



## MARK SCHEME



### Sample Assessment Material GCSE (9-1) COMPUTER SCIENCE

#### Component 1: Understanding Computer Science

Q	Answer	Marks	AO1	AO2	AO3	Total
1.(a)	<p>Award one mark for each of the following up to a maximum of two marks:</p> <ul style="list-style-type: none"> <li>The purpose of the CPU is to process instructions consisting of: <ul style="list-style-type: none"> <li>simple arithmetic</li> <li>and logical operations.</li> </ul> </li> </ul>	2	2			2
1.(b)	<p>Award one mark for each of the following up to a maximum of one mark per register:</p> <p><b>Program counter (PC)</b></p> <ul style="list-style-type: none"> <li>stores the memory location of the next instruction that will be needed by the processor</li> </ul> <p><b>Current instruction register (CIR)</b></p> <ul style="list-style-type: none"> <li>stores the instruction that is currently being executed by the processor</li> </ul> <p><b>Accumulator (ACC)</b></p> <ul style="list-style-type: none"> <li>stores the results of calculations made by the ALU</li> </ul> <p><b>Memory address register (MAR)</b></p> <ul style="list-style-type: none"> <li>stores the memory location where data is currently being written to or read from</li> </ul> <p><b>Memory data register (MDR)</b></p> <ul style="list-style-type: none"> <li>stores the data that is being transferred from memory to the CPU (or vice versa).</li> </ul>	2	2			2
2.(a)(i)	<ul style="list-style-type: none"> <li>Spec A has a quad-core CPU, which means it is able to process four instructions at the same time, whereas Spec B is a dual-core CPU and two instructions may be processed at the same time.</li> </ul>	1		1		1
2.(a)(ii)	<ul style="list-style-type: none"> <li>Spec B has 8GB of RAM, which means it is able to store more currently running programs than Spec A which only has 4 GB of RAM.</li> </ul>	1		1		1
2.(a)(iii)	<ul style="list-style-type: none"> <li>Spec B has a dedicated GPU which means that the processing of games won't be hindered like an integrated GPU which shares its processing with a CPU.</li> </ul>	1		1		1

Q	Answer	Marks	AO1	AO2	AO3	Total
2.(b)	<p>Award one mark for each of the following up to a maximum of four marks:</p> <p><b>Hard Disk Drive</b></p> <ul style="list-style-type: none"> <li>uses magnetic secondary storage technology</li> <li>non-volatile, rewritable memory</li> <li>data is stored on a hard drive platter</li> <li>platter is divided into billions of tiny areas</li> <li>each one of those areas can be independently magnetized (to store a 1) or demagnetized (to store a 0)</li> <li>data is read and saved using an arm that has a special read/write head at the end</li> <li>as the disk spins, the arm travels across the disk</li> <li>each sector of the platter can store data and the movement of both the disk and the read/write head means that every sector on the hard drive can be reached</li> <li>the faster the platter spins, the faster data can be read from the disk</li> <li>a common speed for hard drives is 7200 RPM, but it can vary</li> <li>fragmentation can slow access speeds.</li> </ul> <p><b>Solid-state storage</b></p> <ul style="list-style-type: none"> <li>uses solid-state secondary storage technology</li> <li>non-volatile, rewritable memory</li> <li>non-mechanical design of semiconductor chips</li> <li>does not require defragmentation</li> <li>there are two types of flash memory: NOR and NAND</li> <li>both contain cells -- transistors -- in a grid, but the wiring between the cells differs</li> <li>if a chain of transistors conducts current, it has the value of 1</li> <li>if it doesn't conduct current, it's 0</li> <li>at first, all transistors are set to 1. But when a save operation begins, current is blocked to some transistors, turning them to 0</li> <li>this occurs because of how transistors are arranged. At each intersection of column and row, two transistors form a cell</li> <li>one of the transistors is known as a control gate</li> <li>the other as a floating gate</li> <li>when current reaches the control gate, electrons flow onto the floating gate, creating a net positive charge that interrupts current flow</li> <li>by applying precise voltages to the transistors, a unique pattern of 1s and 0s emerges.</li> </ul>	4	4			4
3.(a)	<p>Award one mark for the following:</p> <ul style="list-style-type: none"> <li>XOR</li> </ul>	1	1			1
3.(b)	<p>Award one mark for the following:</p> <ul style="list-style-type: none"> <li><math>R = P \cdot \bar{Q}</math></li> </ul>	1		1		1

Q	Answer	Marks	AO1	AO2	AO3	Total																				
3.(c)	<table border="1"> <thead> <tr> <th><math>A.B</math></th> <th><math>\overline{A.B}</math></th> <th><math>\overline{B}</math></th> <th><math>\overline{A.B + B}</math></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> <td>1</td> <td>1</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table> <p>Award one mark for each of the following columns:</p> <ul style="list-style-type: none"> <li><math>A.B</math></li> <li><math>\overline{A.B}</math></li> <li><math>\overline{B}</math></li> <li><math>\overline{A.B + B}</math></li> </ul>	$A.B$	$\overline{A.B}$	$\overline{B}$	$\overline{A.B + B}$	0	1	1	1	0	1	0	1	0	1	1	1	1	0	0	0					4
$A.B$	$\overline{A.B}$	$\overline{B}$	$\overline{A.B + B}$																							
0	1	1	1																							
0	1	0	1																							
0	1	1	1																							
1	0	0	0																							
4.(a)	<p>Award one mark for each of the following up to a maximum of three marks:</p> <ul style="list-style-type: none"> <li>they are easier to understand, learn and program as commands are similar to natural language – <b>High Level</b></li> <li>they require less time for translation into machine code – <b>Low Level</b></li> <li>they are preferred when the execution speed is critical – <b>Low Level.</b></li> </ul>	3	3			3																				
4.(b)(i)	<p>Award one mark for each of the following up to a maximum of two marks:</p> <ul style="list-style-type: none"> <li>converts low-level language programs into executable code</li> <li>each mnemonic is replaced with the corresponding machine code.</li> </ul>	2	2			2																				
4.(b)(ii)	<p>Award one mark for each of the following up to a maximum of two marks:</p> <ul style="list-style-type: none"> <li>convert high-level language programs into executable code, one line at a time</li> <li>each instruction generates several low-level instructions</li> <li>if an error is encountered, the interpreter stops and shows the error.</li> </ul>	2	2			2																				

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Q	Answer	Marks	AO1	AO2	AO3	Total								
5.(a)	<p>Award one mark for each of the following up to a maximum of three marks:</p> <ul style="list-style-type: none"> <li>the OSI model is a conceptual model</li> <li>it characterises communication between two endpoints in a network</li> <li>the model separates a communication system into 7 abstraction layers</li> <li>a layer serves the layer above it and is served by the layer below it</li> <li>in a given message between users, there will be a flow of data down through the layers in the source computer</li> <li>data is sent across the network, and then up through the layers in the receiving computer.</li> </ul>	3	3			3								
5.(b)	<p>Award one mark for each of the following up to a maximum of three marks:</p> <table border="1" data-bbox="363 913 855 1160"> <thead> <tr> <th></th> <th>LAYER</th> </tr> </thead> <tbody> <tr> <td>7</td> <td>Application</td> </tr> <tr> <td>4</td> <td>Transport</td> </tr> <tr> <td>2</td> <td>Data link</td> </tr> </tbody> </table>		LAYER	7	Application	4	Transport	2	Data link	3	3			3
	LAYER													
7	Application													
4	Transport													
2	Data link													
5.(c)(i)	<p>Award one mark for each of the following up to a maximum of two marks:</p> <ul style="list-style-type: none"> <li>transports data using electrical, mechanical or procedural interfaces</li> <li>responsible for sending computer bits from one device to another along the network</li> <li>determines how physical connections to the network are set up and how bits are represented into predictable signals as they are transmitted either electrically, optically or via radio waves.</li> </ul>	2	2			2								
5.(c)(ii)	<p>Award one mark for each of the following up to a maximum of two marks:</p> <ul style="list-style-type: none"> <li>moves data into and through other networks</li> <li>packages data with correct network address information</li> <li>selects the appropriate network routes and forwards the packaged data up the stack to the transport layer.</li> </ul>	2	2			2								

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Q	Answer	Marks	AO1	AO2	AO3	Total											
6.	<p>Award one mark for each of the following up to a maximum of six marks:</p> <p><b>Data type</b></p> <ul style="list-style-type: none"> <li>• <b>Gender:</b> Character</li> <li>• <b>Telephone number:</b> String</li> <li>• <b>Membership paid:</b> Boolean</li> </ul> <p><b>Validation check</b></p> <ul style="list-style-type: none"> <li>• <b>Membership ID:</b> Type check/Format check</li> <li>• <b>Date of birth:</b> Range check</li> <li>• <b>Post code:</b> Format check (NOT TWICE)</li> </ul>	3  3		3  3		6											
7.(a)	<p>Award one mark for each of the following up to a maximum of three marks:</p> <table border="1"> <thead> <tr> <th>DENARY</th> <th>BINARY</th> <th>HEXADECIMAL</th> </tr> </thead> <tbody> <tr> <td>252<sub>10</sub></td> <td>11111100<sub>2</sub></td> <td>FC<sub>16</sub></td> </tr> <tr> <td>184<sub>10</sub></td> <td>10111000<sub>2</sub></td> <td>B8<sub>16</sub></td> </tr> <tr> <td>54<sub>10</sub></td> <td>00110110<sub>2</sub></td> <td>36<sub>16</sub></td> </tr> </tbody> </table>	DENARY	BINARY	HEXADECIMAL	252 <sub>10</sub>	11111100 <sub>2</sub>	FC <sub>16</sub>	184 <sub>10</sub>	10111000 <sub>2</sub>	B8 <sub>16</sub>	54 <sub>10</sub>	00110110 <sub>2</sub>	36 <sub>16</sub>	1  1  1		1  1  1	3
DENARY	BINARY	HEXADECIMAL															
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54 <sub>10</sub>	00110110 <sub>2</sub>	36 <sub>16</sub>															
7.(b)	<ul style="list-style-type: none"> <li>• 10100100<sub>2</sub></li> </ul>	1		1		1											
7.(c)	<p>Award one mark for each of the following up to a maximum of two marks:</p> <ul style="list-style-type: none"> <li>• 01101110<sub>2</sub></li> <li>• Overflow</li> </ul>	1  1		1  1		2											
8.	<p>Award one mark for each of the following up to a maximum of four marks:</p> <p>A. (B + A)</p> <ul style="list-style-type: none"> <li>• A.B + A.A</li> <li>• A.B + A</li> <li>• A.(B + 1)</li> <li>• A</li> </ul> <p>Accept other appropriate solutions <b>DO NOT</b> accept truth table solutions</p>	1  1  1  1		1  1  1  1		4											

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Q	Answer	Marks	AO1	AO2	AO3	Total
9.	<p><b>Indicative content</b></p> <pre> 1  Declare RainfallProc 2 3  rainfall[12] is integer 4  total is integer 5  mean is real 6 7  set total = 0 8  set mean = 0 9 10 for i = 1 to 12 11   input rainfall[i] 12   total = total + rainfall[i] 13 next i 14 15 output "The total rainfall is ",     total 16 mean = total / 12 17 output "The mean rainfall is ", mean 18 19 output "Months above mean:" 20 21 for i = 1 to 12 22   if rainfall[i] &gt; mean then 23     output i 24   end if 25 next i 26 27 End RainfallProc </pre> <p>Award one mark for each of the following up to a maximum of ten marks:</p> <ul style="list-style-type: none"> <li>• declare array</li> <li>• initialise variables</li> <li>• loop structure allowing 12 monthly readings</li> <li>• input rainfall</li> <li>• calculate total</li> <li>• output total</li> <li>• calculate mean</li> <li>• output mean</li> <li>• comparison of rainfall value against mean to determine if it is higher</li> <li>• output months above mean.</li> </ul>	10			10	10

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Q	Answer	Marks	AO1	AO2	AO3	Total
10.(a)	<p>Award one mark for each of the following up to a maximum of four marks:</p> <ul style="list-style-type: none"> <li>• RGB colour uses three colour components for each pixel</li> <li>• a bitmap graphic stores the colour of every individual pixel in a 2D array</li> <li>• the number of colours that an image can represent depends on its colour depth</li> <li>• a black and white image has a colour depth of 1</li> <li>• the simplest grey scale image would have a colour depth of 2 — representing four colours</li> <li>• increasing the colour depth will increase the amount of storage needed to store the image</li> <li>• but will result in a better quality image.</li> </ul>	4	4			4
10.(b)	<p>Award one mark for each of the following up to a maximum of two marks:</p> <p><b>Lossy file size</b></p> <ul style="list-style-type: none"> <li>• 80 KB</li> </ul> <p><b>Lossless file size</b></p> <ul style="list-style-type: none"> <li>• 180 KB</li> </ul> <p><b>DO NOT</b> award marks if units not present</p>	1 1		1 1		2
11.(a)(i)	<p>Award one mark for the following:</p> <ul style="list-style-type: none"> <li>• The role of a web browser is to render HTML</li> </ul>	1	1			1
11.(a)(ii)	<p>Award one mark for each of the following up to a maximum of four marks:</p> <ul style="list-style-type: none"> <li>• https is the protocol</li> <li>• www.eduqas.co.uk is the domain name stored on a DNS</li> <li>• /qualifications/ is the folder structure leading to where the web page is located</li> <li>• compsci is the requested web page.</li> </ul>	4		4		4

Q	Answer	Marks	AO1	AO2	AO3	Total
11.(b)	<p><b>Indicative content</b></p> <ul style="list-style-type: none"> <li>a DNS server will contain a list of domain names</li> <li>a DNS server will contain a list of corresponding IP addresses</li> <li>a web site address is typed into the address bar of a browser</li> <li>the browser checks the local (cached) host file to check if it already holds the IP address</li> <li>the local (your domain) DNS server is queried for the IP address</li> <li>if the local DNS server does not hold the IP address then the query is passed to another DNS server at a higher level until the IP address is resolved</li> <li>the address is passed on to DNS servers lower in the hierarchy</li> <li>when the full address has been resolved, the IP address is then passed to your browser</li> <li>the browser then connects to the IP address of the server and downloads the web site.</li> </ul>	6	6			6
<p><b>Band</b></p> <p style="text-align: center;"><b>AO1.1b (Max 6 marks)</b></p>						
<p style="text-align: center;"><b>5 - 6 marks</b></p>						
3	<p>The candidate has:</p> <ul style="list-style-type: none"> <li>shown strong understanding of the requirements of the question and a clear knowledge of the indicative content. Clear knowledge is defined as a response that provides five to six relevant detailed points from the indicative content</li> <li>shown a sustained line of reasoning which is coherent, relevant, substantiated and logically structured</li> <li>used appropriate terminology.</li> </ul>					
<p style="text-align: center;"><b>3 - 4 marks</b></p>						
2	<p>The candidate has:</p> <ul style="list-style-type: none"> <li>shown some understanding of the requirements of the question and sound knowledge of the indicative content. Sound knowledge is defined as a response that provides three to four relevant detailed points from the indicative content</li> <li>shown a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure</li> <li>used mainly appropriate terminology.</li> </ul>					



## GCSE COMPUTER SCIENCE Sample Assessment Materials 29

Q	Answer	Marks	AO1	AO2	AO3	Total
	<p style="text-align: center;"><b>1 - 2 marks</b></p> <p>The candidate has:</p> <ul style="list-style-type: none"> <li>shown limited understanding of the requirements of the question and superficial knowledge of the indicative content. Superficial knowledge is defined as a response that provides one to two relevant points from the indicative content</li> <li>shown a basic line of reasoning which is not coherent, largely irrelevant with very little structure</li> <li>used limited terminology.</li> </ul>					
	<p style="text-align: center;"><b>0 marks</b></p> <p>No attempt made or no response worthy of credit.</p>					
12.(a)	<p>Award one mark for each of the following up to a maximum of three marks:</p> <ul style="list-style-type: none"> <li>multitasking allows a user to seemingly perform more than one task at a time</li> <li>in reality, a computer never performs more than one task at a time, but the CPU is so fast that it gives the impression of performing multiple tasks at the same time</li> <li>the computer uses scheduling to manage the selection and processing between different tasks</li> <li>tasks are sorted according to different criteria, such as task delivery time and priority</li> <li>task are allocated a time-slice by the CPU.</li> </ul>	3	3			3
12.(b)	<p>Award one mark for each of the following up to a maximum of two marks:</p> <ul style="list-style-type: none"> <li>a signal sent of the CPU usually generated when I/O is required</li> <li>there are two types of interrupt, hardware and software.</li> </ul> <p>Accept examples</p> <ul style="list-style-type: none"> <li>hardware interrupts are generated when a key is pressed or when the mouse is moved</li> <li>software interrupts are generated by a program requiring disk input or output.</li> </ul>	2	2			2

Q	Answer	Marks	AO1	AO2	AO3	Total
13.(a)	<p>Award one mark for each of the following up to a maximum of four marks:</p> <ul style="list-style-type: none"> <li>allows interception of communication in the interests of national security — <b>Regulation of Investigatory Powers Act 2000</b></li> <li>when a programmer gives people the right to share and modify their work — <b>Creative Commons Licensing</b></li> <li>ensures protection against unauthorised or unlawful processing of data — <b>General Data Protection Regulation</b></li> <li>protects intellectual property in software development — <b>Copyright Designs and Patents Act 1988</b></li> </ul>	4	4			4
13.(b)	<p>Award one mark for each of the following up to a maximum of three marks:</p> <ul style="list-style-type: none"> <li>unauthorised access to computer material. This refers to entering a computer system without permission (hacking)</li> <li>unauthorised access to computer materials with intent to commit a further crime. This refers to entering a computer system to steal data or destroy a device or network (such as planting a virus)</li> <li>unauthorised modification of data. This refers to modifying or deleting data, and also covers the introduction of malware or spyware onto a computer (electronic vandalism and theft of information)</li> <li>making, supplying or obtaining anything which can be used in computer misuse offences.</li> </ul>	3	3			3
14.(a)(i)	<p>Award one mark for each of the following up to a maximum of two marks:</p> <ul style="list-style-type: none"> <li>software program</li> <li>can perform a variety of different functions such as: <ul style="list-style-type: none"> <li>stealing data, encrypting or deleting sensitive data</li> <li>altering or hijacking core computing functions</li> <li>monitoring users' computer activity without their permission.</li> </ul> </li> </ul>	2	2			2

Q	Answer	Marks	AO1	AO2	AO3	Total
14.(a)(ii)	<p>Award one mark for each of the following up to a maximum of two marks:</p> <ul style="list-style-type: none"> <li>• a hacking algorithm</li> <li>• tries all possible combinations of lowercase and uppercase characters, numbers and symbols to gain unauthorised access to a computer system.</li> </ul>	2	2			2
14.(b)(i)	<p>Award one mark for each of the following up to a maximum of four marks:</p> <ul style="list-style-type: none"> <li>• the process of testing a computer system, or network, to find vulnerabilities an attacker could exploit</li> <li>• the tests can be automated with software applications or they can be performed manually.</li> </ul> <p>Penetration testing strategies include:</p> <ul style="list-style-type: none"> <li>• targeted testing — testing carried out by the organisation's ITC team and the penetration testing team working together</li> <li>• external testing — to find out if an outside attacker can get in and how far they can get in once they have gained access</li> <li>• internal testing — to estimate how much damage a dissatisfied employee could cause</li> <li>• blind testing — to simulate the actions and procedures of a real attacker by severely limiting the information given to the team performing the test.</li> </ul>	4	4			4
14.(b)(ii)	<p>Award one mark for each of the following up to a maximum of three marks:</p> <ul style="list-style-type: none"> <li>• double authentication is a second layer of security to protect an account or system</li> <li>• users must go through two layers of security before being granted access to an account or system</li> <li>• increases the safety of online accounts by requiring two types of information from the user, such as a password or PIN, an email account, an ATM card or fingerprint, before the user can log in</li> <li>• the first factor is the password; the second factor is the additional item.</li> </ul>	3	3			3
<b>TOTAL</b>		100	60	30	10	100