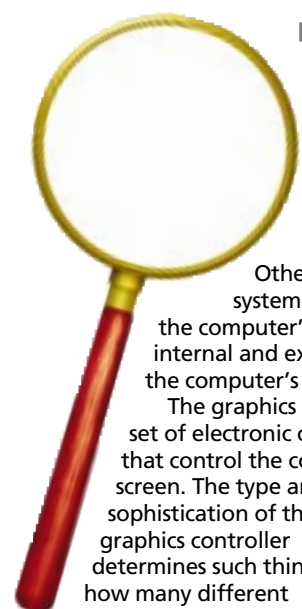


getting started

What's inside the case?



The processing hardware is all contained in one box called the system unit. The most important piece of equipment in the system box is the CPU (central processing unit). This is often referred to as simply the 'processor'. The CPU can be thought of as the heart, or engine, of the computer.

Other essential components inside the system unit are the graphics controller, the computer's memory (RAM), and the internal and external disk drives that form the computer's long-term storage. The graphics controller is just a set of electronic components that control the computer's screen. The type and sophistication of the graphics controller determines such things as how many different colours you can display on the screen and how many coloured dots are used to make up the picture.

Because a computer's working memory is blanked every time you switch off the system unit, the internal disk drive is used to store data so that it can be used again. These internal drives are called hard disks, for the rather prosaic reason that the data is magnetically stored on hard metal disks. Usually, you can't see the disk drive itself because it is mounted inside the system unit, but there is nearly always a light on the system unit to show that the hard disk is working.

The external disk drive is for floppy disks. All modern computers use a 3 1/2 in floppy disk, encased in a rigid plastic holder. The floppy disk fits into a slot in the system unit, behind which is the floppy disk drive itself. Hard and floppy disk drives work in essentially the same way, but hard disks are much faster, can store a lot more and cost hundreds of pounds.

Software that is not supplied on CD-ROM will come on several floppy disks and, before you can use it, you have to

copy the contents of each disk onto the hard disk inside the computer. This process is called installation.

Another use for floppy disks is to store extra copies of your work in case your hard disk breaks down, or to pass on to someone else.

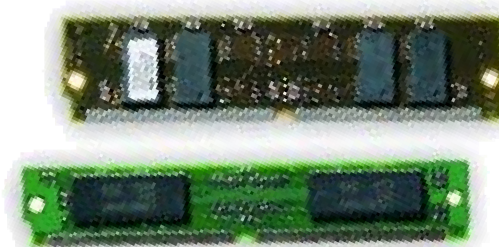


Other essentials

Everything connects to the system unit, which draws its power from the mains. The two input devices (keyboard and mouse) plug directly into the system unit and do not require a power supply.

The monitor is connected to the graphics controller in the system unit via a 15-pin D-shaped plug. It also needs mains power, but many system units have an auxiliary connector on the back which supplies power to the monitor.

Printers receive data from the computer via a cable connected to the system unit. Printers usually incorporate mains transformers and must draw their own power from the mains.



◀ Continued from page 13

Bolt-on goodies

Modems are used to connect your computer to the telephone system, from where you can connect with other computers on the Internet, join an on-line service such as CompuServe, or connect with any other computer equipped with a modem. Virtually all modems allow you to send and receive faxes, and many of the more recent ones can act as telephone answering machines by recording messages onto the PC's internal hard disk.



Scanners translate printed pictures or words into an electronic form that can be stored and manipulated by the computer. For scanning photographs, you need a colour scanner capable of recognising at least 256 colours, but one described as 16-bit or higher can handle over 65,000 colours, which gives even more naturalistic results.

The cheapest models are hand-held devices; these work well, but are too narrow to scan A4 paper without a lot of fuss. Next in price are sheet-fed scanners that will handle A4, but cannot be used to scan bulky items from books or magazines unless you copy them onto A4 first. Flat-bed scanners are the dearest, but also the most useful in that they can scan from any printed source.



In close-up

The display controller

This is a circuit board (known as a card) fitted inside your computer and it determines how many different colours you can have on the screen at one time and also the number of dots used to produce the image (the resolution). More expensive cards generally work faster, use more colours and work at higher resolutions. Make sure the card is described as being accelerated local bus (it could be VL-bus or PCI) and that it has at least 1Mb of memory.

The type of processor

This is the component that actually does the computing and you should buy the fastest you can afford.

The amount of memory
Random Access Memory (RAM) is what counts. Memory, like hard disk size, is measured in megabytes and 8Mb is the minimum we'd recommend if you use Windows programs.

CD-ROM drive
Most drives today are quad-speed. But, six and eight-speed drives are common.

The size of the hard disk
The hard disk stores your software as well as the data you produce when working with your computer. Capacity is measured in megabytes (Mb) and it's really not worth buying anything smaller than 850Mb. Go for a larger disk if you can afford it.

Floppy drive
For 3 1/2 in floppy disks.

Output (viewing your work)

Output can take many forms. The primary output of a modern PC is via the screen on the monitor. Actually, the computer will work without a monitor, but if you can't see what's happening on the screen it's almost impossible to use.

Monitors vary in performance and price. The most significant factor affecting the price is the size of the screen: a 15in monitor may cost around £300, but every extra inch above this is very expensive. The average price for a 17in monitor is around £600; for a 20in or 21in model, expect to pay well over £1,000. Most work done on a PC will eventually end up on paper, so some sort of printer is essential (see the 'Buying a printer' section a few pages on). Another common output is sound, either synthesised (artificially created) or digitised (taken from life). But a PC can be used to drive almost any type of device, given the right connections, so the control of other machines also counts as output.



What is multimedia?

Multimedia is the buzzword of the moment. It usually means adding a sound card, speakers and a CD-ROM drive to a computer to enable you to record and play back voice, sound effects and music. CD-ROM sales are booming and many programs, reference works and libraries of artwork are available in this format. You can also use a CD-ROM drive to play conventional audio recordings. If you want multimedia capabilities, it's often cheaper to buy them built in than to add them later. Check with your supplier.

Whether you buy built-in multimedia or add it afterwards, make sure the CD-ROM drive is at least a quad-speed model and that you buy a 16-bit sound card. Many computers now come with 6, 8, and even 10-speed drives.



Essential extras

A printer is not normally included with the basic system, so this must be budgeted for separately.

To make your computer do anything useful you'll need software for each type of task: word processing, accounts, graphics, spreadsheet, and so on.

Disposables such as floppy disks, paper, toner or ink.

Staff training (or time spent teaching yourself) can be quite expensive.

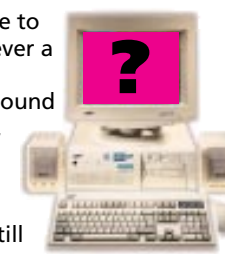
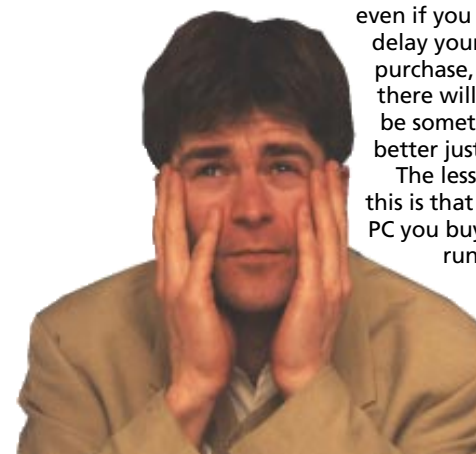
Buying your PC

There are literally hundreds of PC manufacturers and suppliers. Look through the tables at the back of *What PC?* and you'll see for yourself. The surprising thing is that almost all the machines you see are based on the same original design from IBM, which means many of their components are interchangeable.



Choosing a system Which processor?

Just as there is never a good time to start a new business, there is never a right time to buy a PC. Newer, faster, cheaper models are always around the corner. But, even if you delay your purchase, there will still be something better just about to be released. The lesson to be learned from this is that you should ensure the PC you buy is at least capable of running the software you intend to buy now, and that it has as much extra capacity as possible to cope with future developments.



Most PCs are powered by a member of a processor family designed by Intel. The best known of these is the Pentium, but there is an older type of Intel processor called the 486 and a newer type called the Pentium Pro.

It's not worth buying a computer fitted with a 486 processor unless you are really desperate to save money: for very little more you can buy the starter model of the Pentium. At the other extreme, the Pentium Pro is too expensive to be considered for general-purpose use and offers few real advantages when used with ordinary software.

Choose the fastest Pentium you can afford. Speeds range from 75 to 200, measured in megahertz (MHz), but Intel also makes a range of upgrade chips that can be added afterwards to boost the speeds of slower Pentiums.



Processors are also made by other manufacturers, such as Cyrix and AMD. Their Intel-compatible chips, modelled on 486 and Pentium processors, cost less than their Intel equivalents and can marginally reduce the overall cost of the system.



Value for money

A basic configuration includes the main system unit containing the CPU, memory, hard and floppy disk drives and graphics controller. Apart from this unit, you also get a monitor, keyboard, all the cables and connectors required to set up the system and, more often than not, a mouse.

The complete systems offered by most vendors are designed to make sure that all the components work together without conflict, but there is a drawback in that you might have to spend a lot of time finding a supplier who has put together exactly the specification you are looking for. You will find that most vendors are happy to deliver a modified system (with perhaps a larger hard disk or a bigger monitor) if it entails selling an extra or more expensive item of kit, but they are not all so willing to remove items from the basic configuration. It's worth asking.

Other choices

Personal computers are also available from manufacturers who strayed from the path marked out by IBM. The most successful example is the Macintosh, made by a company called Apple. But, to keep it simple, in this feature we'll use the term PC to mean an IBM-compatible personal computer.



A question of balance

A PC is a matched set of components and the overall performance depends on how well the parts work together. Buying a PC equipped with a really fast Pentium processor but with a tiny amount of memory, or a hard disk that's not big enough for today's greedy software, is a waste of money.

In general, as the speed of the processor increases, you should look for a corresponding rise in the amount of main memory, graphics memory and the size of the hard disk.

Reputable suppliers will put together well-balanced systems that are sensibly configured, but beware of end-of-range brand-name PCs being sold off cheaply. Always compare them with current models to see how the specification measures up.



Buying a printer

Unless you have bought a PC solely to play games, you will eventually want to get your work onto paper. For this, you'll need a printer. Almost everything a computer can be used to produce has a real-world equivalent: for example, letters, invoices, record cards and pictures. While all these might look wonderful on the screen, if you can't print them out and give or send them to other people, they are ultimately worthless.

Choosing a printer

Choosing the right printer is not just a question of how much you are prepared to pay to get your words and pictures onto paper. Each printer has its strengths and weaknesses. For most people, finances permitting, a laser printer is the best all-rounder, provided you don't need colour.



Dot-matrix printers have a capability that neither inkjets nor lasers possess – they can print on multi-part paper. This is invaluable if your primary output is going to be invoices and statements from an accounting program.

However, be warned, the noise from even a modern dot-matrix becomes very annoying after a couple of minutes' printing. They are noisy because they print by firing metal pins onto an ink ribbon. The pins then press the ribbon against the paper to produce the image. For this reason, dot-matrix printers are said to be impact printers.

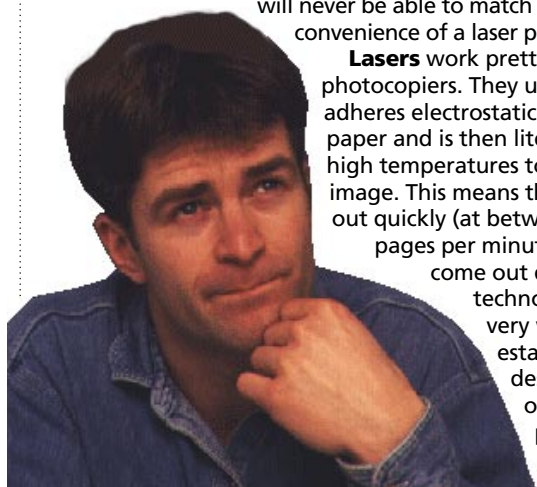
Inkjets work by spraying ink onto the paper. This makes them

virtually silent, but also accounts for their high running costs: the ink is expensive. In addition, the paper comes out of the printer with wet ink on it and, unless you leave each page to dry for a few seconds, it will smudge if you touch it. The inkjet technology, which is capable of producing high-quality output, thus carries its own insuperable disadvantages and



will never be able to match the speed and convenience of a laser printer.

Lasers work pretty much like photocopiers. They use toner which adheres electrostatically to the paper and is then literally fused at high temperatures to form the image. This means the copies come out quickly (at between 4 and 16 pages per minute) and they come out dry. Laser technology is now very well established and, despite their fast output, laser printers are very reliable.



What is resolution?

This is expressed in dots per inch, horizontally and vertically. It's a measure of how many dots it takes to print a solid black one-inch square. A printer described as 300x300 will use 300 rows, each consisting of 300 dots, to print the square. That's a lot of dots: 90,000 to be precise.

A simple rule of thumb is, the more dots that are used, the clearer and finer the printed image will be. Most cheap lasers print at 300x300 dots per inch. More expensive ones print at 300x600 or even 600x600.

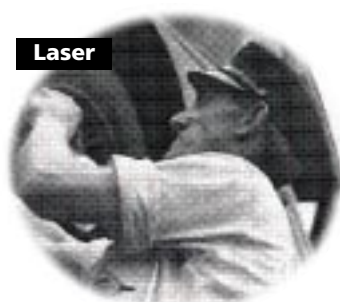
If you compare resolutions, only do so within a particular printer family. For example, the output of a dot-matrix printer will never equal that of a laser, however high a resolution the dot-matrix uses.

Similarly, many inkjets are capable of 360x360dpi, but you should not assume this makes them better than a laser of 'only' 300x300dpi. Lasers place their dots more accurately.

A **Dot-matrix**

A **Inkjet**

A **Laser**



Printing costs

Dot-matrix printers are the cheapest to run, requiring little attention other than a new ribbon every couple of months. Inkjet printers use ink voraciously, especially when used to print graphics. Ink can be expensive, especially if you buy a colour printer where all the ink comes in one cartridge that has to be thrown away when just one colour runs out. Find out how much new ink cartridges cost, and whether they can be refilled to save money.

Laser printers need replacement toner, usually every two to five-thousand pages, depending on the make of printer. Some models use an all-in-one cartridge containing both toner and a new electrostatic drum. Every time you replace the toner, you throw away what could be a perfectly good drum; others use separate toner and drum systems so you only need to replace the drum when it wears out, usually after around 10,000 pages.

Whatever printer you are considering, don't be fobbed off with vague promises about running costs. Ask about ink, cartridge, toner and drum prices and how often they need changing.



Colour printers

All three types of printer can be bought in versions capable of producing colour. A colour printer can also be used to print in monochrome, though this can work out to be more expensive than using a designated mono printer. If you want good quality, the only affordable option is an inkjet.

- Colour laser printers do exist and they produce terrific output, but you'll need the best part of £5,000 to get hold of one.
- Colour dot-matrix printers can be bought for only £20-£30 more than monochrome versions, but they are only suitable for the simplest type of output.

- For colour work, the inkjet is once again a compromise between the desirable laser and the disappointing dot-matrix machines.

However, for only £50-£100 more than the price of a monochrome machine, it's possible to buy an inkjet printer capable of producing quite acceptable colour, even if the cost per page is high.



10 things to do with a PC

The flexibility of a modern PC is so great that, once you get to grips with it, you can use it for thousands of purposes. Here's what our readers tell us they do with their computers:

1 Surf the Internet More and more people are getting onto the Internet. You'll need a modem to plug your computer into the phone system, and you'll have to pay around £15 a month to a service provider for a connection. Once on line you can retrieve information, get free software, join special-interest groups from all over the world, and send and receive electronic mail.



2 Send and receive faxes Any document you create on your computer, whether it contains words or pictures and regardless of what sort of software you used to create it, can be faxed directly from your PC without ever existing on paper at all. You can also receive faxes from other computers or from ordinary fax machines. You'll need a modem to send and receive faxes.

3 Work from home You can bring work home from the office on a floppy disk and take it back the same way, or you can go the whole hog and work entirely from home using a PC with printer, scanner and modem as your combined fax, answering machine, copier and electronic mail system. You need never go to work at all!

4 Create music Plug any digital instrument with a MIDI interface (most electronic keyboards have one) into your sound card and you can edit and experiment with the music, play it back and, with the right software, even print it out in musical notation.



5 Edit pictures If you have a scanner, you can copy any of your own pictures into the computer and electronically enhance them, then view them as an on-screen slideshow or include them in the letters and documents you create. Even if you haven't got a scanner, many photo shops will transfer your films onto a Photo-CD at a reasonable cost.



6 Play games There's hardly a PC anywhere that isn't used as a games machine at some time in its life. Serious games players plug joysticks (and even steering wheels) into their computers instead of using the keyboard and mouse.

7 Build an electronic reference library You can assemble a world-class library for a fraction of the cost of real books. Encyclopaedias, atlases, massive reference works and even fiction are all available, many with sound and moving pictures too.



8 Help kids with their schoolwork At one level, just giving young minds access to a word processor with a spell-checker is enough to stimulate a new enthusiasm for studying, but there's a wealth of special programs covering most school subjects and some really excellent reference titles aimed specifically at children.

9 Keep accounts For many small businesses, keeping accounts is the justification for buying a PC in the first place. Computerising your accounts won't necessarily save you money, but you'll always know exactly where you stand.

10 Run a club or society With a simple set of software or an integrated package you can keep membership lists and addresses, track subscriptions and publish the club's newsletter.

Buying a notebook

A notebook PC is a portable computer of approximately the same dimensions as a sheet of A4 paper, but about two inches thick. The term 'notebook' has almost universally superseded the older designation 'laptop', which referred to machines that, while portable, could actually be quite bulky and heavy to carry.

What is there to gain?

Apart from using it to impress your friends and colleagues, there are two good reasons for buying a notebook, rather than a desktop, PC:

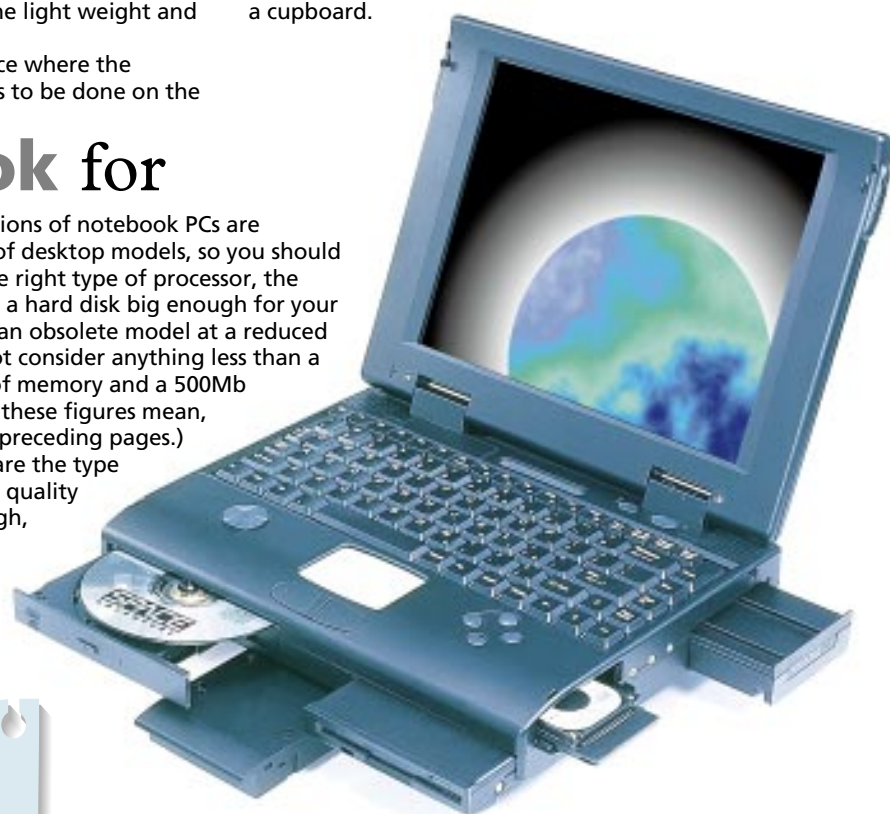
- To compute 'on the move', in which case the light weight and battery power of a notebook are essential.
- Space might be limited in the home or office where the computer is to be used. If your computing has to be done on the

kitchen table or in the living room, it's a pain putting away a full-size computer every time you finish using it. A notebook can be stored on a bookshelf or popped away in a cupboard.

What to look for

The technical specifications of notebook PCs are comparable to those of desktop models, so you should make sure you buy the right type of processor, the right amount of memory and a hard disk big enough for your needs. Unless you are buying an obsolete model at a reduced price, this means you should not consider anything less than a Pentium 75MHz processor, 8Mb of memory and a 500Mb hard disk. (For an explanation of what these figures mean, see the 'Buying your PC' section on the preceding pages.)

Two other important considerations are the type of screen and, for mobile computing, the quality of the battery system. Bear in mind, though, that if you're buying a notebook, just because it's small and easy to move around the house or office, you'll use mains power most of the time, so you can safely ignore the battery's capabilities.



Buying tips

- It's harder, and more expensive, to upgrade notebooks than desktop PCs, so don't cut corners. Buy the most powerful machine you can afford and its useful life will be prolonged.
- For mobile computing, select a lightweight model of rugged construction, preferably with a Lithium Ion or Nickel Metal Hydride battery.
- Manufacturers keep prices low by selling models without floppy disk drives. This also keeps the weight down. There's nothing wrong with this if the notebook is to be your second computer; otherwise, get one with a built-in floppy disk drive.
- Never buy a notebook PC without first trying it out. The keyboard and the display are your means of communicating with your PC. You must feel comfortable with both of them.
- Check both the battery life and also the recharge time. Some notebooks offer a fast-charge facility.

Types of screen

Price reductions in recent months have almost resulted in the disappearance of monochrome screens. Most budget notebooks now include dual-scan colour screens, sometimes referred to as passive-matrix or DSTN. These are fine for word processing and spreadsheet work which involves relatively static displays, but for presentations, graphics or games you need an active colour (TFT) screen.

Some of the dual-scan screens are now so good that it's hard to tell the difference between them and the more expensive TFT versions, but others are subject to blurring, vertical shadows that run down the screen from dark areas and cursors that disappear when moved quickly. Do try before you buy.

Battery technology

Most notebooks use one of three types of rechargeable battery. The cheapest are Nickel Cadmium (NiCad) but these are being rapidly superseded by the superior Nickel Metal Hydride (NiMH) units, which run for longer between charges. Sophisticated notebooks, especially those with TFT screens and CD-ROMs, should be bought with Lithium Ion (Li-Ion) batteries because they're lighter, charge faster and store more power for their size. Beware of spurious claims for battery life based on unrealistic operating conditions, and ask whether the battery can be charged while the PC is in use.



What is software?

However powerful your computer, it is ineffectual without software. Software is to a computer what records, tapes and CD discs are to a hi-fi system. The big difference between the two is that, if you buy computer software on floppy disks or on a CD-ROM, you don't necessarily have to put the disk or CD into the computer every time you want to use it. It is possible, and often essential, to copy the contents of the disk or CD onto the hard disk that's inside the computer. Thereafter, you keep the original disks in a safe place and work with the copy that's on the hard disk.

Many new PCs are sold with what is called 'bundled' software. These are programs included in the price of the PC and they are often pre-installed on the hard disk. If nothing else, a new PC will be supplied with software that forms part of its operating system, and without which it won't work at all. The best known operating system is Microsoft Windows. The most current version of this is Windows 95, though earlier versions, such as Windows 3.1 and 3.11, are still offered by some vendors.



Microsoft Windows

One of the reasons personal computers have gained such wide acceptance is that they are comparatively easy to use compared with their predecessors. This is thanks to operating

systems like Microsoft Windows that let you control a computer by moving a pointer around the screen and clicking on buttons, menus or icons (tiny pictures) to issue your commands. Without Windows, you'd have a

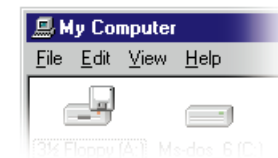
blank screen, onto which you'd have to type complicated instructions using only the keyboard.

These days, almost every piece of software you buy expects to find Windows already on the computer, and if it doesn't, it won't work. Almost the only exceptions to this rule are games, which often bypass Windows in order to run faster than would otherwise be possible.

The version of Windows used makes quite a difference to the way it works. New PCs powered by Intel's Pentium processor are almost always supplied with at least 8Mb of memory, and should come with Windows 95. Older and slower machines, particularly those with only 4Mb of memory, will run better with an older, less demanding version of Windows, such as version 3.1. Unfortunately, most of the latest software is designed specifically for Windows 95, so having an older version may restrict your choice of programs. If your PC is capable of running Windows 95, you'd be wise to choose it.



My Computer



Solo performers

There is general agreement that everyone with a computer will want to use it at some time to type a letter, store information or add up lists of numbers, but once you get beyond these straightforward functions you'll need some extra software. A suite or integrated package is not specialised enough to do proper accounting, for example.

And if your computer is destined for family use, you'll want reference and entertainment software, games and encyclopaedias. There are tens of thousands of programs out there, some good, some bad and some indifferent; but whatever your needs, someone will have written a program to satisfy them.

Buying software is a bit like buying a film on video: you don't know whether it's any good until you actually try it. It's a good idea then, to rely on the same indicators you do when choosing a film: read reviews, ask knowledgeable friends for their opinions if they've seen it, or get hold of a demo version – the equivalent of watching a trailer for a film.

You should check out the shareware options too. Shareware programs are distributed free of charge, often on CD-ROMs, like the one that comes with this magazine, and you pay for them only if you want to keep using them. If you decide to do this, you must register with the manufacturer, whereupon you'll receive a printed manual, upgrades when they're available, and possibly the use of a telephone helpline.



Paintshop Pro



LapLink for Windows 95



Netscape

Office suites & integrated solutions

New computers supplied with pre-installed software will probably come with either an integrated package or an office suite, as well as some games and entertainment software.

Both types of software make it possible for you to carry out most of the tasks for which you probably bought your PC. You'll be able to compose letters and draft documents with the word processor, calculate and store figures using the spreadsheet and store information in the database. On top of this, you'll find features such as diaries, drawing tools, and possibly communications modules that enable you to connect with other computers over a telephone line.



The difference between an integrated package and a suite is that an integrated package is one program that is capable of all these functions, whereas a suite is a set of separate programs which work in harmony to do the same thing.

Given the choice, a suite is better value because each of the programs within it is likely to be more powerful than the version incorporated within an integrated package. On the other hand, integrated packages are easier to learn and generally run better than suites on less powerful computers. Many people learn on an integrated package and when, and if, they outgrow it, buy a suite.