How to use this booklet

This booklet is designed to help you study for your ICT & Computer Science lessons in school.

It contains information, activities and resources that should be completed on a **step by step** basis, so that you build and reinforce your knowledge and skills as you progress through each section.

Don't panic if you haven't done a section before, just try your best to complete it.

As you complete each section, you should use the **Sample Exam Questions** to check what you have learned

This booklet is for students studying for ICT[1] & Computer Science

ICT Exam Skills Booklet – Paper 2
What you need to do and when

| WEEK #	SECTION	PAGES	COMPLETE
1	2.1	1-4	
2	2.1	5-8	
3	2.1-2.2	9-12	
4	2.2	13-16	
5	2.2-2.3	17-20	
6	2.3	21-24	
7	2.4	25-28	
8	2.4-2.5	29-32	
9	2.5-2.6	33-36	
10	2.6-2.7	37-40	
11	2.7	41-44	
12	2.7-2.8	45-48	
13	2.8-2.9	49-52	
14	2.9	53-54	

ICT Exam Skills Booklet – Paper 2

What is the purpose of this booklet?

This booklet is designed to **help you practice what you have learnt in ICT/Computing and what you will learn in the future.** .

Each section explains what you need to learn about a particular topic and provides exercises for you to complete to help your understanding. It is <u>important that you complete these exercises</u>, as they **will** help you to remember the information.

What are the revision topics?
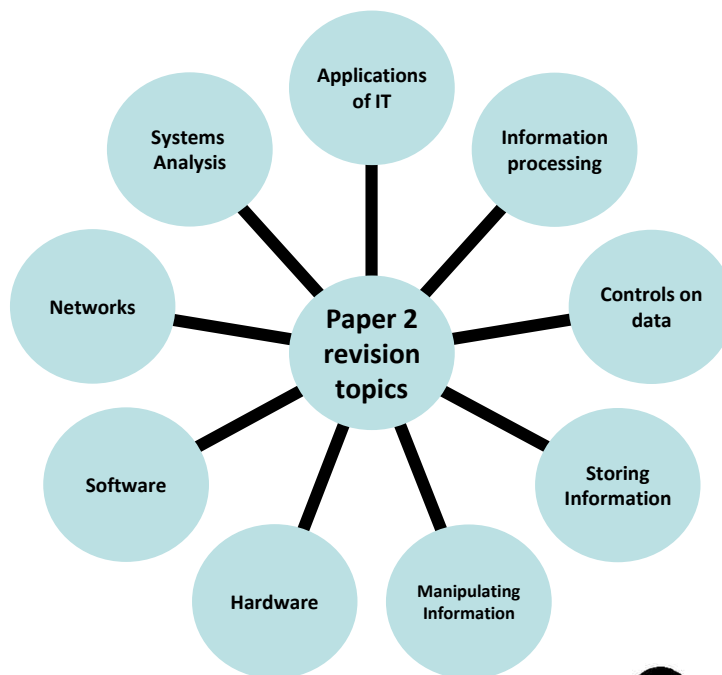
What's Special about this exam paper?
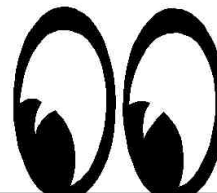
Look!

S*ome* questions will ask you to combine topics from different sections (*like a jigsaw – called synoptic questions*)

To help you understand *how* topics are combined and *where* to look for the relevant information, this booklet uses stars (*like this one*) to show you where you can look for the extra information you need.

See Also Section 2.1

ICT Exam Skills Booklet – Paper 2

How should I approach revision?

It is important that you are aware of the topics and subject areas that you need to know for the exam.

- ❑ It's also very important to revise **ALL** topics.
- ❑ **Don't take a risk** of only certain areas appearing on the paper.
- ❑ If you do, then you are already reducing your chances of getting the grade you deserve.
- ❑ **Don't PANIC!!**

All of these topics will be explained in more detail and example questions will be given in the booklet

Top tip

It helps to **get organised** so plan out a **revision schedule**. It is important to know which subjects you should be revising and when.

Review

Learn

Test
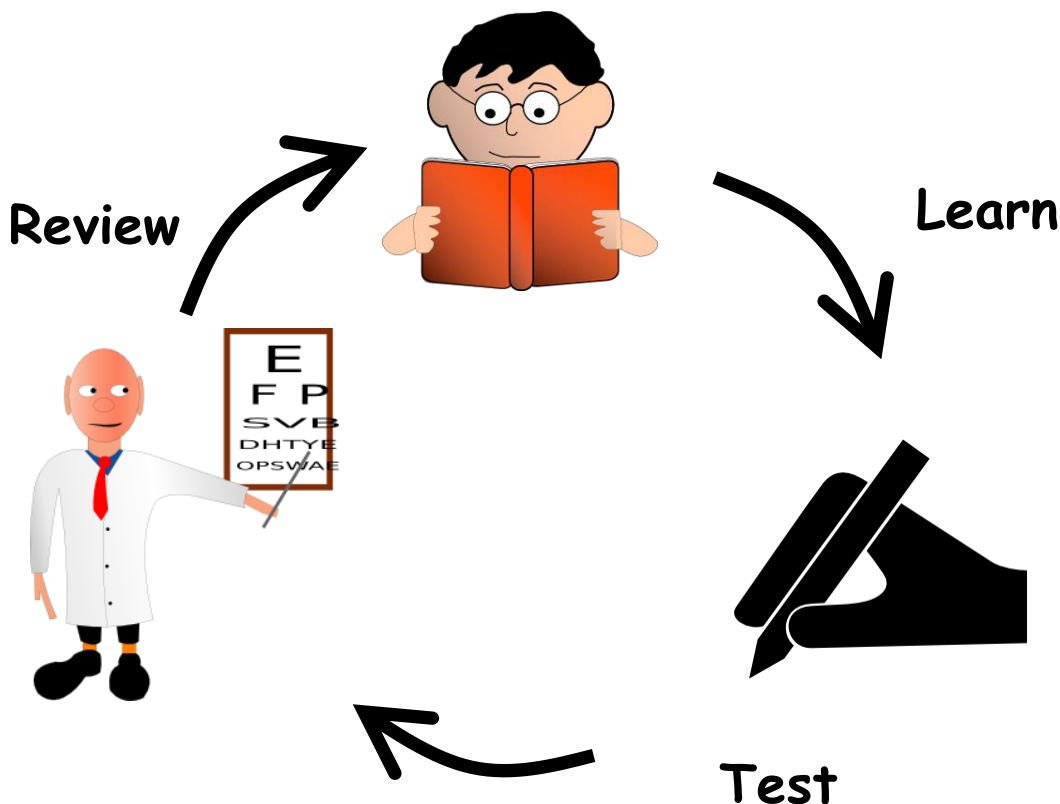
ICT Exam Skills Booklet – Paper 2

Section Index & Revision Checklist

Section	Subject	Planned Revision Date	Exam Questions Completed?
2.1	Application of ICT		
2.2	Storing Information		
2.3	Hardware & Memory		
2.4	Software		
2.5	Networks		
2.6	Controls on Data		
2.7	Manipulating Information		
2.8	Information Processing		
2.9	Systems Analysis		

Use the above checklist (*together with your revision planner if you have one*) to plan and monitor your progress

Plan a date for each section and the tick when you have completed the exam questions for that section.

This will help you to organise your revision more effectively and help you to know what you have *(and have not*) revised.

ICT Exam Skills Booklet – Paper 2

2.1 Applications of ICT
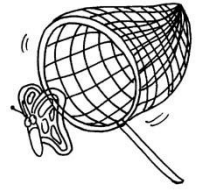
Data capture.

Data capture is the way that information is first gathered and put on a computer system. Data capture turns information into data.

There are several methods of data capture.

Manual Data Capture. Such as forms and questionnaires. These are <u>paper based</u>.

Questionnaires usually need a human to key in the results. However some forms require people to enter data in code.

This then input automatically using an **OMR (Optical Mark Recognition)** e.g. multiple-choice answer sheets.

Automatic Data Capture. Collecting information from sensors, barcodes, readers and scanners.

Advantages of different data capture

Automatic data capture systems:
Faster, more accurate, humans don't have to be present.

Manual data capture systems:
Sometimes necessary (such as collecting personal details)
It's cheaper, less hardware & software needed

Questions on this topic will often ask to compare advantages and disadvantages

ICT Exam Skills Booklet – Paper 2

How is data captured?

It is important to know how ICT is captured before being processed.
There are **three main ways**.
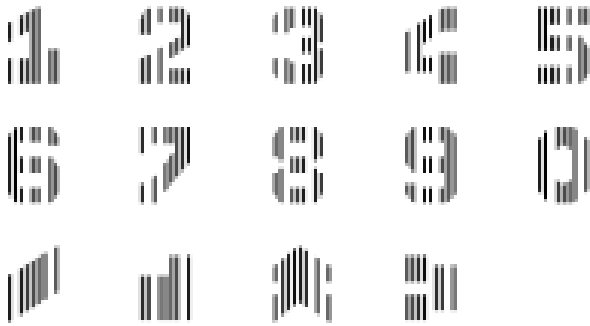
MICR – **M**agnetic **I**nk **C**haracter **R**ecognition

E.g. Computers are used to process cheques.

There are three sets of numbers on the bottom of the cheque these are: cheque number, sort code and account number. They are typed using **Magnetic Ink**. All cheques go to a clearing-house, where they are read using **MICR**.
The main benefits of this are that it is *quicker* and *more accurate* than processing the cheques by hand**.**

Other ways of Capturing Data

LOOK!
You will often be asked to identify other ways that data is captured electronically.

Pay close attention to these examples. You may only be given the names of each type and asked <u>how</u> they are used.

Optical **M**ark **R**ecognition
Uses infra red light to scan marks entered onto forms such as lottery tickets, multiple choice exam papers and registers

Good for large amounts, but marks must be recorded accurately

Optical **C**haracter **R**ecognition
uses scanner to convert hand written or typed text into digital format
good for easy data capture – prone to mistakes
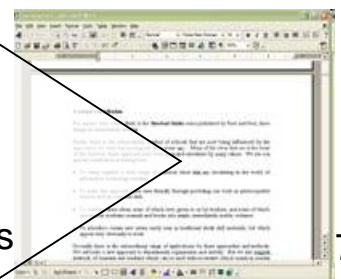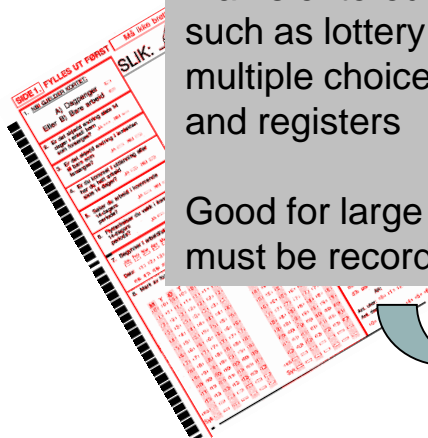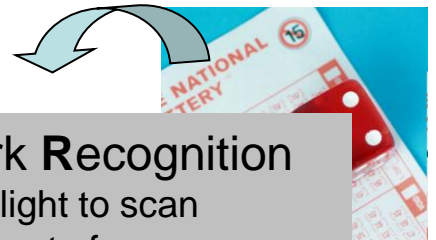
ICT Exam Skills Booklet – Paper 2

Data processing.

There are **4** main ways that computers, can process data.

Real-time processing:
Does it straight away. This is when data files are updated a soon as new information is entered, or becomes available. E.g. booking plane tickets.

Batch processing:
Is when lots of different jobs are stored up, and then all get processed together at the same time. E.g. large businesses usually work out wages for all their staff at the same time every month.

Transaction Processing:
This is the opposite of batch processing. Individual data files are updated in response to individual requests. E.g. someone cancelling their subscription to a magazine.

Interactive Processing:
This is when a data file is updated by an operator one item at a time in response to prompts given by the computer. E.g. a cinema ticket booking system.

To do: Can you match these descriptions of processing types with the correct processing type name?

'All at once'   'Right now'   'As and when'   'One at a time'

Real time processing   **Batch processing**   **Transaction processing**   **Interactive Processing**

Top tip

Flash cards are very helpful when trying to learn topics like this

ICT Exam Skills Booklet – Paper 2

Data Validation and Verification.

Data Validation - checks that the data is the right type. It can be performed automatically by the computer whilst the data is being entered.

There are 4 main techniques as shown below:

```
                        ┌─────────────────┐
                        │   Validation    │
                        └─────────────────┘
```

Range check	Presence check	Check digit	Data type check
Checks data within a specific range	Makes sure that important information is entered.	Checks that numerical data has been entered accurately.	Checks that text hasn't been put where numbers are needed.
e.g. >1 AND <10	e.g. Key fields cannot be left blank	e.g. Barcode checks last digit to make sure others are entered	e.g. Postcode check- B1 2JP = L9 9LL (L -number 9-letter)

Problems with Validation
1. Any problems with the verification program could mean mistakes are allowed.
2. It only makes sure the data is the right type, <u>not that it is accurate</u>.

ICT Exam Skills Booklet – Paper 2

Data Validation and Verification.

Data Verification is different to validation. It means making sure the data which has been input is the **same** as the original data.

In other words, where validation checks the type of data is correct, verification makes sure that the value or meaning of the data is correct (*i.e. right number, letter or word etc.*)

There are 2 main verification techniques:
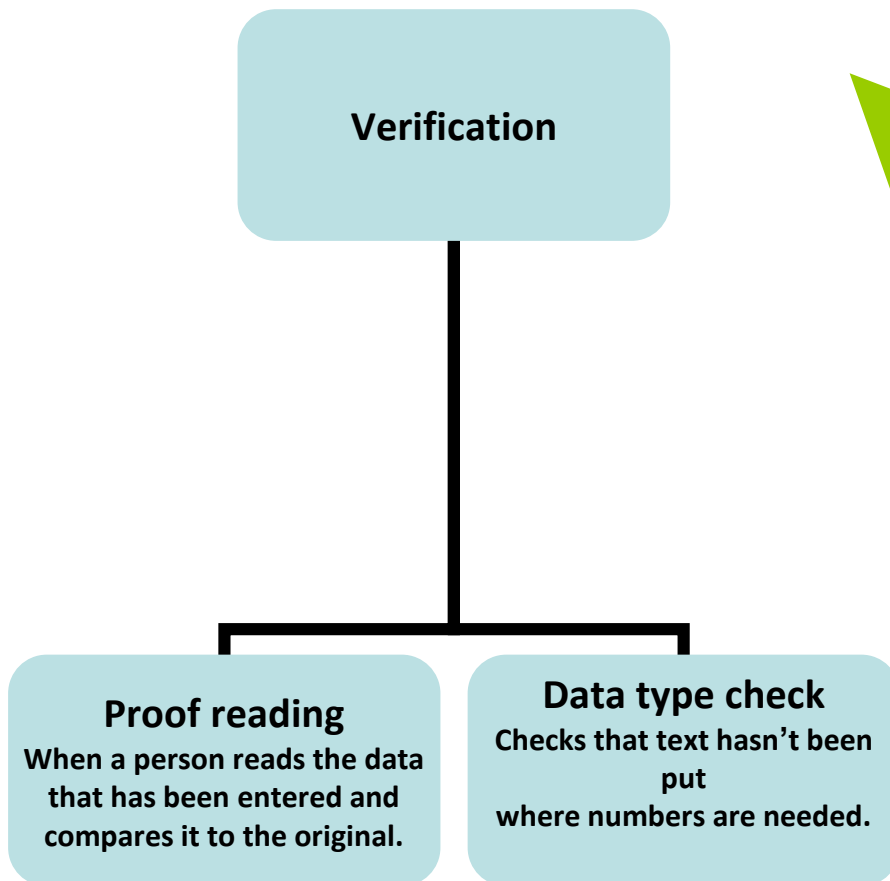
If your name's not down, ….blah….blah

Think of the humble bouncer!

He has to **validate** complicated things like dress codes and guest lists, as well as **verifying** things like your age, state of inebriation and criminal status……..no wonder they're all so grumpy!

Verification

Proof reading
When a person reads the data that has been entered and compares it to the original.

Data type check
Checks that text hasn't been put
where numbers are needed.

Problems with Verification
1. Proof-reading is time consuming and doesn't always eliminate human error.
2. Double entry is also time-consuming and so it can be very expensive.

Test it: Applications of ICT

3. Complete the following sentences using the list below.

OMR	**OCR**	**MICR**
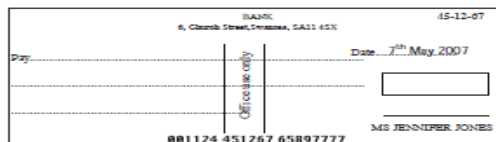
(i)   Banks make great use of ....   [1]
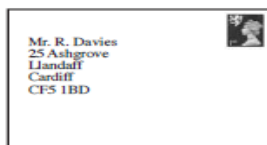
(ii)   One use of .... is to read postcodes on letters.   [1]
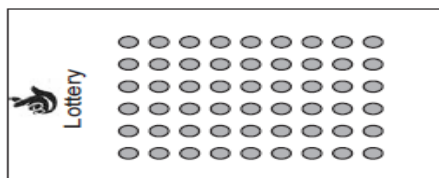
(iii)   The National Lottery uses .... to capture data.   [1]

(c) Complete the table by matching the following operating system to the tasks listed in the table.
An example has been done for you.   [2]

Multi-access	**Real time processing**	**Batch processing**

Task	*Operating System*
Control robots.	**Real time processing**
Many travel agents accessing a flight booking system at the same time.	
Produce gas bills.	

2.2   Storing Information

What is Data?

Examiners are always keen to check that you understand the difference between **Knowledge, Information & Data**. Therefore, it's worth taking time to make sure you do in fact **know** this.

Hmmmn,.... I just know I know this one!!!
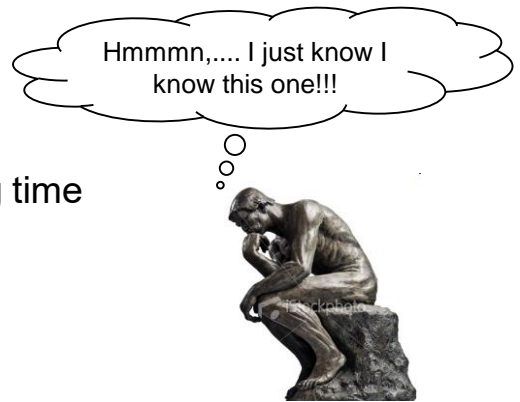
Data is words, numbers, dates, images, sounds etc without context.

Kenny   Newport

e.g.   22   Fluffy bunny

nil   love

Information is a collection of words, numbers, dates, images, sounds etc put into context, i.e. to give them meaning. .

e.g.   Fluffy bunny loves you

Newport 22, Pompey nil
Kenny is 22

LOOK!
You will sometimes be asked to just
Give definitions of what data, knowledge and information are, so it is worth practising these definitions

Knowledge is the ability to understand information and to then form judgements, opinions, make predictions and decisions based on that understanding.

e.g.   "Newport have won ten games in a row, therefore I predict they will be promoted!"

Want to find out more?   12
http://www.bbc.co.uk/schools/gcsebitesize/ict/databases/0datainforev1.shtml

ICT Exam Skills Booklet – Paper 2

Computers and Data

Computers are all about data. Binary data is at the very root of computing and without it computers as we know them would not exist!

Which looks like this

you can try it out here:
http://home2.paulschou.net/tools/xlate/

Bytes, Bytes and more on data

A binary number is either a 0 or a 1 and is known as a **'bit' (**or **b** *inary dig* **it**).

However, the computer's CPU cannot deal with just one **bit** at a time, it is just too small. It usually deals with 8 bits at a time, which is known as a **Byte** .

11100101 is a byte, 10000111 is also a byte, or any other combination you can think of which contains 8 zeros and ones.

What you need to know about data

From the foundation of a basic bit, the whole complex world of computing has grown so quickly that we struggle to keep up and new terms for units of data (latest is heileybyte) have to be invented regularly.

The table below shows main information you need to know.

I tried to patent bits you know!

Quantity	Information
8 bits = 1 byte.	This is the lowest 'data' level and is a series of 0s and 1s, e.g. 00111010 = 1 byte with each 0 or 1 equal to 1 bit.
Each keyboard character = 1 byte.	Each number, letter and keyboard symbol is represented by a series of 8 bits (each, of course, is different).
1000 keyboard characters = 1000 bytes or 1 KB (kilobyte).	In reality it is really 1024 bytes which make a kilobyte, but generally people refer to 1000 bytes as a kilobyte.
1000 kilobytes = 1 MB (1 million keyboard characters).	Floppy disks have a capacity of 1.44 MB CD ROM disks have a capacity of 650 MB.
1000 megabytes = 1 GB (gigabytes or 1 billion characters)	DVD disks can hold between up to 4.7 GB of data.

K is short for **kilo**   1Kb is one **kilobyte**
M is short for **mega**. 1 Mb is one **megabyte**.

ICT Exam Skills Booklet – Paper 2

Organising Data

Data, files and directories.

Data → **Files** → Which are often stored in → **Folders** → Which are organised using → **Directories**
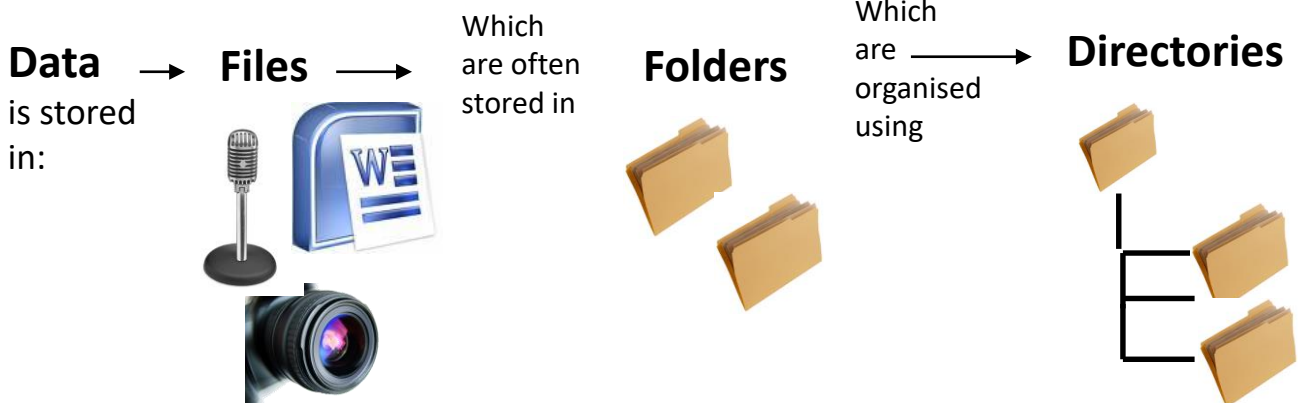
is stored in:

Definitions

A **file** is a collection of data that has been organised in a particular way and is stored under one *filename*. (e.g. a picture, or a letter written using a word processor)

A folder is a virtual container for storing and organising files

A **directory** is a system for organising groups of files or folders.

Data-files.

Data-files are organised using:

> **Tip: Records** are made up of **Fields**, which are themselves made up of items of **Data**

Records and **Fields**

height weight gender age

Definitions

Data-files are organised collections of data and can be divided into records.
Records are collections of information about a specific topic that is organised into categories (or fields).
A Fields is a specific piece of data, that describes one aspect of a record

---

E.g. A **data-file** about your class might contain your personal **record**, which is made up of **fields** such as 'name', 'age', 'd.o.b. etc

ICT Exam Skills Booklet – Paper 2

Field structures.

Fields can be **fixed length** or **variable length**.
The length of a field is the number of characters that it contains. The longer the field the more memory it uses.

Fixed length
Specified no. of characters
Brings the benefit of speed, as the computer knows how characters to count
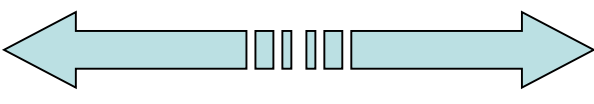
Variable length
The field is only as long as it needs to be. Uses less memory, but the computer needs to be told when each field has ended, so needs more processing time.

Databases.

What are they?
A database is an organised collection of data.

When do you use them?
They can be used when you need to store a lot of data.

How are they organised?
Data is organised into fields and records.
The key field contains an item of data that is unique to that record.

So what are the benefits?
A big benefit of databases is that you can search them quickly to find specific data or use them to generate reports.

Before starting a database...
You firstly need to decide what fields you will need. Each field needs a name, a description and a data type.
It is important to decide on the correct data type, as different processes can be performed on different types of data. Some of the most common are Text, Date/Time, Currency, Number.
One way to reduce the file size of the database is to use coding e.g. M or F for gender instead of Male and Female.

tblStudentContactDetails : Table				
TripID ①	StudentsFirst N. ②	StudentsSurnar	StudentsDOB	ContactPersonTitle
1	Johnny	Jones	12/02/1990	Mr
2	Charlotte	Hughes	03/04/1990	Mrs
3	David	James	07/08/1990	Mrs
③ 4	Sebastian	McDonald	05/06/1990	Mr
5	Thomas	James	07/09/1990	Miss
6	Sarah	Killen	09/09/1990	Mr
(AutoNumber)				

To do:
Can you correctly identify a field, a record and a key field in the database picture above?

1. ....
2. ....
3. ....

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ICT Exam Skills Booklet – Paper 2

Test it: Applications of ICT

6. A school keeps a database of pupils on computer. Part of the database is shown below. The database is made up of *fields*, *records* and *files*.

Pupil id	Surname	Firstname	Form	DOB
8345	Daaavies	David	7C	57/02/09
8356	Thomas	Pat	7Y	15/04/96

(a) Explain the terms: [3]

    (i) **field;** ....

    (ii) **record;** ....

    (iii) **file.** ....

(b) Part of the database shown above contains **two** mistakes, one of which could be prevented by a *verification* process, the other by a *validation* process.

Complete the table below by identifying **each** mistake, identify whether it is a validation or verification error and state a method which could have been used to prevent the error.

Mistake	Validation or Verification	Method which could have been used to prevent the error

See Also Section 2.1
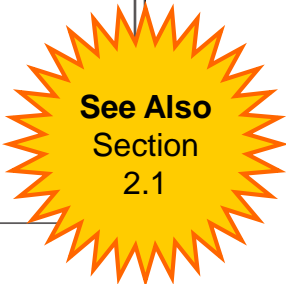
(c) Some of the fields in this database are of **fixed length** while others are of **variable length**.

    (i) Give **one** advantage of using fixed length fields.

    (ii) Give **one** advantage of using variable length fields.

    ----
[2]

(d) A variety of data types can be found in this database.

See Also Section 1.1

    (i) Give the data type for *Pupil id*.

    (ii) Give the data type for *Form*.

16

    ----
[2]
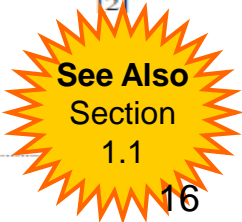
ICT Exam Skills Booklet – Paper 2

Storing Information

Secondary storage is used to keep data or programs.

Backing storage devices are the hardware peripherals used to store data.
These devices write data onto backing storage media and read it back.

Magnetic disks.
- Common magnetic disks are hard disks and floppy disks.
- They store data by magnetising a special material that coats the surface of a disk.
- When a disk is formatted, magnetic rings are written to the disk, ready to hold data.

Floppy disks.
- Are removable and easy to carry about They hold a relatively small amount of data, usually 1.44 megabytes.
- Data on floppy disks is retrieved slowly. Used to make backups of data. They are becoming obsolete.

Hard disks
- Hard disks hold a lot of data
- Data on hard disks is retrieved very quickly
- Hard disks store the computers operating system, the applications and the users data.

Memory sticks and optical storage
- Also called USB drives.
- Very fast storage. Useful for backup or transfer data.
- Read-only optical medium
- Useful for distribution of software. Useful for multimedia resources such as encyclopaedias.

How Computers use memory
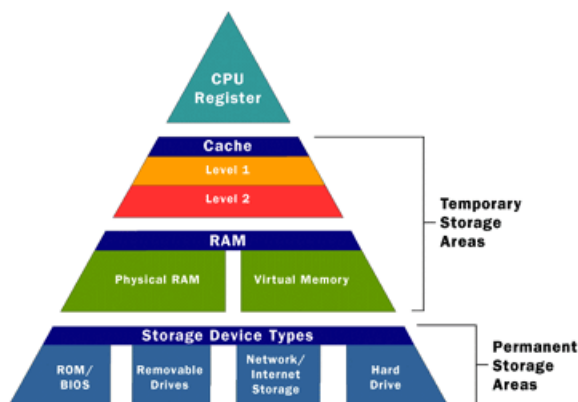
The Computer Chip (or CPU) uses a mixture of temporary (Cache & RAM) memory to swap and store data.

Memory needed in a hurry that won't be stored for very long is processed using the RAM or a Cache (*cache is memory built into CPU – disk cache is vital folders copied from disk to cache for easy access*)

Memory that the CPU needs to be able to store for a long time and retrieve is stored using ROM and Backing devices.

Test it: Storing Information

3. Hard disks are one type of storage device.

    (a)   Name **THREE** *other* different types of storage devices.   [3]

        (i) ....

        (ii) ....

        (iii) ....

    (b)   Explain using an example the term 'disk cache'.   [2]

....

....

....

●——●

    (c)   From the list below, select the *most suitable* secondary storage medium for **each** of the following.
        Do not use any storage medium more than once.

        DVD   **Tape Streamer**   **Hard Disk**   **USB memory stick**

        (i)   Taking homework files to and from school.

....
        [1]

        (ii)   An on-line database for a large school.

....
        [1]

        (iii)   Backing up the school's user accounts and pupils' work.

....
        [1]

        (iv)   Giving parents a free electronic copy of the latest school prospectus including video clips.

....
        [1]

Types of computer:

Main frames: Are the biggest, most powerful. They are very large and expensive. They are used to run large computer systems and networks in banks, insurance companies etc.

Mini computers: Are less powerful than mainframes, but more powerful than micros. Typically used to run medium-sized systems in small businesses.

Microcomputers: Are the most common, usually called personal computers or PC's. They can be either desktops or laptops.

Others

Personal Digital Assistants (PDA's) : Such as electronic organisers can be used instead of a diary.

Mobile phones: Increasingly being used as simple computers, sending and receiving text messages, and connecting to the Internet.

Microprocessors : These are embedded in many consumer products such as cars, video recorders, DVD players

To do:
List how many of the different types of hardware in the previous table you might expect to find in a school building, where you might find them and what they are used for.

....

....

....

....

....

....

....

Memory.

ROM : Read Only Memory, the processor can read from ROM but it cannot write to it.
ROM is **not volatile**. It keeps its contents when switched off.
ROM contains programs that the computer needs to start-up such as how to load the operating system.

RAM: Random Access Memory, the processor can address any part directly. The processor can read from and write to RAM.
RAM **is volatile**. It loses its contents when switched off.
RAM is loaded with programs and data that the user chooses to put there.
There is always much more RAM than ROM.

To do:
List 3 differences between ROM and RAM.

1. ....
2. ....
3. ....

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ICT Exam Skills Booklet – Paper 2

Hardware - Inputs, Outputs & Processing Devices

Input devices allow us to enter raw *data* into a computer. The computer processes the data and then produces *outputs* that we can understand using an output device. Input devices can be manual or automatic.

The processing is mainly handled by the Central Processing Unit (CPU), but specific tasks can be enhanced by devices created to do specialist applications (e.g. sound and video).

Hardware can be roughly divided into 5 main categories:

Input devices
Scanner, Bar code reader, Keyboard, Mouse, Trackball, Microphone, Webcam, Digital Camera, Touch screen, Sensor, Optical mark reader

Output Devices
Printer, Monitor, Plotter, Headphones, Screen reader, Braille display, Actuator

Processing Devices
Graphics card, sound card, CPU, Motherboard

Storage Devices
DVD, CD, Flash Memory, Hard drive, Portable drive,

Network Devices
Server, Network Card, Router, Cat5e cable, Fibre optic cable, USB port, Modem, Wireless card

To do:
Look around you and make a list of Hardware devices. For each one, explain the category and whether input or output.

Device Name	Category	Input/Output
……………………	……………………	……………………
……………………	……………………	……………………
……………………	……………………	……………………
……………………	……………………	……………………
……………………	……………………	……………………
……………………	……………………	……………………
……………………	……………………	……………………
……………………	……………………	……………………
……………………	……………………	……………………

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ICT Exam Skills Booklet – Paper 2

Test it: Hardware & Memory

*Answer **all** questions.*

1. (a) Tick (✓) the correct column to show whether each of the following statements about RAM and ROM are True or False. [4]

Statement	True	False
RAM is used to store programs and data temporarily		
ROM retains its memory when the power is switched off		
A computer's performance is improved if it has more ROM than RAM		
ROM is volatile		

   (b) State what is meant by the following terms. [2]

   (i) BIT ....

   (ii) BYTE ....

   (c) Write down the **largest** and **smallest** amount of memory from the list below. [2]

   1 Megabyte

   1 Gigabyte

   1 Kilobyte

   (i) **Largest** ....

   (ii) **Smallest** ....

(a) (i) What do the letters **ROM** stand for? [1]

   ....

   (ii) What do the letters **RAM** stand for? [1]

   ....

(b) (i) What is **RAM** used for? [1]

   ....

Test it: Hardware & Memory

1. *(a)* Different types of computers are used by people in the workplace.

   (i) .... are types of powerful computers used to control large computer systems. [1]

   (ii) .... are sometimes used by electricity or gas meter readers. [1]

●━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━●

4. The hardware components of a computer system are shown below.

```
┌──────────┐      ┌──────┐      ┌──────────┐
│  INPUT   │─────▶│ CPU  │─────▶│  OUTPUT  │
│  DEVICE  │      └──────┘      │  DEVICE  │
└──────────┘         │  ▲       └──────────┘
                     ▼  │
               ┌────────────┐
               │  INTERNAL  │
               │  MEMORY    │
               └────────────┘
                     │  ▲
                     ▼  │
               ┌────────────┐
               │  SECONDARY │
               │  STORAGE   │
               └────────────┘
```
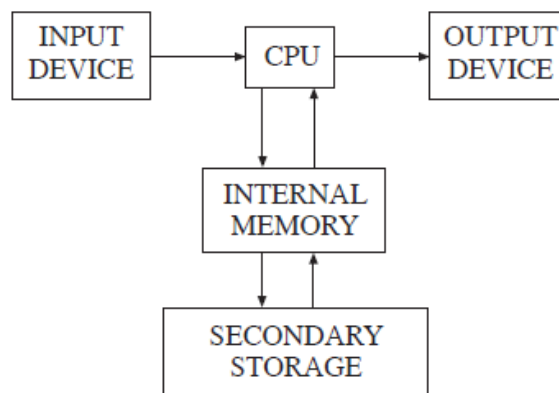
   (a) Name **two** different *output* devices.

   Device 1 ....

   Device 2 ....
   [2]

   (b) **RAM** and **ROM** are different types of *internal* memory.

   (i) Give a use for **RAM**.

   ....
   [1]

   (ii) Give a use for **ROM**.

   ....
   [1]

Test it: Hardware & Memory

2. Using the following words complete the sentences shown below: [4]

Palmtops   Microprocessors   Mainframes   Microcomputers

(a) .... are used to run large computer systems and networks in banks.

(b) .... can be used as an electronic diary.

(c) .... can be found in washing machines and microwave ovens.

(d) .... are most likely to be found as workstations on school networks.

●————————————————————————●

(d) Complete the blank cells in the table below:

Name	Approx size of bytes
Byte	1
	1000
	1000000
Gigabyte	1000000000

[6]

ICT Exam Skills Booklet – Paper 2

2.4 Software

Like a brain without memory and thoughts, computers are pretty useless devices without software.

The software we will be looking at falls into two groups – **Operating Systems** and **Applications**

Grrr! I only asked you to make me breakfast in bed
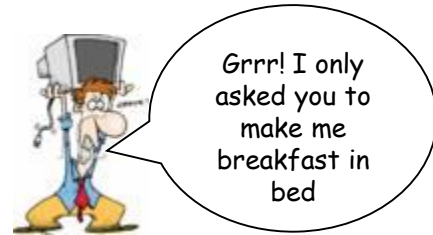
Operating Systems

An operating system is a system ***program*** that controls and organises the general operation of the computer

Like some kind of super-efficient assistant, the operating system manages all the general computer tasks and processes, so that the specialist applications can perform effectively. It does things like:

- **Controlling the *backing store* and *peripherals* such as scanners and printers**
- **Dealing with the transfer of programs in and out of memory**
- **Organising the use of *memory* between programs**
- **Organising *processing time* between programs and users**
- **Maintaining security and access rights of users**
- **Dealing with errors and user instructions**
- **Allowing the user to save files to a backing store**
- **Providing the interface between the user and the computer - for example, *Windows Vista* and Apple *OSX*.**
- **Issuing simple error messages**

That shirt and that tie?!!!!!!!?
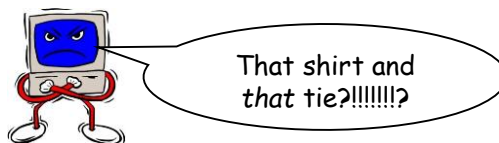
Applications Software

Applications are programs written to carry out a specific task or set of tasks, for example: ***word processors***, ***spreadsheets***, accounting packages, media players and games.

Like some kind of opera diva or leading lady, applications only really shine when they get support from the operating system.

ICT Exam Skills Booklet – Paper 2

Software – Applications

Applications come in several different types:

Utility programs - examples include *virus scanners*, *disk defragmenters* and *backup* utilities.

Generic - general purpose software that is not written for any particular type of business. Examples of this include word processors and spreadsheets.

Integrated - a collection of software that has a common set of *commands*/icons. Usually they include word processors, spreadsheets and *graphics software*, but they can contain *databases* as well. They tend to be cheaper than purchasing each application separately.

Specific - software written for a defined purpose. Accountancy software is a good example of this that can be bought by anyone.

Bespoke - bespoke software is written when a company requires a piece of software to perform a very specific task or function and there's no existing software that does what they need. It can be very expensive

Interacting with Computers

User Interfaces
A user interface is the method by which the user and the computer exchange information and instructions. There are three main types: command-line, menu driven and graphical user interface (GUI).

Command-Line Interfaces
A command-line interface allows the user to interact with the computer by typing in *commands*. The computer displays a prompt, the user keys in the command and presses enter or return (e.g. DOS)
Advantage – Because you type commands in, you can see what you typed if wrong

Menu Driven Interfaces
A menu driven interface allows the user to interact with the computer by making choices from a 'menu' of options

Menus can be full screen or 'pull down'.
Advantage- no need to learn commands like you would have to with command line interface

26
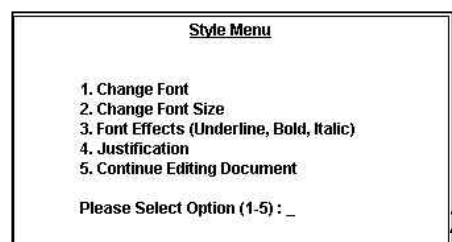
ICT Exam Skills Booklet – Paper 2

Software – Graphical User Interfaces

It's all about Gooeys and WIMPs nowadays!

In order to make the process of using computers easier, software designers such as Doug Engelbart, Steve Jobs and Bill Gates came up with ways of combining lots of computer applications into one **G**raphical **U**ser **I**nterface (GUIs or "Gooey" for short)

w.i.m.p

window	icon	menu	pointer

LOOK!
You will often be asked to list the above **features** of a GUI, so it's worth remembering what W.I.M.P stands for

To Do: Identify the four features of a GUI on the picture below

Window

Icon

Menu

Pointer
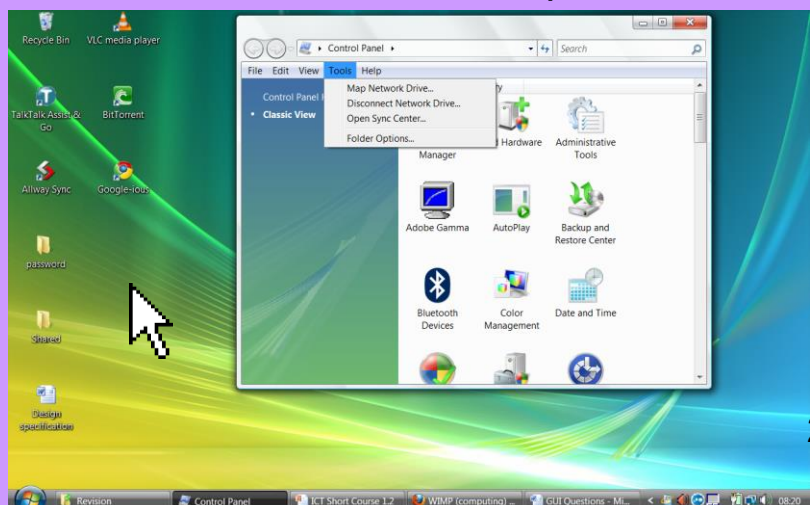
Test it: Software

5. A user interface allows humans to communicate with computers. One such type of interface is a Graphical User Interface (GUI).

   (a) Two features of a GUI are *windows* and *pointers*. List **FOUR** other features of a GUI. [4]

      (i) ....

      (ii) ....

      (iii) ....

      (iv) ....

   (b) State **ONE** disadvantage of a GUI. [1]

....

....

   (c) Name **TWO** *other* types of user interface and give a different advantage for each type. [4]

      (i) ....

      Advantage ....

      ....

      (ii) ....

      Advantage ....

      ....

6. All computers have an operating system.

   (a) Explain what is meant by an operating system. [1]

....

....

   (b) List **FOUR** different functions of an operating system. [4]

      (i) ....

      (ii) ....

      (iii) ....

      (iv) ....

9. Two types of software are *application software* and *operating system software*.

    (a) Name two different types of *application software*.   [2]

        (i) ....

        (ii) ....

    (b) Linux is an operating system, name **two** other *operating systems*.   [2]

        (i) ....

        (ii) ....

    (c) One of the functions of an operating system is to provide a user interface.
        Give **three** *other* functions of an operating system.   [3]

        (i) ....

        (ii) ....

        (iii) ....

    (d) Give **three** different features of Graphical User Interfaces (GUI) which make them easy to
        use.   [3]

        (i) ....

        (ii) ....

        (iii) ....

    (e) Complete the table below by suggesting a suitable application for **each** type of operating
        system.   [3]

Type of Operating System	Application
Batch processing	
Real time (transaction processing)	
Real time (process control)	

See Also Section 2.1

    (f) Complete the following table by matching the appropriate type of operating system from the
        list below with the given definitions.   [3]

        single program   multi-programming   multi-tasking

Types of operating systems	Definition
	more than one program is held in RAM at the same time
	one program is run at a time
	the processor divides its time between programs, a time-slice is allocated to each process

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Test it: Applications of ICT

7. (a) Name an application that uses **real-time transaction processing** and give a reason why this type of processing is required. [2]

Application ....

Reason ....

....

(b) Explain what is meant by the following terms: [2]

(i)   multi-tasking ....

....

(ii) multi-programming ....

....

⬤───⬤

2. Complete the table shown below to show how *different* types of organisations make use of the input devices. [6]

An example has been done for you.

Input Device	Organisation	Use
Bar code reader	Library	Scanning the code when a book is borrowed
Optical Mark Reader		
Touch Screen		
Sensors		

Test it: Software

8.   (a)   Place a tick (✓) in the correct column to show whether **each** task is carried out by the *Operating System* or an *Application Program*.

Task	Operating system	Application Program
playing a game		
drawing a picture		
controlling the printer		
shutting down the computer		

To Do:

Identify whether you believe the following jobs would be done by **Operating Systems** or **Applications.**

Creating a poster   …………………………………………………..

Organising use of memory   …………………………………………………..

Writing a letter   …………………………………………………..

Adding up a series of figures …………………………………………………..

Controlling peripheral devices …………………………………………………..

Issuing error messages   …………………………………………………..

Providing a User Interface   …………………………………………………..

2.5   Networks

c) What is a computer network? [1]

....

d) *Other than email*, give **one** advantage of a computer network over standalone computers. [1]

....

....

e) The company is considering the benefits of a wireless network versus a traditional cable linked network.

Give **one** advantage of a wireless computer network over a traditional computer network. [1]

....

....

f) The company has a code of conduct for staff using the computer network (*this does not include Internet use*).
Give **three** rules staff should follow when using the computer network. [3]

Rule 1 ....

....

Rule 2 ....

....

Rule 3 ....

....

Networks: Advantages
1) **Peripherals** such as printers **can be shared** amongst many different users.
2) **Terminals are cheaper** than stand-alone PC's.
3) **Software can be shared** amongst different users.
4) **Communication** across the network **is cheap and fast**.

Networks: Disadvantages
1) Cabling can be **expensive** to install and replace.
2) **A fault with the server will prevent the whole network from working**.
3) **Security measures are needed** to restrict access to the network.
4) WAN's are **vulnerable to hackers and viruses**.

Network Topologies
Networks come in many shapes and sizes. Each has advantages and disadvantages

Bus Network
Single connection for all computers
Easy to make but only works well when small.

The **Internet** is: all networks linked together

Ring Network
Sends messages through shared link.
No server needed, but one machine fails and whole network fails

Star Network
Machines linked to central server
Stable and easy to manage but if server fails, network fails

Mesh Network
All machines linked to multiple others
Fast and powerful buts lots of redundant machines

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ICT Exam Skills Booklet – Paper 2

Networks & Data Security

With the increasing importance of data, it is essential that you can show you are aware of the dangers of data loss and how to keep data safe

Dangers to data include

• Getting lost or damaged during a system crash - especially one affecting the hard disk which can get corrupted as a result of faulty disks, disk drives, or power failures
• Getting lost by accidentally deleting or overwriting files
• Getting lost or become corrupted by computer viruses
• Getting hacked into by unauthorised users and deleted or altered destroyed by natural disasters, acts of terrorism, or war
• Getting deleted or altered by employees wishing to make money or take revenge on their employer

Keeping data secure

Measures that can be taken to keep data secure include:
• Making regular *backups* of files (backup copies should be stored in fireproof safes or in another building)
• Protecting yourself against *viruses* by running *anti-virus software* using a system of passwords so that access to data is restricted
• Safe storage of important files stored on *removable disks*, eg locked away in a fireproof and waterproof safe
• Allowing only authorised staff into certain computer areas, eg by controlling entry to these areas by means of ID cards or magnetic swipe cards
• Always logging off or turning *terminals* off and if possible locking them
• Avoiding accidental deletion of files by *write-protecting* disks
• Using data *encryption* techniques to code data so that it makes no apparent sense

To Do:

Give examples of data that would be important for the following:

A Doctor's surgery ……………………………………………………………
A Bank ………………………………………………………………………..
A Political Party …………………………………………………………….
A Health Club ……………………………………………………………….
A Nursery …………………………………………………………………..
A School ……………………………………………………………………

ICT Exam Skills Booklet – Paper 2

Test it: Networks

11. Computer systems are said to be networked when they are linked together.

   (a) List **THREE** advantages of networks over standalone computers. [3]

     (i) ....

     (ii) ....

     (iii) ....

   (b) (i) Draw a diagram of a **RING** Network. Include in your answer a fileserver, workstation and a printer. [4]

     (ii) Name **TWO** *other* different computer network topologies. [2]

      (I) ....

      (II) ....

Want to find out more?
http://www.gcse.com/ict/networks.htm

Test it: Networks

8. Most schools and businesses have computer networks.

    (a) What name is given when computers on **one** site are connected together?

    .... A .... N .... [1]

    (b) What name is given when computers on **different** sites are connected together?

    .... A .... N .... [1]

    (c) Give **three** reasons why networks are useful compared with a number of stand alone computers. [3]

    (i) ....

    ....

    (ii) ....

    ....

    (iii) ....

    ....

    (d) In the space below, draw and label a diagram of a star network. Show the position of the **fileserver**, **workstations** and **printer** on your diagram. [4]

2.6   Controls on Data

In order to combat the misuse of information and ICTs, a number of pieces of legislation (laws) have been introduced so that businesses, organisations and individuals know their rights and expectations. Two important laws are the **Data Protection Act** and the **Computer Misuse Act.** Summaries of these laws are given below.

The Data Protection Act

THE DATA
PROTECTION
ACT 1998

An Introduction
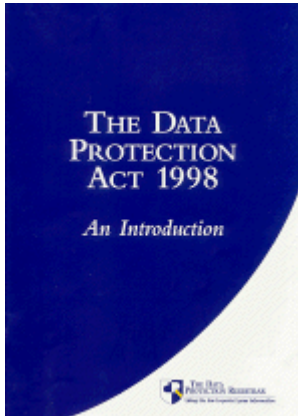
The DPA deals with information held about people (called **data subjects**) and sets out rules regarding:

i.   What information is held about *data subjects* (people)
ii.   How this Information is stored
iii.   How this information is used processed
iv.   Who can access the information

The DPA has **8 Principles** that data users (**Data Controllers**) must follow. Data must be:

- Processed fairly and lawfully
- Used for the lawful purpose it was collected for
- Adequate and relevant to purpose collected for
- Kept accurate and up-to-date
- Kept no longer than necessary
- Processed within the rights of the data subjects
- Kept secure
- Kept only within the EEC

> **Look!**
> You will often be asked to list at least 3 of these principles.

Data subjects (*people like us*) and their rights

Data subjects have a number of rights regarding the data that is held *about them.* They can:

- **See data** held on them on request.
- *Alter* inaccurate or incorrect data.
- **Sue** if data is wrong, and the mistake *causes harm* to them

Limits on the rights of Data subjects

There are some occasions when Data Controllers do not need to follow the principles of the DPA. These are called **Exemptions** and can be complete or partial

Complete Exemption Examples	Partial Exemption Examples
National Security Agencies (e.g. MI5)	Taxman can hold back fraud information
Domestic Purposes (e.g. birthday list)	Doctor can hold back health information
	School can hold back educational information

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ICT Exam Skills Booklet – Paper 2

The Computer Misuse Act

The Computer Misuse Act is a fairly complicated piece of legislation aimed at reducing crimes like **Hacking** and the threat from **Computer Viruses**.

The main crimes/offences it tries to prevent are:

- Unauthorised access to computer material (hacking).
  (This includes copying software illegally - called software piracy)

- Gaining *unauthorised access* to a computer to carry out serious crimes like *fraud* or *blackmail*.

- Unauthorised changing of computer files, including planting viruses and deleting files.

It also tries to tackle crimes like:

- Misuse of E-mail and Chat rooms (Impersonation, deception & defamation)
- Distribution of illegal materials (e.g. extreme pornographic or violent images)
- Identity and financial abuses (computer based fraud)

How the CMA works

The CMA is more of a rule-book than a set of guidelines (like the DPA) and generally act as guidance for judges and prosecutors. Conviction for any of the three main offences listed above can lead to an **unlimited fine** or **five years in prison**.

Data Controls in action

Gary McKinnon is a Scottish hacker facing extradition to the United States on charges of perpetrating what one US prosecutor claims is the "biggest military computer hack of all time," although McKinnon himself states that he was merely looking for evidence of a UFO cover-up, the suppression of Free Energy, and other technologies potentially useful to the public.

Following legal hearings in the UK it was decided in July 2006 that he should be extradited to the US. If successfully convicted there, he could face a jail term of up to 70 years in prison!

ICT Exam Skills Booklet – Paper 2

Test it: Controls on Data

13. 'Crime and socially related offences are on the increase because of the misuse of computer systems.'

    Discuss the above statement. Identify **THREE** such crimes or offences and outline the different consequences on individuals, organisations or society and describe in detail how they can be prevented or minimised. [11]

> **Look!**
> The examiner is expecting details of **3 different** crimes, with the **consequences** and **prevention** methods **for each one.**
>
> Try listing them or laying them out in a table **before** you start to write.
>
> This will help you to **organise** your answer.

Test it: Controls on Data

7. The *Data Protection Act* (**DPA**) of 1998 contains eight basic principles.

    (a) Write down the principle that is designed to protect data that is held about you by an organisation. [1]

    ....

    ....

    (b) Write down the principle that is designed to prevent data held about you containing errors. [1]

    ....

    ....

    (c) Write down two *other* principles of the DPA. [2]

    (i) ....

    ....

    (ii) ....

    ....

    (d) Give two exemptions from the DPA. [2]

    Exemption 1 ....

    Exemption 2 ....

ICT Exam Skills Booklet – Paper 2

2.7 Manipulating Information

Data plays a hugely important role in everyday life and its uses have been greatly enhanced by ICTs. Some of the areas you will be expected to demonstrate knowledge of data manipulation techniques are:

• **Payroll Systems**
• **Computers in Education**
• **Control in Organisations**
• **Weather Forecasting**

Payroll Systems

At the end of each **pay period**, businesses need to *pay* their employees.
A **payroll system** uses a computer to calculate the wages of each employee, print out pay-slips and record the information for accounting purposes.
Input may come from **a database** of employees details (salaries, pay rates, bonus rates, etc.) or **timesheets**. If employees are paid hourly, *timesheets* are used to input and validate the hours worked including any overtime (possibly using OMR or OCR techniques).

Payslip Name: Joe Smith

Employee No	Tax Code	N.I. Code	Week/ Month	National Insurance No
062	568LR	A	3	KT 66 99 88 D

Gross Pay:	£830 per month (or 10,000 per year)
Annual Income Tax:	£80 per month
National Insurance Contribution:	£45 per month
Pension Contribution:	£45 per month
Net Pay:	£660 per month (or £7,920 per year)

Along with their pay, employees will be given a payslip that will include their name and address, as well as: their **Employee Number** (usually the key field), **Tax Code**, **National Insurance details**, **Pay details and Pension contributions.** For security reasons they are often printed using an impact printer on carbonised paper.

Computers in Education

Computers are also used extensively in Education; both as an educational aid and for the general administration of the school.

When computers are used to help learning the process is called **Computer Assisted Learning (CAL)**.

CAL systems can use things like **text, graphics, sound, animation** and **self-assessments** to produce the following benefits

i.   **Flexible Learning** (students can access learning materials at any **time**; at their own **speed**)
ii   **Distance Learning** (students can access learning materials from anywhere)
iii. **Less Teachers** (savings for school)
iv. **Increased Interest/Motivation** (if learning is more enjoyable or engaging).

ICT Exam Skills Booklet – Paper 2

Computers in Education 2 - Administration

As well as all the usual applications like **office**, **productivity**, **communication** and **financial** systems, schools use ICTs to manage the data they record.

This can include subjects such as:

• Personal details of students
• Performance records of students
• Details of behaviour
• Details of Educational Needs or special talents
• Class lists
• Medical Information

"Well if you don't want to see me in here anymore, then tell the teachers to stop picking on my bad behaviour!"
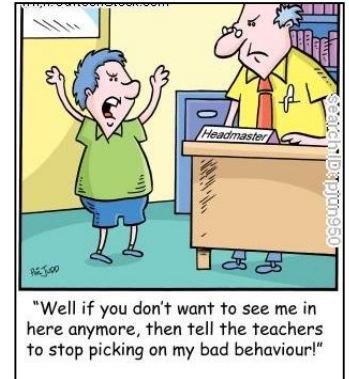
Advantages
Include: Easier to update, Easier access around the school, More up to date better awareness of pupil needs, less errors, plus usual ICT advantages

Disadvantages
Include: Cost, training, maintenance

Computers and Control in Organisations

In a similar fashion, other organisations can use a mixture of ICT based systems to manage and monitor their activities and processes. An example of this is hospitals, where in addition to the general applications at the top of the page, ICT can be used in the following ways:

• Life support systems monitor and regulate body processes
• Sensors record details such as pulse, heart rate, temperature, blood preassure
• Control systems manage and monitor drips
• Control systems manage the environment (heat and light),
  as well as automating   doorways, lifts and sterilisation processes.

Advantages

Include: 24/7/365 service, less staff, better quality of information on patients cleaner and more hygienic, easier to share and access plus usual ICT advantages

Want to find out more?
www.gcse.com/ict/index.htm

ICT Exam Skills Booklet – Paper 2

Manipulating Information – Weather Forecasting

Some of the world's most powerful computers are used to forecast the weather. Accuracy of forecasts is improving all the time and many people rely on these forecasts - TV companies, shipping, farmers, the military etc...

The computer systems are also used for hurricane and tornado tracking, global warming monitoring, ocean monitoring (eg El Nino).

Step 1- Data Collection

Millions of pieces of data are collected from thousands of locations and devices such as:

- satellites
- weather stations
- weather balloons
- aircraft
- radar
- weather ships
- automatic weather buoys

Step 2- Data Processing

At the meteorological office **ultra-powerful supercomputers** process data that has been **validated** and **formatted very quickly**

Step 3- Sharing Information

Once the raw data has been processed and converted into meaningful information, it is then passed on for consumption and use by others

Test it: Manipulating Information

8. Payroll is an application which uses *batch processing*.

    (a) Explain what is meant by *batch processing?* [1]

    (b) The diagram below shows the monthly payroll process.
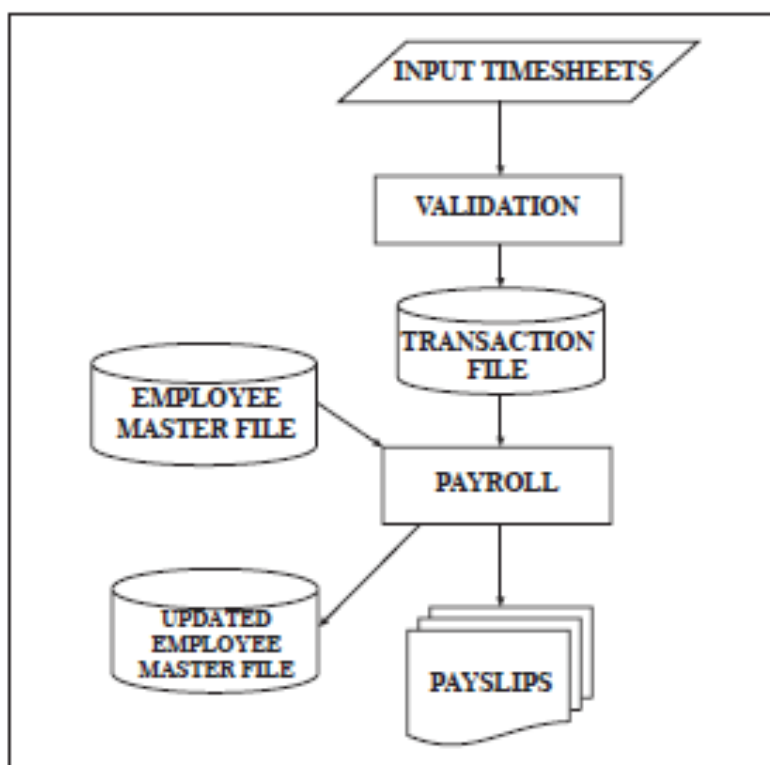
    See Also Section 2.1

    (i) List **TWO** items of data found on the payroll *Transaction File*. [2]

    Item 1 ....

    Item 2 ....

    (ii) Other than name and contact details, list **FOUR** items of data held in the payroll *Master File*. [4]

    (I) ....

    (II) ....

    (III) ....

    (IV) ....

Test it: Manipulating Information

5. Computer Assisted Learning (CAL) is used in a number of subjects in schools.

   (a) Using specific examples, describe in detail the advantages of using CAL in the classroom.

   Example 1 ....

   Description/Advantage:

   ....

   ....

   ....
   [3]

   Example 2 ....

   Description/Advantage:

   ....

   ....

   ....
   [3]

   (b) Give **one** disadvantage of using CAL.

   ....
   [1]

11. Hospitals use computer control.
    Give two different examples of computer control in hospitals and for each state an advantage.
    Use a *different* advantage for each.

    Example 1 ....

    Advantage ....

    ....

    ....

    Example 2 ....

    Advantage ....

    ....

    ....
    [4]
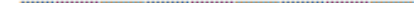
12. A school has a computerised library system.

   (a) *Other than a mouse and keyboard*, name TWO different devices which could be used to input data. [2]

     (i) ....

     (ii) ....

   (b) Other than name and address, state the key field and TWO *other* fields you would expect to find in the borrowers file. [3]

     (i) ....

     (ii) ....

     (iii) ....

   (c) Describe the stages involved in borrowing a book using the computerised library system. [3]

....

....

....

....

....

....

....

....

....

....

....

....

....

....

12.   *'The paperless school office is nearly upon us'*

Comment on the above statement by suggesting **five** ways ICT has helped to advance this development. In addition point out at least **four** advantages or disadvantages of a paperless office.

[9]

Look!

Don't be misled by the language, the examiner just wants an explanation of how ICT has changed the way we work (this time it's in schools), plus the advantages or disadvantages

Draft a list on paper **before** you start writing.

It will help you to get **organised**

9 marks means examiner expects one impact, advantage or disadvantage per mark.

ICT Exam Skills Booklet – Paper 2

Information processing and specialist applications often appear in the exam. It is an area that covers a lot of topics and some of the main ones have been selected and presented below.

Embedded computer systems

Embedded computers systems are a specialist type of computer (see section 2.3) and consist of a single microchip that has all the essential elements of a computer (RAM, ROM,CPU etc.) contained within it.

They are used to give computer capabilities to 'smart devices' such as:

- telephones
- televisions
- cameras
- washing machines
- microwave cookers
- dishwashers
- cars
- Robots and automated production machinery

By using an embedded computer (sometimes called a micro-controller) manufacturers are able to create devices that can be 'taught' to perform different tasks. This makes them much more flexible and useful that pre-programmed devices, as the instructions can be altered and updated, whilst still maintaining all the benefits (e.g. no breaks, very accurate, no training etc.) of a traditional automated device.

Computerised Management systems

Computers have also found their way into business management systems, with lots of organisations using them to create systems that everyone can access, and that are easy updatable and backup. Examples include:

Stock Management
Booking Systems
Databases
Production Management Systems
Training systems

ICT Exam Skills Booklet – Paper 2

Test it: Information Processing

(b) Name **two** devices which contain *embedded* computers. [2]

Device 1 ....

Device 2 ....

---

2. Computer systems are often used to control a manufacturing process.

(a) Give **TWO** advantages of such process control systems. [2]

(i) ....

....

(ii) ....

....

(b) Give **TWO** disadvantages of such process control systems. [2]

(i) ....

....

(ii) ....

....

(178-06)

(c) Glass manufacturing is one example of an industry that uses computer process control.

Name **TWO** *other* examples of industries that use computer process control. [2]

(i) ....

(ii) ....

To Do:

List all the places you encounter or use ICTs in an average day

....

....

....

....

....

....

.... 48

ICT Exam Skills Booklet – Paper 2

Specialist Applications – Computer Aided Design

Computer aided design is and ICT based system, where designers use powerful computers instead of paper based solutions

How CAD works
Instead of drawing designs on paper, designers are able to create virtual models or plans that have a number of benefits such as:

• Easy to update
• Easy to share
• Can be tested without having to be built
• Quick to create
• More accurate
• Can use pre-made components
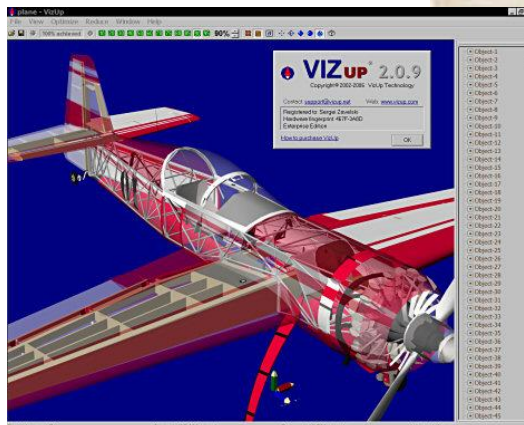
Although CAD is **expensive** and **requires training**, CAD systems have greatly improved the quality of design in many areas – leading to advances in Architecture, Engineering, Aeronautics and Planning.

Features of CAD
• Can work to almost any scale
• Objects and drawings can be created in 2D, 3D, 2D CAD and 3D CAD
• Images can be viewed from any angle
• Powerful scaling, rotation and reflection options
• Libraries of engineering components which can be *imported*
• Links to packages to calculate costs

To Do:
Imagine you have been asked to design a kitchen for your home using **CAD**. Describe which CAD features could help you do the following things:

1. Create a series of views……………………………………………………………………………
2. Try out different surfaces or components …………………………………………………
3. Produce a 3 dimensional version ……………………………………………………………
4. Create different sized plans……………………………………………………………………
5. Work out the budget for your kitchen……………………………………………………

7. Computer Aided Design (CAD) packages are used by designers to assist them with their work.

(a) Name **two** different uses of CAD.

(i) ....

(ii) ....

(b) Complete the following sentences using the words below.

high resolution   plotter   memory

(i) A .... is sometimes used to print the design.

(ii) Monitors used for CAD have .... , from 1024 to 4096 pixels across.

(c) Give **three** special features/facilities you might expect to find in CAD software.

(i) ....

(ii) ....

(iii) ....

[7]

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3. An architectural company uses a Computer Aided Design (CAD) package to design buildings.

(a) Give **three** *different* features of the CAD package and describe how **each** could be used *by an architect* to design a house.

(i) ....

....

[2]

(ii) ....

....

[2]

(iii) ....

....

[2]

(b) (i) Give **two** advantages *to the company* of using CAD.

Advantage 1 ....

Advantage 2 ....

[2]

(ii) Give **two** disadvantages of using CAD.

Disadvantage 1 ....

Disadvantage 2 ....

[2]

2.9 Systems Analysis

An area you need to make sure you understand is the **Systems Life Cycle**, or what Is sometimes referred to as the process of systems analysis and implementation.

This is a system that **Systems Analysts** (people who build and maintain ICT systems) use when they create a new ICT system. The system can be large (e.g. hospital management), or small (e.g. greenhouse control), but will generally go through a number of similar stages.

The Systems Life Cycle

Evaluation

Analysis

Implementation & Testing

Design
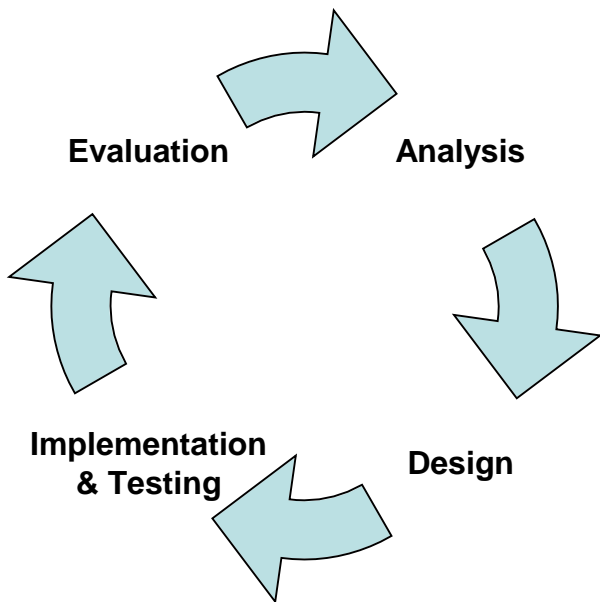
The basic stages of the systems life are as follows:

1.   Analysis
During this stage, the systems analyst will spend time analysing the current system and working out how it works and any strengths, weaknesses or issues it may have. During this period they will probably do some or all of the following activities:

- •   **observe staff at work**
- •   **interview staff about their work**
- •   **send out questionnaires about working practice**
- •   **inspect documents such as *user guides*, *data capture forms* and any printouts the current system creates**

2. Design
Once the analysis is complete, the analyst will set some aims and objectives for the new system in the form of a **requirements specification**. This outlines exactly what the new system will do, and will describe descriptions of things like:

- • what *hardware* is needed
- • what *software* is needed
- • what *inputs* are needed
- • what processing must take place
- • what information needs to be produced (*output*) by the system

Think!
back to when you created your own system for your ICT project. You will have done many of these activities.

Want to find out more?
www.teach-ict.com/gcse/theory/syslifecycle/miniweb/index.htm

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Systems Analysis Part 2

3. Implementation & Testing

Once the analyst believes they have created a realistic (or **feasible**) design, they will begin the process of implementation, which could involve:

• writing *programs*
• purchasing *hardware* and *software*
• writing *user documentation*
• **testing the system using the test plan**
• installing *networks*
• **training staff**

During this stage, system will undergo regular testing. If any part of the system fails, problems are corrected and system tested again.

The Changeover Process

To make sure the change over to the system goes smoothly, the analyst can use one (or more) of the following techniques:

Parallel Running – where new and old systems run alongside each other to make sure new system runs correctly. **Expensive** but **Safe**.

Pilot Changeover – where small part of organisation is used to test new system, before whole change- **Cheaper** but **System may fail in other parts when introduced**

Direct Changeover – where old system scrapped and new one introduce in one big change. **Risky** but if well planned and designed, can be cheapest option

Phased Changeover- where gradual introduction takes place with parts of old system being swapped for new. **Expensive** but **Safe**.

4. Evaluation

Once the system has been installed it will be monitored to check whether it is working correctly. Sometimes problems with a system will not be found until it is being used by a large number of people or an unusual situation occurs.
Evaluation is really re-analysing - starting the same systems analysis process all over again. Many of the same techniques can be used, such as interviewing staff or using questionnaires

10. A garage is updating its billing system.

    (a)   Give three activities a systems analyst would carry out when *analysing* the existing system.

        [3]

        Activity 1 ....

        ....

        Activity 2 ....

        ....

        Activity 3 ....

        ....

    (b)   Give three activities a systems analyst would carry out when *designing* the new system. [3]

        Activity 1 ....

        ....

        Activity 2 ....

        ....

        Activity 3 ....

        ....

    (c)   When the system is installed *parallel running* takes place.

        Describe what is meant by *parallel running* and state when it is no longer required.   [2]

        ....

        ....

ICT Exam Skills Booklet – Paper 2

Test it: Systems Analysis

10. In designing a new ICT system a systems analyst has to consider the following, gathering data, designing the new system, changeover methods and documenting the system. Describe what is involved in each of the following [8].

(a) Gathering data

(b) Designing the new system

(c) Changeover methods

(d) Documenting the system