



GCSE MARKING SCHEME

COMPUTER SCIENCE

SUMMER 2015

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2015 examination in GCSE COMPUTER SCIENCE. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

	Page
UNIT 1	1
UNIT 2	11

GCSE COMPUTER SCIENCE
SUMMER 2015 MARK SCHEME

Qu	Answer	Marks	MAX								
1	<p>One mark for each of:</p> <ul style="list-style-type: none"> 2. Controller 4. Internal memory 5. Arithmetic and Logic Unit (ALU) 7. Registers <p>Deduct one mark for each additional tick above 4</p>	<p>1 mark 1 mark 1 mark 1 mark</p>	4								
2 (a)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Backing storage</th> <th style="text-align: center;">Example of typical use (Suitability)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Solid state</td> <td style="text-align: center;">Moving small files from work to home</td> </tr> <tr> <td style="text-align: center;">External hard drive</td> <td style="text-align: center;">Backing up an internal hard disc Transferring or using (large) files from machine to machine</td> </tr> <tr> <td style="text-align: center;">Magnetic tape</td> <td style="text-align: center;">Backing up a large commercial server</td> </tr> </tbody> </table> <p>NOTE cloud storage could replace either of the backing storage methods above but MUST be a different method for each scenario</p>	Backing storage	Example of typical use (Suitability)	Solid state	Moving small files from work to home	External hard drive	Backing up an internal hard disc Transferring or using (large) files from machine to machine	Magnetic tape	Backing up a large commercial server	<p>1 mark 1 mark 1 mark</p>	3
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2 (b)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Backing storage 1</th> <th style="text-align: center;">Backing storage 2</th> <th style="text-align: center;">Backing storage 3</th> <th style="text-align: center;">Backing storage 4</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Solid state</td> <td style="text-align: center;">External hard drive</td> <td style="text-align: center;">Compact Disc</td> <td style="text-align: center;">Magnetic Tape</td> </tr> </tbody> </table> <p>NOTE order of devices must be as above but cloud storage could replace any of the devices as access speed would depend on speed of connection and cloud storage provider</p>	Backing storage 1	Backing storage 2	Backing storage 3	Backing storage 4	Solid state	External hard drive	Compact Disc	Magnetic Tape	1 mark	1
Backing storage 1	Backing storage 2	Backing storage 3	Backing storage 4								
Solid state	External hard drive	Compact Disc	Magnetic Tape								

3 (a)	Marking – one mark for each disadvantage which needs to be clarified, perhaps with an example, for additional mark	2 marks (x4)	8
	Disadvantages of network <ul style="list-style-type: none"> • A network manager may need to be employed <ul style="list-style-type: none"> ○ which might be expensive • Could be infected with a virus <ul style="list-style-type: none"> ○ that could spread to all other computers • Security problems <ul style="list-style-type: none"> ○ receives traffic from other networks • Hackers may gain access <ul style="list-style-type: none"> ○ as network only as secure as weakest point of entry ○ to data and steal/destroy • The server / switch could go down (main cable break) so <ul style="list-style-type: none"> ○ all workstations on the network are affected • Can be expensive to set up <ul style="list-style-type: none"> ○ as Initial cost of servers, communication devices, switches, network software etc. • Substantial Initial disruption <ul style="list-style-type: none"> ○ drilling holes, fitting trunking, running cables between buildings etc... • Can have a slow response time <ul style="list-style-type: none"> ○ due to heavy network traffic ○ so users cannot work as effectively • Detecting network problems can be more difficult on a network <ul style="list-style-type: none"> ○ difficult to isolate • Can be slow to login to a network <ul style="list-style-type: none"> ○ As slow to download software / check password • Only limited storage space available on network <ul style="list-style-type: none"> ○ Have access to all hard disc drive on standalone computer • Time and effort to set up users <ul style="list-style-type: none"> ○ Can just start a standalone and use computer 		
3 (b)	Marking – any three rules from: <ul style="list-style-type: none"> • Passwords must contain numeric and not numeric characters • Passwords must contain upper case and lower case characters • Passwords must contain non-alphanumeric characters • Passwords must be a minimum length • Passwords must not be written down or divulged to anyone else • Passwords must be changed regularly • Not re-use password • Not containing obvious guessable things such as name or DOB • Not be recognisable series of characters such as 1234 or ABCD or QWERTY • Passwords can be randomly generated 	3 marks	3
3 (c) (i)	Pupils will have read and write access to all their files	1 mark	1
3 (c) (ii)	Pupils will only have read access OR Teachers will have read and write access to all their files	1 mark	1
4 (a)	Global - Num1 or Num2 Local –Total CONDONE 'is integer' with the variable but nothing else	1 mark 1 mark	2

4 (b)	Global variables can be used throughout the whole program (or project) Local variables can only be used in the procedure/module/function/subprogram where they are declared	1 mark 1 mark	2								
5 (a)	Differences between a compiler and interpreter are: A compiler translates the whole program in one go whereas An interpreter translates each line of code (often an intermediate code) at run time A compiler produces an executable file that will run on the target hardware machine without the compiler being installed A run time interpreter will be required at run time Compilers tend to be large complex programs Interpreters are smaller simpler programs Interpreted programs can be amended and run without translating whole program Compiled programs have to be re-compiled after a change Compilers compile programs that will usually only run on the target platform (hardware/operating system) Interpreters will interpret same program (or intermediate code) on different (some virtual) platforms	4 x 1	4								
5 (b)	Assemblers translate low level (assembly language) code into machine code.	1 mark	1								
6 (a)	One mark for each correct row <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: left;">Row</th> <th style="text-align: left;">Data</th> </tr> </thead> <tbody> <tr> <td style="border-right: 1px solid black; padding-right: 10px;">2</td> <td>0111 1000</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 10px;">4</td> <td>0100 0000</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 10px;">5</td> <td>0111 0000</td> </tr> </tbody> </table>	Row	Data	2	0111 1000	4	0100 0000	5	0111 0000	1 mark 1 mark 1 mark	3
Row	Data										
2	0111 1000										
4	0100 0000										
5	0111 0000										
6 (b)	1	1 mark	1								
6 (c)	$10 \times 1 = 10$	1 mark	1								
6 (d) (i)	256 colours would require 1 byte CONDONE 3 bytes if it clear that there is one byte for each red, green and blue	1 mark	1								
6 (d) (ii)	1 mark for method, 1 mark for answer $10 \times 8 \times 1 = 80$ bytes CONDONE 240 bytes with calculation $10 \times 8 \times 3 = 240$ bytes	2 marks	2								

7 (a)	<p>One mark for each facility named, and one mark for each description.</p> <p>Facilities offered by Software Development Environments include:</p> <ul style="list-style-type: none"> • Editor: this allows a programmer to enter and edit source code • Automatic formatting: Correctly indents code • Automatic colour coding: Changes key words, literals and annotation to different colours • Linker: this is a program which allows previously compiled code, from software libraries, to be linked together • Loader: this is a program which loads previously compiled code into memory. • Debugger: this is a program which helps locate, identify and rectify errors in a program • Syntax error detection: Highlighting syntax errors before code is translated • Trace: this is a facility which displays the order in which the lines of a program are executed, and possibly the values of variables as the program is being run • Break point: this is a facility which interrupts a program on a specific line of code, allowing the programmer to compare the values of variables against expected values. The program code can then usually be executed one line at a time. This is called single-stepping • Variable watch: this is a facility which displays the current value of any variable. The value can be 'watched' as the program code is single-stepped to see the effects of the code on the variable. Alternatively a variable watch may be set, which will interrupt the program flow if the watched variable reaches a specified value • Memory inspector: this is a facility which will display the contents of a section of memory • Error diagnostics: these are used when a program fails to compile or to run. Error messages are displayed to help the programmer diagnose what has gone wrong • Emulator: will provide and emulator to run the code/app so no physical device required • Context sensitive menu: SDE suggests available options • Statement completion: SDE will complete a statement such as adding an 'end if' to an 'if' statement • GUI creation: Allows programmer to create a GUI by dragging and dropping controls (buttons, etc...) onto a form. • Publisher: facility to package up and deploy program as an easy to install package 	8 marks	4+4															
7 (b)	<p>Marking – example could be the description or an actual example</p> <p>Examples of private functions include: standard mathematical operations such as square root or random number generator</p> <p>Examples of subprograms include: standard input / output routines such as saving data to disk</p>	2 marks	2															
8 (a)	<p>One mark for each correct answer:</p> <table border="1" data-bbox="194 1688 1211 1865"> <thead> <tr> <th>A</th> <th>B</th> <th>A AND B</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	A	B	A AND B	0	0	0	0	1	0	1	0	0	1	1	1	1 mark 1 mark 1 mark	3
A	B	A AND B																
0	0	0																
0	1	0																
1	0	0																
1	1	1																

8 (b)	<p style="text-align: center;">C <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr></table></p> <p>Marking a one in last column and rest blank award one mark for all zeros and a one in last column award two marks</p>	0	0	0	0	0	0	0	1	2 marks	2
0	0	0	0	0	0	0	1				
8 (c)	<p>The 6 most significant bits are always 0 The least significant bit in register C takes the value of the least significant bit in B (is changed to 1)</p> <p>Masking of the 6 most significant bits accepted not expected (both marks for this)</p>	1 mark 1 mark	2								
9	<p>1 mark for naming each role up to a maximum of four 1 mark for description up to a maximum of four</p> <p>Manages peripherals such as input and output devices</p> <ul style="list-style-type: none"> • Sends data to output devices such as monitors • Receives data from input devices such as mouse/keyboard <p>Manages printing using spooling</p> <ul style="list-style-type: none"> • Data is stored on hard disc in a queue • Document is printed when printer is free / in correct order • Benefit of spooling - User can carry on working / log off when waiting for job to print <p>Manages backing store</p> <ul style="list-style-type: none"> • Ensures that data is stored and can be retrieved correctly from any disc drive • Creates and maintains filing system such as FAT or NTFS (accepted but not expected) • Organise files in a hierarchical directory structure. <p>Carries out file compression</p> <ul style="list-style-type: none"> • Where files are made smaller • Which saves space <p>Carries out disc de-fragmentation</p> <ul style="list-style-type: none"> • where disc access speed can be increased • is moving file parts closer together <p>Manages memory (RAM)</p> <ul style="list-style-type: none"> • Allocates memory to programs currently executing • Ensures programs / data do not corrupt each other • Ensures all programs and data including itself is stored in correct memory locations <p>Manages processes</p> <ul style="list-style-type: none"> • Ensures different processes can utilise the CPU and do not interfere with each other or crash • Allows user to run programs • On a multi-tasking O/S ensure that all tasks appear to run simultaneously • Allocates time slices • Scheduling of programs • Handles interrupts • Allows user to configure hardware 		8								

10	<p>Marking</p> <p>One mark for all literals correct – ‘Total is’ and ‘Mean is’</p> <p>One mark for 1 3 6 10 15</p> <p>One mark for correct mean 3</p> <p>Output would be:</p> <p>Total is 1</p> <p>Total is 3</p> <p>Total is 6</p> <p>Total is 10</p> <p>Total is 15</p> <p>Mean is 3</p>	<p>1 mark</p> <p>1 mark</p> <p>1 mark</p>	3																								
11	<p>1 mark for naming each error</p> <p>1 mark for suitable example (there are many suitable examples)</p> <table border="1" data-bbox="209 651 1195 1301"> <thead> <tr> <th>Error</th> <th>Suitable Example</th> </tr> </thead> <tbody> <tr> <td>Syntax</td> <td>Incorrect: IF A ADN B Then Correct: IF A AND B Then</td> </tr> <tr> <td>Semantic</td> <td>Attempting to assign incorrect data type integer = real</td> </tr> <tr> <td>Runtime or Execution</td> <td>Division by zero Reading past end of file or out of memory</td> </tr> <tr> <td>Logical</td> <td>Count = Count – 1 should be Count = Count + 1</td> </tr> <tr> <td>Linking</td> <td>When the Square Root function is used and the library that calculates the Square Root has not been linked to the program.</td> </tr> <tr> <td>Rounding</td> <td>34.5 rounded to nearest whole number is 35, an error of +0.5.</td> </tr> <tr> <td>Truncation</td> <td>34.9 truncated to whole number is 34, an error of -0.9.</td> </tr> </tbody> </table>	Error	Suitable Example	Syntax	Incorrect: IF A ADN B Then Correct: IF A AND B Then	Semantic	Attempting to assign incorrect data type integer = real	Runtime or Execution	Division by zero Reading past end of file or out of memory	Logical	Count = Count – 1 should be Count = Count + 1	Linking	When the Square Root function is used and the library that calculates the Square Root has not been linked to the program.	Rounding	34.5 rounded to nearest whole number is 35, an error of +0.5.	Truncation	34.9 truncated to whole number is 34, an error of -0.9.	<p>2 mark (x3)</p>	6								
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12 (a)	<p>212 → 11010100</p> <table border="1" data-bbox="325 1395 994 1518"> <tr> <td>2^7</td> <td>2^6</td> <td>2^5</td> <td>2^4</td> <td>2^3</td> <td>2^2</td> <td>2^1</td> <td>2^0</td> </tr> <tr> <td>128</td> <td>64</td> <td>32</td> <td>16</td> <td>8</td> <td>4</td> <td>2</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> </tr> </table> <p>128 + 64 + 16 + 4 = 212</p> <p>1 mark for each correct nibble</p> <p>1101</p> <p>0100</p>	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	128	64	32	16	8	4	2	1	1	1	0	1	0	1	0	0	<p>1 mark</p> <p>1 mark</p>	2
2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0																				
128	64	32	16	8	4	2	1																				
1	1	0	1	0	1	0	0																				
12 (b)	<p>1101 0100 → D4</p> <p>1101 → D</p> <p>0100 → 4</p>	<p>1 mark</p> <p>1 mark</p>	2																								

12 1 mark for ONLY converting one Hex digit correctly
 (c) 2 marks for converting both Hex digits correctly with correct answer

1 mark 2
 1 mark

2F → 47

Convert via binary 2 → 0010 F → 1111

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
0	0	1	0	1	1	1	1

$+ 32 \qquad \qquad + 8 \qquad + 4 \qquad + 2 \qquad + 1 = 47$

Alternatively convert direct

16^2	16^1	16^0
256	16	1
	2	F

$2 \times 16 \quad 15 \times 1$
 $32 \quad + 15 = 47$

13	<p>How packet switching and routing operates</p> <ul style="list-style-type: none"> • Data is split into packets before transmission • Packets are sent in-order but might arrive out of order and are re-assembled at destination • Each node can route a packet along different routes according to its routing table <p>Contents of a packet</p> <ul style="list-style-type: none"> • The actual data • Destination address • Source address • Order number of packet • Control signals / tracking information • Error control bits <p>Benefits of transmitting packets using routers:</p> <ul style="list-style-type: none"> • Each packet can take a different route through network which therefore makes it secure as it is difficult to intercept all the packets • Packets are less likely to be affected by network failure because they can simply take an alternative route • Each packet can take a different route through network which means more efficient use of data lines as packet can use least busy route • Each packet can take a different route through network which means a node failure does not stop the packet reaching its destination <p>Accept answers using the network nodes in the diagram</p> <p>9 – 12 marks Contents of a packet, how packets are transmitted and benefits of transmitting packets using routers are all described. There will be few, if any, errors in spelling, grammar and punctuation. Technical terms will be used appropriately and correctly.</p> <p>5 – 8 marks Contents of a packet, how packets are transmitted and benefits of transmitting packets using routers are all described. There may be occasional errors in spelling, grammar and punctuation. Technical terms will be mainly correct.</p> <p>1 – 4 marks Superficial coverage of contents of a packet, how packets are transmitted or benefits of transmitting packets using routers. Information will be poorly expressed and there will be limited, if any, use of technical terms. There are significant errors in grammar, punctuation and spelling.</p> <p>0 marks No appropriate content.</p>	12
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Unit 2: Solving Problems Using

Task 1	Answer	MAX 6
	<p>One mark for each correct <u>pair</u> in the correct location: i.e. <h1> </h1> <center> </center> </p> <p> (Note http:// is required or the link will not work correctly on many devices)</p> <p>Accept either <p> or <p> </p> (No need to close p) Accept alternative tags e.g. <big></big> instead of <h1></h1>, etc</p> <p>Accept alternative solutions which work. (Only if the identical formatting would be achieved.)</p> <p><html><body></p> <p><center></p> <p><h1> Cloud Storage for you! </h1></p> <p><p> <i> Access your data anywhere! </i> </p></p> <p></center></p> <p><p><u> Cloud Storage</u> is the powerful and convenient way to access all of your information, documents, pictures, music and videos wherever you are, using any device!</p></p> <p><p>Click the link below to find out more.</p></p> <p><p> www.cloudstorageforyou.co.uk </p></p> <p></body></html></p>	<p>1</p> <p>1(centre)</p> <p>1(h1)</p> <p>1(p & i)</p> <p>(/centre here)</p> <p>1(b & u) only award if all.</p> <p>1 (only if both href and http are present.)</p> <p></body /html required here for first mark)</p>

Task 2	Answer	MAX 9
	<p>The solution provides <u>all</u> correct outputs OR The solution provides <u>some</u> correct outputs</p> <p>Declare StaffMemberTotal array (1..99) of integer Declare NumberOfStaffMembers is integer Declare NumberSold is integer Declare i as integer Declare j as integer Declare k as integer</p> <p>Output "Please enter number of Staff Members: " Input NumberOfStaffMembers</p> <p>for i = 1 to NumberOfStaffMembers (Repeat i) for j = 1 to 12 (Repeat j) output "Enter month" j "figures for Staff Member" i input NumberSold if NumberSold>4 then output "Bonus awarded." StaffMemberTotal(i)=StaffMemberTotal(i) + NumberSold next j (End for repeat until j = 12) next i (End for repeat until 1 = NumberOfStaffMembers) Output "Totals:" for k = 1 to NumberOfStaffMembers (Repeat) Output "Staff Member " k ":" StaffMemberTotal(k) next k (End for repeat until k = NumberOfStaffMembers) End</p> <p>Please see marking notes on next page. Brackets+Bold text indicate other accepted Pseudocode.</p> <p>Accept i,j,k for loops, accept any other meaningful variable name. (e.g. Months,)</p>	<p>2 marks OR 1 mark</p> <p>Condone no declarations</p> <p>1 (input)</p> <p>1 (Setup a loop for number of salesmen) 1 (setup a loop for the year/each month) 1 output correct format question</p> <p>1 (Bonus using IF)</p> <p>1 adding total correctly</p> <p>(May award marks for loops from above here, but do not double mark.)</p> <p>1 (output –values from array)</p>

	<p>Ammendments to check for 0 salesmen error (and any further validation) accepted not expected.</p> <p>Line numbers not necessary Ignore indentation or lack of it.</p> <p>Accept alternative solutions as long as they provide the exact same result.</p>	
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Task 3	Answer		MAX 15
	11-15 Marks	<p>The candidate has produced a complete working solution to the task. The program is written efficiently and has been compiled. The Ship turns left, right, up and down on key press and a sound is played when the ship collides with an Iceberg. The ship breaks icebergs on collision (removing them from the world), adding to the counter. The program has been written coherently, technical terms have been used correctly, the meaning is clear and there are no errors in spelling and punctuation.</p> <p>Only award 15 if all tasks completed correctly (including naming of files correctly and all tasks implemented fully)</p>	
	6-10 Marks	<p>The candidate has produced a working solution. The program has been compiled but one or more of the elements is missing or incomplete. Technical terms have been used correctly, the meaning is clear and there are few errors in spelling and punctuation.</p> <p>Trivial syntax errors that prevent compilation of an otherwise functional solution should not be penalised.</p>	
	1-5 Marks	<p>The candidate has produced a partial solution to the task but there is some evidence of functionality. Technical terms, where used, are correct, but there are significant errors in spelling and punctuation.</p> <p>Only award 5 if the file is saved correctly (task h)</p>	
	0 Marks	No valid response	
Total Marks for Paper:			30 Marks



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