shown as '`cosine_grf`'. EASEL is still expecting you to save a graph – you don't want to, so:

ESC 4 Press **ESC** (**ESCAPE**)
EASEL returns you to the command menu.

You can get a display of the directory of the right-hand Microdrive by typing a '?' in response to any of the commands covered in this chapter.

Return to this section at any stage if you want to know how to save your graph.

LOSING YOUR GRAPHS OR FILES

While you're working on your graph, it's held in temporary storage in the QL machine. You will lose the graph if any of the following occurs:

- You use the ZAP command to erase everything you are doing. This erases the graph forever from the temporary storage
- If you exit from EASEL using the QUIT command you will automatically lose everything in temporary memory, including your graph
- Loss of electrical power, whether accidental or intentional, will erase your graph from the QL, so the graph will be lost unless you've already saved it on a Microdrive
- If you need to do a 'warm boot' for any reason (that is, re-start EASEL) you will lose everything you've done

Even if you've saved your graph on a Microdrive, you will lose it if you do any of the following:

- Save another graph under the same name as one that you've already saved, and the new will replace the old
- Format a Microcartridge – this erases any files currently saved on the cartridge
- Choose the DELETE option of the FILES command – this will irreversibly erase a graph in the deleted file

You must also take care of your cartridges, since if one is damaged you could lose or not be able to retrieve any of the files on it. To avoid damage, follow these rules:

- Don't turn the QL on or off when there's a cartridge in the Microdrive
- Never remove a cartridge when it's running (i.e. the red light by the Microdrive is on)
- Don't do a 'warm boot' when there's a cartridge in a Microdrive, if you can possibly avoid it
- Never touch the tape in the cartridge
- Always insert and remove the cartridge gently, and replace the cartridge in its protective cover
- Don't move the QL while there's a cartridge in a Microdrive

WORKING WITH SAVED GRAPHS

Taking a copy of a saved graph

Several of the above mishaps can be rendered harmless by the simple precaution of taking a backup copy.

- To take a second copy on another cartridge, replace the cartridge in the Microdrive on the right with another cartridge. Then repeat the procedure detailed in the last section to save another copy of your graph. As it's on a different Microdrive you can use the same name for your graph as last time
- To take a copy of your graph on the same Microcartridge, use EASEL's BACKUP facility

Harold decides to make another copy of his graph for fear of the twins' tampering. To do this:

F3 1 Press F3 (COMMANDS)

F 2 Press F (FILES)

B 3 Press B (BACKUP)
EASEL responds 'backup from' on the input line and asks you to enter a file name. If you can't remember what files are already

on the cartridge, use ? – EASEL will remind you by listing the existing files on the cartridge

`cosine` 4 Type `cosine`

↵ 5 Press **ENTER**
EASEL looks for that file on the cartridge (if it could not find the file EASEL would reply '`file not found`'). Then EASEL responds '`backup from cosine to`'

`trig` 6 Type `trig`

↵ 7 Press **ENTER**
EASEL saves another copy of the graph under the name '`trig_grf`'.

Harold tells the twins to be extra careful of his file called '`cosine`' but keeps carefully quiet about the '`trig`' copy.

Erasing saved graphs

To delete a graph that you no longer have any use for, to make way for other files on the cartridge, choose the DELETE option of the FILES command.

Chris and Paula, aware that Dad is liable to repeat the lecture on trigonometrical functions, decide to erase the prized '`cosine`' graph. To do this:

F3 1 Press **F3** (COMMANDS)

F 2 Press `F` (FILES)

D 3 Press `D` (DELETE)
EASEL responds '`Files: delete `', and asks you to enter the name of the file you want to erase

`cosine_grf` 4 Type `cosine_grf`
EASEL requires you to type the complete name of your graph, including the '`_grf`' – this is a check that you really want to delete that particular file

↵ 5 Press **ENTER**
EASEL erases the graph from the cartridge, then returns you to the command menu

Recalling a saved graph

To recall a graph you've already saved, use the LOAD command. You recall the file using the name you gave it when you saved it.

Harold, having found a book in the Linton library entitled *Trigonometry made easy*, has assembled the reluctant twins for another try at trigonometrical functions. He wants to re-display his sine/cosine graph. To do this:

F3 1 Press **F3** (COMMANDS)

L 2 Press L (LOAD)
EASEL responds 'Load' on the input line and asks you to enter the name of the graph you want to display on the screen, or enter ? to list the files on the Microdrive. Harold, suspecting some monkey business, looks at the list first:

? 3 Type ?
EASEL responds 'dir mdv2_'

↵ 4 Press ENTER
To confirm you want to see the list (or directory) of MDV2 files. EASEL accesses the Microdrive to discover what's on the drive. The screen clears and a list of the files saved on the Microdrive appears. 'cosine_grf' is nowhere to be seen, but a graph called 'trig_grf' is much in evidence. Harold has this trick up his sleeve, so LOADS this graph:

trig 5 Type trig

↵ 6 Press ENTER
EASEL again clears the screen, then, to the twins' dismay, draws Harold's lovely graph showing how a sine and cosine curve behave

Harold launches on his second attempt to educate the reluctant children, who resign themselves to his successful double-cross.

MAKING HARD COPIES

Printing out your graph

You can print your graph on a special printer, if you have one available. You use the PRINT command to print out graphs.

The lesson complete, Harold insists that Chris and Paula take a copy of the graph showing cosine and sine, so they can impart their new-found knowledge to their classmates.

F3 1 Press F3 (COMMANDS)

P 2 Press P (PRINT)
EASEL displays the printers on which it will print graphs in the CONTROL AREA, plus the option of storing a graph ready for printing on a Microdrive

E 3 Press E (Epson FX80)
The screen clears, and EASEL re-draws the graph on the screen without the CONTROL AREA above or the STATUS AREA below. After a pause, the printer springs to life and a copy of the graph appears on the paper

You may want to take a copy of the screen in order to print it at some time in the future. You can do this by choosing the 'SCREEN DUMP' option of the PRINT command. Beware – only three screen

dumps will fit on to one Microdrive cartridge, whereas you can fit large numbers of raw graphs on to a Microdrive.

When you use the PRINT command in ABACUS, ARCHIVE and QUILL, simple text files are produced. In contrast, EASEL produces a special graphics file when you use the PRINT command. The file reproduces exactly what is on the screen – this is what is called a 'screen dump'. Unfortunately this means you can't make EASEL talk to any old printer – only those listed in the CONTROL AREA when you use the PRINT command.

Note: Early editions of the QL software will allow you only to print graphs on the Epson FX80. Later the facility will be extended to cater for more printers.

Taking photographs of your graph

If you don't have a suitable printer, you can either take a Microcartridge with the graph on it to a friend who has, or take a photograph of the screen.

You can expand the graph by pressing F2 to turn off the prompts. Then you can erase the STATUS AREA too by pressing **SHIFT** and F2 together. The graph is then displayed on the screen in splendid isolation.

When you take a photograph of the screen, there are a few points to bear in mind:

- Ensure that the rest of the room is fairly dark, avoiding the possibility of light being reflected off the screen
- Use an exposure time of at least a 25^{th} of a second or less otherwise the TV screen will appear unevenly lit
- A normal colour film (ASA 100) suitable for prints or slides will require a setting of about *F*5.6
- If you can, use a lens with a long focal length (about 100mm). This reduces the distortion caused by the curved surface of the TV screen
- Record all the settings used (including camera distance and the screen brightness and contrast levels) so that you can see what works best for you – and give the screen plenty of time to warm up before you start
- Use a tripod or other fixed camera mount

CHAPTER 11

Integrating EASEL

This chapter explains how to use EASEL in conjunction with the other Psion packages. It covers:

- The type of information which can be exchanged between packages
- The EASEL commands:

  FILES IMPORT – to bring in information from ABACUS and ARCHIVE

  FILES EXPORT – to save information for use by ABACUS and ARCHIVE

Points to remember

- If you save a file with the express intention of using the information in another package, i.e. you use the EXPORT choice of the FILES command (see below), you cannot use the LOAD command to recall the file. You must treat it as a special file, and IMPORT it.
- Use the NETO (network output) command in SUPERBASIC to pass information to another Sinclair QL, and the NETI (network input) command to accept information from another Sinclair QL.

INTRODUCTION

EASEL, ABACUS, ARCHIVE and QUILL have been designed to work together. There are certain tasks which are made much easier by the ability to exchange information between these four packages – for instance being able to create graphs directly from selected information held in ARCHIVE. Each Psion package has been written in the most efficient and flexible manner for its task. You can choose the best tool for each job, and then transfer the files into the format relevant for each of the other packages as and when necessary. When it comes to sending information from one package to another, the four programs work together as one.

A separate book in this series, *Integrating the Software*, concentrates on using the packages in combination to best advantage, giving pertinent examples.

WHAT TYPE OF INFORMATION?

EASEL and another program can only exchange information which is understandable to both EASEL and the other program. Such miscellany as graph titles and annotations have no place on a spreadsheet in ABACUS or in a database in ARCHIVE. The information you can transfer is set out below.

EASEL and ABACUS

This is probably the most useful combination. You can send sets of numbers, along with the name of the set and the cell labels, to ABACUS, and receive sets of numbers with attendant set names (which must follow the normal rules for set names) and cell labels from ABACUS. No other information can be transferred, because ABACUS has no equivalent of axis names or line graphs or any of the other elements which are peculiar to a graph.

EASEL and ARCHIVE

You can send exactly the same type of information between these two packages as you can between EASEL and ABACUS, for exactly the same reasons.

EASEL and QUILL

This is something of a problem – in fact you can't transfer information directly between these two. QUILL doesn't understand lists of numbers or cell labels, so you cannot send it sets of numbers. Unfortunately, the file created when you PRINT a graph is a graphics file, not a text file (as we discussed in the last chapter), and QUILL doesn't understand graphics files either. The best way to include a graph in text is to leave enough space in your QUILL file to accomodate a graph which has been printed straight out from EASEL. Then you can either paste the graph in the relevant place in the text, or make a photocopy of the graph in the right position.

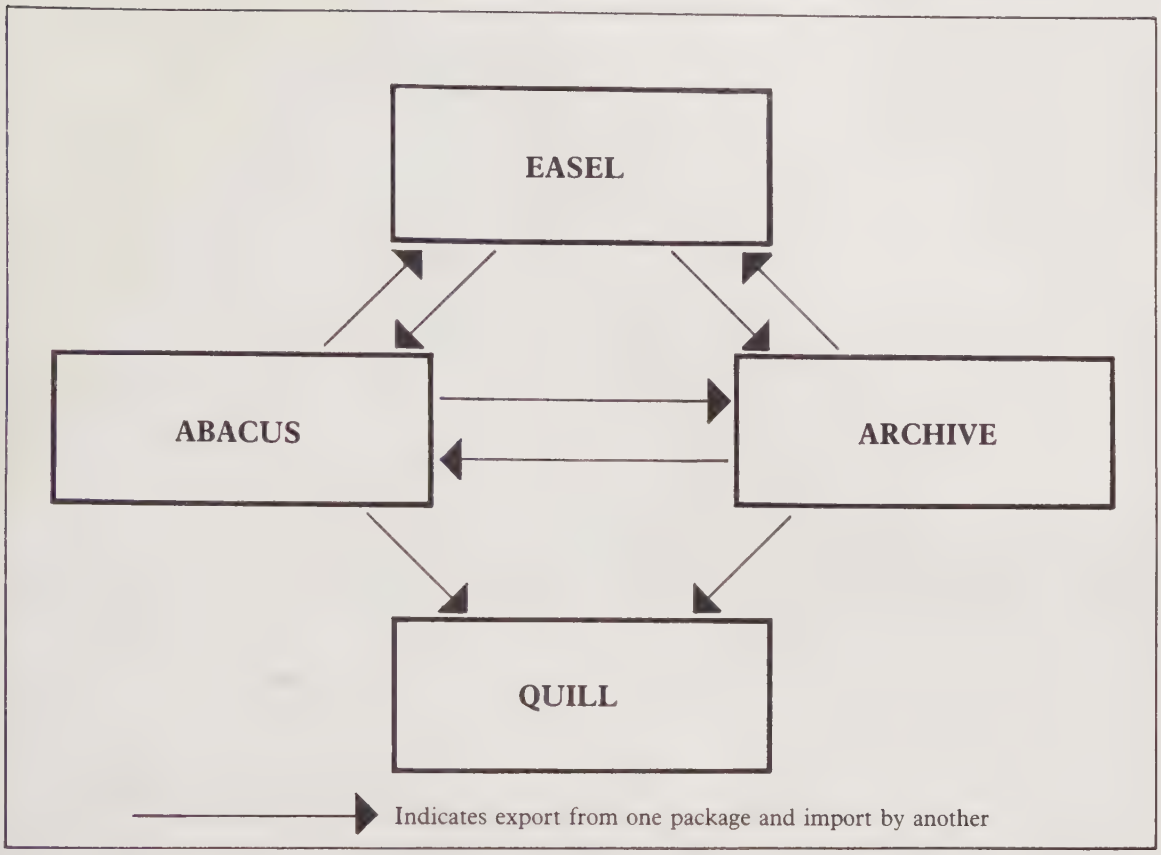


Figure 11.1 – Lines of communication between the four Psion packages on the QL

SENDING INFORMATION FROM ABACUS TO EASEL

To send sets of numbers from ABACUS to EASEL, you must use the EXPORT command from ABACUS, and then the IMPORT command from EASEL.

Example: Joyce's Z chart

Joyce's sales were shown to good effect on a 'Z' chart in Chapter 8. We mentioned that she might well do the relevant calculations in a spreadsheet in ABACUS, then send them over to EASEL. Here we shall explain how to transfer the information from ABACUS to EASEL.

Joyce has created a spreadsheet in ABACUS which does all the fiddly calculations required for her 'Z' chart. This is shown below:

	A	B	C	D
1	JADA JEWELLERY SALES - AUGUST 1982 TO JULY 1984			
2				
3		SALES £000		
4	AUG	10		
5	SEP	14		
6	OCT	15		
7	NOV	28		
8	DEC	25		
9	JAN	8		
10	FEB	11		
11	MAR	18		
12	APR	17		
13	MAY	14		
14	JUN	12		
15	JUL	10		
16				
17	MONTH 83/84	SALES£000	CUMSALES	MOVINGAVE
18	AUG	14	14	186
19	SEP	16	30	188
20	OCT	19	49	192
21	NOV	24	73	188
22	DEC	22	95	185
23	JAN	14	109	191
24	FEB	16	125	196
25	MAR	22	147	200
26	APR	23	170	206
27	MAY	18	188	210
28	JUN	17	205	215
29	JUL	15	220	220

Exporting a file from ABACUS

Joyce saved the sales figures under the name '`sale8284`'. ABACUS gave the file the name '`sale8284_aba`' to signify that it was saved from ABACUS. She now wants to send the sales figures for the last year to EASEL to create a graph with it.

F3 1 Press **F3** (COMMANDS)

F 2 Press **F** (FILES)

E 3 Press **E** (EXPORT)
ABACUS writes '`export to quill`' on the input line. You want to EXPORT to EASEL, so:

E 4 Press **E** (EASEL)
ABACUS replies '`range A1:D29`'. You only want to send the '83 / '84 figures to EASEL, so

`A17:D29` 5 Type `A17:D29`

↵ 6 Press **ENTER**
ABACUS replies 'by rows' on the input line. It's asking whether you want to have each row as a set of numbers or each column. In this case you want each column to be a set of numbers, so

C 7 Press C
ABACUS replies 'to ', asking you to give the file a name

sale8384 8 Type sale8384

↵ 9 Press **ENTER**
The Microdrive whirrs, and ABACUS saves your file. This time ABACUS saves your file as 'sale8384_exp' to signify that it is an EXPORTed file, which can then be IMPORTed by other packages

Note: It's very important to ensure that the set names which you send over to EASEL obey the normal rules for set names. It is all too easy to construct your spreadsheet headings with blank spaces in them. If you try to export such headings as set names to EASEL, you will not be successful.

Importing a file to EASEL

To receive information into EASEL, you must first have a file which has been EXPORTed from another package. You use the IMPORT choice of the FILES command to receive that information into EASEL. You should choose the type of graph in which you want the information displayed before you import the sets of numbers.

Joyce now wants to draw a 'Z' chart (a line graph) of Jada Jewellery's sales over the last 12 months, using the information from her ABACUS spreadsheet.

1 Start up EASEL (see Chapter 1)

F3 2 Press **F3** (COMMANDS)

C 3 Press C (CHANGE)

F 4 Press F (FORMAT)

3 5 Press 3
EASEL draws the skeleton of Format 3, a white grid. Any information you now import will be drawn in Format 3, a line graph

F 6 Press F (FILES)

I 7 Press I (IMPORT)
EASEL replies 'from', asking for the name of the file from which you want to receive information

sale8384 8 Type 'sale8384'

↵ 9 Press ENTER
This accepts the three sets of figures 'sales£000', 'cumsales' and 'movingave' from the file you exported from ABACUS into the line graph format. EASEL accesses the Microdrive and displays a 'Z' chart of Joyce's sales for the last 12 months. Joyce alters the graph so that all sets of numbers are represented by simple lines. Her graph, with relevant titles added, is shown in figure 11.2.

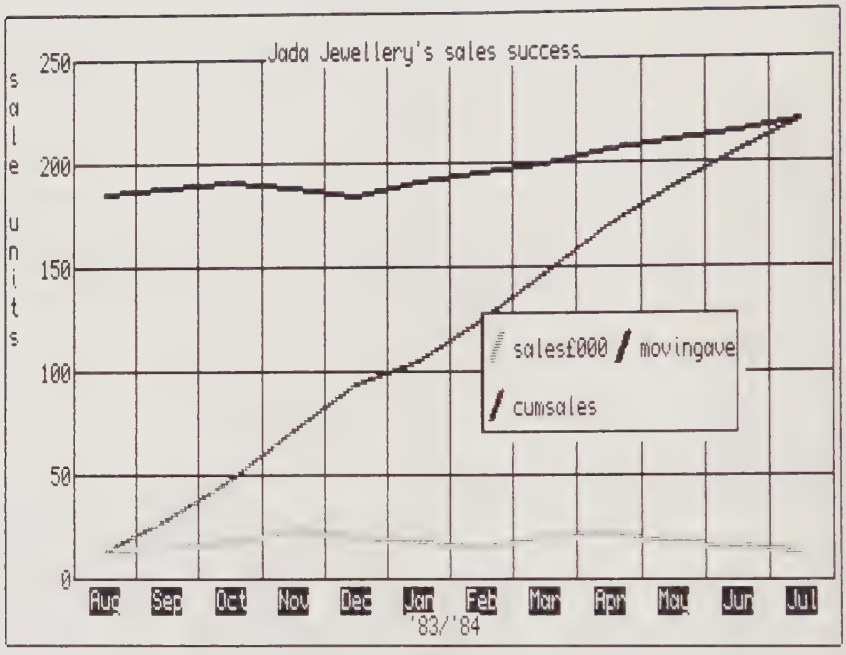


Figure 11.2 – Joyce's Z chart from figures in *Abacus*

EXPORTING FILES FROM EASEL

To pass information to either ARCHIVE or ABACUS, you use the EXPORT choice of the FILES command. The process is just the same as for IMPORT. The computer stores the sets of numbers which are part of the graph you are drawing, plus their names and the cell labels currently displayed on the grid.

Joyce wants to know what the actual figures are for her Renault's petrol consumption when she and Miranda used it. EASEL does not supply lists of numbers, but ABACUS does, so she EXPORTS the set of figures 'mpg' to ABACUS.

1 Load the graph from which you want to EXPORT some numbers on to the screen in EASEL

F3 2 Press **F3** (COMMANDS)

F 3 Press F (FILES)

E 4 Press E (EXPORT)
EASEL asks '`export to`' on the input line. It's asking what the name of the exported information should be

`mpg` 5 Type `mpg`

↵ 6 Press **ENTER**
EASEL saves the information on the right hand Microdrive, ready to be IMPORTed by either ABACUS or ARCHIVE

APPENDIX A

How to get out of trouble

GENERAL POINTS

Remember the HELP key, **F1**. This is available at any time and does not lose your place.

Computer stops responding to keystrokes

Is the COMMAND MENU still displayed at the top of the screen? Look at the CONTROL AREA – are there commands there, and does it say '`COMMAND>`' on the input line? If so, press **ESC** to return to the original screen.

Press the **ESCAPE** key or the **ENTER** key if in trouble. They may return you to familiar territory.

If the computer continues not to respond you may need to 'reboot' the machine. You will lose any material in current memory which you had not saved onto a Microdrive. In other words, press the button on the right hand side of the QL. This tells the computer to take you back to the basic screen. Then you press **F2** to re-start EASEL.

Computer does not appear to load EASEL

- Is the screen connected to the computer?
- Are the screen and the QL connected to a power source?
- Do you have an EASEL program cartridge in the left-hand Microdrive?

If the answer to all the above is 'yes', reboot the machine.

File names

If you do not follow the rules about file names, EASEL may cease to function. To remind you, the file name must obey the following rules:

- It must not be more than 8 characters long
- It must only include numbers or letters of the alphabet
- It must start with a letter of the alphabet
- It must not contain blank spaces, but can include underscores '_' instead

Long loading time

Microdrives become very inefficient as they become full. As the drives start approaching 90% of capacity, there are fewer and smaller slots available for saving files. These can become very fragmented and the cartridge may need to be read many times before the complete file is loaded. Loading times could take as long as half an hour.

- As soon as your files appear to be taking a long time to load, use the BACKUP command to copy each file over onto a fresh formatted cartridge. Once all the files have been copied successfully, erase your original files. You can now reuse this clean cartridge. The copying process brings all the separate parts of the file into one continuous space on the tape, and hence cuts down the number of times the QL has to access the Microdrive.

ERROR MESSAGES

These will appear below the input line when you make a mistake, or when there is a fault in the system – normally it will be due to the former. All the error messages EASEL can give you are listed below, with an explanation of why the message has appeared, and what to do next.

ERROR – EASEL overlay file not found

If you see this message:

```
* Ensure EASEL is on mdv1

Press ESCAPE to abort or
another key to try again
```

Cause: This message is displayed when EASEL needs more information from the EASEL cartridge, which should be on Microdrive 1 but is not. EASEL cannot carry on without the master programme on Microdrive 1.

Solution: To exit entirely from EASEL, press the ESC key to return to the QL's SUPERBASIC screen, where you can press F1 or F2 to re-start EASEL, or any of the other three programmes whose programme cartridge is in Microdrive 1

If you want to stay in EASEL, first replace the EASEL cartridge in the left hand Microdrive (Microdrive 1). Then press any key (except ESC, SHIFT or ALT) to allow the QL to look again on Microdrive 1 for the EASEL master cartridge. If it still doesn't work, you may have a fault on the QL Microdrive or the EASEL cartidge

Unrecognised input

Cause: You have entered something into the graph which EASEL doesn't understand. You should only enter either a number, a formula, or text preceded by a '!' into the graph.

Solution: Enter one of these three types of input or press ESC

Enter a number

Cause: EASEL is expecting a number, for instance as a response to which number bar you want to choose, and you have entered something else.

Solution: Enter a number or press ESC

Figures names must start with ALPHABETIC character

Cause: All names of sets of figures must start with a letter of the alphabet. The name you have entered does not.

Solution: Enter a new name of the set, this time starting with an alphabetic character or press ESC

Figures names must not contain blanks

Cause: Names of sets of figures must not contain blanks, and the one you've just entered does contain a blank.

Solution: Enter a new name of the set, which does not contain blanks or press ESC

NNNNNNNN: this name undefined

Cause: You have asked EASEL to retrieve (OLDDATA) or RENAME a set of figures whose name is NNNNNNNN, but NNNNNNNN is not on EASEL's list of names, usually because you have not called any sets NNNNNNNN.

Solution: Type in the name of a set of figures which you have already used or press ESC

NNNNNNNN not known

Cause: You have asked to VIEW or KILL a set of figures whose name is not on EASEL's list in current memory.

Solution: Type in the name of a set of figures which is on EASEL's internal memory, or press **ESC**

WARNING negative values ignored for pies

Cause: You have asked EASEL to show a set of numbers on a pie chart, one or more of which is negative. EASEL will not display negative values on a pie chart, and is telling you that it has ignored the negative values.

Solution: You must either change all the numbers to positive or accept that EASEL will not show all the numbers in the set

CELL and CELLMAX are reserved names

Cause: You have entered a name of a set of figures as `CELL` or `CELLMAX`. EASEL reserves these two names for its own use, so you cannot call a set of figures by that name.

Solution: Call your set of numbers any other valid name or press **ESC**

ERROR — out of memory

Cause: You will get this message if you have run out of internal memory, as shown by '`OK Memory`' in the status area. This happens if you are trying to store too much information about a graph on the QL. Generally it only occurs if you are saving many different sets of numbers and / or calculating values for a large number of cells on the graph.

Solution: EASEL will display as much information as it can store, so you may see an incomplete set of figures on your graph. You can carry on using EASEL, and the first thing to do is get rid of any sets of numbers you don't want. If you want them all, save the graph then get rid of a few sets of numbers from internal memory

File not found

Cause: EASEL cannot read the file from the cartridge for some reason. This may be that there is no file on the cartridge under that name, or that there is no cartridge on Microdrive 2, or that you are trying to read a file of the wrong file type.

Solution: Ensure there is a cartridge is in Microdrive 2, then look at the list of files you have on the cartridge. Choose one that is there and has the correct file extension

Bad file format

Cause: EASEL is trying to import a file which does not have the correct layout. It will proceed but the file it imports may not be at all sensible.

Solution: Start again from the point where you exported the file from another package

ERROR – incomplete I/O

Cause: Hardware or system software failure. This could be due to a number of problems – a corrupted Microcartridge, dirty tape heads etc.

Solution: Your current graph is lost, and you must press the warm boot button to re-start EASEL

ERROR – cannot open file

Cause: The system cannot read or write a file from or to the Microcartridge. This may be because the cartridge is too full, and the file writing cannot be completed.

Solution: Use another cartridge which is not so full of saved files

ERROR – bad file name

Cause: You have not obeyed the rules for file names. However, often EASEL doesn't provide this message, and simply will not accept an incorrect file name. You must then re-enter a new name.

Solution: Choose a file name which obeys the rules

No figures names in files

Cause: There are no names of any sets of figures in the file you are trying to retrieve from the Microdrive. This may either be due to there being no sets of figures saved in the file you are retrieving, or due to the names of the sets being incorrect (they don't obey the rules). Note that you may not see this message: EASEL flashes it onto the screen so quickly that you may miss it.

Solution: There is none except to ensure that any file you save includes sets of figures with valid names

Invalid or no printer driver on mdv1

Cause: In order to print a graph on a printer, EASEL needs a special programme on the programme cartridge designed to send information to the particular printer. This error message indicates that there is no such programme on Microdrive 1 (which should contain the programme cartridge).

Solution: The only solution is to ensure that such a program exists on the program cartridge

APPENDIX B

Easelspeak

EASELSPEAK – AN EXPLANATION OF SOME TERMS

ANNOTATION	A piece of text you add to a graph near to a particular feature that you wish to emphasise.
APPLICATION	A program that has been written for a particular purpose.
AXIS	The vertical line at the right of the graph and the horizontal line at the bottom are the two graph axes. Each normally has numbers or labels along it.
AXIS NAME	The name along the vertical or horizontal axis which explains to what the numbers or labels along that axes refer.
BASIC	A programming language developed in the mid-1960's. Varying versions of this language are available on almost all microcomputers.
BASIC SCREEN	The screen from which you can enter basic commands and write programs, or perform operating functions such as formatting and copying programs.
CAPS LOCK	Converts all input to upper case. Press again to restore lower case.
CARTRIDGE	Used here to refer to the Microdrive cartridge, the cassette with its tape which holds your recorded files or programs.
CELL	Space on the graph in which the numbers are represented. Also is the name of a special word in EASEL which supplies the number of each cell, starting at 1 for the left cell, 2 for the next to the right, 3 for the next etc., when used in a formula.
CELL LABEL	Name attached to a cell on the graph which explains what the number(s) in that cell represent.
CELLMAX	EASEL special word which supplies the number of cells currently displayed on your graph when used in a formula.
COMMAND	Tells the QL to perform a certain job. It is an instruction to do something to your graph.
CONTROL KEY	Deletes characters and words when used in conjunction with the arrow keys.

CONTROL AREA — The box at the top of the screen which contains prompts telling you what to do and how to do it.

CRASH — A program or the computer stops functioning correctly. A crash requires some intervention from you before you can continue.

CURRENT MEMORY — Holds your graph in transient form. The graph will be erased when you quit EASEL, use the ZAP command or the power to the QL is lost.

CURSOR — The red rectangle which shows your position on the input line.

DEFAULT — EASEL's automatic choices, which are built into the EASEL program cartridge.

DISPLAY AREA — The area in the middle of the screen which shows the graph you are creating. It also displays any design screens which you are using.

ENTER KEY — This tells EASEL that you've finished a particular entry, or confirms that you want to accept the choice it is offering.

ESCAPE KEY — In EASEL this is used to take you back one step, cancelling what you were just doing. This will only work if you press it before you tell EASEL to go ahead with a command: you can't stop EASEL deleting a file if the Microdrive is already at work, for instance.

FILE EXTENSION — The three characters that EASEL adds after the '_' in a file name. This is usually used to distinguish different file's types, eg. a graph has the extension '_grf' when saved on a Microdrive.

FILES — A collection of data or text kept under one file name on a CARTRIDGE or in CURRENT MEMORY. The computer identifies a file by its name.

FORMAT (GRAPH) — The type of graph e.g. stacked bar chart, line graph etc. EASEL has eight different formats from which you can choose.

FORMAT — The name given to the process which the QL performs to mark the cartridge so that it can read the tape and rapidly find its way around. When you format a tape it makes the tape ready to take information.

FORMULA — A mathematical expression which can produce a set of numbers. Everything on the right of the = sign is made equal to the name of the set on the left.

FUNCTION KEY — A key that has been designed to instruct EASEL to do something.

GRAPH — An analogue representation of digital information ie. a picture which represents some numbers.

GRAPH KEY — A box containing the names of the different sets of numbers displayed on the graph, alongside the type of bar or line in which each is displayed. Only relevant if more than one set of numbers on graph.

GRAPH PAPER — The background grid of the graph in the display area.

HELP — Screen of information explaining what is happening, and what you can do from your present position. Call at any time by pressing **F1**, the top function key.

HORIZONTAL AXIS — The horizontal line along the bottom of the graph (not in pie charts).

INPUT LINE — Line at the top of the status area where everything you type is initially displayed, along with EASEL's brief prompts.

INSERT — Add a new cell to the right of the crosswire position, or new segment in a pie chart.

INTEGRATION — Transferring information between the four packages so that it can be used together.

LOAD — To take a file from a cartridge and put it into CURRENT MEMORY, so that a copy will appear on your screen.

LRUN — To LOAD and RUN a SUPERBASIC program.

MDV — The code the QL understands as refering to a Microdrive. For example, `MDV1` identifies the left-hand drive.

MEMORY — In this book, refers to either CURRENT MEMORY held within the QL, or permanent memory stored on the Microdrive cartridges.

MICRODRIVE — The mechanism and housing which holds the Microdrive Cartridge.

MODEM — A device that can convert computer-speak to send elsewhere, usually over telephone lines.

MONITOR — A special screen designed for use with computers.

NETI — The SUPERBASIC network input command on the QL which allows your QL to receive information from other computers

NETO — The superbasic network output command on the QL, which allows your QL to transmit information to another computer.

NETWORK — Communication between different Microcomputers.

PROMPTS — The helpful words in the CONTROL or STATUS areas telling you what to do next.

RUN — To follow the instructions of a pre-written program.

SHIFT KEY — Gains access to capital letters and the upper characters on the keys.

SOFTWARE — The programs which tell the computer what to do.

SPACE BAR — The long bar at the bottom of the keyboard which inserts blank characters into the text.

SPREADSHEET — Package such as ABACUS which is designed to manipulate tables of figures and text.

STATUS AREA — Area at the bottom of the screen which shows what the computer is doing, or waiting for you to do. It asks for information in response to commands.

SUPERBASIC — The name for the brand of BASIC available on the QL.

TABULATOR — **TAB** key, which when pressed moves the crosswires one cell to the right of their current position. **SHIFT** plus **TAB** moves the crosswires one cell to the left.

TITLE — The heading at the top of your graph which describes what the graph is all about.

VERSION — The edition of the program. Each new updated program of EASEL is given a VERSION number.

VERTICAL AXIS — The vertical line on the right hand side of the graph.

APPENDIX C

EASEL Quick reference

THE FUNCTION KEYS

	F1	HELP
SHIFT	F2	TURN PROMPTS ON AND OFF
SHIFT	F2	TURN STATUS AREA ON AND OFF
	F3	COMMANDS
	F4	DELETE
	F5	INSERT

THE COMMANDS

CHANGE	C	Changes the appearance of various features of the graph. Choices are:
	A	Changes Axis markings. Either choose one of EASEL's axis types (see Chapter 4) or design your own (see Chapter 7)
	B	Changes colour of Bar. Either choose one of EASEL's designs (see Chapter 2) or design your own (see Chapter 7)
	F	FORMAT: changes between EASEL's eight available types of graph – six bar charts, one line graph and one pie chart (see Chapter 2)
	G	Changes the type of background graph paper. Either choose one of EASEL's seven suggestions (see chapter 4) or design your own (see Chapter 7)
	L	Changes the type of Line, allowing you to represent your numbers with one of EASEL's 16 lines or one of your own design (see Chapter 8)
	S	SEGMENT: changes the colour of a particular pie chart segment. Only available on a pie chart (see Chapter 9)
	T	Changes the appearance of Text (see Chapter 4)

DEFAULTS [D] Selects different width of display – either 80 character (monitor), 64 character (TV screen) or 40 character.

EDIT [E] Alters or moves various parts of the skeleton. You have the choice of the following:

[A] To alter or move the horizontal or vertical Axis names

[K] to move or delete (F4) the graph Key

[L] To alter the cell Label nearest the crosswire

[T] To alter and/or move the Text nearest the crosswires

FILES [F] Allows you to copy, erase, IMPORT or EXPORT a graph on a Microcartridge. Also to 'FORMAT' a cartridge (see Chapter 10). Choose one of the following:

[B] BACKUP: makes a security copy of a file. Type name of original graph, and the name of the copy. If the copy is on a different drive from drive 2, type the destination drive number as well. (eg. `MDV1_copy`)

[D] DELETE: erases a file from a cartridge. Type the name of the file to be erased then press **ENTER**

[F] FORMAT: to prepare a cartridge in drive 2 for saving files. This erases everything on the cartridge. Before going ahead make sure that there is nothing of importance on the tape

[I] IMPORT: to call a file from the Microdrive which has been previously exported from QL ABACUS or ARCHIVE

[E] EXPORT: to save a file for subsequent import by QL ABACUS or ARCHIVE

HIGHLIGHT [H] Allows you to HIGHLIGHT a value or values on pie and bar charts

[V] To highlight the value nearest the crosswires. On a bar chart you choose another type of bar (see Chapter 7). On a pie chart you detach a particular segment (see Chapter 9)

[N] To highlight all negative values on a bar chart with another type of bar of your choice (see Chapter 7).

KILL [K] Deletes one or more sets of numbers from the graph and destroys the numbers (see Chapter 3)

LOAD [L] Recalls a graph saved on a cartridge onto the screen and into the QL's temporary storage. Press '?' for a list of the files on the cartridge in drive 2 (see Chapter 10)

NEWDATA [N] To plot a new set of numbers on the existing skeleton, without losing the numbers you've already plotted (see Chapter 3)

OLDDATA [O] To recall a set of numbers which isn't the 'current set' (see Chapter 3)

PRINT [P] Prints a copy of the screen. Choose the letter corresponding to your printer, or press 'S' to copy the screen onto a Microdrive (see Chapter 10)

QUIT [Q] Returns you to SUPERBASIC. If you don't really want to leave EASEL, press ESC to cancel QUIT (see Chapter 2)

RENAME [R] To give an existing set of numbers a new name – EASEL forgets the old name (see Chapter 2)

SAVE [S] Makes a copy of the graph onto a Microdrive cartridge. Type in the name of the graph, or press '?' for directory of Microdrive 2. If any graph with the same name already exists on the cartridge the new graph will overwrite it (see Chapter 10)

VIEW [V] To re-display your graph, combining as many or as few sets of numbers as you want. The pie chart will display only one set of numbers – either the current set or the first set you type in when you use this command (see Chapter 2)

ZAP [Z] Erases the whole of the graph on the screen from current memory, without saving it on a Microdrive cartridge. EASEL then allows you to create a new graph (see Chapter 2)

FUNCTIONS

The functions convert one set of numbers into another (see Chapter 7). You must not have a blank space between the function name and the brackets. The functions available on EASEL are as follows:

ABS(n) Returns the absolute value of n, ie. the numerical value irrespective of sign, eg:
```
ABS(8) = ABS(-8) = 8
```

ATN(n) Returns the angle in radians whose tangent is n

COS(n) Returns the cosine of the angle n (where n is in radians)

EXP(n) Returns the value of *e* (approx 2.718) to the power n

INT(n) Returns the integer value of n by truncating at the decimal point. Always returns the smaller number, eg:
```
int(4.9) = 4
int(-3.2) = -4
```

LN(n) Returns the natural, or *base e*, logarithm of n, which must be greater than zero

PI(n) Returns the value of the mathematical constant 'pi' (approx 3.14)

SGN(n) Returns +1, 0 or –1 depending whether the number is positive, negative or zero

SIN(n) Returns the value of the sine of the angle n, where n is in radians

SQR(n) Returns the square root of the value n (n must not be negative)

TAN(n) Returns the tangent of the angle (*n*), where n is in radians

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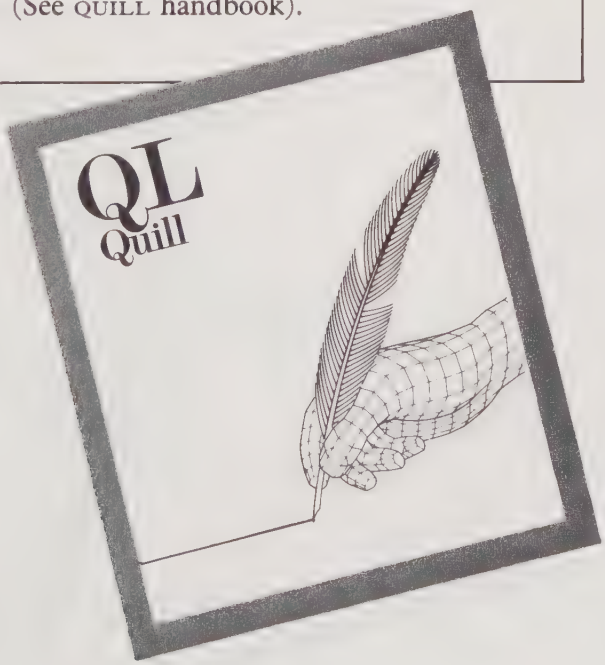
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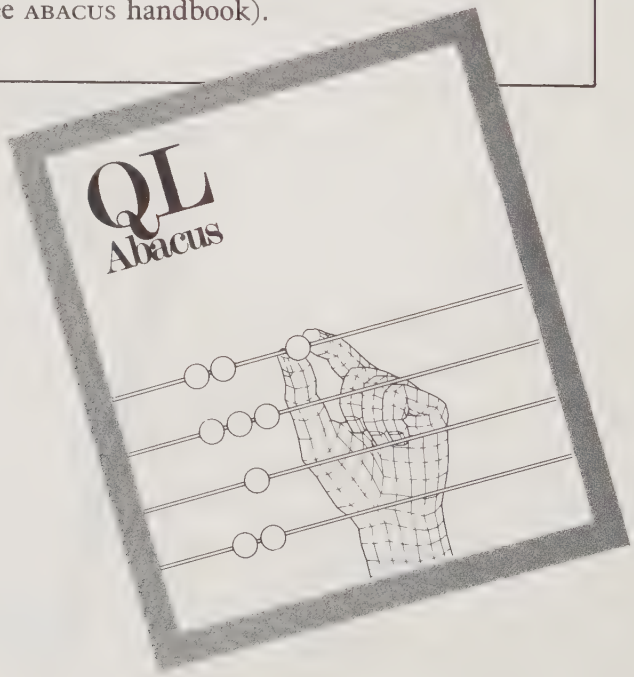


Does Joyce approve of Miranda's catch? Or does she think longingly of that nice Phillips boy? (See QUILL handbook).



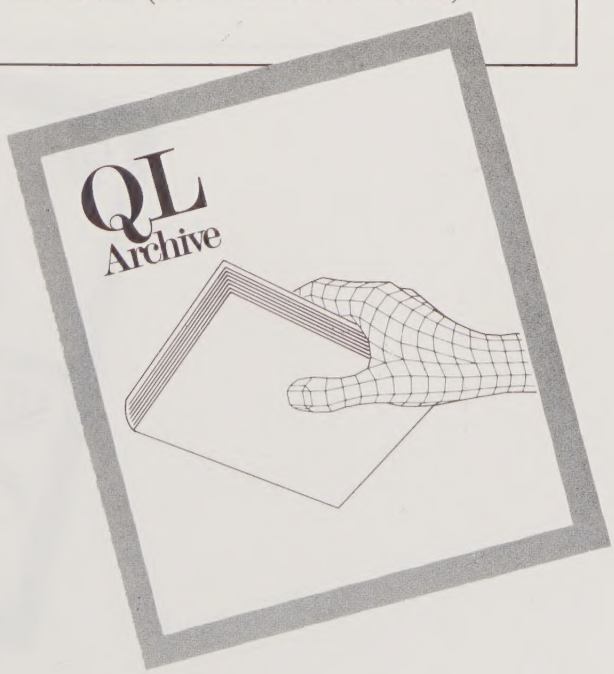


Will Joyce's brooches arrive in time for Christmas?
(See ABACUS handbook).



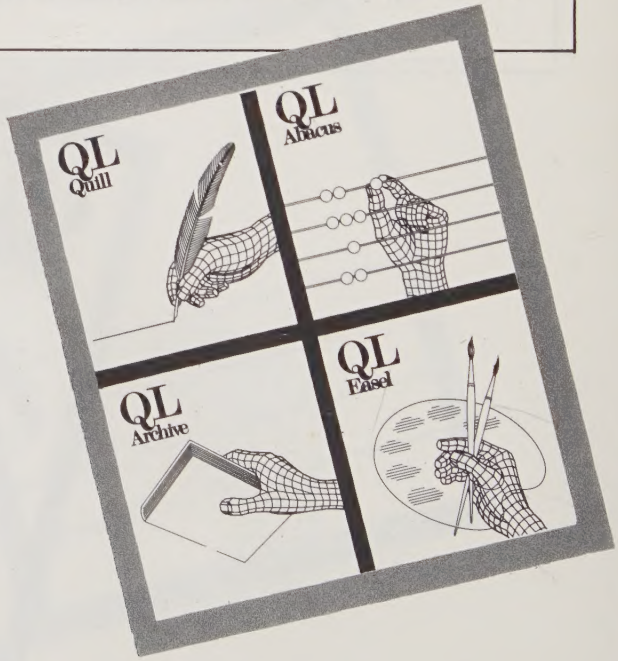


Will Lawrence Lizard rise Phoenix-like as Larry Lizard?
Or will he remain in the ashes? (See ARCHIVE handbook).





Will Harold lose those last ten pounds and be able to squeeze into his tuxedo before Miranda's wedding? (see INTEGRATING handbook).



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