Number of weeks (between 6&8)	**Content of the unit**	**Assumed prior learning (**tested at the beginning of the unit)

7	The unit is subdivided into six learning hours spread across six or seven lessons in order to fit with most school timetables. It is a theoretical unit covering the basic principles of computer architecture and use of binary. Pupils will revise some of the theory on input and output covered in previous learning and continue to look at the Input-Process-Output sequence and the Fetch-Decode-Execute cycle through practical activities. Pupils will then look at some simple binary to decimal conversion and vice versa, and learn how text characters are represented using the ASCII code. This will be followed by some simple binary addition. Pupils will learn more in depth how storage devices represent data using binary patterns and physically save these patterns. Finally, they will look at a brief history of communication devices, how new technologies and applications are emerging and the pace of change.	No previous learning is necessary with this unit. Many pupils may have a basic understanding of binary and its use to represent text and images from previous years. They may also have an understanding of input and output devices and their role in the Input – Process – Output sequence.

Assessment points and tasks	**Written feedback points**	**Learning Outcomes** (tested at the end and related to subject competences)
Pupils will sit multiple choice questions as their final assessment. This Scheme of Work is aimed towards GCSE Grade E-C.	Provide written feedback following the end of unit assessment.	**At the end of this Unit all pupils should be able to:** • Distinguish between hardware and software • Give examples of computer hardware and software • Draw a block diagram showing CPU, input, output and storage devices • Name different types of permanent storage device • Suggest appropriate input and output devices for a simple scenario • Explain what RAM and ROM are used for • Show how numbers and text can be represented in binary • Explain the impact of future technologies **Most pupils will be able to:** • Perform simple binary arithmetic • State strengths and weaknesses of different storage devices • Describe briefly how data is stored on a CD **Some pupils will be able to:** • Identify input and output devices for more complex scenarios • Explain how characters are encoded using the ASCII system • Use an ASCII reference chart to convert a character into binary and its decimal equivalent

Lesson	**Clear learning intentions**	**Clear success criteria**	**Hook**	**Presentation of content**	**Guided practice**	**Independent practice** (homework)	**Closure**

1	• Distinguish between hardware and software • Identify input, output and storage devices • Name at least five pieces of software • Understand what happens at the "Process" stage • Suggest appropriate input and output devices for a given scenario	Understand the difference between hardware and software Be able to Identify input, output and storage devices Be able to name at least five pieces of software Be able to understand what happens at the "Process" stage Be able to suggest appropriate input and output devices for a given scenario	Pupils to come up with a definition of a computer.	Briefly discuss the difference between hardware and software. Use the worksheet or PowerPoint slide for pupils to identify different devices, and establish whether or not they represent an input, output or storage device. Identify the software represented by the icons. Discuss how *Input* and O*utput* fit around *Process* in the *Input - Process - Output* sequence. What happens at the *Process* stage? Is the output the same as or different from the input? Why? An alternate explanation of IPO uses the human senses as inputs, the brain as the processor and storage device, and speech and movement as outputs.	Pupils to complete **Worksheet 2 Inputs, Processes and Outputs**. Pupils identify what is happening at each of the stages in the IPO sequence in different scenarios. Worksheet 2 pupils are asked to analyse the inputs, outputs and storage requirements of a supermarket self-checkout system.	Consider three devices at home (such as a washing machine, a security light or a blender) and note the inputs, processes and outputs of each. Note that a blender does not have a processing chip but still has input, processing and output!	Re-cap on the difference between hardware and software as well as IPO.

2	• Draw a block diagram of the main components of a computer: input, processor, output and storage • Explain what main memory is used for • Distinguish between main memory and permanent storage devices • Name the three stages in the Fetch Execute Cycle • Define Hz, MHz and GHz and state how these relate to the speed of the processor • Understand the difference between RAM and ROM and what ROM is used for	Be able to draw a block diagram of the main components of a computer: input, processor, output and storage Understand how to explain what main memory is used for Understand the difference between main memory and permanent storage devices Explain the three stages in the Fetch Execute Cycle Be able to define Hz, MHz and GHz and state how these relate to the speed of the processor Pupils to be able to know the difference between RAM and ROM and what ROM is used for	Pupils to identify some of the internal parts of a computer.	Look at the components pictured in the PowerPoint slide 3 and discuss their uses and or features. • Motherboard – contains all of the base components and houses the processor chip and connections to other components • Processor chip – slots into the motherboard • RAM chip – working memory used for temporary storage of programs and files whilst the computer is switched on • Graphics card – used to feed an output to a monitor and can contain additional memory and processing for video or graphics • Hard disk – used for permanent offline storage • Data bus – a cable used to transfer data Explain the difference between main memory (RAM) and backing storage (the hard drive).	Pupils use **Worksheet 3 Memory and Storage** to record the specification of processors and storage devices from websites such as PC World's.	Research the difference between RAM and ROM.	Re-cap the main components of a computer and understand the three stages in the Fetch Execute Cycle.

3	• State why all data is represented in binary in a computer • Understand that a particular bit pattern may represent, for example, an instruction to do something, a letter, a number or a tiny piece of a graphical image • Define a Bit, Byte, Kb, Mb and Gb • Convert integers to binary numbers • Convert binary numbers to integers • Look up from a table the bit pattern for a given character • State how many different characters can be represented using 8 bits • Give examples of alphanumeric characters and special symbols that can be represented in ASCII • Show that a bit pattern can represent either a character or a decimal number	Understand why data is represented in binary Convert integers to binary numbers Convert binary numbers to integers Understand the ASCII table Be able to state how many different characters can be represented using 8 bits	Begin by explaining that computers are calculators but use a different number system from the one we are used to, and cannot understand letters.	Show pupils the video explaining the principles of binary to decimal conversion. Using only 4 bits, ask pupils to work out the binary numbers from 1 to 10. Do they see a pattern? Explain **bits** and **bytes**. Demonstrate how the number of possible number combinations doubles with each additional bit. Ask pupils to work out all of the combinations of ONs and OFFs with one switch, two switches and again with three. Have they identified a pattern? Begin by explaining that computers are calculators but use a different number system from the one we are used to, and cannot understand letters.	Pupils use **Worksheet 4 Binary to Decimal Conversion** and complete *Challenge 1*. Pupils complete *Challenges 2* and *3* on the worksheet. Pupils complete *Challenges 1* and 2 from **Worksheet 5**.	Binary conversion worksheet.	Re-cap on binary and denary numbers as well as what is ASCII.

4	• Add two binary numbers (each less than 7 binary digits) • Multiply a binary number by 2 • Identify a binary number as being odd or even	Understand how to add two binary numbers (each less than 7 binary digits) Understand how to multiply a binary number by 2 Understand a binary number as being odd or even	Revise the basics of binary with a quick starter activity. Convert the numbers 1 to 10 from decimal to binary. Write these on the board with the pupils' help. Begin looking at simple binary addition.	Introduce binary addition. Show that there are only five simple rules to follow: 0 + 0 = 0 0 + 1 = 1 1 + 0 = 1 1 + 1 = 0 *Carry 1* 1 + 1 + 1 = 1 *Carry* 1 In rule 4 remind pupils that 1+1 = 10 rather than 2 because 10 = 2 in binary. In example 5, 1+1+1 = 11 which is 3 in binary. Given two binary numbers to add together, start at the right hand end of the binary number, as you would do with a denary calculation and follow the examples above. Go through the worked example in the PowerPoint Guide. What happens when you add a zero to a binary string? Show how to identify a binary number as odd or even. A useful tutorial exists online by following the *Link Binary Addition Tutorial* shortcut. Pupils may wish to revisit this to help their learning.	Pupils complete **Worksheet 6 Binary Addition**. **Extension:** Question 10 looks at overflow errors	Binary addition worksheet.	How do computers store numbers greater than 255?

5	• State the typical capacities, strengths and weaknesses of different storage devices • Describe how data is stored on a CD • Describe how 0s and 1s are represented by pits and lands on a CD • Name three types of optical storage device	Understand the typical capacities, strengths and weaknesses of different storage devices Understand how data is stored on a CD Understand how 0s and 1s are represented by pits and lands on a CD Be able to list three types of optical storage device	As a starter activity pupils can collectively identify each of the storage devices shown at the beginning of PowerPoint Guide **L5 Storage Devices**.	The lesson will then focus on the principles of how data is stored permanently; in this example, on Optical Media such as CDs. Look at how data is written to a CD ROM using Laser light – hence why they are known as Optical Media along with DVD, CD-R, CD RW, Blu-Ray etc. Explain that Pits are 'burnt' into the surface of the disk and these are read by a laser. Light is reflected against the silver surface of the CD and the intensity of the reflection is measured. A strong reflection is read as a 0, a poor reflection (scattered by the start or end of a Pit) is not reflected so well and is measured as a 1. Pits are burnt patches of disk. Lands are untouched parts of the disk. Pits and Lands are created in sequence along one long track arranged in a tight spiral starting from the centre of a CD. It would be over 5Km if laid out on the floor! Show pupils the diagram of a CD being read. Explain that as the laser passes along the track, it is constantly measuring the reflection from the disk's surface.	Pupils can then use **Worksheet 7 Storage Devices** to record their advantages and disadvantages. They should be able to access some research tools such as the Internet to find out their storage capacities. UCom Worksheet 5 ASCII Codes Pupils can use the PowerPoint slides on data units as a reference for their capacities and usefulness.	Research how a Hard Disk stores data as 0s and 1s.	Refer back to the different types of storage device at the beginning of the lesson. Ask pupils how they think similar principles might be applied to a hard disk with a magnetic surface.

6	• Review the history and development of communication. • Understand how modern communication and computing devices combine multiple technologies • Discuss the different ways and applications in which modern technology is used • Discuss future uses of technology and the pace of change (Moore's Law)	Understand the history and development of communication. Understand how modern communication and computing devices combine multiple technologies Understand the different ways and applications in which modern technology is used Understand future uses of technology and the pace of change (Moore's Law)	Look at all of the different technologies or gadgets that we are used to using. These have all now converged into the ultimate example of the convergence of technology – the Smartphone.	The Apollo 11 mission to land men on the moon in 1969 used a computer considerably less powerful than today's mobile phones. Pupils can discuss recently emerging technologies and possible future technology. Radio Frequency ID (RFID) e.g. used in contactless bank payment cards, provides a good example of emerging technology with big potential. The Information Age represents the current era. Pupils can look at and discuss the online article **"Welcome to the Information Age"** – an article by the Telegraph about the growing quantity of data we all are exposed to everyday (see **Link Telegraph Information Age**). Given an understanding that things are changing and technology is developing, pupils might want to think about where their own technology is at now and where this might go. Introduce Moore's Law which hypothesised that the number of transistors in technology double every two years.	Pupils can get into pairs or small groups and look at one of the effects of changing technology using **Worksheet 9 Changing Technologies**. They can discuss, makes notes and report back to the class.	Revise the topics covered in the unit for the exam next lesson.	Re-cap on the future uses of technology and the pace of change.
7	• Assessment of learning for the unit.			Briefly revise at the start of the lesson. Explain rules for the assessment. Explain how the assessment is to be completed.	8.1 Final Assessment		