## Introducing peripherals

Peripherals are devices that are *not* the computer's core architecture involved in **memory** and processing. Peripherals include input hardware, output hardware and storage devices.

A typical desktop computer could include:

- **Inputs** - mouse, keyboard, webcam, games controller etc.
- **Outputs** - screen, printer, speakers, headphones etc.
- **Storage** - hard drive etc.
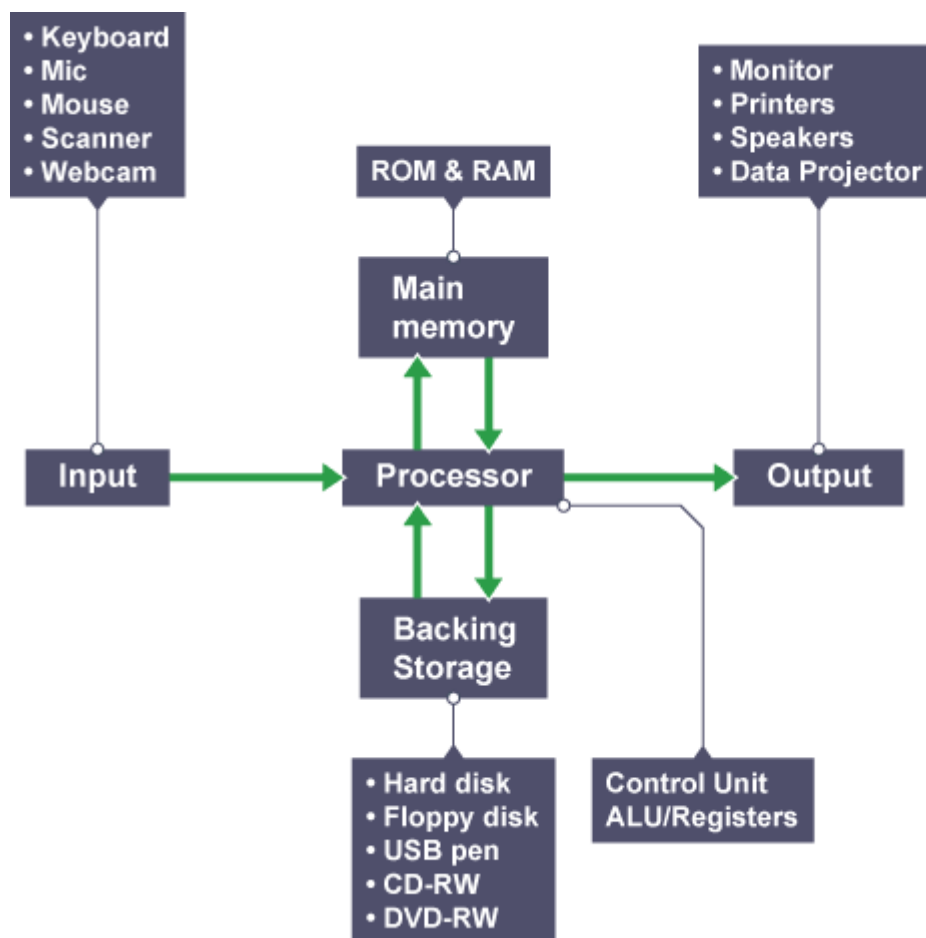
Input Devices:

In computing, an **input device** is a peripheral (piece of computer hardware equipment) used to provide data and control signals to an information processing system such as a computer or information appliance.
Input devices are hardware that allows data to be input into computers. Input devices send signals into the computer that have to be interpreted by the **operating system** using drivers.
Some of the most common input devices include: keyboards, mice, scanners, digital cameras and joysticks etc.
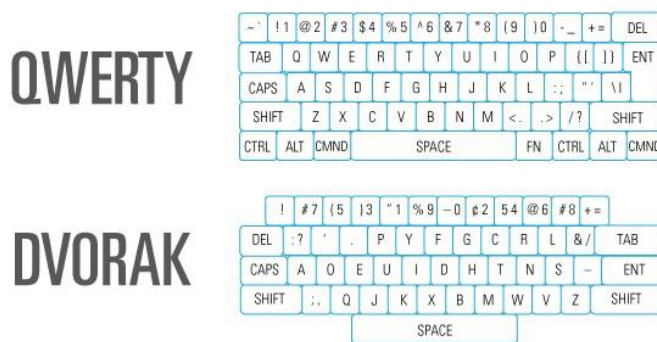
Keyboards: -

The keyboard is the most common and widely used input device. It is made up of buttons called 'keys'. The keys are arranged into sections:
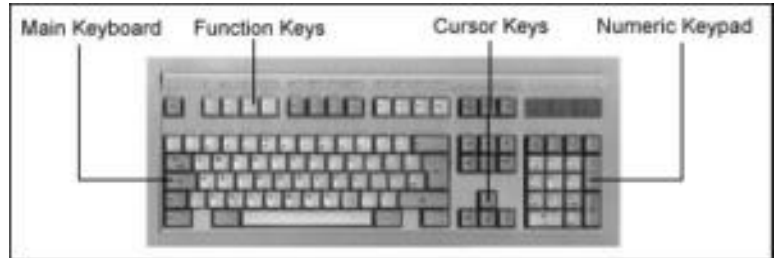
- Alphabet keys
- Function or F keys (F1, F2, F3)
- Numeric keys
- Arrow keys
- Command keys (insert, delete, home, end, page up/down)

Most keyboards are called **'QWERTY'** keyboards. This name comes from the first six letters on the top row of the alphabet keys.

Uses: - Keyboards are used to enter characters and data into computers. A QWERTY keyboard uses the standard layout for English-speaking countries.

The **Dvorak** keyboard layout is an alternative and was designed to avoid awkward key combinations.

Did You Know?

The current keyboard layout, or the QWERTY layout, which is based on the layout of the typewriter, was designed not to increase the speed of typing, but to slow it down in order to avoid typewriters from jamming.

Keys on a keyboard send information into the computer which is interpreted using the **ASCII** or **Unicode** character sets. Most people find the QWERTY arrangement best as they have had some practice using it, but users trained on the new keyboards can type faster than the fastest typists can on QWERTY keyboards.

Advantages	Disadvantages
Most computers come with a keyboard supplied	It is easy to make mistakes when typing in data
People are used to using keyboards to enter data, they need very little training	If you can't touch type, it can be time consuming to enter data
A skilled typist can enter data very quickly	Keyboards are not suitable for creating diagrams
Specialist keyboards are available e.g.	Disabled people often find keyboards difficult

Advantages	Disadvantages
ergonomic, gaming keyboards	to use
	Excessive use can lead to health problems such as repetitive strain injury (R.S.I.)

Concept keyboard: - is a flat board that contains a grid of buttons. Each button can be programmed to do whatever you want. Concept keyboard uses icons or phrases instead of standard letters.

An overlay sheet with pictures or symbols is placed on the grid so that the user can tell what pressing on different areas will do. Concept keyboards are used when fast input is needed and are ideally suited to selecting from a limited range of choices such as fast food restaurants.

- **Checkout tills** such as McDonalds use symbols to make ordering faster and easier.

- **In Primary schools Games for young children**: The overlay image could be a picture of a farmyard. Pressing on an animal would cause the computer to make the noise that the animal does.

- **For disabled people** concept keyboards are particularly useful who would find using an ordinary keyboard difficult.

It is also very handy in locations where an ordinary keyboard might be damaged e.g. by spillage or dust. Concept keyboards are excellent where there is a limited set of things to select and it needs to be done fast e.g. fast food store, pub, skating and other recreation events.

Advantages of concept keyboards	Disadvantages of concept keyboards
Much faster for making non-text selections such as menu choices on the till of a fast-food outlet.	Poor for text or numeric input - although some keyboards do include a numeric keypad so the operator can enter the amount sold.
The keyboard is waterproof which can be useful where there is dirt or the risk of splashes	Limited to the options shown on the keyboard.

Numeric Pad: -

A Numeric keypad is used to enter numbers only. (Although some have function key to allow input of alphabetic characters). A small keyboard that only has **numbers** Used to enter **numeric data** into computers such as those in ATMs. Most computer keyboards have a numeric keypad on the right side, and most mobile phones (there are also computers) have a one for entering phone numbers, etc

Advantages	Disadvantages
Faster than standard keyboards for entry of numeric data.	They can be difficult to use due to very small keys
Since many are small devices (e.g. mobile phones), they are very easy to carry around	Sometimes order of the numbers on the keypad isn't intuitive.

PIN Pad: -

This is a device with a **numeric keypad** used to enter a person's **Personal Identity Number** (PIN) e.g. when paying with a credit card. PIN pads are also found on electronic door **locks** – you enter a PIN to unlock the door.

Mouse:

Everyone is familiar with a computer mouse; along with the keyboard, it is one of the most common input devices you will use.

A mouse is also called a 'pointing device' because it enables you to control what happens on the screen by moving the mouse on your desk and pointing, clicking and selecting items on the screen.

A mouse usually has two buttons, a right and left one and also a central wheel which allows you to scroll up and down the page (some mice have up to five buttons). The left and right button have different functions. Left clicking usually lets you put your cursor at a certain point on the page or lets you choose a menu item. Right clicking brings you up a list of relevant menu items from which you can select a task.

Many of the older styles of mice used a ball which moved against two internal rollers to record the direction that the mouse was being moved in. Recent versions of mice use 'optical' or 'wireless' technology to track mouse movement.

Turn over the mouse you are using right now, do you see a red light? If you do, then you are using an optical mouse.
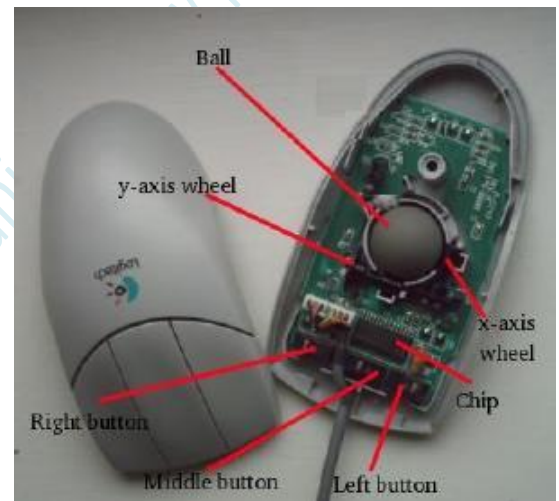
Advantages of mice	Disadvantages of mice
Ideal for use with desktop computers	They need a flat space close to the computer
Usually supplied as part of a new computer system	Older style mice which have roller balls can become clogged with grease and grime and lose their accuracy until cleaned.
Most computer users are familiar with them and require little training	Excessive use can lead to health problems such as repetitive strain injury (R.S.I.)
Works well in conjunction with a keyboard for data entry	If the battery wears out in a wireless mouse, it cannot be used until it has been replaced

Touchpad / Trackpad

A **pointing** device found on most **laptops**. Used instead of a mouse since it takes up **less space**. The user moves a finger across the touch pad and this movement data is sent to the computer. Usually used to control the pointer in a **GUI**. sensors underneath detect the movement direction and speed. The sensors only react to a fingertip and not a pencil or other object. There are usually two buttons next to the touchpad which are used to replace the left and right mouse button.

Advantages of touchpads	Disadvantages of touchpads
Useful for laptops when using a mouse isn't practical	Takes practice and skill to control the position of the cursor using the touchpad
The pad's position is fixed compared to the keyboard, unlike with a traditional mouse	Gloves cannot be worn i.e. in a clean room or industrial environment where gloves need to be worn.
Very short finger movements are required to move the cursor	Moist, sweaty or calloused fingers can disrupt the signals picked up by the sensors.

Trackball / Tracker Ball

This **pointing** device is not moved about like a mouse, instead it has a **large ball** that the user spins. Data about which direction the ball is spun is passed to the computer.
It can be used to control a **GUI** pointer.
Tracker balls are often used by people with **limited movement** (disabled) or by the **very young** since they are **easier to use** than a mouse.

Trackball - similar to a mouse, this is used where extreme accuracy is needed - for example, in **CAD**, sound and video editing, and some medical imaging applications (such as **MRI** scans).

Touch Screen

A touch screen is an alternative to a separate pointing device. With a touch screen the user selects items on the screen by **touching** the surface. This makes touch screen systems very **intuitive** and **simple to use**.

Often used for **information terminals** in public places e.g. libraries or museums where mice or keyboards may be stolen or damaged.

Because they are so intuitive to use, and now they are getting cheaper to manufacture, touch screens will probably become the most common hardware interface for our electronic gadgets.

Another major use of touch screens are on smart phones and modern tablet computers. Each 'app' is accessed by an icon on the touch screen.

Advantages of touch screens	Disadvantages of touch screens
Easy to use - intuitive, don't need much training	Not suitable for inputting large amounts of data
No extra peripherals such as a mouse are needed	Not very accurate - selecting detailed objects can be difficult with fingers
Software can alter the screen while it is being used, making it more flexible than a concept keyboard which has a permanent overlay.	Tiring to use for long periods
Touch screen is the main interface on smart phones and tablet computers	More expensive than alternatives such as a mouse (unless it is part of the computer \ smartphone in any case)
Can make use of finger gestures to make sophisticated actions such as zooming and selecting.	Less useful as a control input to a standard computer that makes use of the mouse \ keyboard combination e.g. laptop, desktop pc

Joystick

Joysticks were originally used by pilots as part of an aeroplane's controls and the technology was developed to let computer gamers experience a more realistic game environment.

You can move joysticks in many directions and the joystick tells the computer which direction it has been moved into. They also have one or more buttons whose position when pushed can be read by the computer.

Joysticks can also be used for controlling machines such as cranes, trucks and powered wheelchairs.

Advantages of joysticks	Disadvantages of joysticks
They give a better gaming experience for racing or flying styles of computer games	Some people find joysticks more difficult to control than a traditional mouse.

Advantages of joysticks	Disadvantages of joysticks
	Joysticks are not particularly robust and can break easily if too much force is used on them.

Magnetic Stripe Reader

Magnetic strips are usually found of the back of most credit cards, cheque guarantee cards, loyalty cards, membership cards etc.

The magnetic strip can hold personal details such as account number and name. The strip can contain up to 60 characters, stored magnetically.

To read the data on the card, it is 'swiped' through a Magnetic Stripe Reader machine and the data is read and fed back to the computer.

Advantages of Magnetic Stripe Readers	Disadvantages of Magnetic Stripe Readers
Simple for people to use - little or no training	Very limited storage capacity for data
Cards are inexpensive to produce	Data can be easily destroyed by strong magnetic fields
Data on the cards can be altered if necessary	Not always secure as thieves can obtain the readers (machine that reads the stripe) and read the data on card.
Security is improved by the use of PIN numbers to confirm that the person is the rightful card owner	

Smart Card

A **smart card** is a device that includes an embedded integrated circuit that can be either a secure microcontroller or equivalent intelligence with internal memory or a memory chip alone. The **card** connects to a reader with direct physical contact or with a remote contactless radio frequency interface.

A **smart card** contains more information than a magnetic stripe **card** and it can be programmed for different applications. Some **cards** can contain programming and data to support multiple applications and some can be updated to add new applications after they are issued.

Advantages of Smart Cards	Disadvantages of Smart Cards
Some smart cards (e.g. transport tickets) are used instead of money, reducing the need to carry cash.	Very limited storage capacity for data
Chip on card does not to be in contact with reader, so there is less damage as compared to Magnetic stripe reader.	Data can be easily destroyed by strong magnetic fields

Fraudulent and Crimes involving Card Readers

Credit card/debit card fraud is a wide-ranging term for theft and fraud committed using or involving a payment card, such as a credit card or debit card, as a fraudulent source of funds in a transaction.

Victims of credit card skimming are completely blindsided by the theft. They notice fraudulent charges on their accounts or money withdrawn from their accounts, but their credit and debit cards never left their possession. How did the theft happen?

How Credit Card Skimming Works

Credit card skimming is a type of credit card theft where crooks use a small device to steal credit card information in an otherwise legitimate credit or debit card transaction.

When a credit or debit card is swiped through a skimmer, the device captures and stores all the details stored in the card's magnetic stripe. The stripe contains the credit card number and

expiration date and the credit card holder's full name. Thieves use the stolen data to make fraudulent charges either online or with a counterfeit credit card.

Credit card skimmers are often placed over the card swipe mechanism on ATMs and gas stations, but they skimmers can be placed over almost any type of credit card reader. With ATMs, the crooks may also place a small, undetectable camera nearby to record you entering your PIN. This gives the thief all the information needed to make fake cards and withdraw cash from the cardholder's checking account.

Occasionally, certain retail and restaurant workers who handle credit cards are recruited to be part of a skimming ring. These workers use a handheld device to skim your credit card during a normal transaction.

For example, we routinely hand our cards over to waiters to cover the check for a restaurant. The waiter walks away with our credit cards and, for a dishonest waiter, this is the perfect opportunity to swipe the credit card through a skimmer without being detected.

Once the victim's credit card information is stolen, thieves will either create cloned credit card to make purchases in store, use the account to make online purchases, or sell the information on the internet.

Victims of credit card skimming are often unaware of the theft until they notice unauthorized charges on their account, have their card unexpectedly declined, or receive an overdraft notification in the mail.

Scanner

Scanners can be used to convert images or text on paper into a digital format that can be used by the computer.

A scanner works by shining a beam of light onto the surface of the object that you are scanning. This light is then reflected back onto a sensor that detects the colour of the light. This is then used to build up the digital image.

Items that are scanned are usually stored in an image format.
However, special software - Optical Character Recognition - can be used to convert text on the paper into text which can be edited with a word processor. However, the text doesn't always get converted very well and you could end up with a lot of mistakes.

There are three types of scanner:

- Flatbed scanners
- Handheld scanners
- Specialist scanners

Flatbed scanner: The most popular type is the flatbed scanner. This is shown in the picture above that has its lid raised to show the glass surface where you place the item to be scanned. This is probably the one that you use at school. They can scan larger images and are more accurate than handheld scanners.

Handheld scanners are usually only a few inches wide and are held in the hand whilst they are rolled across the document to be scanned. The images produced are generally not as large or as high quality as those captured with a flatbed scanner.

Specialist scanners: If you are a photography enthusiast with a large collection of pre-digital 35mm negatives, then there are specialist scanners that can scan older 35mm film. In theory a standard scanner could do it but the film itself is relatively tiny and will result in very poor scans. The 35mm film scanner is exactly the same technology but the scan is set to go accurately over the 35mm range of the negative.

Another aspect of scanning is emotional - say you can scan the perfect reproduction of a loved family photograph. Question - do you then throw away the original photo? Only you can answer this question. But it does imply that there is something important about original documents - something that all the leading archive libraries in the world have to deal with despite the state-of-the-art scanning process.

Advantages of scanners	Disadvantages of scanners
Flatbed scanners are very accurate and can produce reasonably high quality images.	Images produced by the scanner can take up a lot of memory space.
Any image which is digitized by the scanner can then be included on electronic documents.	Images lose some quality in the scanning and digitising process.
Images once digitized can be enhanced with a graphics application.	The quality of the final image is dependent on the quality of the original image .
Specialist scanners can convert old material such as 35mm negatives into digital files.	Emotional value - is there value in the original image?
Can accurately capture an image, but the original source may be more important than the scanned image.	

Digital Camera

A device that captures **digital photographs**.

Most digital cameras do not directly input data into a computer - they store photographs on **memory cards**. The photographs can later be **transferred** to a computer.

A modern digital camera can capture 20 Megapixels or more per photograph - that's 20,000,000 coloured dots (pixels) in every photo!

Video Camera

A device that captures **moving images**, or **video**.

Like a digital camera, most video cameras do not directly input data into a computer – the captured movies are stored on **video-tape** or **memory cards** and later **transferred** to a computer.

However, there are some situations where video cameras do feed video data directly into a computer: **television production** and **video-conferencing**. In these situations the video data is required in real-time.

Webcam

A webcam is short for 'web camera'.

A webcam is an input device because it captures a video image of the scene in front of it. It is either built in to the computer (e.g. laptop) or it is connected through an USB cable.

The video signal is made up of a series of individual 'image frames' which are an instant snapshot of the scene in front of it. Each image frame is sent to the computer for further processing by webcam software. If the 'frame rate' is fast enough (more than 25 frames per second) it appears as motion video.

Many webcams are also used to catch an image frame every now and then, perhaps every minute or even every hour.

Common uses of webcams include:

Security

Webcams can also be used to capture an image only if movement is detected in the scene in front of it so they are widely used in burglar alarm and other security equipment

Crimes and Laws of Digital Cameras

Enterprise security investigators, investigative firms and law enforcement more often today are involved in incidents that center on digital cameras, camera-embedded cellular telephones and other image capture and storage devices.

In addition to crimes of violence and assaults, digital cameras can be the thief's tool in intellectual property crimes – in offices, plants, research and development centers.

There have been reported incidents of a visitor to a corporation taking illicit pictures with a personal cell phone, sending them to a remote site and then erasing the photos. Some enterprises now prohibit cell phones in certain sensitive areas. Similar to data erased from a computer hard drive and e-mails erased from local desktop, erased digital photos may still be recoverable during an investigation. – Editor

The Wall Street Journal, just two years ago, estimated that approximately three billion of the six and a half billion people in the world would have a cell phone. Many of these phones have Internet access and digital cameras built into them. In addition to that, millions of digital cameras, personal computer Web cams, and digital picture frame devices are sold worldwide. These statistics are meant to give an idea of the enormity of digital picture taking and sharing activities.

It is also common knowledge that cybercrime has been increasing in magnitude each year. However, another interesting development has been the number of electronic devices that show up at crime scenes as either belonging to the victim or having been dropped or left by an alleged criminal.

Microphone

An input device that converts **sound** into a signal that can be fed into a computer. The signal from a microphone is usually **analogue** so, before it can be processed by a computer, it must be converted into digital data. An **Analogue-to-Digital Convertor (ADC)** is used for this (usually built into the computer's sound card)

Many headphones now come with microphones to allow them to be used with chat and phone applications
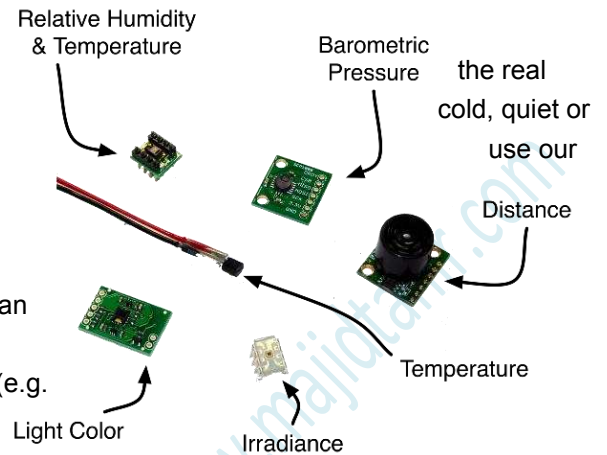
Sensors

A normal PC has no way of knowing what is happening in
world around it. It doesn't know if it is light or dark, hot or
noisy. How do we know what is happening around us? We
eyes, our ears, our mouth, our nose and our skin -
our **senses**.

A normal PC has no senses, but we can give it some: We can
connect **sensors** to it...

A **sensor** is a device that **converts** a **real-world property** (e.g.
temperature) into **data** that a computer can **process**.

Examples of sensors and the properties they detect are...

Sensor	What it Detects
Temperature	Temperature (used in automatic cookers, washing machines, green houses, central heat controllers and environmental monitoring etc.)
Light	Light / dark (used in computer controlled greenhouses, burglar alarm systems, robotics, production line control, scientific experiments and environmental monitoring etc)
Pressure	Pressure (e.g. someone standing on it, used in burglar alarms, robotics, automatic washing machines, production line control and environmental monitoring etc)
Moisture	Dampness / dryness
Water-level	How full / empty a container is
Movement	Movement nearby
Proximity	How close / far something is
Switch or **button**	If something is touching / pressing it

A sensor measures a specific property data and sends a signal to the
computer. Usually this is an **analogue** signal so it needs to be converted

into **digital** data for the computer to process. This is done using by an **Analogue-to-Digital Converter** (ADC).

Sensors are used extensively in **monitoring / measuring / data logging systems**, and also in **computer control systems**.

Graphics Tablet

A **pointing** device often used by **designers** and **artists** to allow **natural hand movements** to be input to **graphics** applications.

A stylus is held like a pen and moved over the surface of the tablet. Data about the stylus movements are sent to the computer.

Since it is so like using a pen, it is very easy to create '**hand-drawn**' sketches.

A graphics tablet consists of a flat pad (the tablet) on which you 'draw' with a special pen. As you draw on the pad an image is created on the computer monitor from within the application that the tablet is connected to.

The pen is usually radio controlled rather than touch control. This is very useful should you want to trace out an existing line drawing on paper, as you can simply place the paper over the pad and start tracing it out. Some pens have a pressure sensitive tip to allow the artist to draw heavier or lighter lines.

| Advantages of graphics tablets	Disadvantages of graphics tablets
It is much more natural to draw diagrams with a pencil type implement (the stylus) rather than with a mouse	Not really suitable for general selection work such as pointing and clicking on menu items
A great level of accuracy can be achieved	Graphics tablets are much more expensive than a mouse

MICR Reader

Magnetic Ink Character Recognition (**MICR**) is a technology that allows details from **bank cheques** to be read into a computer **quickly** and **accurately**.
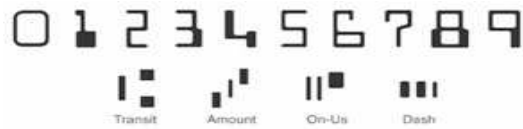
The **cheque number** and **bank account** number are printed at the bottom of each bank cheque in **special magnetic ink** using a **special font**. These numbers can be detected by an **MICR reader**.

OMR **Optical Mark Reader**

Optical Mark Recognition (**OMR**) is a technology that allows the data from a **multiple-choice** type form to be read **quickly** and **accurately** into a computer.

Special OMR forms are used which have spaces that can be **coloured in** (usually using a pencil). These **marks** can then be **detected** by an **OMR scanner**.

Common uses of OMR are **multiple-choice exam** answer sheets and **lottery number** forms.

Barcode Reader / Scanner

A barcode is simply a **numeric code** represented as a series of **lines**. These lines can be read by a **barcode reader/scanner**.

The most common use of barcode readers is at Point-of-Sale (**POS**) in a shop. The **code** for each item to be purchased needs to be entered into the computer.

Reading the **barcode** is far **quicker** and more **accurate** than **typing** in each code using a keypad.
Barcode can be found on many other items that have numeric codes which have to be read quickly and accurately - for example ID

Light Pen

A light pen is a device used as a **pointing** device or to '**write**' on the **screen** of a computer.

Light pens are **rarely used** today since graphics tablets and high-quality touch screens provide similar functionality.

References:
 http://www.buzzle.com/articles/computer-keyboard-functions-how-does-a-keyboard-work.html