

**ICT Department-OCR GCSE Computer Science**

**Year: 10 Term 1a**

**Topic: Programming Fundamentals**

**Learning Journey**

**Prior learning:** Students will have learnt Python programming at KS3 in year 8 and year 9, where these programming fundamentals would have been taught. Students will recap on these constructs in this first term and develop their practice by creating interactive programs.

<b>Learning sequence –</b>						<b>Endpoint</b>
<b>Main learning steps</b>	<p>Students will learn what variables, constants, operators, inputs, outputs and assignments are.</p> <p>Students will practice Python programming tasks and use variables, constants, operators, inputs, outputs and assignments in their code</p>	<p>Students will recap the three constructs used to control the flow of a program: Sequence, selection, iteration.</p> <p>Students will practice Python programming tasks and use Sequence, selection, iteration in their code</p>	<p>Students will learn about the common arithmetic operators and Boolean operators (AND, OR, NOT)</p> <p>Students will practice Python programming tasks and use arithmetic and boolean operators</p>	<p>Students will learn that there are different data types: Integer, Real, Boolean, String</p> <p>Students will learn that data types can be changed within a code and that this is known as casting</p> <p>Students will practice using data types and casting in their Python code.</p>	<p>Students will practice creating Python programs which allow a user to interact and input data that is processed by the Python code</p> <p>Students will practice Python programming by creating interactive games</p>	<p>Students will be able to make use of the following constructs in their Python programs:</p> <ul style="list-style-type: none"> <li>• Variables</li> <li>• Constants</li> <li>• Assignments</li> <li>• Sequence</li> <li>• Selection</li> <li>• Iteration</li> <li>• Arithmetic operators</li> <li>• Boolean operators</li> <li>• Data types</li> <li>• Casting</li> </ul>
<b>Assessment</b>			Formative assessment- Multiple choice quiz		Progress check 1- Programming Fundamentals	

**Where will we use these ideas again:** Students will put their Python understand into learning programming techniques further in topics 2.1.1, 2.1.2, 2.1.3, 2.2.3

**ICT Department-OCR GCSE Computer Science**

**Year: 10- Term 1b**

**Topic: Architecture of the CPU, CPU Performance and Computer systems**

**Prior learning:** Student will have learnt about computer systems and the input, process, output cycle at KS3. Students will also have learnt about the purpose of the CPU and the Fetch-Decode- Execute cycle at KS3

<b>Learning sequence –</b>						<b>Endpoint</b>
<b>Main learning steps</b>	<p>Students will learn:</p> <ul style="list-style-type: none"> <li>-The purpose of the CPU</li> <li>-The fetch-decode-Execute cycle</li> <li>-The common CPU Components and their functions (ALU, CU, Cache, Registers)</li> </ul>	<p>Students will be introduced to the Von-Neumann architecture and will learn how it works.</p> <p>Students will learn what the following are: MAR, MDR, Program counter, accumulator</p>	<p>Students will understand how the characteristics of CPUs affect their performance</p> <p>Students will look at the CPU clock speed, cache size, and number of cores to understand CPU performance</p>	<p>Students will learn that all computer systems have an Input, process, output and storage cycle.</p> <p>Students will learn the difference between a computer system and an embedded system.</p>		<p>Students will know the purpose of the CPU and how the fetch-decode-execute cycle works to process instructions</p> <p>Students will learn about the CPU components and the Von Neumann architecture</p> <p>Students will understand how the characteristics of CPUs affect their performance</p> <p>Students will learn about computer systems and the differences between a general computer system and an embedded system</p>
<b>Assessment</b>			Formative assessment- Multiple choice quiz		Progress check 2- Systems Architecture	

**Where will we use these ideas again:** Students will continue to learn about other hardware components in paper 1 units. The concepts of OP codes and Operands will be taught in paper 2 which are instructions in the FDE cycle.

**ICT Department-OCR GCSE Computer Science**

**Year: 10- Term 2a**

**Topic: Memory and Storage Part 1**

**Prior learning:** Students will have learnt the about storage devices at KS3 (Primary and secondary) They will have also been introduced to the concepts of ROM and RAM at KS3.

<b>Learning sequence –</b>						<b>Endpoint</b>
<b>Main learning steps</b>	Students will understand the need for primary storage  Students will learn the difference between RAM and ROM	Students will know what Virtual memory is and how this memory works when RAM is filled	Students will understand the need for secondary storage.  Students will learn about the Common types of storage:  -Optical -Magnetic -Solid state	Students will be able to identify suitable storage devices and storage media for a given application	Students will be able to identify advantages and disadvantages of different storage devices and storage media relating to these characteristics: -Capacity -Speed -Portability -Durability -Reliability -Cost	Students will know the difference between primary, secondary storage  Students will understand what ROM and RAM are and how virtual memory works  Students will know the common types of secondary storage and when they should be used
<b>Assessment</b>			Formative assessment- Multiple choice quiz		Progress check 3- Memory and storage	

**Where will we use these ideas again:** The concepts in this unit are discrete to other units but have been a follow-on from the prior unit on CPU architecture. In the following part of this unit students will look at file sizes and how they impact on the storage required for a device.

This unit will be revisited before the Y10 and Y11 mock exam to recall key concepts. Students will also revisit this unit during revision classes in Term 3 of year 11

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**Year: 10- Term 2b**

**Topic: Memory and Storage Part 2**

**Prior learning:** Students will have learnt about file storage in the previous part of this unit. Students have also learnt about file sizes, binary numbers and data representation at KS3

<b>Learning sequence –</b>						<b>Endpoint</b>	
<b>Main learning steps</b>	<p>Students will learn about the units of data storage</p> <p>Students will understand how to calculate data capacity</p> <p>Students will learn that data needs to be converted into a binary format to be processed by a computer</p>	<p>Students will learn how to:</p> <ul style="list-style-type: none"> <li>- convert positive denary whole numbers to binary numbers and vice versa</li> <li>-add two binary integers together (up to and including 8 bits) and explain overflow errors which may occur</li> <li>-perform binary shifts (multiplication and division of binary numbers)</li> </ul>	<p>Students will learn how to:</p> <ul style="list-style-type: none"> <li>-convert positive denary whole numbers into 2-digit hexadecimal numbers and vice versa</li> <li>-How to convert binary integers to their hexadecimal equivalents and vice versa</li> </ul>	<p>Students will learn about Character Sets – ASCII and Unicode and the differences between and impact of each character set</p>	<p>Students will learn how an image is represented as a series of pixels, represented in binary</p> <p>Students will learn about Metadata and what types of data stored of an image</p> <p>Students will understand the effect of colour depth and resolution on:</p> <ul style="list-style-type: none"> <li>-The quality of the image</li> <li>-The size of an image file</li> </ul>	<p>Students will understand how sound can be sampled and stored in digital form</p> <p>Student will learn of the effect of sample rate, duration and bit depth on:</p> <ul style="list-style-type: none"> <li>-The playback quality</li> <li>-The size of a sound file</li> </ul> <p>Students will understand the need for compression and learn of the types of compression:</p> <ul style="list-style-type: none"> <li>-Lossy</li> <li>-Lossless</li> </ul>	<p>Students will be able to:</p> <ul style="list-style-type: none"> <li>-calculate file sizes and convert the units of storage e.g. from bytes to Kilobytes</li> <li>-understand binary representation and how to convert binary numbers to denary and vice versa</li> <li>-add binary numbers</li> <li>-Convert Hexadecimal numbers to denary and vice versa</li> </ul> <p>Students will understand how text, images and sound files are represented as binary digits and how to calculate the file sizes.</p>
<b>Assessment</b>			Formative assessment- Multiple choice quiz		Progress check 4- Memory and Storage		

**Where will we use these ideas again:** Students will re-visit ASCII code representations when writing algorithms to convert binary representations in paper 2

**ICT Department-OCR GCSE Computer Science**

**Year: 10- Term 3a**

**Topic: Networks and Topologies**

**Prior learning:** Students will have looked at other computer hardware components in earlier topics, but will be introduced in this topic to hardware used to form networks. Students have been introduced to the concepts of networking in year 9.

<b>Learning sequence –</b>						<b>Endpoint</b>
<b>Main learning steps</b>	<p>Students will learn:</p> <ul style="list-style-type: none"> <li>-the types of networks and the factors that affect the performance of networks "</li> <li>-the different roles of computers in a client-server and a peer-to-peer network</li> </ul>	<p>Students will learn:</p> <ul style="list-style-type: none"> <li>-the hardware needed to connect stand-alone computers into a Local Area Network</li> <li>-the Internet as a worldwide collection of computer networks</li> <li>-that there are Star and Mesh network topologies</li> </ul>	<p>Students will learn:</p> <ul style="list-style-type: none"> <li>- that there are different modes of network connections</li> <li>- the principle of encryption to secure data across network connections</li> </ul>	<p>Students will learn:</p> <ul style="list-style-type: none"> <li>-the difference between IP addressing and MAC addressing</li> <li>-about network standards to provide rules for areas of computing</li> </ul>	<p>Students will know the common protocols to communicate between networks and how layers are used in protocols (TCP/IP layer)</p>	<p>Students will know why and how networks can be configured.</p> <p>Students will know the hardware required to form networks including topologies and modes of connection</p> <p>Students will learn about common protocols in computer networking to transfer data and the concept of protocol layers</p>
<b>Assessment</b>			Formative assessment- Multiple choice quiz		Progress check 5- Networks and topologies	

**Where will we use these ideas again:** Students will continue to learn networks in the next topic, where they will investigate the security threats posed to networks and how these threats can be prevented