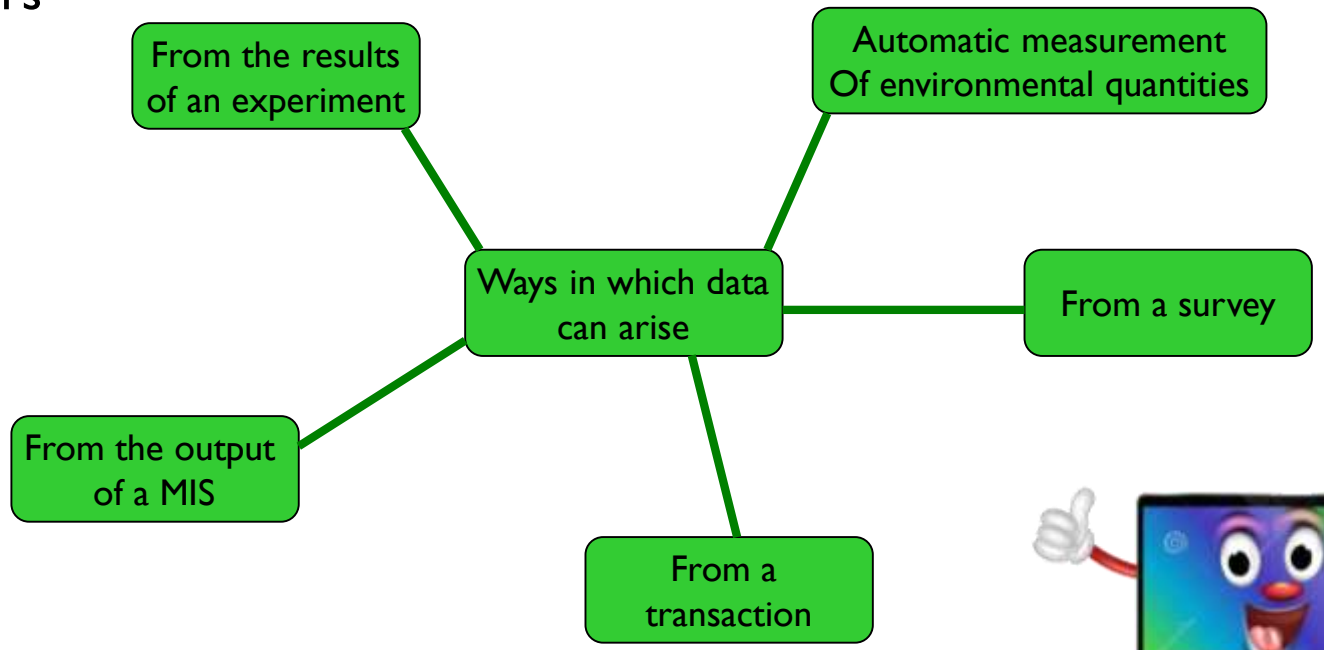
Topic 1 - Data, information and knowledge

What you need to know:

- The relationship between data, information and knowledge.
  - data consists of raw facts and figures e.g. readings from sensors, survey facts;
  - information is data which has been processed by the computer;
  - knowledge is derived from information by applying rules to it;
- The reasons for encoding data and the problems associated with encoding.
  - Candidates should understand why data is encoded and the potential problems associated with this, especially value judgements.

The relationship between data, information and knowledge

- Data are details which are meaningless because they lack relevance. It is either no use to a user or not in the form that the user can use. Data can be:
  - Numbers
  - Words
  - Images
  - Sound



The relationship between data, information and knowledge

- Information comes from processing data. People or computers can find patterns in data which gives them information which enhances their knowledge of the subject. Information is data which has been:
  - Processed
  - Converted to give it meaning
  - Organised in some way.
- Knowledge comes from applying rules to the information which then helps makes decisions.

The relationship between data, information and knowledge

- The relationship between data, information and knowledge:

4.31, 4.18, 4.29, 4.32, 4.19 and 4.21.

→

These are race times in minutes 4.31, 4.18, 4.29, 4.32, 4.19 and 4.21.

→

The winner is the person with the fastest time.

Above is a list of numbers. It is impossible to know what they mean as there is no context, therefore these numbers are **DATA**.

→

If we are told these numbers are race times, we are now adding context to the data, therefore it becomes **INFORMATION.**

→

By applying a rule to the information we now convert the information into **KNOWLEDGE.**

The reasons for encoding data and the problems associated with encoding

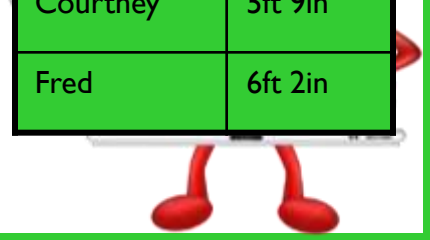
- Encoding is a process where data is shortened. The reasons for encoding data are:
  - Fast to search
  - Takes up less storage space
  - Easier to check that a code is accurate using validation checks.
- Examples of encoding are:
  - Size of clothes:
    - S = Small
    - M = Medium
    - L = Large
    - XL = Extra large

The reasons for encoding data and the problems associated with encoding

- 2 main problems associated with encoding:
  - Coarsens precision
    - The encoded data is less accurate than the data originally collected. A database may contain a persons eye colour. What happens if someone has green/blue eyes? You will settle for one colour and then question the integrity of the current data stored. What if we were talking about paint colours? We loose detail on the shade of the colour.
  - Value judgements
    - The person entering information into the database or collecting the original data will have to make judgements about which code to use. Data is collected on heights of people. The person collecting or entering may have to make a judgement as to what code to use, i.e. T for Tall, M for Medium and S for Short. Value judgement can be different for different people. One person may think Chloe should be put as M but someone else may say S.

Eye colour	Code
Blue	BL
Brown	BR
Green	GR
Grey	GY

Name	Height
Chloe	5ft 5in
James	4ft 11in
Courtney	5ft 9in
Fred	6ft 2in



Topic 2 - The value and importance of information

What you need to know:

- The importance of up to date, accurate and complete information. Candidates should understand:
  - that up to date, accurate and complete information adds value to organisations by aiding decision making, monitoring progress (company and individual) and the targeting of resources so giving a competitive advantage;
- The costs in terms of money, time and human resources to get good quality information.
  - the costs associated with data collection (direct and indirect), data entry, processing and maintenance.

The importance of up-to-date, accurate and complete information

- Why managers need information
  - All managers need information, they make decisions based on the information obtained from day-to-day operations as well as from external information. Some of the types of decisions can be placed under the following headings:
    - Planning
    - Directing
    - Forecasting
  - The higher the manager is within the business, the more responsibilities they will have which means they will need to view different information.

The importance of up-to-date, accurate and complete information

- Information aids decision making in the following ways:
  - The more information there is that is relevant to making the decision, the less risk there is in taking the decision.
  - Information enables a manager to take corrective action, i.e. if a customer owes a large amount of money, then no orders should be sent to them.
  - Simulations can be performed using spreadsheet software to perform 'what if scenarios' using the information.
- Monitoring progress
  - Information can be used to monitor progress. For example, companies can use the data to compare themselves against targets set. Individual staff can judge their performance using their sales figures from the previous sales. Companies can compare monthly sales figures.

The importance of up-to-date, accurate and complete information

- Using information for the targeting of resources:
  - Organisations only have a limited amount of resources, i.e. money, human resources, time, hardware, software and materials.
  - These resources need to be correctly allocated, this can be achieved by using ICT, i.e. creating schedules, planning projects and stock control systems.
- The competitive advantage information gives:
  - Most companies have a competitor (a company which sells similar products or services to the same type of customer). Therefore it is imperative that organisations remain competitive. In order to do this it is necessary to:
    - Use market research information from customers to understand why they use the product/service.
    - Ensure all customer orders are always satisfied by having accurate stock information.
    - Be able to anticipate customer demand from pervious sales information.

The importance of up-to-date, accurate and complete information

- As the information is so important it can only be used if it is:
  - Up-to-date, accurate and complete
- Up-to-date
  - Information should always be date stamped to ensure that any information used is not out-of-date. Legal requirement of the DPA if the information held is personal. There are consequences of not keeping information up to date such as, sending letters to someone who has died or sending a letter to a customer threatening legal action for an unpaid bill which has actually been paid.
- Accurate
  - Errors can be caused if the information is not as accurate as possible. The consequences could be; customers being sent the wrong item or customers being invoiced the wrong amount.
- Complete
  - Information needs to complete as consequences could be; an order only partly fulfilled or not including a postcode on a letter, resulting in the letter being received late.

The costs of obtaining good quality information

- The cost of obtaining good quality information is split into three categories:
  - Human resources
    - Cost of any staff performing data entry, cost of training these staff and the cost of specialist staff for programming.
  - Time costs
    - Time taken to enter the data which can slow down the whole process from collecting the data to the production of the information.
  - Hardware costs
    - Human resources can sometimes be lowered if money is spent on different methods of automatically entering data into the system, i.e. using barcodes, OMR and MICR.

The costs of obtaining good quality information

- Costs associated with good quality information:
  - The designing/creating of the data collection sheets
    - paying someone to create the forms
    - Takes time to trial the sheets for using for real
  - Data collection
    - New staff have to be employed to go and ask people questions
    - Training needed to show them how to collect data
  - Data entry
    - New staff employed to type in the results
    - OMR devices may need to be purchased
    - Takes time for someone to enter the data into the computer

The costs of obtaining good quality information

- Costs associated with processing and maintenance:
  - Once the data has been collected and input into the system it needs to be processed.
  - Processing
    - New software/staff has to be purchased/written to allow the results to be obtained before the data gets out of date
  - Maintenance/updating
    - Staff have to be employed to keep the hardware running and modify the software when legislations change or bugs are found. There are a number of maintenance activities that will need to be performed such as:
      - Keeping data up-to-date
      - Taking backups
      - Small changes to the structure of the database
  - These cost in the following ways:
    - Financial costs
      - Data may need transferring from one place to another using expensive communication lines. Outside firms may be needed for back up and there may be costs of ink cartridges.
    - Human resources
      - Staff may be needed to oversee the batch processing. Specialist staff will be needed to give instructions to the database. Staff might be needed to analyse the system.
    - Time costs
      - Reports are often needed, these can take time to process. Also the backup of large amounts of data is very time consuming.

Topic 3 - Quality of information

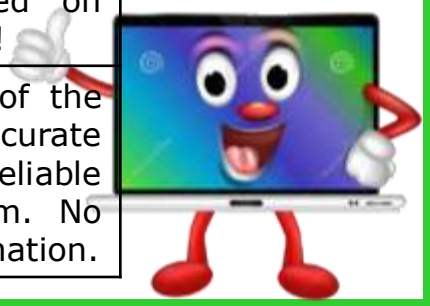
What you need to know:

- How information can improve the quality of decision making.
  - Candidates should understand that accurate, correctly targeted, understandable, complete, relevant, up to date information has user confidence.
- How to find information
  - On-line (Internet, Intranet, CD Roms) and non-ICT sources.

How information can improve the quality of decision making

- Quality of information
  - A decision needs to be made on how reliable the information is, this is important as decisions are made from this information. The quality of information is measured using the following:
    - Accuracy of the information, i.e. a credit card statement must have the correct rate of interest applied.
    - Relevance for a particular use, a band wanted a break down of their earnings for all months over the last 3 years and the company only gave them the earnings for the year.
    - How up-to-date the information is.
    - The completeness of information.
    - Correctly targeted, information should be presented to people who need it, otherwise can cause overload.
    - How easy the information is to understand, the information should be clear and any code used should be explained.
    - How much user confidence there is in the information.

Accurate	No errors! Even minor erros can lead to poor quality decisions being made eg giving someone a +£5000 balance instead of -£5000
Complete	Information must include all the data that the user needs to make his decision. Nothing should be left out.
Up-to-date	Information should be accurate when it is presented. It should be a true reflection of how things are at the time.
Relevant	Information should not include data that is not needed. Receiving more information than is needed can lead to information overload and the information **needed** to be able to make effective decisions becomes lost amongst data that is **not needed**.
Correctly targeted	Information should be presented to the people who need it. Giving information to people who don't need it can lead to information overload. It can also create confusion and could result in confidential information being in the wrong hands
Understandable	Information should be set out in a clear format that is appropriate for the intended audience.
Timely	Accurate information must be available when needed. No decision should be based on 'accurate' information which is 2 weeks old!
Has user confidence	Information should have the confidence of the users. If the user believes the data is inaccurate or the original source of the data is unreliable then the information will be useless to them. No decision can be made based on such information.



How to find information

- Many companies use information supplied from outside the organisation, these methods include:
  - On-line sources
    - Intranet
    - Internet
  - CD-ROMs
  - Non-ICT sources of information

How to find information

- On-line sources can provide information about the company and systems of other companies.
    - Intranet – An internal network that uses internet facilities. It allows staff within the business to look at any information from any department which is made available.
    - Internet – Many companies subscribe to on-line services which provide them with the information they need. For example, high street travel agents have access to flights that aren't available to book direct.
  - CD-ROMs – Information on a CD ROM cannot be altered. Information on this disc may include a list of known UK Addresses sent from the Royal mail which is updated quarterly.
  - Non-ICT sources of information – Some files are still stored on paper files as it takes time to transfer them to the computer. Non-ICT information could include directories such as the Yellow Pages, maps, etc.

Good Quality Information

Why managers need it

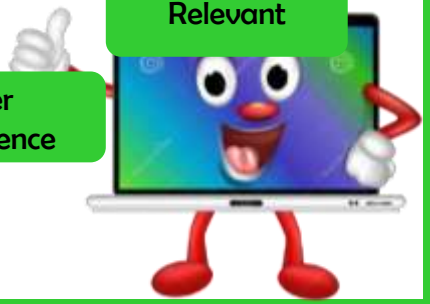
- Monitoring progress
- Competitive advantage
- Targeting resources

Needs to be:

- Accurate
- Complete
- Up to date
- Relevant
- User confidence
- Understandable
- Correctly targeted

Costs of getting good information

- Designing/creating forms
- Collection of data
- Data entry
- Processing
- Maintenance



Topic 4 - Validation and verification

What you need to know:

- How data errors occur.
  - understand how data errors can occur during input, transcription, processing and transmission;
- The purpose of validation and use of the common types.
  - be able to define and understand the purpose of validation, including the following types: presence, format, range, data type, fixed value, check digit;
- The purpose of verification.
  - be able to define and understand the purpose of verification, including the following types: double entry, proof reading, sending back printouts.

How data errors occur

- Problems with inaccurate data:
  - Incorrect decisions may be made which may result in loss of money
  - Goods may be sent to the wrong address
  - Spend time sorting the mistakes out
  - Loss of trust
  - Being prosecuted under the DPA 1998.
- Data errors can occur during:
  - Transcription
  - Input
  - Processing
  - And transmission

How data errors occur

- Transcription
  - These errors are mistakes humans make when either keying in data or filling in forms. They often occur from not proof reading work (verification). Careful training of staff and stressing the importance of accurate data entry may help reduce transcription errors. Validation performed by the computer program that accepts the data can help, but the incorrect data being entered is often valid data which means that it is impossible to detect.
- Input
  - Data that has been checked via validation and verification methods can still be incorrect. It is usually human involvement at the data collection or input stage. The only way to avoid these errors are to keep human involvement to a minimum and therefore use direct methods of data capture such as MICR, OCR, OMR, bar coding, etc.

How data errors occur

- Processing
  - A programming error which is usually undiscovered during testing, may cause the program to crash.
  - Using the wrong version of a data file rather than the latest one.
  - Incorrect formulas in spreadsheets not detected during testing will result in the wrong information being output.
  - Damage by viruses
  - Equipment malfunction, i.e. hard disk drives may break down occasionally.
- Transmission
  - Transmission is when data is passed through a communication medium, it is important that the data is not corrupted in anyway. A parity check is used to check the file is not corrupted.

The purpose and types of validation

- Validation checks data entered is sensible and reliable. For a piece of data to be valid, it has to be obey certain rules. For example if a field is set to accept numbers and a letter is entered instead, the letter is not a valid piece of data therefore will not be accepted. If the surname 'James' was entered instead of 'Jones', it would still be accepted as both pieces of data are valid even though one is incorrect.
- Two types of errors:
  - Transcription (transferring of data to the computer. Problems usually arrive from not understanding someone talking; poor handwriting; misinterpretation).
  - Transposition (typing data into the computer at high speeds, usually the swapping of characters).

The purpose and types of validation

- Validation checks are used to restrict the user as to the data they can enter. There are many different validation methods:
  - Data type check (check the data entered is the same type as the data specified for that field)
  - Presence check (checks that data is present, i.e. a password)
  - Length check (checks the data is entered has the same amount of numbers specified, i.e. a phone number needs 11 numbers)
  - Range checks (checks data entered is within a particular range, i.e. a birthday day needs to be between 1 and 31)
  - Format checks (checks that data is entered in the correct combination, i.e. a post code has 2 letters, 3 numbers followed by 2 letters.
  - Check digit (added to important numbers such as account numbers. The numbers are placed at the end of the block of numbers. A check is done when the number is entered to ensure the correct number is entered correctly.

The purpose of verification

- Verification means checking data entered matches the original source of the data, i.e. the data entered into a computer must perfectly match the data on the form you are typing from.
- There are 3 types of verification methods:
  - Proof reading (carefully comparing the data entered to the data on the original form)
  - Double entry of data (one or two people enter the same data source into the system, only if the two sets of data are identical, will it be accepted)
  - Sending back printouts (printout out what has been typed in and sending it back to the person who supplied it, to check it).

Topic 5 - Capabilities and limitations of ICT

What you need to know:

- Advantages of ICT over manual methods of processing data.
  - Candidates should be able to give an application and explain each of the following: repetitive processing, speed of processing, data storage capacity, speed of searching, accuracy and speed of data communications, the ability to produce different output formats.
- Factors affecting the efficiency of data processing systems. Candidates should understand the effects of:
  - hardware, software, suitability of the operating system, communication and input (GIGO);
  - the nature of computer software, change in circumstances during development, speed of implementation, compatibility, insufficient testing, poor communications with user, abilities of the user, poor post-implementation procedures, maintenance procedures, cost, hardware, support.

Advantages of ICT over manual methods of processing data

- Repetitive processing
- Speed of processing
- Data storage capacity
- Accuracy
- Speed of data communications
- The ability to produce different output formats
- The ability to search and combine data in many ways that would otherwise be impossible
- Improved security of data and processes.

Advantages of ICT over manual methods of processing data

- Repetitive processing
  - A computer processes similar tasks which are repeated over and over again with just a few small changes. Fast repetitive processing is required in many applications such as billing system for producing utility bills. Here are some examples of the tasks performed:
    - Mail merge
    - Sending the same email to everyone in your address book
    - Replicating a formula down a formula in a spreadsheet.
- Speed of processing
  - Depends on the speed of the processor; the speed of communication if the processing is being performed online; the speed at which the data arrives for processing.
  - The faster the data can be processed, the faster the results are outputted.
    - All monthly paid staff will need to be paid on a certain day.

Advantages of ICT over manual methods of processing data

- Data storage capacity
  - Being able to store information has come down in price over recent years which has allowed organisations to store more data in order to produce useful information. For example a supermarket is able to find out what a customer is not buying (via their loyalty card), therefore they are able to target those customers which special offers.
- Speed of searching
  - Searching a computer/on-line for information compared to manually looking through a book.
- Accuracy
  - Accuracy of computer based systems is much higher than possible with manual systems.

Advantages of ICT over manual methods of processing data

- Speed of communications
  - Most companies communicate with each other using networks, because manual methods are too slow.
- The ability to produce different output formats
  - Being able to put data into a variety of formats such as: text; tables; graphs and pictures by using a variety of programs.
- The ability to search and combine data in many ways that would otherwise be impossible
  - Allows organisations to perform complex searches.
- Improved security of data and processes
  - Data is easily backed up; fewer mistakes are made during processes and better security of data.

Factors affecting the efficiency of data processing systems

- The effects of hardware
  - Software uses the capabilities of the hardware. This means software can only run on particular hardware. The more memory (RAM) means the more instructions can be run at the same time.
- The effects of software
  - It is essential to make sure the correct software is bought. In some cases different software can perform the same tasks, i.e. Word Processing could be used to create a magazine however DTP would be needed to create a more complex one. Some software contain bugs which cause problems, i.e. crashing.

Factors affecting the efficiency of data processing systems

- The suitability of the operating systems
  - Need to make sure you check what operating software is needed to run a particular software.
- The effects of communication
  - Wherever a new system is being developed, all staff who will use the new system should be consulted and involved in the development.
- The effects of input (GIGO)
  - The output of a system should be considered first to determine what needs to be inputted. The output of the data is dependant on the accuracy of the data inputted.

Limitations of data processing systems

- The nature of computer software
  - Problems arise when people who know very little about the tasks performed choose the software. Most organisations have their own software written from scratch rather than use an existing piece of software.
    - Ability to transfer data from one piece of software to another
    - Bugs cause software to crash, therefore they need to be tested thoroughly
    - Some software may not be compatible with the operating system you are using
    - Poor design of software can cause user frustration.

Limitations of data processing systems

- Changes in circumstances during development
  - Businesses need to adapt quickly to change in order to survive. This means they must change their systems on a regular basis in order to cope with new demands. It takes so long to design a system that it may no longer satisfy the needs of the business.
- Organisations constantly changing
  - Organisations constantly change, and therefore the information systems used may also need changing.
- Speed of implementation
  - The systems need to developed quickly in order to be useful. This can cause a problem as if they are developed too quickly there may be problems.

Limitations of data processing systems

- Compatibility
  - There are a number of things to consider when developing a new system:
    - Will it work with the existing data?
    - Will the old system work with the new data?
    - Will the new software work with the existing software?
    - Will the new system work with the existing hardware?
  - Insufficient testing
    - Software often needs to be written in a rush, therefore testing often suffers as a result. Insufficient testing means:
      - Software that is frustrating to use
      - Does not do what was required
      - Does not produce the correct results
      - The software contains bugs which cause the computer to crash.

Limitations of data processing systems

- Poor communications with user
  - You should ensure that anyone who has a vested interest in the system should be consulted at all stages.
- Abilities of the user
  - The new system should be developed with consideration to the users abilities with ICT. Not doing so could result in:
    - Increased frustration
    - Increased training costs
    - Frequent calls to the help-desk
    - Resistance by users to use the software.

Limitations of data processing systems

- Poor post-implementation procedures
  - Once the system has been implemented, you need to ensure that:
    - The system is performing as it should
    - Bugs and problems are recorded
    - Suitable support is given to users.
  - Maintenance procedures
    - Systems need to be maintained so that they function correctly.
      - Not taking regular backups
      - Not updating software regularly
      - Not changing passwords regularly.

Limitations of data processing systems

- Cost
  - Will effect the amount of time that can be spent on producing the systems
  - The amount of new hardware and software can be bought
  - Staff training to use the system
  - The ability to keep updating software
- Hardware
  - All systems must be fully justified financially.
- Support
  - Need to ensure users are given enough support with the system.

Topic 6 - Uses of ICT

Business

What you need to know:

- Candidates should (where relevant);
  - understand how input, storage and output devices work, what they are used for, and their strengths and limitations
  - be able to discuss the problems caused by errors
  - be aware of any relevant coding, validation, verification methods and identify and describe data handling processes associated with these activities
  - be able to design appropriate field and data structures
  - be able to describe the purpose and functions of the data held within the file
  - be able to evaluate suitable HCI's
  - be able to discuss changes in working practices, ethical issues and associated health hazards
  - be able to describe the dangers from computer crimes and the measures needed to protect the data
  - be able to discuss the advantages and disadvantages

What you need to know:

- **CAD/CAM**
  - features of CAD/CAM packages
  - hardware requirements (speed of processor, memory, graphics card etc.
  - advantages and disadvantages of using CAD/CAM software
  - examples such as product design, home and garden
  - design and fashion design would be suitable applications.
- **Computer based shopping systems**
  - payment methods
  - on-line shopping
  - e-commerce
  - EFT
  - EPOS
  - bar codes
  - other methods of data entry
  - automatic stock control
  - pricing
  - just in time control systems, advantages / disadvantages
  - HCI's
  - loyalty cards.

Computer-aided design (CAD) and Computer-aided manufacturing (CAM)

- CAD is the use of computer systems for the design of an item.
- CAM is the use of computer-based systems to control the machinery in manufacturing process.
- Often the design has been created using the CAD package, the information can be programmed into the CAM system, where the actual component is manufactured into using tools, such as drills. Here's an example:
  - A CAD package will design the upholstery for car seats. The CAM system will cut the foam upholstery for the car seats.
  - A CAD package will design a transfer for a t-shirt. The CAM system will cut the transfer out.

Computer-aided design (CAD) and Computer-aided manufacturing (CAM)

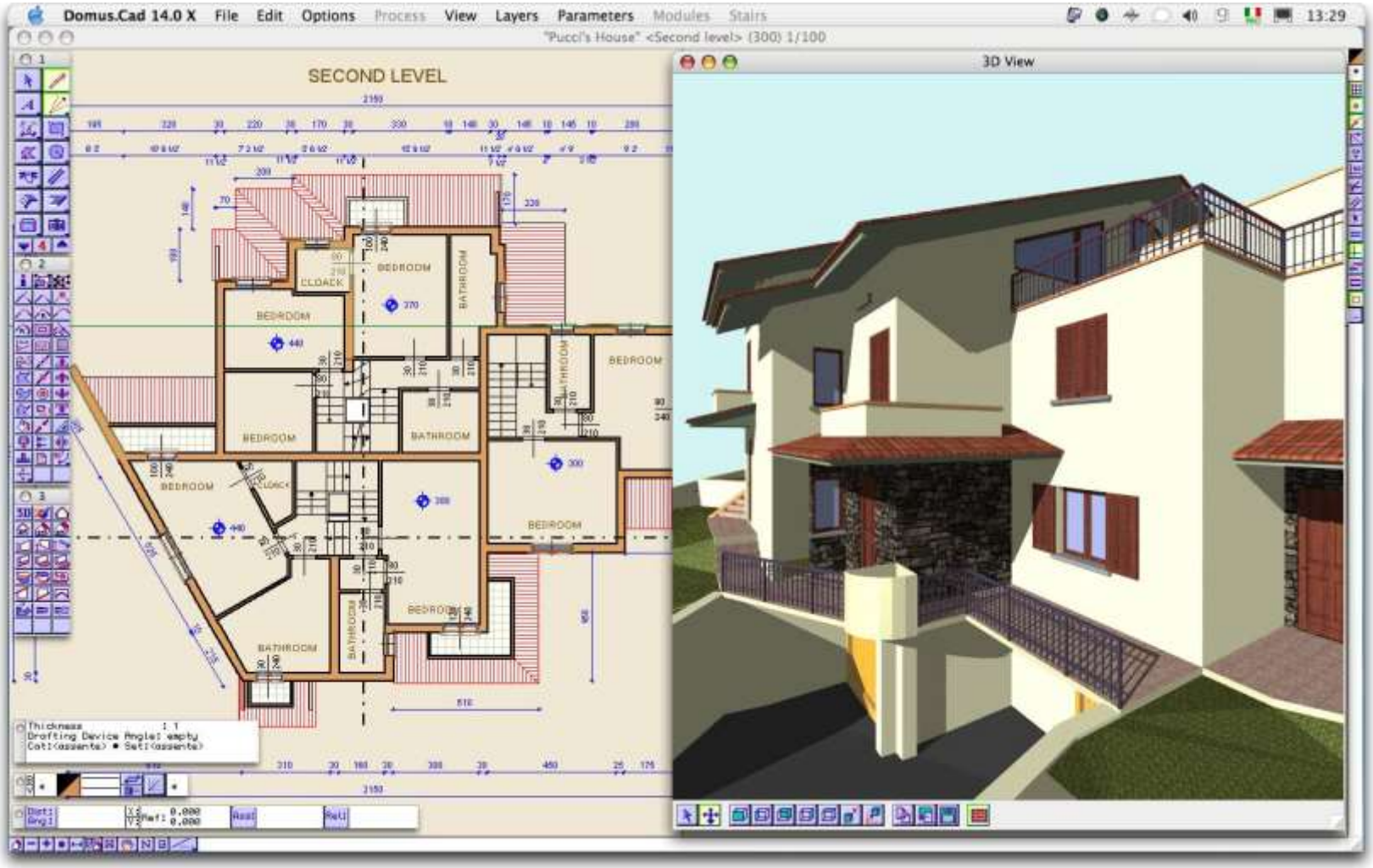
Examples of CAD

- Producing kitchen or bathroom designs
- Used by architects for designing buildings
- Used by gardeners to design a garden.

Examples of CAM

- Used to manufacture components used in car engines and gear boxes
- Used to manufacture double glazed windows and conservatories.

Computer-aided design (CAD)



Computer-aided manufacturing (CAM)

Computer-aided design (CAD) and Computer-aided manufacturing (CAM)

Features of CAD packages	Advantages of using CAD
•Zoom •2D and 3D •Rotation •No need to build a prototype •Layering (showing more detail on each layer) •Hatching/rendering (try out different finishes on a building) •Wire drawing (Outline design) •Walkthrough (Inside of the building)	•Easily stored and transferred •Easily altered •Can produce designs into 3D •Easily scaled up or down •Can use libraries of images, such as trees •Can identify stress/strain problems – will only allow you to design buildings which are safe.

Computer-aided design (CAD) and Computer-aided manufacturing (CAM)

Features of CAM packages	Advantages of using CAM
•Uses a computer, CAM software and a device that produces the product •Takes the input from CAD packages and uses the information to produce a set of instructions to give machinery. •Used to program and control equipment •Products are made automatically •CAM equipment can be re-programmed.	•Cheaper manufacture (it is automatic so costs are reduced) •Faster time from design to manufacture •Better quality •Lower wages cost •Machines can be re-programmed

Computer-aided design (CAD) and Computer-aided manufacturing (CAM)

- Hardware requirements for CAD and CAM:
  - Input devices (Use a keyboard and a special mouse)
  - Processing (The speed of the processor and the memory capacity needs to be taken into consideration)
  - Graphics card (CAD places lots of demands on a graphics card, therefore you need to ensure you have the right one)
  - Output device (Consideration needs to be taken into the screen, printers ad machinery used)

Computer based shopping systems

- This looks at the way ICT is used in the retail environment.
  - Payment methods
  - On-line shopping
  - E-commerce
  - EPOS
  - Other methods of data entry
  - Automatic stock control
  - Just in time stock control systems
  - Pricing
  - HCI
  - Loyalty cards
  - Barcodes

Computer based shopping systems

- Payment methods
  - EFT (Electronic funds transfer) refers to the electronic payments of good from one account to another, i.e. credit card, PayPal, etc.

Customer		Store	
Advantages	**Disadvantages**	**Advantages**	**Disadvantages**
•Faster receipt of goods •Quicker to enter card details rather than send a cheque.	•Impulse buy •Spend too much on credit cards •Fraud.	•Improved cash flow •No time dealing with cheques •Faster delivery; improve turnover.	•Pay commission for EFT •Fraud •Security.

Computer based shopping systems

E-commerce to customers	
Advantages	**Disadvantages**
• Ability to order goods 24/7 •Greater choice of goods from a global market place •No travelling needed as goods are ordered from home •Allows disabled people to do their own shopping •Cost savings are passed to customers with cheaper goods.	•Problems with fraudulent sites •Sometimes more hassle when returning goods. •Harder to assess the quality of goods before ordering •Loss of the social pleasure of shopping •Hidden costs of postage or duties •Customers worried about security of credit/debit card details.

Computer based shopping systems

E-commerce to Businesses	
Advantages	**Disadvantages**
•On-line catalogues are more easily updated •Fewer staff needed •Ability to reach customers at any time of the day •Global marketplace means customers from around the world •Fluid pricing – easy to change prices from day to day •Low start up and running cost compared to traditional stores.	•Network downtime can be very expensive •Cost of delivery may make goods more expensive •Increased competition from abroad offering cheaper goods •Reliance on third party delivery companies who may be unreliable.

Computer based shopping systems

- E-commerce
  - Involves the selling or products and services via the internet. A variety of technology is needed, such as:
    - EFT
    - Just in time
    - Automatic stock control system
    - Internet
    - Extranets
    - Email
    - Databases, etc

Computer based shopping systems

- Electronic point of sale (EPOS)
  - The hardware and software needed to automate the checkout process.
  - POS terminals placed in stores where customers pay for goods.
  - Barcode readers

Advantages	Disadvantages
•Need for less staff as no need to put price on each item •Money taken straight out of customers account so the company is guaranteed it •Less need for physical security as you don't need to carry cash •Allows just in time, better stock control •Automatic re-ordering	•Equipment can be expensive

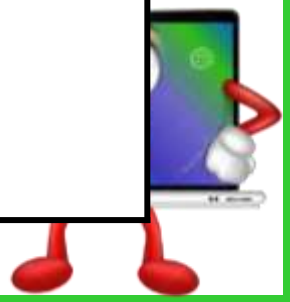
Computer based shopping systems

- Other methods of data entry
  - Hand held scanners, magnetic strip readers, chip and PIN readers.
- Pricing
  - Prices fluctuate from time to time. The barcode of an item is linked with a database that stores all relevant information, such as product name and price. The price is updated on the database.
- Human Computer Interfaces (HCI's)
  - Stores have improved their systems by introducing scanners and touch screens to reduce health problems in staff.
- Loyalty cards
  - Identifies the card holder as a member in a loyalty program. Used to encourage customers to shop regularly in their store and allows stores to find the shopping habits of customers. This is linked to a database that stores information such as, name, address, recently bought items, etc.
- Automatic stock control
  - Allows stock to be controlled. Ensures stock is deducted correctly from the stock level when the item is bought.

Computer based shopping systems

- Just in time stock control systems
  - Goods are delivered to the stores as fast as they are being sold. Ensures stores do not run out of stock
  - Code is scanned and matched with stock on database
  - Quantity is deducted from database
  - Stock level is compared to re-order level
  - If stock level is below re-order level an automatic request is sent for more stock
  - Stock is delivered
  - Database is updated.

Advantages	Disadvantages
•Ensure stores do not run out of fast-selling items. •Easier to cope with several small deliveries than one large delivery. •Smaller storage needed •Less risk of stock being out of date.	•Expensive to introduce •Stores are more responsible for their own ordering. •Cannot respond to unusual demand •True stock may differ due to theft.



Computer based shopping systems

- Barcodes
  - Series of light and dark bars of differing widths. A code number is printed underneath which is made up of the country of origin, manufacturer code, the product code and a check digit.

Advantages	Disadvantages
•Faster to enter data •More accurate as it eliminates typing errors •Low printing costs •Frees staff	•Can only be used for the input of numbers •Equipment is expensive •Corrupted barcodes can cause delays.

Topic 6 - Uses of ICT

Education

What you need to know:

- Candidates should (where relevant);
  - understand how input, storage and output devices work, what they are used for, and their strengths and limitations
  - be able to discuss the problems caused by errors
  - be aware of any relevant coding, validation, verification methods and identify and describe data handling processes associated with these activities
  - be able to design appropriate field and data structures
  - be able to describe the purpose and functions of the data held within the file
  - be able to evaluate suitable HCI's
  - be able to discuss changes in working practices, ethical issues and associated health hazards
  - be able to describe the dangers from computer crimes and the measures needed to protect the data
  - be able to discuss the advantages and disadvantages

What you need to know:

- **Use of computers for Teaching and Learning**
  - CAL - Computer Assisted Learning
  - CBT - Computer Based Training
  - distance learning
  - video-conferencing
  - online learning / e-learning
  - chat rooms for discussion with tutors / experts
  - features of software packages
  - revision programs
  - authoring software
  - interactive whiteboards.
- **School / college administration**
  - Computer based methods of registration e.g. OMR,
  - wireless, smart cards, retina scans
  - student record keeping.

Teaching & learning

- CAL (Computer-assisted learning)
  - Computer based packages which provide interactive instructions in a particular area.
- CBT (Computer-based training)
  - Uses ICT systems for training in the workplace.

Features of CAL/CBT	
•Interactive •Use multimedia •Used for tutorials •Used for revision	•Encouragement •Games to make learning fun •Testing and assessments •Used for distance learning

Teaching & learning

Advantages of CAL/CBT	Disadvantages of CAL/CBT
•Flexibility •Materials are provided in lots of ways •Access material using a variety of devices •Learn in many different environments •Revisit when you need to •Multilingual support	•Software is complex •Students often need interaction from others •Present opportunities to take breaks •Hard for teachers to gauge progress.

Teaching & learning

- Distance learning (Learning takes place away from the confines of a traditional teaching room).
- Videoconferencing (Allows two or more people to talk to each other and exchange files).
- On-line learning/e-learning (Multimedia products on-line to teach a particular subject).

Advantages of above	Disadvantages of above
•Work at own pace •Computer will not judge •Immediate feedback •Fit learning around commitments •Wide range of subjects	•No social side •Lack of flexibility (teachers can explain in a variety of ways) •Expensive •Need more self-control

Teaching & learning

- Chat rooms for discussions with tutors/experts
  - Useful for students learning a subject on their own, i.e. Can question experts about something
- Features of software packages (make use of multimedia, i.e. PP)
- Interactive white boards

Use of computers for school/college administration

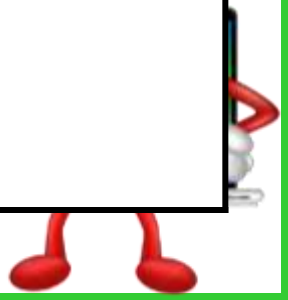
- There are two main systems used in schools/colleges; student registration and student-record keeping.
- Computer based registration systems should:
  - Capture student attendance accurately
  - Capture student attendance automatically
  - Fast at recording attendance details
  - Avoid misuse of system
  - Relatively inexpensive

Use of computers for school/college administration

System	How does it work?	Advantages	Disadvantages
OMR	Teacher marks attendance by shading in a box. Forms are then batched together and processed using an optical mark reader.		•Not possible for admin staff to take immediate action •Form may be left unattended
Wireless systems	RFID (Radio Frequency Identification). Information is stored on a chip, the chip does not have to come in contact with the reader.	•No need to remove card from your pocket	•Expensive
Smart cards/ Swipe card	Card with a chip that holds the information. Or card with magnetic strip The card is placed into a reader to be read.	•Cost of cards and readers are low compared to other methods •Readers can be made almost vandal proof	•Cards are often lost •Students can be swiped in by someone else.
Biometric	Makes use of a feature of the human body that is unique, i.e. fingerprint scanner.	•Nothing to forget •Unique to the individual	•Expensive •Readers may get dirty.

Use of computers for school/college administration

Advantages of using ICT systems for registrations	Disadvantages of using ICT systems for registrations
•Details are recorded almost in real time •Teachers have administration burdens removed •Not possible for students to abuse system •Encourages students to be responsible •Possible to check attendance for each lesson •Records lates •Reports can be generated quickly	•Biometric readers are very expensive •Human rights issues when fingerprint systems are used •Readers must be kept clean



Use of computers for school/college administration

- Student record keeping
  - Information about students would be kept on a database.
  - Personal information would be collected, such as DOB, doctors name, etc
  - Reports written about students
  - Results
  - Exclusions
  - Child protection reports, etc
- All of the information needed is combined into one system, a Management Information System.
  - Reduces workload for teachers
  - Provide up-to-date information for parents
  - Tackle truancy, etc.

Topic 6 - Uses of ICT

Health

What you need to know:

- Candidates should (where relevant);
  - understand how input, storage and output devices work, what they are used for, and their strengths and limitations
  - be able to discuss the problems caused by errors
  - be aware of any relevant coding, validation, verification methods and identify and describe data handling processes associated with these activities
  - be able to design appropriate field and data structures
  - be able to describe the purpose and functions of the data held within the file
  - be able to evaluate suitable HCI's
  - be able to discuss changes in working practices, ethical issues and associated health hazards
  - be able to describe the dangers from computer crimes and the measures needed to protect the data
  - be able to discuss the advantages and disadvantages

What you need to know:

- **Scanning, life support, computer controlled equipment**
  - sensors (analogue and digital), data measured and its use
  - scanning devices; MRI (magnetic resonance image); CAT (computerised axial tomography)
  - advantages and disadvantages of scanning devices
  - backup and recovery procedures
  - new and future developments and limitations.
- **Medical databases**
  - electronic patient record keeping (EPR)
  - blood bar coding and tracking systems ISBT 128
  - use of the Internet, intranets and extranets
  - distributed medical databases
  - backup and recovery procedures
  - new and future developments and limitations.
- **Expert systems**
  - Artificial Intelligence
  - neural networks and how parallel processors work
  - software languages (PROLOG, ASPRIN)
  - expert system shells (knowledge base, inference engine, user interface)
  - how expert systems work
  - medical uses of expert systems e.g. MYCIN, NEOMYCIN etc.
  - advantages and disadvantages of expert systems.

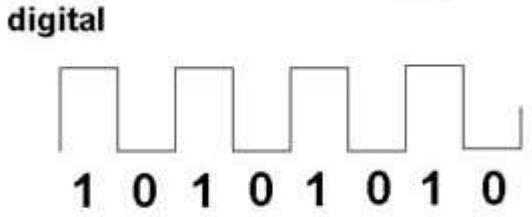
Scanning, life support and computer controlled equipment

- Hospitals use ICT to:
  - Diagnose patients
  - Monitor patient's condition
  - Control patient's condition
- There are many ways this can be done:
  - Sensors
  - Scanning devices

Scanning, life support and computer controlled equipment

A sensor is a device that can take automatic readings such as physical, chemical and biological signals and can usually provide a method of measuring and recording these signals.

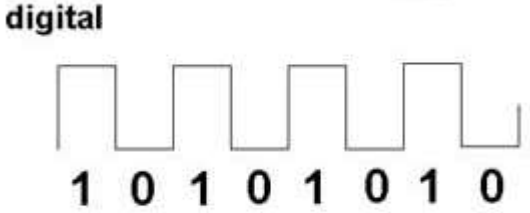
- There are two types of sensors:
  - Analogue (Measures analogue quantity such as temperature and pressure).
  - Digital (Detects digital quantity, i.e. a switch can be either on (1) or off (0)).
  - Once an analogue signal records the data, the data is converted into a digital signal before being processed by the computer.



Scanning, life support and computer controlled equipment

A sensor is a device that can take automatic readings such as physical, chemical and biological signals and can usually provide a method of measuring and recording these signals.

- There are two types of sensors:
  - Analogue (Measures analogue quantity such as temperature and pressure).
  - Digital (Detects digital quantity, i.e. a switch can be either on (1) or off (0)).
  - Once an analogue signal records the data, the data is converted into a digital signal before being processed by the computer.



Scanning, life support and computer controlled equipment

- There are many physiological measurements that need to be recording for a patient in hospital.
  - Temperature
  - Blood pressure
  - Pulse
  - Blood sugar
  - Brain activity
  - Respiratory rate, etc.
- Advantages of using sensors are:
  - Measurements are never missed as they are taken automatically
  - Real-time monitoring
  - Frees up medical staff
  - Trends in the patient's condition.

Scanning, life support and computer controlled equipment

- Monitoring and controlling of a patient's condition:
  - The sensors are used to monitor patients but the data collected is also used to control medical equipment that takes over the function of some of the organs of the patient.
  - Data from sensors can be used to control:
    - Respiration
    - Heart function
    - Kidney function
    - Intravenous drips containing fluids.

Scanning, life support and computer controlled equipment

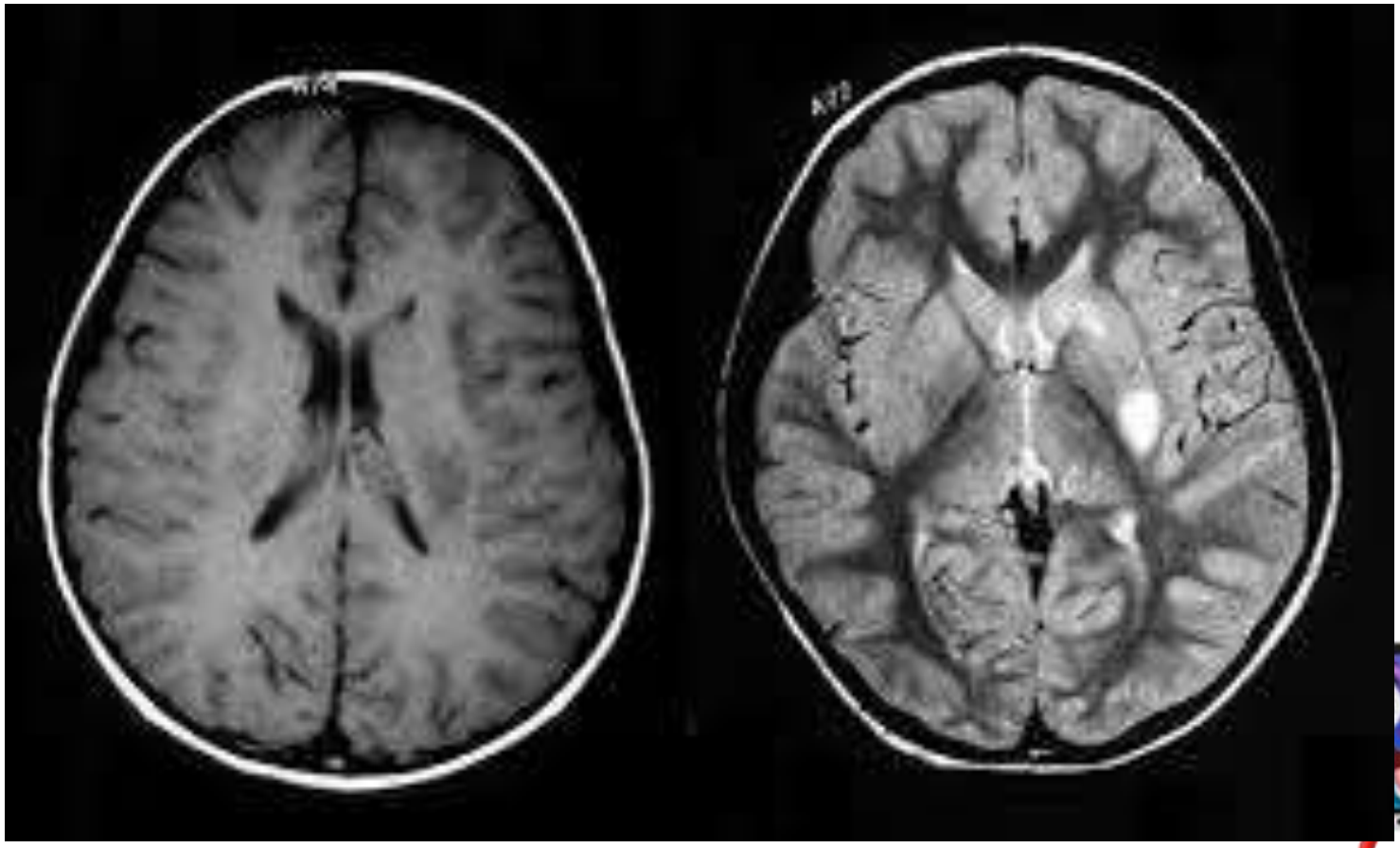
- Scanning devices
  - These devices are used to build up a model of the internal structures of a patient which aids diagnosis and ensures patients get the correct treatment.
  - There are two main types:
    - MRI
    - CAT

Scanning, life support and computer controlled equipment

- MRI (Magnetic Resonance Image)
  - Makes use of magnetic and radio waves to build up a picture of the inside of a patient. They do not cause any damage as they do not use X-rays.
  - A patient lies inside a large powerful magnetic tunnel and radio waves are sent into the patient's body. The body then produces its own radio waves which then form a picture. A computer is then needed to analyse the data which forms a picture.
- MRI's are used for:
  - Checking for tumours
  - Examining the heart and its blood vessels for damage
  - Examining joints and the spine for damage
  - Checking the function of certain organs, i.e. liver.

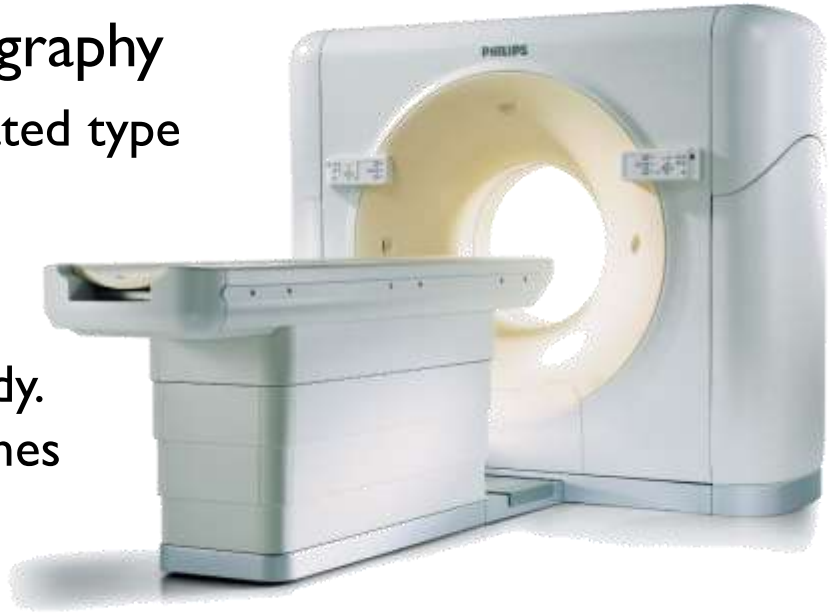
Scanning, life support and computer controlled equipment

- MRI (Magnetic Resonance Image)



Scanning, life support and computer controlled equipment

- CAT (Computerised Axial Tomography
  - This is a more special and complicated type of X-ray machine. A normal X-ray machine sends out a single X-ray. A CAT scan sends out several X-ray beams at different angles of the body. Gives a 3D model of a patient's bones and internal organs and is used for planning the use of radiotherapy.



Scanning, life support and computer controlled equipment

- CAT (Computerised Axial Tomography

Scanning, life support and computer controlled equipment

Advantages	Disadvantages
•Higher cure rate because of early detection of tumours. •Reduces unnecessary 'investigation' operations. •Helps surgeons plan operations •Faster diagnosis •MRI scans are safe •Can look at internal organs in 3D using computer modelling.	•The equipment is very expensive •Can break down - The equipment is sophisticated which means more things can go wrong. •Can be dangerous for staff to use CT scans. •With MRI scans the patient needs to stay still for a long period of time.

Scanning, life support and computer controlled equipment

- Back up and recovery procedures
  - Scanners make use of sensors, these sensors need to give the correct readings at all times to ensure a patients condition is being monitored correctly.
  - Therefore sensors have a self-test facility, whereby they are able to check their own readings.
  - Most of the scans are kept with the patient.
  - Any data collected is stored in a large database, this database is backed up in real-time, meaning no downtime.
  - Hospitals have their own back up plan:
    - Mirrored hard drives
    - Backup tapes
    - Off-site archiving of data.

Scanning, life support and computer controlled equipment

- Uninterruptible Power Supply (UPS)
  - Power problems can occur from time to time which is why every scanner and ICT system within a hospital has a UPS which keeps the power running when the supply to the hospital has been cut.

- New and future developments
  - More of a focus has been put on patient care outside of the hospital and in particular prevention. For example, more routine testing is planned, because if many diseases are detected early enough, they can be cured.
  - Enable tasks to be performed at home rather than at your GP surgery.
  - Smart sensors that will collect and process data at home.
  - Use this data to work an actuator.
  - Home healthcare video conferencing
  - Sensors for diabetics
  - Toilets that analyse the user.

Scanning, life support and computer controlled equipment

- Limitations
  - There are some limitations in the use of scanning, life support and other computer-controlled equipment which include:
    - Bandwidth is limited (scans may not be stored with other patient record details as the image file sizes are too big)
    - Life support malfunctions
    - Ethical problems
    - Cost of the equipment – better used for prevention or cure?

Medical databases

- Hospitals have moved away from paper based records to electronic records which are stored in a database. This allows all healthcare workers to access the database if they have the required permission.
- There are many advantages in storing data electronically:
  - Data can be viewed nearly everywhere
  - Easier to ensure consistency
  - Security is improved (passwords)
  - Easier to back-up
  - No need to transfer patient records.

Medical databases

- Blood bar coding and tracking system

1. Blood is taken form donor and tested to determine blood group

2. Blood is stored. Cross matching takes place and bar coded labels are attached to blood bags

3. Matched blood is sent to the hospital and kept in a fridge. The bar code is scanned prior to being placed in the fridge.

4. Hospital staff use their ID card to open fridge to allow blood to be removed. Bar code is scanned and blood is then taken to the ward.

5. Patient who required blood transfusion has a bar code on their wrist. If it matches the bag then transfusion is given.

Medical databases

- Use of internet, intranets and extranets

Internet	Intranet	Extranet
•Send e-mails to patients •Allow staff to perform searches •Send information on lab tests.	•Private networks •Used for sending messages around the network •Transfer patient details from one device to another.	•Protected by usernames and password for external users •Suppliers check stock levels •Social workers •GP's

Medical databases

- Distributed databases
  - Allows patient records to be stored in a variety of places around the network, however can be merged together when needed.
  - Improves security of patient records
  - Speed of access is improved.
- Back up and recovery procedures
  - Important that the medial database is kept secure and backed up regularly.
- Kept secure
  - Access levels
  - Encryption
  - Audit trails
  - Passwords

Expert systems

- Artificial Intelligence
  - a reasoning process performed by computers.
- Neural networks
  - biological systems that are used by the brain for learning new things. By understanding how the brain works, scientists are able to develop ICT systems which make use of artificial neural networks that mimic the way the brain works.
- Parallel processors
  - The human brain is able to process data in parallel, i.e. multi-task, walk, talk and listen all at the same time, something a standard computer cannot do. However a super computer can process data in parallel, i.e. weather forecasting.

Expert systems

- Expert system
  - Uses AI to make decisions based on data supplied in the form of answers to questions.
  - There are 3 components:
    - Knowledge base (A database of knowledge about one subject)
    - Inference engine (A set of rules)
    - A user interface (Presents the questions and receives the answers)
  - They use a 'IF THEN' rule.

Expert systems

- Expert system shells
  - Build expert system from scratch using a software language
    - PROLOG
    - And ASPIRIN
  - Use a expert system shell.
    - Provides the inference engine and user interface, but the knowledge will have to be entered separately.
- MYCIN
  - Used in medicine to pinpoint the correct organism that is responsible for a blood infection.
- NEOMYCIN
  - Used to train doctors with case studies.

Expert systems

Advantages	Disadvantages
•Consistency •Cheaper •Consult a much larger pool of information than a doctor •Available 24/7 •Cannot forget	•No common sense •Can make absurd errors •Not able to provide creative responses •Not being able to realise when no answer is available to a problem •Relies on rules and knowledge being correct.

Topic 6 - Uses of ICT

Home

What you need to know:

- Candidates should (where relevant);
  - understand how input, storage and output devices work, what they are used for, and their strengths and limitations
  - be able to discuss the problems caused by errors
  - be aware of any relevant coding, validation, verification methods and identify and describe data handling processes associated with these activities
  - be able to design appropriate field and data structures
  - be able to describe the purpose and functions of the data held within the file
  - be able to evaluate suitable HCI's
  - be able to discuss changes in working practices, ethical issues and associated health hazards
  - be able to describe the dangers from computer crimes and the measures needed to protect the data
  - be able to discuss the advantages and disadvantages

What you need to know:

- **Entertainment**
  - games
  - photography
  - music including downloading from the Internet and related issues
  - MIDI, sequencers, notators, sound wave editors
  - pay-to-view services
  - home online / interactive shopping
  - cinema and theatre booking
  - email
  - interactive services e.g. betting, voting, dating
  - teletext services
  - mobile phones.
- **Home on-line banking**
  - EFTPOS
  - on-line banking (advantages and disadvantages)
  - security
  - card services - debit/ credit
  - card crimes and methods of prevention.

Entertainment

Type	Advantages	Disadvantages
Games	•Young children can learn from them •Make learning fun •Encourages team work •Lead to game designer jobs	•Can be addictive •Lead to obesity •Wastes time •Health problems
Photography	•Produce inexpensive high quality images •Offers flexibility in sharing and editing	•Can be altered too much
Music	•Download single tracks not albums •24/7 •Burn tracks onto CD •Portable	•File sharing sites •Illegal downloading •Nothing physical
Interactive TV (Pay per view and Pay to view)	•Book cinema tickets •Play games •Use email	•Encourage young children to play games rather than something more energetic •Could cause addiction •Gambling

Entertainment

Type	Advantages	Disadvantages
On-line booking	•Discounts •Check availability •Read reports	•Need to enter card details •Might not have a card
Email	•Emails are sent immediately •Cheaper than a letter •No need to leave the house •File attachments •Send to more than one person	•Not everyone has the equipment to send and receive emails •Junk mail is a big problem •Emails can be intercepted •Relies on people checking their emails regularly
On-line betting	•Do not need to leave the house •Special internet offers •No need to pick up your winnings	•A credit or debit card is needed •Can become addicted •People may gamble more than they have

Entertainment

- Music
  - MIDI (Musical Instrument Digital Interface)
    - Allows the connection of a computer and instrument in order for them to communicate.
  - Sequencer
    - Software or hardware used to create and manage electronic music.
  - Notators
    - Allows you to compose your own music
  - Sound wave editors
    - Allows the editing of sound waves

On-line banking

Advantages	Disadvantages
•Banking services are available 24/7 •No need to keep paper statements •No need spending time travelling to banks •Can move money between accounts •Make transfers	•On-line banking accounts could be hacked into •You cannot get cash out therefore still need to visit the bank •Older people may prefer the personal service.

On-line banking

Type	Use
Credit and debit cards	Chip and pin method allowing you to enter your card into the reader and enter your pin to pay for goods.
PayPal	Anyone with an email address can send and receive payments using PayPal without having to give them your card details.

Card crimes:

- Lost and stolen card fraud
- Counterfeit cards
- Phishing

Topic 7 - Presenting Information

What you need to know:

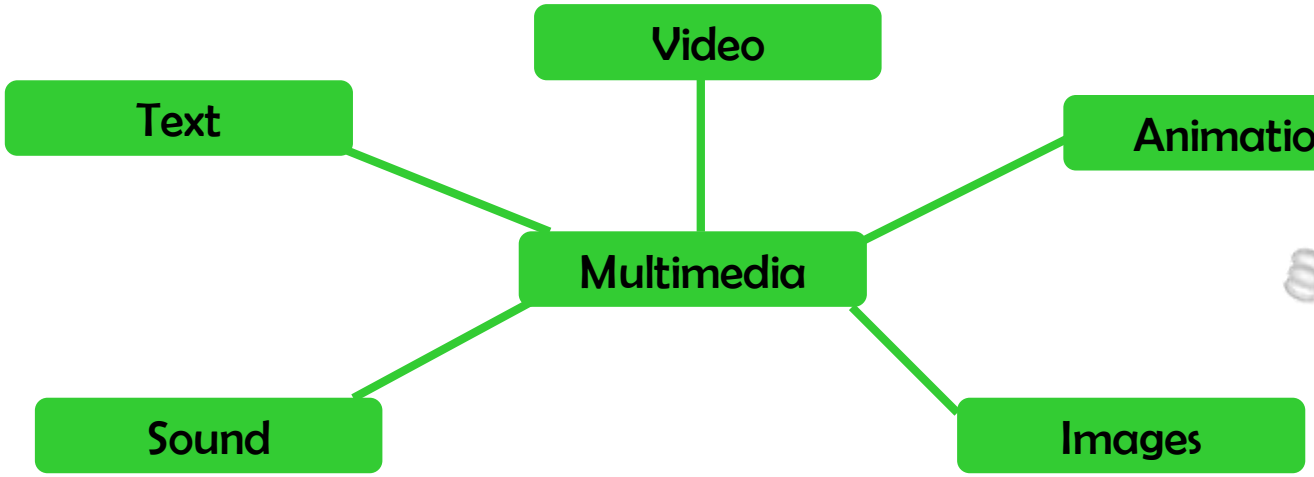
- Formats, media and audience. Candidates should understand:
  - that information may be presented in a range of different formats and via different media and the need to use the most appropriate format for the intended audience;
  - the nature and complexity of information, time to study, needs of the recipient, life span.
- The use, key functions, advantages & disadvantages of:
  - Word processing / DTP
    - templates, style sheets, importing, mail merge, macros.
    - Differentiate between the functions found in home DTP software and large-scale professional DTP software;
  - Presentation
    - templates, creating a show, animated transitions, importing files, (including video and sound files), exporting files, data compression techniques;
  - Databases
    - import/export, query, report;
  - Web authoring
    - hyperlinks, formatting, use of animation, frames, HTML (note – understanding of the programming is not required)

Formats, media and audience for information

- When creating a document you need to ensure it is aimed at the correct target audience, such as:
  - Adults
  - Teenagers
  - Young children
  - Specialist and non-specialist
- Formats for information
  - Text
  - Table
  - Graphics
  - Audio
  - Animation
  - Video

Formats, media and audience for information

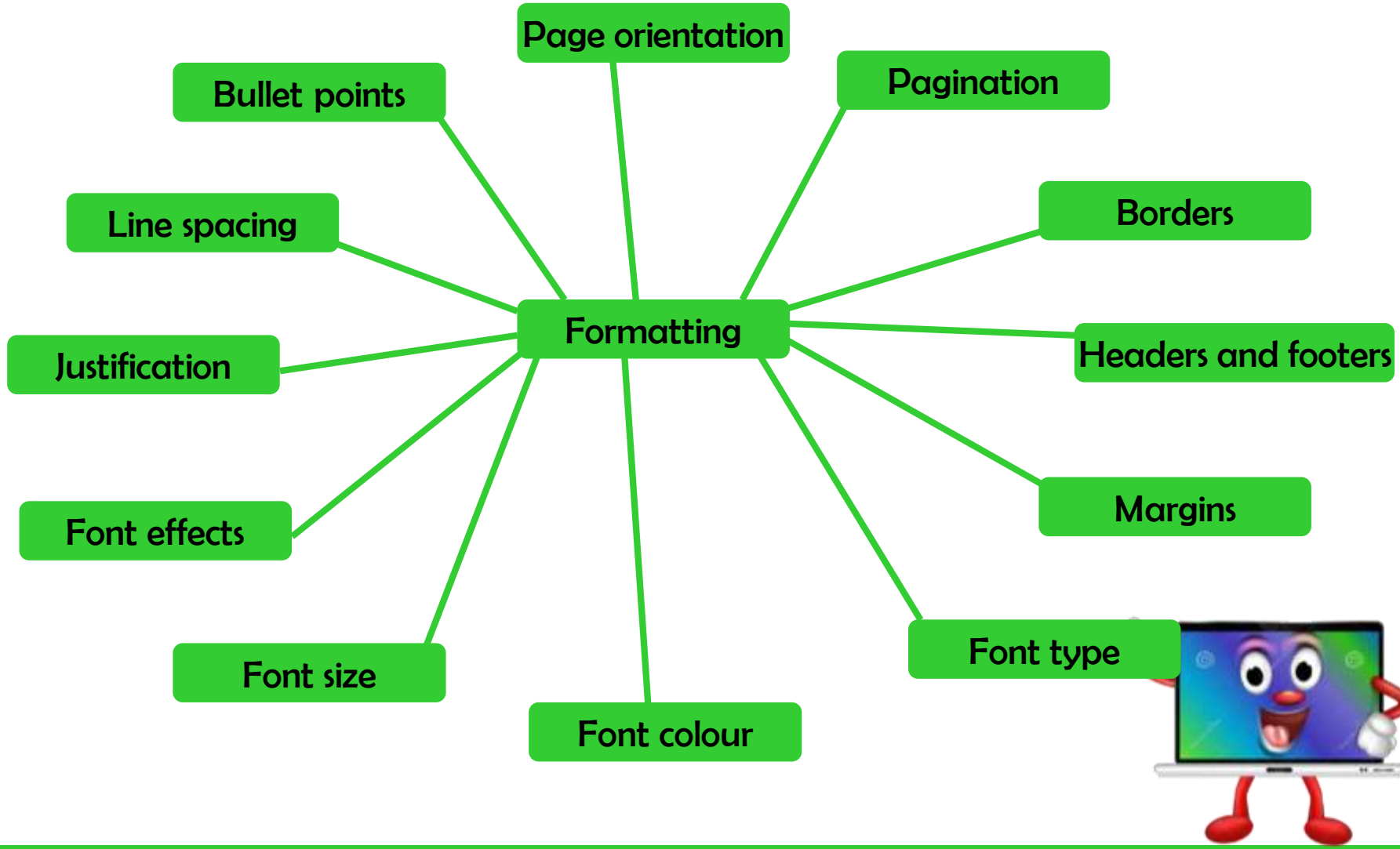
- Factors affecting the choice of format
  - The particular need of the user (a user may be partially sighted or blind so information as audio would be used)
  - The complexity of the information (Complex information can be better explained as pictures)
  - Whether the material is to be presented on-line (Animations and videos can be added to multimedia presentations or websites).



Formats, media and audience for information

- Factors affecting the choice of media
  - Time to study
    - Material which needs to be studied at length needs to be a hard copy
  - The needs of the recipient
    - Ensure that the person who searches for the information understand what the needs are of the recipient
  - Lifespan of information
    - Need to ensure that the information used is kept up to date as some information can have a short lifespan.

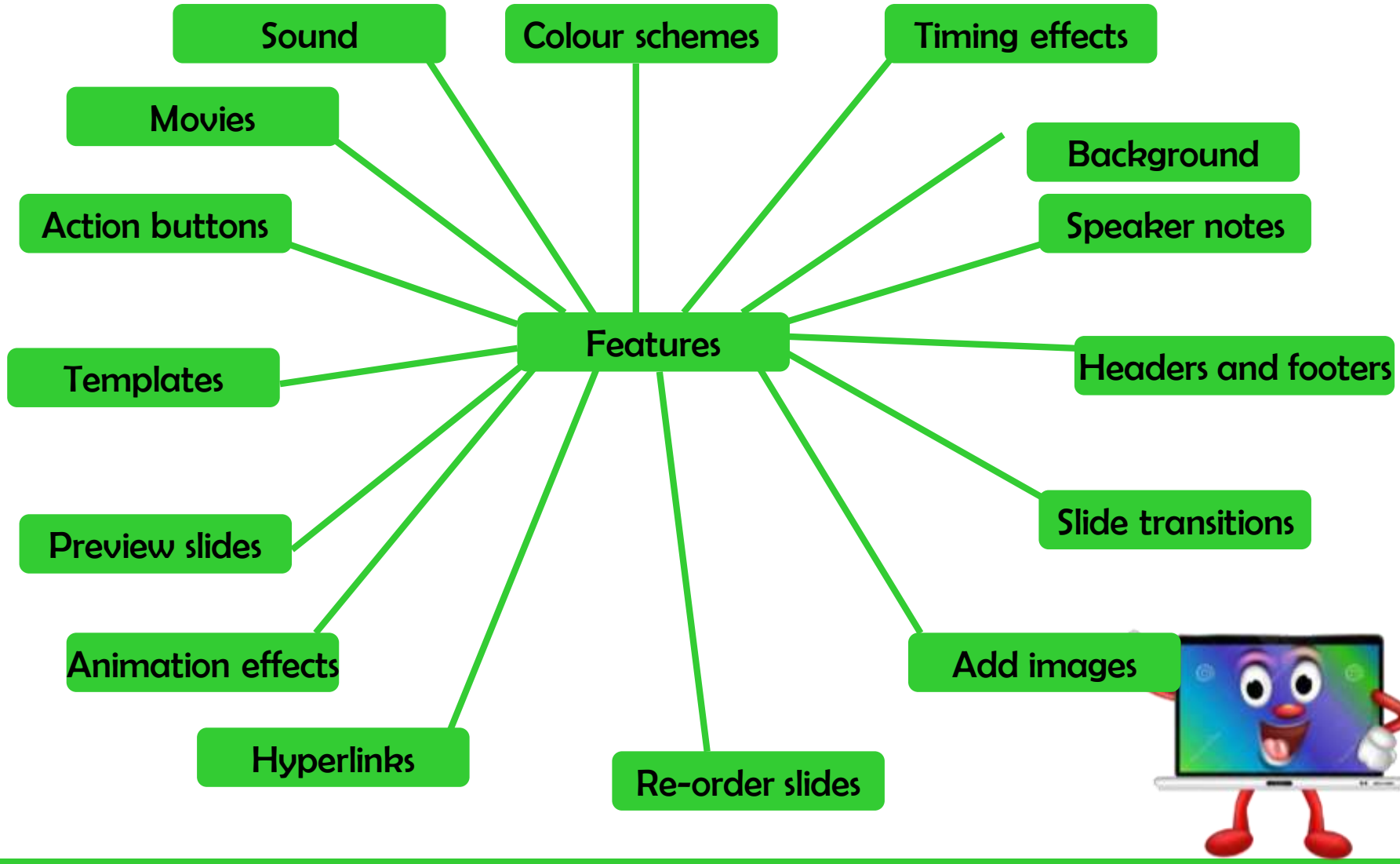
Word processing/DTP



Word processing/DTP

- Templates
  - Pre-prepared page used to specify the structure of a document
- Mail merge
  - Incorporating data automatically from a database in a document, i.e. a letter
- Indexing
  - Allows words to be highlighted so they can be used to form an index
- Macros
  - A stored list of instructions used to automate a task
- Thesaurus
  - Provides a list of synonyms
- Spellchecker
  - Dictionary that checks the spelling
- Grammar checker
  - Checks the grammar in a sentence

Presentation Software



Presentation Software

Advantages	Disadvantages
•Makes the presenter look more presentable •Allows the presenter to summarise what they are saying in bullet points •Make use of multimedia •Can be shown on a projector.	•Presentations containing videos can be very big •The audience may get fed up of all the animation •Good presentations can take a while to set up •Sound effects can annoy the audience.

Database Software

- Import/export
  - Allows you to get information from one application to another
- Query
  - Allows the user to search the database for something specific
- Report
  - Allows the user to view a summary of information in an appropriate format for the user

Web authoring software

- Hyperlinks
  - An area of a webpage, either text or an image, that contains a link to another location on the web
- Hotspots
  - A image that contains a link to another location on the web
- Formatting
  - Alter fonts, bullet points, tables, etc
- Frames
  - A section of a web page in which activities can take place
- Multimedia graphics on the web.

Web authoring software

- HTML
  - The programming language used to create websites
  - Advantages are:
    - Can place graphics more accurately
    - More control over layout
    - Take up less memory
    - Loads faster than using a template

Topic 8 - Networks

What you need to know:

- Networks and standalone computers
  - be able to describe the characteristics and relative advantages of network and stand-alone computers;
- LANs and WANs
  - be able to describe the difference between a Local Area Network and a Wide Area Network;
- The Internet, Intranet and Extranet
  - define the Internet;
  - define and give examples of Intranet, Extranet;
  - show an understanding of the Internet and its uses, including: benefits and developments, communications, sharing data and ideas, accessing information;
  - benefits, disadvantages and dangers of email (services such as voice mailboxes, address books; group sending; file attachments);
  - FTP (definition and purpose), newsgroups, chatrooms, online shopping, on-line databases accessing information;
  - search engines (selection and appropriate use).

Basic elements of an ICT network

- Components:
  - NIC (Network Interface Card, Allows a connection between the computer and the internet cabling).
  - Hub (Join computers in a network together)
  - Switch (Similar to hubs, but also have the ability to analyse packets of data to send them to the correct destination)
  - Router (Joins several wires/wireless networks together)
  - Network software (For large client severs, special software is needed)
  - Data transfer media
    - Metal wires (High transmission but can be expensive)
    - Fibre optic (Data is encoded and transmitted fast but is expensive)
    - Wireless

Basic elements of an ICT network

- Wireless
  - The router is connected to the Internet
  - Router receives data from the Internet
  - It transmits the data as a radio signal using an antenna
  - Computers wireless adapter picks up the signal and turns the signal into something the computer can understand.

Advantages	Disadvantages
•Inexpensive LANS to be set up without cables •Working anywhere there is a signal •Old listed buildings •Global set of standards around the world.	•Power consumption is high •Health problems •Security problems •Limited range •Interference with overlapping signals.

Networks and stand alone computers

- Standalone (computer on its own without any connection to other computers)
- Network (two or more computers are connected in some way)

Standalone		Network	
Advantage	**Disadvantage**	**Advantage**	**Disadvantage**
•Cheaper hardware and software •Less IT knowledge needed •Fewer problems with viruses •Not as hardware dependant.	•Unable to transfer files with ease •Hard to keep data up to date it two people are working on the same document •Software has to be installed on all computers. •Backs up taken by individual users.	•Central pool of data/documents •Ability to share hardware •Ability to share software •Remote management •Improved security •Easier to back up •Improved communication.	•Initial cost of network •Lack of access when server is down •Technical knowledge is needed.

LAN and WANs

- Two types of networks:
  - LAN (Local Area Network)
    - confined to one building or site
    - Ownership of the communications equipment
  - WAN (Wide Area Network)
    - spread over a wide geographical area
    - Third party telecommunications equipment is used.

The Internet, intranet and extranet

- Internet
  - Huge group of networks joined together.
  - WWW is the means of accessing information on the internet.
- Intranets
  - Private internal network allowing the sharing of organisational information.
- Extranets
  - Internal and external network which is restricted to employees, customers, suppliers and other partners of the organisation, accessed via a username and password.

The Internet, intranet and extranet

- Internet

Advantages	Disadvantages
•Methods of cheap communication, i.e. email •Video such as TV programs •Listen to the radio •Run/download educational games •Send and receive files •Research information •Communicate •Share resources •Shop on-line	•Access inappropriate material •Children inadvertently forming 'friendships' with strangers •Cyber bullying •Advertisement pressures.

The Internet, intranet and extranet

- Communications
  - Instant messaging (send and receive messages almost instantly)
  - Webcam services (See and hear who you are talking to)
  - Cheap phone calls (Internet phone calls)
  - Chat rooms (Chat with friends)
  - Text messaging (Send and receive messages via phones)
  - Email (Messages sent)

The Internet, intranet and extranet

- Emails
  - Search (Keyword search to find an email)
  - Reply (Read an email and respond to it)
  - Forward (Read an email and pass it on to someone)
  - Address book (Store a list of email contacts)
  - Groups (Lists of people with their email address)
  - Attachments (Attach pictures, documents, etc to an email)
  - Voice Mailboxes (Voice mail is left which can be played back at a later time).

The Internet, intranet and extranet

- Email

Advantages	Disadvantages
•Virtually instantaneous •No need for familiarity of letter •Easily attach a copy of senders message with reply •Virtually free (Except for initial cost and internet charge) •Accessed using a large number of devices •More environmentally friendly.	•Not everyone has email •May make users more causal about their approach to work •Junk mail •Security aspects.

The Internet, intranet and extranet

- FTP (File transfer protocol)
  - Method for exchanging files over the internet
- Newsgroups
  - A discussion where people are able to post and leave comments
- On-line shopping
  - Purchase or sell items online
- On-line databases
  - Companies store information in a database, i.e. holiday information
- Search engine
  - A way of finding information on the Internet using a search criteria.

Topic 9 - HCI

What you need to know:

- HCI requirements. Candidates should understand the need to have a good dialogue between humans and machines, taking into account factors such as the task, user experience, user preference and resources.
- Types of HCI Candidates should understand the appropriate applications, input devices, advantages and disadvantages associated with the use of;
  - command lines such as MSDOS
  - GUIs - graphical user interfaces including
  - Windows, Icons, Menus, Pointers;
  - voice interfaces:
    - speech recognition systems
    - natural language interfaces
    - speech synthesis;
  - graphical devices such as graphics pads
  - game playing devices such as joysticks, steering wheels, game pads;
  - touch sensitive screens such as public information systems; POS systems at retail outlets;
  - biometric devices such as iris recognition, hand prints.

HCI requirements

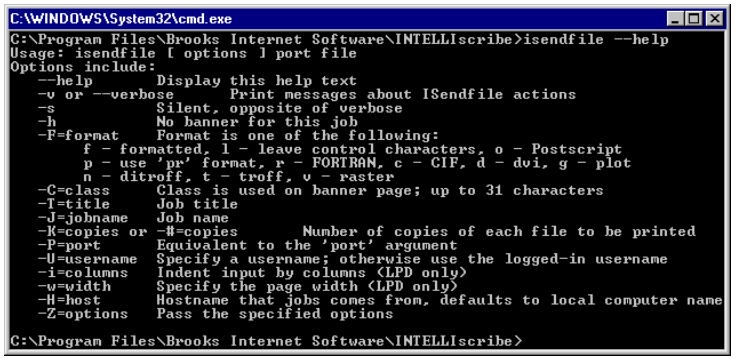
- Need for effective dialogue between humans and machines
- Appropriate interface design to provide effective communication for users
- Need to deign human computer interfaces that take into account the:
  - task
  - user experience
  - user preference
  - and resources.

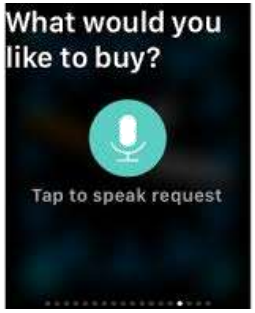
Types of HCI's

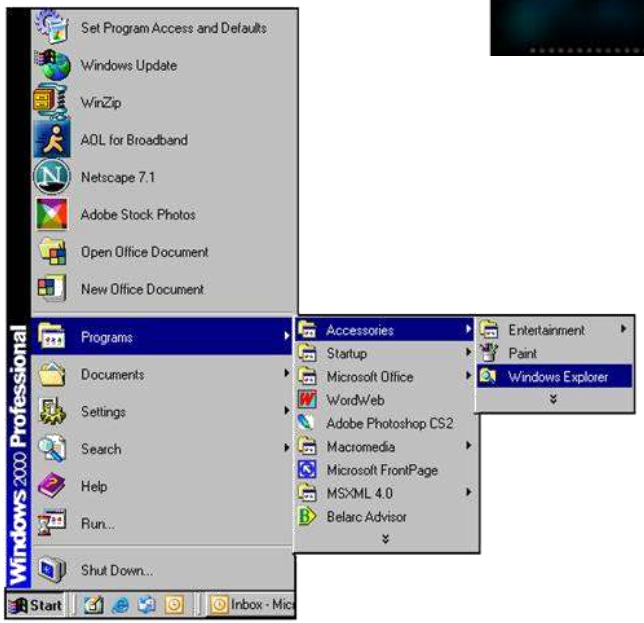
- Command line
  - Interfaces where you have to type in commands
- Graphical User Interface
  - Enter commands by pointing and clicking on objetcs on the screen
- Menu driven
  - User is presented with menus
- Voice driven
  - Interface where you speak commands
- Biometrics
  - Uses a unique characteristic
- Touch screen

Types of HCI's

HCI	Use	Features	Advantage	Disadvantage
Command line	Find information on a network		•Quicker once commands are known •Uses less memory	•Difficult for beginners to use •Have to remember instructions
GUI	Customising a desktop	•Windows •Icons •Mouse •Pointer	•No language needed •Use of icons •Easier to use (mouse)	•More memory is needed •Increased processing requirements
Menu driven	At a call centre		•A simple interface which is easy to use	•Only suitable where there are a few items to select from
Voice driven	Human voice control in a car navigation system		•Faster than typing •99% accurate •Cheap	•Takes a while to get used to •Errors due to background noise •Train the system to your voice
Biometrics	Registration system		•Nothing to forget •Unique	•Dirty
Touch	At a museum POS		•Simple •Can be used by anyone	•Dirty •Glare


C:\WINDOWS\System32\cmd.exe
C:\Program Files\Brooks Internet Software\INTELLIscribe>isendfile --help
Usage: isendfile [options] port file
Options include:
--help Display this help text
-v or --verbose Print messages about ISendfile actions
-s Silent, opposite of verbose
-h No banner for this job
-F=format Format is one of the following:
f - formatted, l - leave control characters, o - Postscript
p - use 'pr' format, r - FORTRAN, c - CIF, d - dvi, g - plot
n - ditroff, t - troff, v - raster
-C=class Class is used on banner page; up to 31 characters
-T=title Job title
-J=jobname Job name
-K=copies or -#=copies Number of copies of each file to be printed
-P=port Equivalent to the 'port' argument
-U=username Specify a username; otherwise use the logged-in username
-i=columns Indent input by columns (LPD only)
-w=width Specify the page width (LPD only)
-H=host Hostname that jobs comes from, defaults to local computer name
-Z=options Pass the specified options
C:\Program Files\Brooks Internet Software\INTELLIscribe>


What would you like to buy?
Tap to speak request


Set Program Access and Defaults
Windows Update
WinZip
AOL for Broadband
Netscape 7.1
Adobe Stock Photos
Open Office Document
New Office Document
Programs
Documents
Settings
Search
Help
Run...
Shut Down...
Windows 2000 Professional
Start
Accessories
Startup
Microsoft Office
WordWeb
Adobe Photoshop CS2
Macromedia
Microsoft FrontPage
MSXML 4.0
Belarc Advisor
Entertainment
Paint
Windows Explorer

Topic 10 - Social Issues

What you need to know:

Candidates should show:

- Health and safety issues associated with ICT
  - an awareness of RSI, stress, eyestrain, dependency, ELF radiation, back strain (posture) and their prevention;
- Acceptable use of ICT equipment and services
  - an awareness of the user's responsibilities relating to the appropriate use of ICT equipment, networks and the Internet;
- Legislation covering the use of computers
  - an understanding of the Computer Misuse Act, Data Protection Act (1998), Copyright Act;
- explain the consequences of malpractice and crime
- on information systems.

Health and safety issues associated with ICT

- Back ache
- RSI (Repetitive Strain Injury)
- Eye strain
- Stress
- ELF (extra low frequency) radiation
  - Given out by all electrical devices including computers and computer equipment.

Health and safety issues associated with ICT

- Back ache
  - Caused by sitting in the incorrect posture.
  - Preventions
    - Use an adjustable chair
    - Check chair is adjusted to you specifically
    - Sit up straight
    - Line up the screen and tilt at an appropriate angle.
- RSI
  - Causes aches and pains in hands, wrists, arms and neck.
  - Prevention
    - Adjust your chair
    - Ensure there is enough space
    - Use an ergonomic keyboard
    - Use a wrist rest
    - Keep your wrists straight when typing.

Health and safety issues associated with ICT

- Eye strain
  - Caused by using the screen for long periods of time
  - Prevention
    - Keep the screen clean
    - Use appropriate lighting
    - Take regular breaks
    - Have regular eye tests
- Stress
  - Caused by pace of work; worrying about new technology; software or loosing work
  - Prevention
    - Good management of time
    - Help desks
    - Anti-virus software, firewalls to prevent loss of work.

The application of current health and safety regulations

- Under the Health and Safety at Work Act 1974, employers have a duty to minimise risks to employees in the workplace.
- Some of these duties are:
  - Computer screens
  - Appropriate training
  - Chairs
  - Desks or workstations
  - Keyboard

Acceptable use of ICT equipment and services

- Appropriate use of ICT equipment
  - Report broken equipment
  - Not store unauthorised software on computers
  - Keep regular backups
- Appropriate use of networks
  - Don't send inappropriate emails
  - Log off system if they leave workstation
  - Do not reveal customer information
  - Change passwords regularly
- Inappropriate use of ICT
  - Deliberately damaging hardware or software
  - Using ICT to commit fraud
  - Downloading offensive material
  - Stealing company data
  - Hacking
  - Identity theft

Acceptable use of ICT equipment and services

- malpractice (improper or careless use)
  - Accidently deleting data
  - Not scanning virus software often
- Crime (any act that is against the law)
  - Hacking
  - Deliberately distributing viruses
- Acceptable use policy
  - This policy makes it clear about what disciplinary action will be taken if the ICT system is abused.

Legislations

- Data Protection Act 1998
- Computer Misuse Act 1990
- Copyright, Designs and Patents Act 1988

Legislations - DPA

- Covers the misuse of personal data, whether by the use of ICT systems or not.
- Terms:
  - Personal data – data about a living identifiable person, which is specific to that person.
  - Data subject – the living individual whom the personal information is about.
  - Data holder/controller – the person whose responsibility it is in an organization to control the way that personal data is processed.
  - Information Commissioner – the person responsible for enforcing the Act. They also promote good practice and make everyone aware of the implications of the Act.

Legislations - DPA

- Anyone can see the personal data held about them. Organisations have to show it and if it is wrong, then it must be corrected.
- A data subject can sue an organisation that does not keep their personal data secure.
- If data is processed unlawfully by an organisation then the person can take them to court
  and claim compensation.
- The data holder is responsible for telling the information commissioner what data they are holding and why.

8 Principles

Adequate, relevant and not excessive

Processed fairly and lawfully

Accurate and kept up to date

Kept secure

Not transferred outside of the EU.

Not kept any longer than is necessary

Obtained only for its specified purpose

Processed in accordance with the rights of the data subject

Legislations - DPA

- Exemptions:
  - Where data is used for personal, family or household use.
  - Where data is used for preparing text (e.g. references).
  - Where data is being used for calculation of pay or pensions.
  - Where data is being used for mailing lists provided only name and address details are stored.
  - Data used for the prevention or detection of crime.
  - Data used for the apprehension or prosecution of offenders.
  - Data used for the assessment or collection of tax or duty.

Legislations – CMA

- Makes it an offence to:
  - Deliberately plant or transfer viruses to a computer system
  - Use an organisations computer to carry out unauthorised work
  - Hack into someone else's computer with a view to seeing the information or altering it
  - Use computers to commit fraud.
- Problem with the CMA:
  - Hard for police to prove the misuse was deliberate.

Legislations – Copyright, Designs and Patents Act 1988

- Makes it a criminal offence to copy or steal software, databases of data, computer files and manuals.
  - Copy or distribute software or manuals without permission
  - Run purchased software covered by copyright on two or more machines at the same time unless there is a software license which allows it.
  - Compel employees to make or distribute illegal software for use by the company.
- Consequences of breaking this law:
  - Unlimited fines and up to 10 years imprisonment
  - Lose your reputation
  - Sued

Consequences of malpractice and crime

- Complete loss of data
- Prosecution under the DPA 1998
- Loss of money
- Loss of ICT facilities
- Loss of customer confidence
- Bad publicity in press
- Possibly put lives in danger.

Topic 11 - Database System

What you need to know:

- Definition of a database
  - Candidates should be able to define a database as a large collection of data items and links between them, structured in such a way that allows it to be accessed by a number of different applications programs.
- Advantages and disadvantages of a database approach over flat files
- Database security
  - Hierarchy of passwords
  - Storage of data separate to programs

Databases

- A database is a large collection of data items and links between them, structured in such a way that allows it to be accessed using different software.
- Here is an example of a game rental shop flat file systems
  - Only contain one table of data

Code	*Name*	*Type*	*Certificate*	*Cost of Hire*	*Name*	*Address*	*Date*
V0001	GTAIV	Action	18	£4.00	John Moses	5 Deane Road	22/11/99
V0002	FIFA12	Sport	12	£5.00	Jon Moses	5 Deane Road	23/11/99
V0003	Gears of War 3	Action	18	£4.50	John Moses	4 Dean Road	24/11/99
V0004	LA Noire	Action	18	£2.50	John Moses	5 Deane Road	25/11/99

Databases

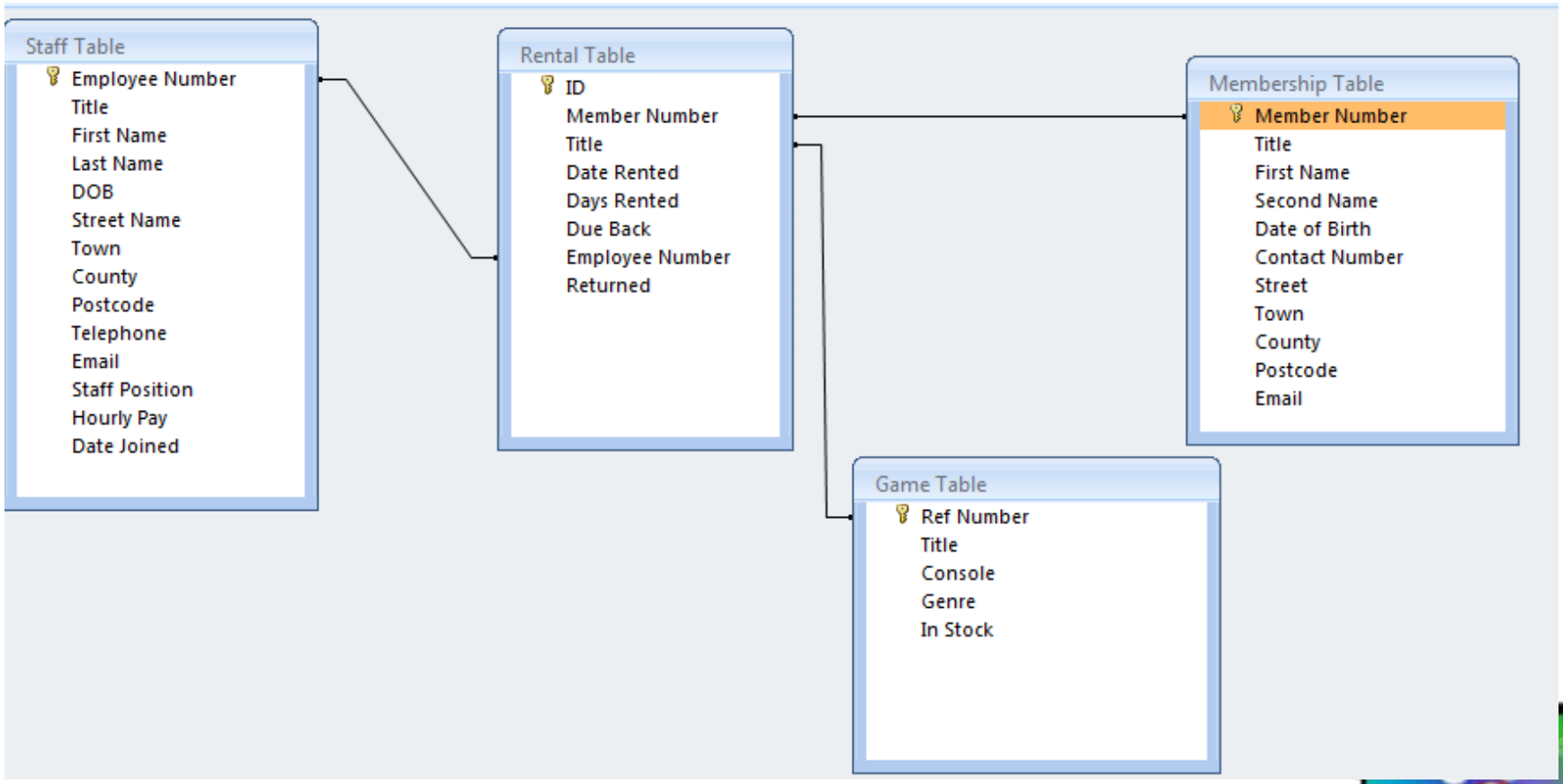
- Problems with flat file systems:

  Can cause **data redundancy**, **data inconsistencies**, and data may not have proper **integrity**.

  Data redundancy is where you store an item of data more than once in a database. This means that data entry/amending time is longer (as multiple copies need to be added/amended), and disk space is wasted.

  Data inconsistencies - data that should be identical, but isn't. File types, or the data itself could differ. If you have several similar pieces of data, how would the user know which one to trust?

This data would be stored in a relational database, as follows.



Databases

- Flat file
  - There is a much more efficient way of organising this data which is by storing it in multiple tables and linking them together to form a relational database.
- Relational database
  - Data is held in two or more tables
  - There are links between the tables
  - Data can be extracted from any table
  - Greater knowledge is needed to set one up.

Databases

Relational database over flat files	
Advantages	**Disadvantages**
•Data may become more flexible •No data duplication •Data integrity is maintained •Easier to search for specific information	•Hard to set up •More expensive •Inappropriate for simple lists

Database Security

- Data in a database needs to be secured against unauthorised access using a password system.
  - Hierarchy of passwords
    - Users can be allocated certain access rights to the database.
    - Gives some users more access and rights than others
    - Read only
    - Read and write
    - Execute

Topic 12 - Modelling

What you need to know:

- undertaking this unit candidates should; understand and use the following spreadsheet modelling concepts;
  - cell
  - label
  - data formats
  - common formulas (as listed below)
  - absolute cell referencing
  - relative cell referencing
  - single and multi-level sorting of data
  - searching for data
  - 3D referencing
  - named cell ranges
  - data validation techniques
  - graphing techniques
  - macros to initiate automated routines
- Candidates should also understand and use:
  - the concept of workbooks
  - a variety of spreadsheet facilities used for data entry including spinners, list boxes or combo boxes
  - a variety of formulas and functions of a spreadsheet
  - various formatting options of their spreadsheet to display a professional presentation