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# **GCE AS MARKING SCHEME**

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**SUMMER 2016**

**COMPUTER SCIENCE - NEW AS COMPONENT 2  
B500U20-1**

## **INTRODUCTION**

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was 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 conference was to ensure that the marking scheme was 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' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

**AS COMPUTER SCIENCE**  
**COMPONENT 2**  
**SUMMER 2016 MARK SCHEME**

**Practical Programming to Solve Problems**

**Guidance for examiners**

Positive marking

It should be remembered that learners are writing under examination conditions and credit should be given for what the learner writes, rather than adopting the approach of penalising him/her for any omissions. It should be possible for a very good response to achieve full marks and a very poor one to achieve zero marks. Marks should not be deducted for a less than perfect answer if it satisfies the criteria of the mark scheme.

For questions that are objective or points-based the mark scheme should be applied precisely. Marks should be awarded as indicated and no further subdivision made.

For band marked questions in **Component 2** the assessment grid advises the marks to allocate to responses which demonstrate the qualities needed in AO2 and AO3. There is limited indicative content as learner response will vary significantly, as the choice of solution will differ based on a variety of factors (e.g. IDE used, interface type chosen, file handling routine used). Where a response is not credit worthy or not attempted it is indicated on the grid as mark band zero.

## **Banded mark schemes**

Banded mark schemes are divided so that each band has a relevant descriptor. The descriptor for the band provides a description of the performance level for that band. Each band contains marks.

Examiners should first read and annotate a learner's answer to pick out the evidence that is being assessed in that question. Once the annotation is complete, the mark scheme can be applied.

This is done as a two stage process.

### **Stage 1 – Deciding on the band**

When deciding on a band, the answer should be viewed holistically. Beginning at the lowest band, examiners should look at the learner's answer and check whether it matches the descriptor for that band. Examiners should look at the descriptor for that band and see if it matches the qualities shown in the learner's answer. If the descriptor at the lowest band is satisfied, examiners should move up to the next band and repeat this process for each band until the descriptor matches the answer.

If an answer covers different aspects of different bands within the mark scheme, a 'best fit' approach should be adopted to decide on the band and then the learner's response should be used to decide on the mark within the band. For instance if a response is mainly in band 2 but with a limited amount of band 3 content, the answer would be placed in band 2, but the mark awarded would be close to the top of band 2 as a result of the band 3 content.

Examiners should not seek to mark candidates down as a result of small omissions in minor areas of an answer.

### **Stage 2 – Deciding on the mark**

Once the band has been decided, examiners can then assign a mark. During standardising (marking conference), detailed advice from the Principal Examiner on the qualities of each mark band will be given. Examiners will then receive examples of answers in each mark band that have been awarded a mark by the Principal Examiner. Examiners should mark the examples and compare their marks with those of the Principal Examiner.

When marking, examiners can use these examples to decide whether a learner's response is of a superior, inferior or comparable standard to the example. Examiners are reminded of the need to revisit the answer as they apply the mark scheme in order to confirm that the band and the mark allocated is appropriate to the response provided.

Indicative content is also provided for banded mark schemes. Indicative content is not exhaustive, and any other valid points must be credited. In order to reach the highest bands of the mark scheme a learner need not cover all of the points mentioned in the indicative content but must meet the requirements of the highest mark band. Where a response is not creditworthy, that is contains nothing of any significance to the mark scheme, or where no response has been provided, no marks should be awarded.

Q	Answer	Mark	AO1	AO2	AO3	Tot
1a	Any one of: <ul style="list-style-type: none"> <li>Support</li> <li>Teaching</li> </ul>	1		2.1a		1
1b	String	1		2.1a		1
1ci	Any one of: <ul style="list-style-type: none"> <li>onRoll</li> <li>parkingPermitHolder</li> </ul>	1		2.1a		1
1cii	Any one of: <ul style="list-style-type: none"> <li>salary</li> <li>hourlyRate</li> <li>contractedHours</li> </ul>	1		2.1a		1
1d	The property <code>pupilID</code> is <b>private to the class Pupil</b> . <ul style="list-style-type: none"> <li>Only an object of <b>type Pupil</b> would be able to view/access/make changes to its internal property <code>pupilID</code></li> </ul> Any one of: <ul style="list-style-type: none"> <li>To read from the property you would need a method within the class such as <code>+getPupilID()</code> that returns the contents</li> <li>To make changes to the property you would need a method within the class such as <code>+setPupilID(Integer)</code> to changes its contents.</li> </ul> This is AO2.1b so must be applied to be awarded the mark.	1 1 1		2.1a 2.1b 2.1b		3
1e	1 mark for all methods within Support: <pre>+setHourlyRate(Real) +getHourlyRate() : Real +setContractedHours(Real) +getContractedHours() : Real</pre> 1 mark for all methods within superclass Staff: <pre>+setStaffID(Integer) +getStaffID() : Integer</pre> 1 mark for all methods within superclass Person: <pre>+setFirstName(String) +setSurname(String) +setHomeAddress(String) +onRoll(): Boolean +setOnRoll(Boolean)</pre>	1 1 1		2.1b 2.1b 2.1b		3

Q	Answer	Mark	AO1	AO2	AO3	Tot
1f	<p>1 mark for all properties within Pupil:            -pupilID : Integer            #telephoneNumber : String            -emergencyContact : String</p> <p>1 mark for all properties within superclass Person:            #firstName : String            #surname : String            #homeAddress : String            #onRoll : Boolean</p>	1		2.1b		2
1g	<p>firstName is common to the superclass and all subclasses.            All subclasses inherit and can use/have access to this property and so it saves re-defining it in every subclass.</p>	1 1		2.1a 2.1b		2
1h	<p>parkingPermitHolder is a private property (indicated by the – preceding the property declaration)</p> <p>Therefore to change this you would need a <b>publicly</b> available method such as            +setParkingPermit( Boolean) within the class to access the private property</p> <p>For objects of other classes there would need to be a publicly accessible method with a <b>return value</b> that could be used to return the current value stored within the internal property parkingPermitHolder such as            +getParkingPermit() : Boolean</p> <p>Again as AO2.1b it must be applied to the question as per regulatory requirements.</p>	1 1 1 1 1		2.1a 2.1b 2.1b 2.1b 2.1b		5

Q	Answer	Mark	AO1	AO2	AO3	Tot																									
2a	$(40/4) - (60/40)$ $10 - 1.5$ <b>8.5</b>  No need for workings.	1		2.1a		1																									
2b	Award 1 mark for each: <ul style="list-style-type: none"> <li>• Non-truncated example               <ul style="list-style-type: none"> <li>○ Stage 1 and 2</li> <li>○ Stage 3</li> </ul> </li> <li>• Truncated example               <ul style="list-style-type: none"> <li>○ Stage 1 and 2 (truncated)</li> <li>○ Stage 3</li> </ul> </li> <li>• Effect upon accuracy</li> </ul> <b>Worked example:</b> 60 syllables, 40 words and 4 sentences <ul style="list-style-type: none"> <li>• Non-truncated example               <ul style="list-style-type: none"> <li>○ <math>40 / 10 = 4</math> <b>and</b> <math>70 / 40 = 1.75</math></li> <li>○ <math>4 - 1.75 = 2.25</math></li> </ul> </li> <li>• Truncated example               <ul style="list-style-type: none"> <li>○ <math>40 / 10 = 4</math> <b>and</b> <math>70 / 40 = 1.75 = 1.7</math> (truncated to 1dp)</li> <li>○ <math>4 - 1.7 = 2.3</math></li> </ul> </li> <li>• Effect upon accuracy               <ul style="list-style-type: none"> <li>○ Truncated – non-truncated = <math>2.3 - 2.25 = +0.05</math></li> </ul> </li> </ul>	1 1 1 1 1			3.1c 3.1c 3.1c 3.1c 3.1c	5																									
2c	1 mark for each correctly completed row. <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>l</th> <th>wordsinsentence</th> <th>Syllablewords</th> <th>readings core[i]</th> <th>flag</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>7.5</td> <td>2.3</td> <td>5.2</td> <td>False</td> </tr> <tr> <td>2</td> <td>9</td> <td>1.8</td> <td>7.2</td> <td>False</td> </tr> <tr> <td>3</td> <td>7</td> <td>1.4</td> <td>5.6</td> <td>False</td> </tr> <tr> <td>4</td> <td>10</td> <td>1.5</td> <td>8.5</td> <td>True</td> </tr> </tbody> </table>	l	wordsinsentence	Syllablewords	readings core[i]	flag	1	7.5	2.3	5.2	False	2	9	1.8	7.2	False	3	7	1.4	5.6	False	4	10	1.5	8.5	True	1 1 1 1			3.1c 3.1c 3.1c 3.1c	4
l	wordsinsentence	Syllablewords	readings core[i]	flag																											
1	7.5	2.3	5.2	False																											
2	9	1.8	7.2	False																											
3	7	1.4	5.6	False																											
4	10	1.5	8.5	True																											

Q	Answer	Mark	AO1	AO2	AO3	Total
3	<p>Any valid/functional comparison based algorithm that returns outputs as stated in question:</p> <p><b>Example</b></p> <pre> 1  goldlane is integer 2  silverlane is integer 3  bronzelane is integer 4  goldtime is real = 999.99 5  silvertime is real = 999.99 6  bronzetime is real = 999.99 7  lane is integer 8  time is real 9 10 for lane = 1 to 8 11   output "Please enter time for lane" + lane 12   input time 13 14   if time &lt; goldtime then 15       bronzetime = silvertime 16       bronzelane = silverlane 17       silvertime = goldtime 18       silverlane = goldlane 19       goldtime = time 20       goldlane = lane 21   else 22       if time &lt; silvertime then 23           bronzetime = silvertime 24           bronzelane = silverlane 25           silvertime = time 26           silverlane = lane 27       else 28           if time &lt; bronzetime then 29               bronzetime = time 30               bronzelane = lane 31           end if 32       end if 33   end if 34 next lane 35 36 Output "Gold medal winner is lane:" + goldlane 37 Output "Fastest time is:" + goldtime 38 Output "Silver medal winner is lane:" +    silverlane 39 Output "Second fastest time is:" + silvertime 40 Output "Bronze medal winner is lane:" + bronzelane 41 Output "Third fastest time is:" + bronzetime </pre> <p>One mark for each:</p> <ul style="list-style-type: none"> <li>• Declare / initialise variable(s) 1 3.1b</li> <li>• Repetition: Use of a loop (Do, For, While, Repeat) 1 3.1b</li> <li>• Selection: comparison to find gold time (if time &lt; gold) 1 3.1b</li> <li>• Selection: comparison to find silver time (if time &lt; silver) 1 3.1b</li> <li>• Selection: comparison to find bronze time (if time &lt; bronze) 1 3.1b</li> <li>• Swap: tracking gold lane or time and replacing silver and bronze (bronze = silver, silver = gold, gold = time) 1 3.1b</li> <li>• Swap: tracking silver lane or time and replacing bronze (bronze = silver, silver = time) 1 3.1b</li> </ul>					11



<ul style="list-style-type: none"><li>• Tracking bronze lane or time (<code>bronze = time</code>)</li><li>• Output lane for each of the three medals</li><li>• Output time for each of the three top lanes</li><li>• Algorithm provides all correct outputs</li></ul> <p>Marks awarded for concepts demonstrated above. Other solutions incorporating above concepts that provide exactly the same result would be awarded credit.</p> <p>Sorting algorithm using array accepted but not expected.</p> <p>Line numbers and indentation not required.</p>					
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Q	Answer	Mark	AO1	AO2	AO3	Total
4ai OR 4bi OR 4ci	<b>Indicative content:</b> <ul style="list-style-type: none"> <li>• Reading contents from text file</li> <li>• Comparing contents to requirement on screen</li> <li>• Incrementing the number of pupils found</li> <li>• Outputting the correct number to screen</li> </ul>	4			3.1b	4

Band	AO3.1b Max 4 marks
<b>3</b>	<b>4 marks</b> The candidate has: <ul style="list-style-type: none"> <li>• Implemented all the points required as stated in the indicative content</li> <li>• Used and fully exploited the programming facilities of the language</li> <li>• Demonstrated a sound understanding of the appropriate tools and techniques available to them</li> </ul>
<b>2</b>	<b>2-3 marks</b> The candidate has: <ul style="list-style-type: none"> <li>• Implemented the majority of the points required as stated in the indicative content. Majority is defined as a response that provides two or three items of the functionality signalled in the indicative content</li> <li>• Used and exploited the programming facilities of the language</li> <li>• Demonstrated an understanding of the tools and techniques available to them</li> </ul>
<b>1</b>	<b>1 mark</b> The candidate has: <ul style="list-style-type: none"> <li>• Implemented only one of the points required as stated in the indicative content</li> <li>• Used some of the programming facilities of the language</li> <li>• Demonstrated a limited understanding of the tools and techniques available to them</li> </ul>
<b>0</b>	<b>0 marks</b> Response not credit worthy or not attempted.

Q	Answer	Mark	AO1	AO2	AO3	Total
4aii 4bii 4cii	<p><b>Indicative content:</b></p> <ul style="list-style-type: none"> <li>• Input data</li> <li>• Any four validation methods of: <ul style="list-style-type: none"> <li>○ Range check</li> <li>○ Format check</li> <li>○ Length check</li> <li>○ Presence check</li> <li>○ Lookup check</li> <li>○ Type check</li> </ul> </li> <li>• Creates a data file called staffdetails.txt</li> <li>• Stores on disc in a text file called staffdetails.txt</li> <li>• Descriptive/useful feedback that file has been saved</li> <li>• Candidates may use custom data types / standard methods</li> <li>• Retrieves data from disc</li> <li>• Retrieves specified staff details from disc (Candidates may use Random (direct), serial, or sequential file access)</li> <li>• HCI fit for purpose (Textual or GUI)</li> </ul>	12			3.1b	12

Band	AO3.1b Max 12 marks
	<b>9-12 marks</b>
<b>3</b>	<p>The candidate has:</p> <ul style="list-style-type: none"> <li>• Created a new program including all or the majority of the functionality as required in the question and stated in the indicative content. The majority of the functionality is defined as a response that provides nine to twelve items of the functionality signalled in the indicative content</li> <li>• Used and fully exploited the programming facilities of the language</li> <li>• Demonstrated a sound understanding of the appropriate tools and techniques available to them</li> <li>• Written code that is well structured</li> <li>• Provided evidence of a completed user interface which aids user interaction and is intuitive</li> </ul>
<b>2</b>	<p style="text-align: center;"><b>5-8 marks</b></p> <p>The candidate has:</p> <ul style="list-style-type: none"> <li>• Created a new program including most of the functionality as required in the question and stated in the indicative content. Most of the functionality is defined as a response that provides five to eight items of the functionality signalled in the indicative content</li> <li>• Made use of an appropriate range of the programming facilities of the language</li> <li>• Demonstrated an understanding of the tools and techniques available to them</li> <li>• Provided evidence of a completed user interface which aids user interaction</li> </ul>
<b>1</b>	<p style="text-align: center;"><b>1-4 marks</b></p> <p>The candidate has:</p> <ul style="list-style-type: none"> <li>• Created a new program with a limited range of the functionality as stated in the indicative content or improved the prototype provided by adding a limited range of the new functionality as stated in the indicative content. A limited range of functionality is defined as a response that provides one to four items of the functionality signalled in the indicative content</li> <li>• Used a limited range of the programming facilities of the language</li> <li>• Demonstrated a limited understanding of the tools and techniques available to them</li> <li>• Provided evidence of a user interface</li> </ul>
<b>0</b>	<p style="text-align: center;"><b>0 marks</b></p> <p>Response not credit worthy or not attempted.</p>

Q	Answer	Mark	AO1	AO2	AO3	Total
4aiii 4biii 4ciii	<b>Indicative content:</b> Clear annotation of steps within the following routines: <ul style="list-style-type: none"> <li>• Validation</li> <li>• Storage of data to file</li> <li>• Retrieving specified data from file</li> <li>• Use of self-documenting identifiers / explanation of variables</li> </ul>	4			3.1a	4

Band	AO3.1a Max 4 marks 4 marks
3	The candidate has: <ul style="list-style-type: none"> <li>• Produced listings that are appropriately laid out and included sufficient annotation to demonstrate an understanding of <b>all</b> programming routines listed in the indicative content</li> <li>• Written code using self-documenting identifiers / explained variables</li> <li>• Used appropriate technical terminology referring to the indicative content confidently and accurately.</li> </ul>
2	<p style="text-align: center;"><b>2-3 marks</b></p> <p><b>Three</b> marks can be awarded if the candidate has:</p> <ul style="list-style-type: none"> <li>• Produced listings that are appropriately laid out and included sufficient annotation to demonstrate an understanding of <b>all</b> programming routines listed in the indicative content</li> <li>• Not written code using self-documenting identifiers / not explained variables</li> <li>• Used appropriate technical terminology referring to the indicative content.</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Produced listings that are appropriately laid out and included sufficient annotation to demonstrate an understanding of <b>two</b> of the programming routines listed in the indicative content</li> <li>• Written code using self-documenting identifiers / explained variables</li> <li>• Used appropriate technical terminology referring to the indicative content.</li> </ul> <p><b>Two</b> marks can be awarded if the candidate has:</p> <ul style="list-style-type: none"> <li>• Produced listings that are appropriately laid out and included sufficient annotation to demonstrate an understanding of <b>two</b> of the programming routines listed in the indicative content</li> <li>• Not written code using self-documenting identifiers / not explained variables</li> <li>• Used appropriate technical terminology referring to the indicative content.</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Produced listings that are appropriately laid out and included sufficient annotation to demonstrate an understanding of <b>one</b> of the programming routines listed in the indicative content</li> <li>• Written code using self-documenting identifiers / explained variables</li> <li>• Used appropriate technical terminology referring to the indicative content.</li> </ul>
1	<p style="text-align: center;"><b>1 mark</b></p> The candidate has: <ul style="list-style-type: none"> <li>• Produced listings that are appropriately laid out and include sufficient annotation to demonstrate an understanding of <b>one</b> programming routine listed in the indicative content</li> <li>• Used limited technical terminology referring to the indicative content.</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Written code using self-documenting identifiers</li> <li>• Used limited technical terminology referring to the indicative content.</li> </ul>
0	<p style="text-align: center;"><b>0 marks</b></p> Response not credit worthy or not attempted.