



## Cambridge International AS & A Level

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**COMPUTER SCIENCE**

**9608/41**

Paper 4 Written Paper

**May/June 2020**

MARK SCHEME

Maximum Mark: 60

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**Published**

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

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This document consists of **15** printed pages.

**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**GENERIC MARKING PRINCIPLE 5:**

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

**GENERIC MARKING PRINCIPLE 6:**

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	It is an unplanned event // an event not wanted	1
1(b)	<b>1 mark</b> per example to <b>max 3</b> e.g. <ul style="list-style-type: none"> <li>• Division by zero</li> <li>• Invalid array index</li> <li>• File does not exist</li> <li>• Run-time error</li> <li>• Invalid input</li> <li>• Invalid argument/value</li> <li>• Stack overflow</li> <li>• Memory leakage</li> <li>• Hardware failure/error</li> </ul>	3
1(c)	<b>1 mark</b> per bullet point to <b>max 2</b> <ul style="list-style-type: none"> <li>• The program will not crash // more robust // program will continue</li> <li>• Result does not cause further errors/problems later</li> <li>• Appropriate error messages/result</li> <li>• Exceptional conditions are identified</li> <li>• Improve readability</li> </ul>	2

Question	Answer	Marks												
2(a)	<p><b>1 mark</b> for the first 3 rows <b>1 mark</b> for the last 2 rows</p> <table border="1" data-bbox="338 317 1151 708"> <thead> <tr> <th data-bbox="338 317 869 381">Feature</th> <th data-bbox="869 317 1151 381">Must be included</th> </tr> </thead> <tbody> <tr> <td data-bbox="338 381 869 448">Incrementation</td> <td data-bbox="869 381 1151 448"></td> </tr> <tr> <td data-bbox="338 448 869 515">General case</td> <td data-bbox="869 448 1151 515">✓</td> </tr> <tr> <td data-bbox="338 515 869 582">Base case</td> <td data-bbox="869 515 1151 582">✓</td> </tr> <tr> <td data-bbox="338 582 869 649">Selection case</td> <td data-bbox="869 582 1151 649"></td> </tr> <tr> <td data-bbox="338 649 869 708">It calls itself</td> <td data-bbox="869 649 1151 708">✓</td> </tr> </tbody> </table>	Feature	Must be included	Incrementation		General case	✓	Base case	✓	Selection case		It calls itself	✓	<b>2</b>
Feature	Must be included													
Incrementation														
General case	✓													
Base case	✓													
Selection case														
It calls itself	✓													
2(b)	<p><b>1 mark</b> for each of the spaces filled in</p> <pre> PROCEDURE Count (BYVALUE <b>Number</b> : INTEGER)   IF <b>MOD</b> (Number, 2) &lt;&gt; 0     THEN       Number ← Number - 1     ENDIF   OUTPUT <b>Number</b>   IF Number &gt; 0     THEN       CALL Count (Number - 1)     ENDIF ENDPROCEDURE </pre>	<b>5</b>												

Question	Answer	Marks
2(c)	<p><b>1 mark per bullet point</b></p> <ul style="list-style-type: none"> <li>• Recursive call</li> <li>• ..with correct parameters</li> <li>• ...in correct working place(s)</li> <li>• Removal of loop</li> <li>• Remainder of program in correct place</li> </ul> <pre> PROCEDURE MealsCount (BYREF MealOption1 : INTEGER, MealOption2 : INTEGER)   DECLARE MealOption : INTEGER   INPUT MealOption   IF MealOption = 1     THEN       MealOption1 ← MealOption1 + 1       CALL MealsCount (MealOption1, MealOption2)     ELSE       IF MealOption = 2         THEN           MealOption2 ← MealOption2 + 1           CALL MealsCount (MealOption1, MealOption2)         ELSE           OUTPUT MealOption1, " ", MealOption2         ENDIF       ENDIF     ENDPROCEDURE </pre>	<b>5</b>

Question	Answer	Marks
3(a)	<p><b>1 mark for each statement</b></p> <ul style="list-style-type: none"> <li>• person(elle).</li> <li>• sport(rugby).</li> <li>• plays(elle, rugby).</li> <li>• will_not_play(elle, hockey).</li> </ul>	<b>4</b>

Question	Answer	Marks
3(b)	johann, jessica	1
3(c)	<p><b>1 mark per bullet point</b></p> <ul style="list-style-type: none"> <li>• person(Y)</li> <li>• AND // ,</li> <li>• sport(X)</li> <li>• AND NOT // , NOT</li> <li>• will_not_play(Y, X)</li> </ul> <p>mightplay(Y, X) IF person (Y) AND sport (X) AND NOT(will_not_play(Y, X))</p>	5

Question	Answer	Marks
4(a)	<p><b>1 mark per bullet point to max 2</b></p> <ul style="list-style-type: none"> <li>• Can use the properties from the parent/super class (without redeclaring them)</li> <li>• Can use the methods from the parent/super class (without redeclaring them)</li> <li>• Can extend the properties from the parent/super class</li> <li>• Can extend the methods from the parent/super class</li> </ul>	2
4(b)	<p><b>1 mark per feature to max 2</b></p> <ul style="list-style-type: none"> <li>• Polymorphism</li> <li>• Encapsulation</li> <li>• Containment</li> <li>• Aggregation</li> <li>• Composition</li> </ul>	2

Question	Answer	Marks
5(a)	<p><b>1 mark per bullet point</b></p> <ul style="list-style-type: none"> <li>• Method header and close (where applicable) ...</li> <li>• ... with correct parameters (LessonType, Instructor)</li> <li>• Initialised LessonType and Instructor to parameter values</li> </ul> <p><b>PYTHON</b></p> <pre>def __init__(self, LType, LInstructor) :     self.__LessonType = LType     self.__Instructor = LInstructor</pre> <p><b>PASCAL</b></p> <pre>Constructor Lesson.Create(LType, LInstructor); begin     LessonType:= LType;     Instructor:= LInstructor; end;</pre> <p><b>VB.net</b></p> <pre>Public Sub New(ByVal LType As String, ByVal LInstructor As String)     LessonType = LType     Instructor = LInstructor End Sub</pre>	<b>3</b>

Question	Answer	Marks
5(b)	<p><b>1 mark per bullet point</b></p> <ul style="list-style-type: none"><li>• function header and close (where applicable)</li><li>• returns Fee</li></ul> <p><b>PYTHON</b></p> <pre>def GetLessonType(self) :     return self.__LessonType</pre> <p><b>VB.net</b></p> <pre>Function GetLessonType () As Single     Return LessonType End Function</pre>	<b>2</b>

Question	Answer	Marks
5(c)	<p><b>1 mark per bullet point</b></p> <ul style="list-style-type: none"> <li>• Function header and close (where applicable)</li> <li>• Takes a parameter value</li> <li>• Check parameter value is valid ...</li> <li>• ... returns the correct fee</li> <li>• Returns -1 if value not valid</li> </ul> <p><b>PYTHON</b></p> <pre>def GetFee(self, Level) :     if Level == 'B' :         return 45     elif Level == 'I' :         return 50     elif Level == 'A' :         return 55     else :         return -1</pre> <p><b>VB.NET</b></p> <pre>Public Sub GetFee(PLevel)     if PLevel = "B" Then         return 45     elseif PLevel = "I" Then         return 50     elseif PLevel = "A" Then         return 55     else         return -1     endif End Sub</pre>	<b>5</b>

Question	Answer	Marks
5(d)	<p><b>1 mark per bullet point</b></p> <ul style="list-style-type: none"> <li>• Array declaration with identifier LessonArray and size 9</li> <li>• Correct data type used</li> </ul> <pre>DECLARE LessonArray : ARRAY[0:8] OF Lesson</pre>	<b>2</b>
5(e)	<p><b>1 mark per bullet point</b></p> <ul style="list-style-type: none"> <li>• Object is created</li> <li>• Correct parameters passed</li> <li>• Stored in correct index of LessonArray</li> </ul> <p><b>PYTHON</b> LessonArray[2] = Lesson("Improve Your Serve", "David")</p> <p><b>VB.net</b> LessonArray[2] = New Lesson("Improve Your Serve", "David")</p>	<b>3</b>

Question	Answer	Marks
6(a)	<p><b>1 mark per bullet point to max 4</b></p> <ul style="list-style-type: none"><li>• Procedure header and end</li><li>• Loop 6000 times</li><li>• Access the UserID and PINNumber for each element in CustomerDetails</li><li>• Correct initialisation of UserID to "" and PINNumber to 0</li></ul> <pre>PROCEDURE InitialiseHashTable()   FOR x ← 0 TO 5999     CustomerDetails[x].UserID ← ""     CustomerDetails[x].PINNumber ← 0   ENDFOR ENDPROCEDURE</pre>	<b>4</b>

Question	Answer	Marks
6(b)	<p><b>1 mark</b> for each completed missing statement</p> <pre> FUNCTION InsertRecord(NewRecord) RETURNS INTEGER   DECLARE Count : INTEGER   DECLARE Index : INTEGER   Count ← 0   Index ← Hash(NewRecord.UserID)   WHILE (CustomerDetails[Index].UserID &lt;&gt; "") AND (Count &lt;= 5999)     Index ← Index + 1     Count ← Count + 1     IF Index &gt; 5999       THEN         Index ← 0       ENDIF     ENDWHILE    IF Count &gt; 5999     THEN       RETURN -1     ELSE       CustomerDetails[Index] ← NewRecord       RETURN Index     ENDIF   ENDFUNCTION </pre>	7

Question	Answer	Marks
<p>7</p> <p><b>1 mark per bullet point</b></p> <ul style="list-style-type: none"> <li>Name, Address and Telephone Number beneath Customer details</li> <li>Order Details below booking form</li> <li>...with appropriate iteration of entering Order Details</li> <li>Shirt ID and Colour beneath Order Details</li> <li>Cost beneath Order Details</li> <li>...with Small, Medium and Large below it</li> <li>...with selection</li> </ul> <p>e.g.</p>	<pre> graph TD     OF[Order Form] --&gt; CD[Customer Details]     OF --&gt; OD[Order Details *]     OF --&gt; TC[Total Cost]     CD --&gt; N[Name]     CD --&gt; A[Address]     CD --&gt; TN[Telephone number]     OD --&gt; SID[Shirt ID]     OD --&gt; C[Colour]     OD --&gt; CO[Cost]     C --&gt; S[Small °]     C --&gt; M[Medium°]     C --&gt; L[Large °]     </pre>	<p>7</p>
<p>7(b)(i)</p>	<p>Serial</p>	<p>1</p>

Question	Answer	Marks																																																																	
7(b)(ii)	<p><b>1 mark</b> per bullet point to <b>max 2</b></p> <ul style="list-style-type: none"> <li>• Sequential</li> <li>• Random</li> </ul>	<b>2</b>																																																																	
7(c)	<p><b>1 mark per</b> completed statement</p> <pre>PROCEDURE UpdateTelephone(<b>BYREF</b> ThisCustomer : Customer,                            <b>BYVALUE</b> NewTelephoneNumber : STRING)     <b>ThisCustomer.TelephoneNumber ← NewTelephoneNumber</b> ENDPROCEDURE</pre>	<b>3</b>																																																																	
7(d)	<p><b>1 mark</b> per column pair</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tbody> <tr> <td rowspan="3" style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>Conditions</b></td> <td><b>Order over \$50</b></td> <td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>N</td><td>N</td><td>N</td><td>N</td> </tr> <tr> <td><b>Monday</b></td> <td>Y</td><td>Y</td><td>N</td><td>N</td><td>Y</td><td>Y</td><td>N</td><td>N</td> </tr> <tr> <td><b>Loyalty card</b></td> <td>Y</td><td>N</td><td>Y</td><td>N</td><td>Y</td><td>N</td><td>Y</td><td>N</td> </tr> <tr> <td rowspan="4" style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>Actions</b></td> <td><b>Additional 5% discount</b></td> <td>Y</td><td>N</td><td>Y</td><td>N</td><td>Y</td><td>N</td><td>Y</td><td>N</td> </tr> <tr> <td><b>10% discount</b></td> <td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>N</td><td>N</td><td>N</td><td>N</td> </tr> <tr> <td><b>Free gift</b></td> <td>Y</td><td>Y</td><td>N</td><td>N</td><td>N</td><td>N</td><td>N</td><td>N</td> </tr> <tr> <td><b>Free delivery</b></td> <td>Y</td><td>N</td><td>Y</td><td>N</td><td>N</td><td>N</td><td>N</td><td>N</td> </tr> </tbody> </table>	<b>Conditions</b>	<b>Order over \$50</b>	Y	Y	Y	Y	N	N	N	N	<b>Monday</b>	Y	Y	N	N	Y	Y	N	N	<b>Loyalty card</b>	Y	N	Y	N	Y	N	Y	N	<b>Actions</b>	<b>Additional 5% discount</b>	Y	N	Y	N	Y	N	Y	N	<b>10% discount</b>	Y	Y	Y	Y	N	N	N	N	<b>Free gift</b>	Y	Y	N	N	N	N	N	N	<b>Free delivery</b>	Y	N	Y	N	N	N	N	N	<b>4</b>
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