

**1: Complete ICT for Cambridge IGCSE® Second edition : Secondary: Oxford University Press**

*Endorsed by Cambridge International Examinations Now including Brian Sargent in the expert author team, alongside first edition authors Graham Brown and David Watson, this book has been fully revised and updated to cover every part of the latest Cambridge IGCSE ICT () syllabus.*

These will be discussed in more detail in Chapter 2, but examples are given in Table 1. The central processing unit CPU is the part of the processor and internal memory computer that interprets and executes the commands and storage devices from the computer hardware and software. It is normally part of the computer motherboard. CPUs used to be made up of discrete components and numerous small integrated circuits; these were combined together on one or more circuit boards. However, due to modern manufacturing techniques, the CPU is now referred to as a microprocessor. This is a single integrated circuit which is at the heart of most PCs and is also found in many household devices and equipment where some control or monitoring is needed for example, the engine management system in a car. The CPU is made up of a control unit, which keyboard mouse controls the input and output devices; an arithmetic Figure 1. Random access memory RAM is an internal chip where data is temporarily stored when running applications. This memory can be written to and read from. Since its contents are lost when power to the computer is turned off, it is often referred to as a volatile or temporary memory. This was fully defined in Figure 1. Read-only memory ROM is a memory used to store information that needs to be permanent. It is often used to contain, for example, configuration data for a computer system. These chips cannot be altered and can only be read from hence their name. One of the main advantages is that the information stored on the 6 computer monitor printer 1. They are often referred to as non-volatile memories. It is worth noting that ROM also contains some coding known as the boot file. When the computer is turned on, the BIOS carries out a hardware check to find out if all the devices are present and whether they are functional. Then it loads the operating system into the RAM. The BIOS stores the date, time and system configuration in a non-volatile chip called a CMOS complementary metal oxide semiconductor – this is usually battery powered. The general tasks for a typical operating system include: There are often a number of commands that need to be typed in, for example, to save or load a file. The user therefore has to learn a number of commands just to carry out basic operations. Having to key in these commands every time an operation has to be carried out is also slow. However, the advantage of CLI is that the user is in direct communication with the computer and is not restricted to a number of predetermined options. For example, the whole of the CLI code in Figure 1. Simply selecting this icon would automatically execute all of the steps shown in Figure 1. One of the most common is WIMP windows icons menu and pointing device , which was developed for use on personal computers PCs. Each window contains an application, and modern computer systems allow several windows to be open at the same time. An example is shown in Figure 1. In recent years, devices such as touch-screen phones use post-WIMP interaction, where fingers are in contact with the screen allowing actions such as pinching and rotating, which would be difficult to do using a single pointer and device such as a mouse. The following sections summarise some of the more common types currently available. It is worth making a comparison here with laptop computers. The advantages of desktop computers over laptop computers are: They do also have disadvantages when compared to laptop computers, however: This makes them extremely portable. Key features you would expect to find in a laptop: Laptop computers do have disadvantages when compared to desktop computers, however: They work in a similar way to a smartphone. The keyboard is part of the touch screen and keys are simply touched by the finger or a stylus. Tablets are equipped with a series of sensors including cameras, microphones, accelerometers and touch screens. Some of the typical features of tablets include: Some of the latest tablet devices have been designed as a hybrid between tablet and smartphone – sometimes referred to as a phablet – which have slightly smaller screens than tablets typically between 12 cm to 15 cm display size. All of the features of a normal phone are available with some of the features of a tablet notably they have a larger screen size than a phone; larger memories – typically 32 GB or more memory as standard; use quad core processors; allows multiple windows to be open and so on. Disadvantages of tablets compared to laptops:

They make use of a number of Apps that allow the following functions, among many others: The touch screens are coated with a crystalline layer that allows the phones to be partially solar powered, but this also allows them to use Li-Fi similar to Wi-Fi except communication uses visible light rather than radio waves. Light on represents the binary value 1, while light off represents the value 0. This is the basis behind the method used for communication. As with smartphones, they use touch screen technology but also have the ability to link to smartphones using Bluetooth technology. Many of the advantages and disadvantages of smartphones also apply to smartwatches, but the following are additional points to be considered. The name comes from the days when the individual components were housed in large often room-sized frames. The main features of mainframe computers are: This section reviews briefly the impact of the following new technologies: A quick review on the internet is advised every six months or so to ensure that the reader is up to date with all the latest technologies. The system learns from the different alignments and is therefore still able to match the fingerprints to those stored on a database. Facial-recognition systems have the same problem. A human being is still able to recognise a face even if the person has grown facial hair, now wears glasses or has aged. Computerised facial-recognition systems are confused by such soft biometric changes. New systems use AI to learn from scanning a number of faces and can pick out these soft biometric features. This means the system can still recognise faces and cross-reference these attributes with corresponding images stored on the database. Other AI biometric technologies are being developed, so these security systems become increasingly more reliable. The system allows images to be projected inside the headset in front of the eyes. This effectively brings the objects closer for examination by the user of the system. Night vision enhancement NVE amplifies infrared light and visible light so that an image can still be seen in apparent darkness. For example, the military use this technology to carry out surveillance at night. The dim light source is captured and passed through an image intensifier tube, which converts the light into electrons. These electrons pass through another tube where they are amplified to produce several times the original number of electrons. A screen at the end of the tube is coated in phosphor dots that glow when electrons collide with them – this results in an image that is considerably clearer than the original. They are used in car factories to weld car bodies, spray body panels and fit items such as windscreens. No human intervention is required. These are unmanned flying devices that are used by both the military and civilians. The military have used drones in reconnaissance missions for a number of years. All of these are currently under evaluation and many more applications could evolve over the coming years. Another application is the use of robots in surgical procedures. Robotic surgery allows surgeons to perform complex procedures with more precision, flexibility and control than standard surgical techniques. This technique is often referred to as encryption. There are many methods of cryptography in existence but all of them have a limited life as computers become faster and faster at number crunching. A consequence of this is that, over the next few years, a hacker is increasingly likely to decipher encrypted messages unless computer designers can further strengthen security systems. Quantum cryptography is based on the use of photons light and their physical quantum properties to produce a virtually unbreakable cryptography system. This helps protect the security of data being transmitted over fibre-optic cables. The technology relies on the fact that photons oscillate in various directions and produce a sequence of random bits 0s and 1s across the optical network. It is based on the laws of physics rather than mathematics which is how current cryptography methods work. How this works in detail is beyond the scope of this book. Consider the insect called a fruit fly, which particularly enjoys eating bananas. What if we typed in the phrase: The statement in German only refers to the banana-shaped flight path of a piece of fruit thrown through the air! Imagine a whole page being translated that is full of such double meanings of words and phrases. Computer-assisted translation CAT goes some way to overcome these issues. CAT is a type of language translator that uses specific software to help in the translation process. In particular, CAT uses two tools: All CAT software needs some post-editing by the user to remove errors from the translation process. While not perfect, they are certainly more accurate than existing free online translators. The technology involves the use of: The hologram is produced by first splitting a laser beam; half of the light known as the object beam is reflected off the object on to a photographic plate. The other half of the light known as the reference beam is reflected off a mirror and on to the same photographic plate. The holographic image is produced where the

two light beams meet on the photographic plate. Holograms have the following applications: Virtual reality is used in all of the following areas:

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