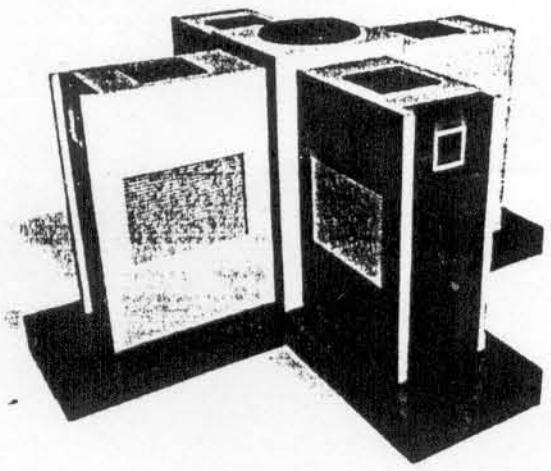
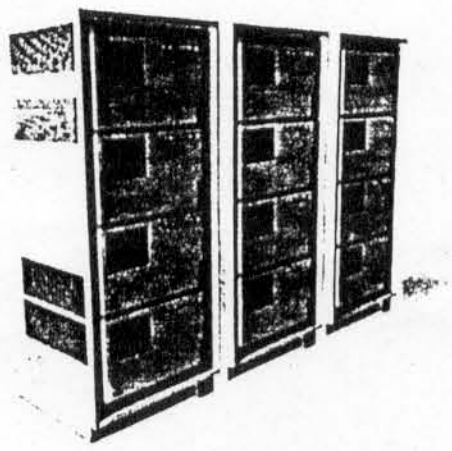
UNIT 2

Computer Architecture

STARTER 1 Name these different types of computers. Then match the possible users below to each type. Justify your choice.



a



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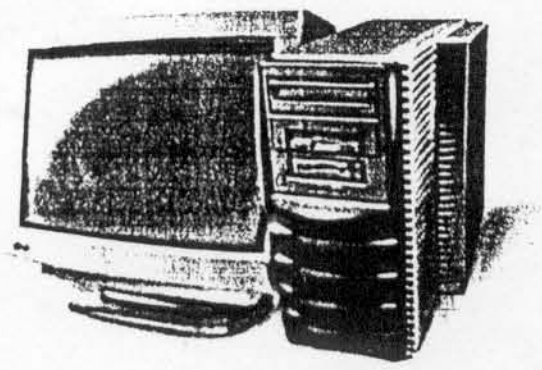

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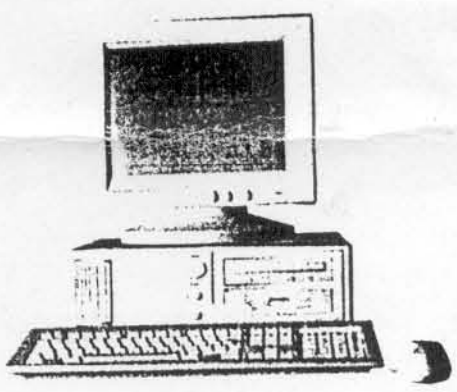

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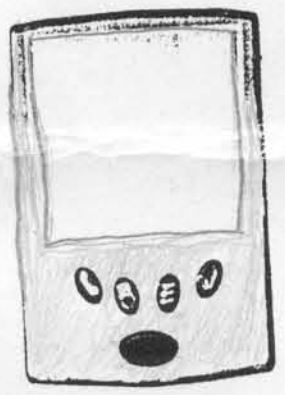


g

Fig 1

1 Marketing research person collecting data from the general public
2 large company processing payroll data
3 travelling salesperson giving marketing presentations
4 large scientific organisation processing work on nuclear research
5 businessperson keeping track of appointments while travelling
6 graphic designer
7 secretary doing general office work

2 What do these abbreviations mean? Use the Glossary if necessary.

1 CD-ROM
2 RDRAM
3 MB
4 GHz
5 AGP
6 SDRAM
7 SVGA

READING 3 Now study the text below to find this information:

1 What is the memory size of this PC?
2 Which input devices are supplied?
3 What size is the monitor?
4 How fast is the processor?
5 What is the capacity of the hard drive?
6 Which operating system does it use?
7 What multimedia features does the computer have?

HOW TO READ A COMPUTER AD.

1 Intel Pentium IV 1.7GHz Processor
2 Mini Tower Chassis
3 256MB Rambus RDRAM
4 60GB Hard Drive
5 Embedded Intel 3D Direct AGP video with 64MB SDRAM
6 64-voice wavetable sound
7 48 X CD-ROM Drive
8 19" (17.9" VIS) Colour SVGA monitor
9 Microsoft Windows XP
10 1.44MB 3.5" Floppy Drive
11 Microsoft Intellimouse
12 105-key keyboard

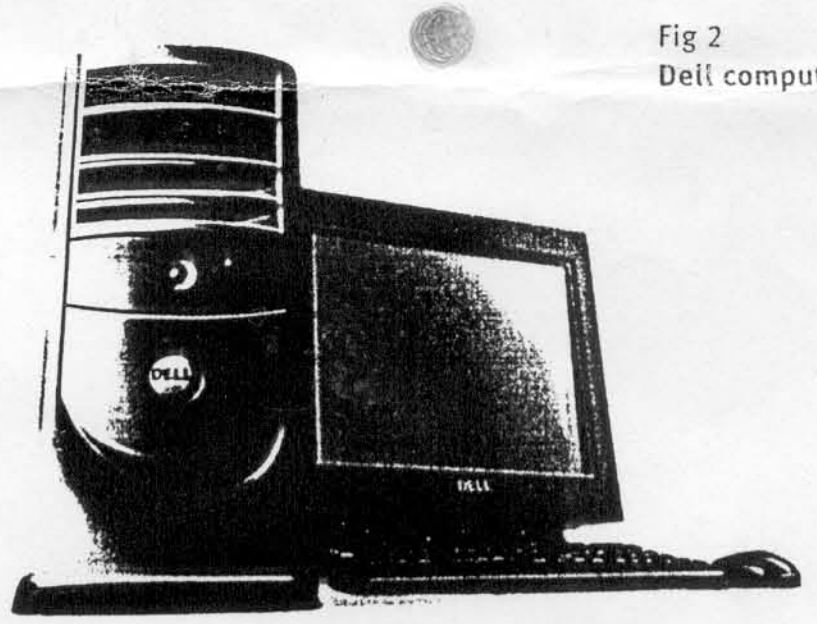


Fig 2
Dell computer

1 The main processing chip that operates at a clock speed of 1.7 thousand million cycles per second.

2 A small size of tall and narrow style of case containing the computer system.

3 256 megabytes of Rambus dynamic type of main memory chips that constitute the computer RAM.

4 A hard drive internal storage device with a capacity of approx. 60 thousand million bytes.

5 A video controller for controlling the monitor screen that is built on to the computer motherboard. It can process 3D images using the AGP type of video bus interface. It also contains approx. 64 million bytes of synchronous dynamic random access memory that is used as video memory.

6 A soundcard that has 64 voices and generates sounds using the wavetable system.

7 A CD-ROM storage device that operates at 48 times the speed of the original CD-ROM devices.

8 A colour monitor for displaying output on a screen at resolutions determined by the SVGA standard. The diagonal measurement of the whole screen is 19 inches but the diagonal measurement of the actual viewable area of the screen is only 17.9 inches.

9 The operating system that is used to control the system.

LANGUAGE WORK Function of an item

We can describe the function of an item in a number of ways. Study these examples.

Using the Present simple

1 ROM *holds* instructions which are needed to start up the computer.

***Used to*-infinitive, *Used for* + *-ing* form**

2 ROM is *used to hold* instructions which are needed to start up the computer.

3 ROM is *used for holding* instructions which are needed to start up the computer.

Emphasising the function

4 *The function of ROM is* to hold instructions which are needed to start up the computer.

4 Match each item in Column A with its function in Column B. Then describe its function in two ways.

A Item	B Function
RAM	controls the cursor
processor	inputs data through keys like a typewriter
mouse	displays the output from a computer on a screen
clock	reads DVD-ROMs
3.5" floppy drive	reads and writes to removable magnetic disks
monitor	holds instructions which are needed to start up the computer
keyboard	holds data read or written to it by the processor
DVD-ROM drive	provides extremely fast access for sections of a program and its data
cache	controls the timing of signals in the computer
ROM	controls all the operations in a computer

5 With the help of the Glossary if necessary, describe the functions of these items.

1 scanner
2 printer
3 ATM
4 PDA
5 hard disk drive
6 supercomputer
7 mainframe computer
8 barcodes
9 swipe cards
10 memory

LANGUAGE WORK Prepositions of place

Study these examples of prepositions of place.

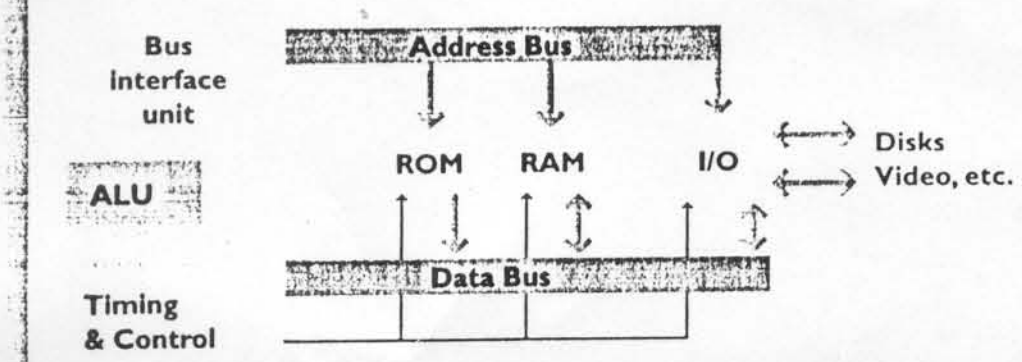


Fig 3
Computer buses

1 Data moves *between* the CPU and RAM.
2 Data flows *from* ROM to the CPU.
3 A program is read *from* disk *into* memory.
4 Data is transferred *along* the data bus.
5 The address number is put *onto* the address bus.

Fig 4
Hard disk

6 The hard disk drive is *inside* a sealed case.
7 Heads move *across* the disk.
8 Tracks are divided *into* sectors.

6 Complete each sentence using the correct preposition.

1 The CPU is a large chip ..... the computer.
2 Data always flows ..... the CPU ..... the address bus.
3 The CPU can be divided ..... three parts.
4 Data flows ..... the CPU and memory.
5 Peripherals are devices ..... the computer but linked ..... it.
6 The signal moves ..... the VDU screen ..... one side ..... the other.
7 The CPU puts the address ..... the address bus.
8 The CPU can fetch data ..... memory ..... the data bus.

PROBLEM-SOLVING 7 Study these 'System upgrades and options' for the computer described in Task 3. Which upgrades and/or options would improve these aspects of this computer?

1 capacity
2 speed
3 protection from damage due to power failure
4 network connections

Upgrades and options
3Com 10/100 Ethernet controller
CD-RW Drive
Extra memory module
APC 1400 Smart-UPS
3 Year Next-Business-Day On-site Service

SPEAKING 8 Work in pairs, A and B. Find out as much as you can about your partner's computer and complete this table.

Student A your computer details are on page 184.
Student B your computer details are on page 190.

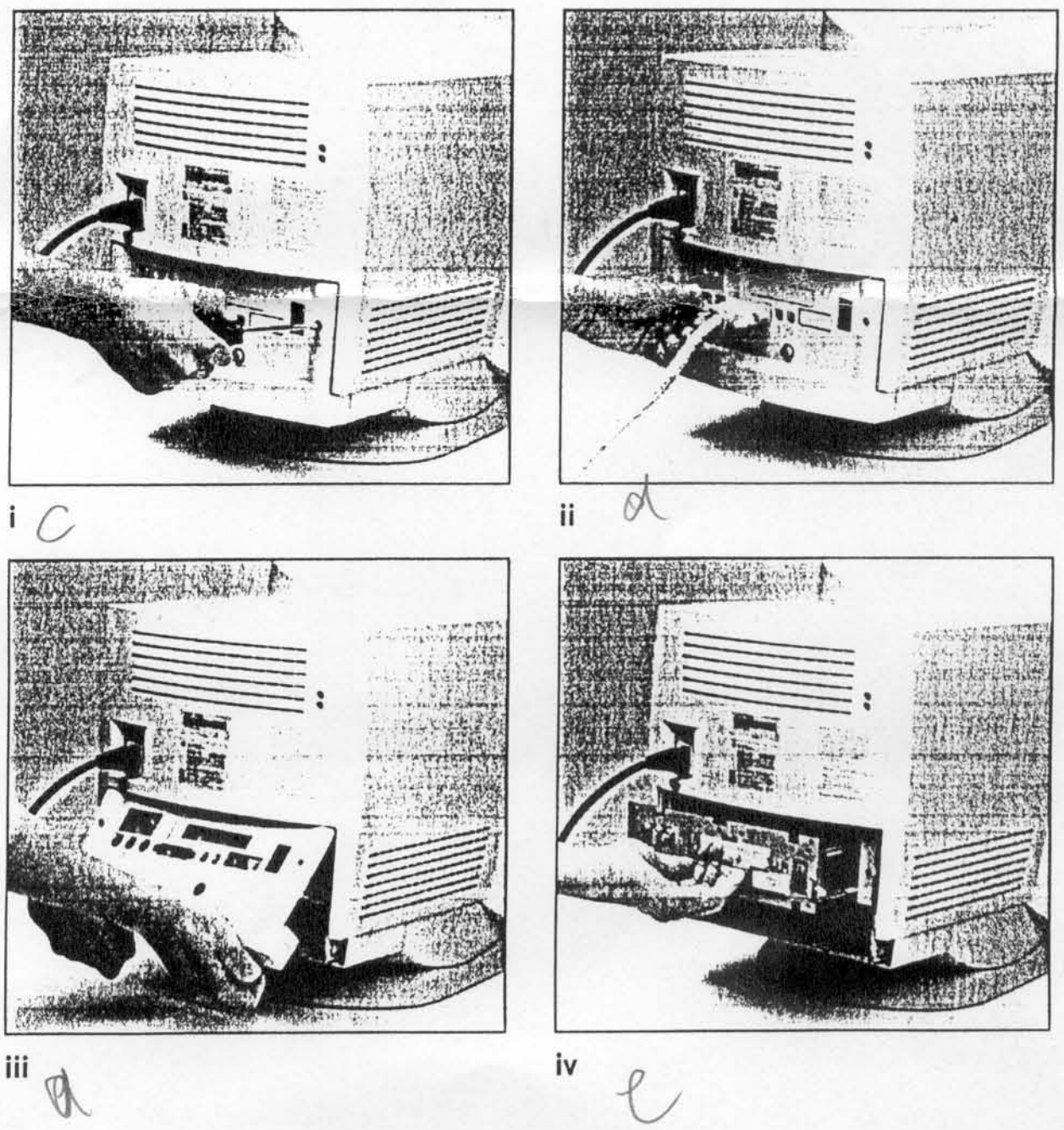
Feature	A	B
processor type		
processor speed		
bus speed		
memory (RAM)		
memory type		
hard disk capacity		
hard disk type		
monitor size		
monitor resolution		
CD-ROM drive speed		

WRITING **9** Put these instructions for opening a computer in the correct sequence.

a Release the two catches underneath and lift up to remove panel.
b Shut down your computer by choosing Shut Down from the Apple menu or the Special menu.
c If there are security screws on the vertical plate on the back of the computer, remove them with a Philips screwdriver.
d Unplug all the cables except the power cord from your computer.
e Pulling gently, slide the tray out.

10 Match these figures to the instructions.

Fig 5
Opening a computer



i C

ii d

iii a

iv e

11 Add these sequence words to your instructions: *first*, *then*, *next*, *after that*, *finally*.

SPECIALIST READING

A **Find the answers to these questions in the following texts.**

1 What is one of the main causes of a PC not running at its highest potential speed?
2 What word in the text is used instead of 'buffer'?
3 What device looks after cache coherency?
4 What is the main alternative to 'write-through cache'?
5 When does a write-back cache write its contents back to main memory?
6 When is data marked as 'dirty' in a write-back cache?
7 What determines what data is replaced in a disk cache?

CACHE MEMORY

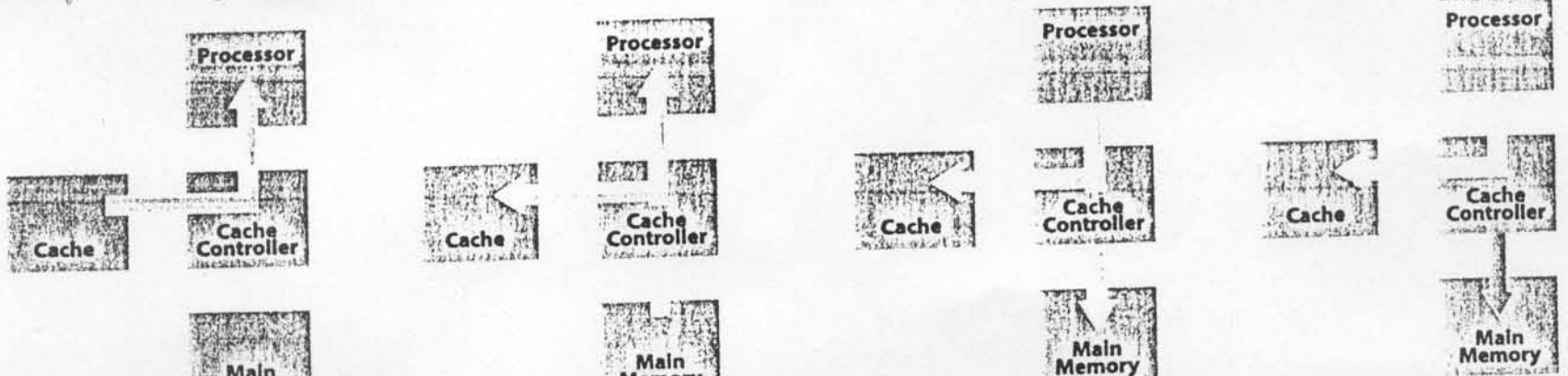
Most PCs are held back not by the speed of their main processor, but by the time it takes to move data in and out of memory. One of the most important techniques for getting around this bottleneck is the memory cache.

The idea is to use a small number of very fast memory chips as a buffer or cache between main memory and the processor. Whenever the processor needs to read data it looks in this cache area first. If it finds the data in the cache then this counts as a 'cache hit' and the processor need not go through the more laborious process of reading data from the main memory. Only if the data is not in the cache does it need to access main memory, but in the process it copies whatever it finds into the cache so that it is there ready for the next time it is needed. The whole process is controlled by a group of logic circuits called the cache controller.

One of the cache controller's main jobs is to look after 'cache coherency' which means ensuring that any changes written to main memory are reflected within the cache and vice versa. There are several techniques for achieving this, the most obvious being for the processor to write directly to both the cache and main memory at the same time. This is known as a 'write-through' cache and is the safest solution, but also the slowest.

The main alternative is the 'write-back' cache which allows the processor to write changes only to the cache and not to main memory. Cache entries that have changed are flagged as 'dirty', telling the cache controller to write their contents back to main memory before using the space to cache new data. A write-back cache speeds up the write process, but does require a more intelligent cache controller.

Most cache controllers move a 'line' of data rather than just a single item each time they need to transfer data between main memory and the cache. This tends to improve the chance of a cache hit as most programs spend their time stepping through instructions stored sequentially in memory, rather than jumping about from one area to another. The amount of data transferred each time is known as the 'line size'.



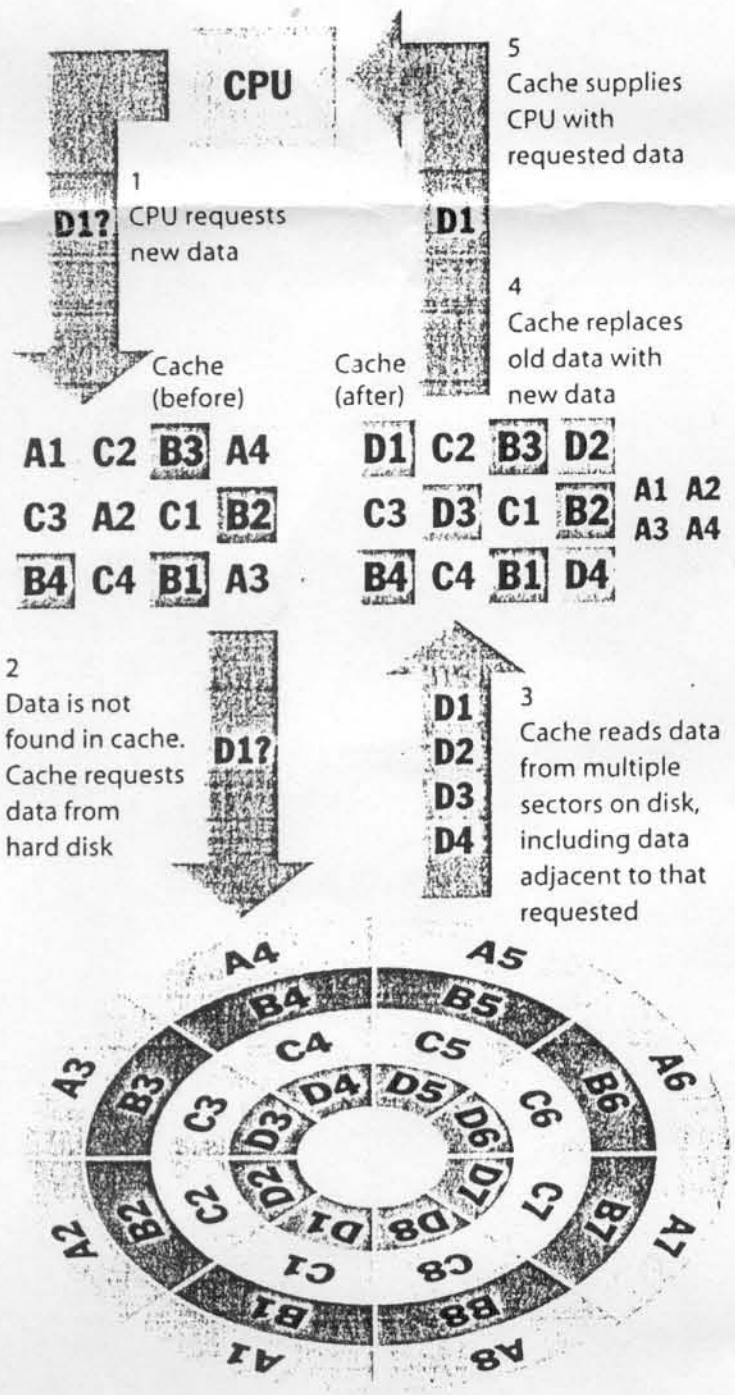
If there is a cache hit then the processor only needs to access the cache. If there is a miss then it needs to both fetch data from main memory and update the cache, which takes longer. With a standard write-through cache, data has to be written both to main memory and to the cache. With a write-back cache the processor needs only write to the cache, leaving the cache controller to write data back to main memory later on.

[Adapted from Cache Memory, PC Plus, February 1994, Future Publishing Ltd.]

How a Disk Cache Works

Disk caching works in essentially the same way whether you have a cache on your disk controller or you are using a software-based solution. The CPU requests specific data from the cache. In some cases, the information will already be there and the request can be met without accessing the hard disk.

If the requested information isn't in the cache, the data is read from the disk along with a large chunk of adjacent information. The cache then makes room for the new data by replacing old. Depending on the algorithm that is being applied, this may be the information that has been in the cache the longest, or the information that is the least recently used. The CPU's request can then be met, and the cache already has the adjacent data loaded in anticipation of that information being requested next.



[Adapted from 'How a Disk Cache Works', PC Magazine, September 1990]

B **Re-read the texts to find the answers to these questions.**

1 Match the terms in Table A with the statements in Table B.

Table A

a	Cache hit
b	Cache controller
c	Cache coherency
d	Write-through cache
e	Write-back cache
f	Line size

Table B

e i	The process of writing changes only to the cache and not to main memory unless the space is used to cache new data
f ii	The amount of data transferred to the cache at any one time
d iii	The process of writing directly to both the cache and main memory at the same time
a iv	The processor is successful in finding the data in the cache
c v	Ensuring that any changes written to main memory are reflected within the cache and vice versa
b vi	The logic circuits used to control the cache process

2 Mark the following as True or False:

a ✗ Cache memory is faster than RAM.
b ✗ The processor looks for data in the main memory first.
c ✗ Write-through cache is faster than write-back cache.
d ✗ Write-back cache requires a more intelligent cache controller.
e ✓ Most programs use instructions that are stored in sequence in memory.
f ✓ Most cache controllers transfer one item of data at a time.
g ✓ Hardware and software disk caches work in much the same way.