



# Cambridge IGCSE™

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COMPUTER SCIENCE

0478/23

Paper 2

May/June 2021

MARK SCHEME

Maximum Mark: 50

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**Published**

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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

Cambridge International is publishing the mark schemes for the May/June 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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This document consists of **17** printed pages.

**PUBLISHED****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.

**Please note the following further points:**

The words in **bold** in the mark scheme are important text that needs to be present, or some notion of it needs to be present. It does not have to be the exact word, but something close to the meaning.

If a word is underlined, this **exact** word must be present.

A single forward slash means this is an alternative word. A double forward slash means that this is an alternative mark point.

Ellipsis (...) on the end of one-mark point and the start of the next means that the candidate **cannot** get the second mark point without being awarded the first one. If a MP has ellipsis at the beginning, but there is no ellipsis on the MP before it, then this is just a follow-on sentence and **can** be awarded **without** the previous mark point.

Question	Answer	Marks
<b>Section A</b>		
1(a)(i)	<p><b>One</b> mark per bullet point</p> <ul style="list-style-type: none"> <li>• Constant      <code>NumberOfOptions</code></li> <li>• Value          <code>5</code></li> <li>• Use             Storing the maximum number of options (for the referendum)</li> </ul>	<b>3</b>
1(a)(ii)	<p><b>One</b> mark per bullet point</p> <ul style="list-style-type: none"> <li>• Variable      <code>UniqueNumber</code></li> <li>• Use             Storing/inputting the voter's unique identification number</li> </ul>	<b>2</b>
1(a)(iii)	<p><b>One</b> mark for each valid mark point (<b>Max 4</b>)</p> <ul style="list-style-type: none"> <li>• Suitable name e.g. <code>IdNumber</code></li> <li>• Suitable data type e.g. <code>Integer</code></li> <li>• Suitable array length e.g. <code>170</code> (elements)</li> <li>• Suitable sample data e.g. <code>100</code></li> <li>• Suitable use e.g. to store the unique numbers</li> </ul>	<b>4</b>

Question	Answer	Marks
1(b)	<p>Any <b>six</b> from:</p> <p>MP1 Initialisation of totalling variables  MP2 Loop to cycle through all the data  MP3 Totalling the votes for at least one of the options  MP4 Totalling the votes for all five options  MP5 Separate totals for students and staff  MP6 Output to show one set of results  MP7 Output to show more than one set of results with messages  MP8 Comprehensive output to show student, staff and combined results, with messages</p> <p><b>Example answers</b>  <b>Version 1</b></p> <pre>TotalAS ← 0; TotalBS ← 0; TotalCS ← 0; TotalDS ← 0; TotalesES ← 0; TotalAF ← 0; TotalBF ← 0; TotalCF ← 0; TotalDF ← 0; TotaleEF ← 0 FOR Count ← 0 TO 150   TotalAS ← TotalAS + StudentA[Count]   TotalBS ← TotalBS + StudentB[Count]   TotalCS ← TotalCS + StudentC[Count]   TotalDS ← TotalDS + StudentD[Count]   TotalesES ← TotalesES + StudentE[Count] NEXT Count FOR Count = 0 TO 20   TotalAF ← TotalAF + StaffA [Count]   TotalBF ← TotalBF + StaffA [Count]   TotalCF ← TotalCF + StaffA [Count]   TotalDF ← TotalDF + StaffA [Count]   TotaleEF ← TotaleEF + StaffA [Count] NEXT Count OUTPUT "Option      Students      Staff      Total" OUTPUT "A ", TotalAS, TotalAF, (TotalAS + TotalAF) OUTPUT "B ", TotalBS, TotalBF, (TotalBS + TotalBF) OUTPUT "C ", TotalCS, TotalCF, (TotalCS + TotalCF) OUTPUT "D ", TotalDS, TotalDF, (TotalDS + TotalDF) OUTPUT "E ", TotalesES, TotaleEF, (TotalesES + TotaleEF)</pre>	6

Question	Answer	Marks
1(b)	<p><b>Version 2</b></p> <pre>TotalAS ← 0; TotalBS ← 0; TotalCS ← 0; TotalDS ← 0; TotalesES ← 0; TotalAF ← 0; TotalBF ← 0; TotalCF ← 0; TotalDF ← 0; TotaleEF ← 0 OUTPUT "Are you a student? (Y or N)" INPUT Student IF Student = "Y" THEN   OUTPUT "Enter your number"   INPUT Number   IF Students[Number] = 0 THEN     REPEAT       OUTPUT "Enter preference for A"       INPUT Vote       UNTIL Vote &gt;= 1 and Vote &lt;= 5       TotalAS ← TotalAS + Vote     REPEAT       OUTPUT "Enter preference for B"       INPUT Vote       UNTIL Vote &gt;= 1 and Vote &lt;= 5       TotalBS ← TotalBS + Vote     REPEAT       OUTPUT "Enter preference for C"       INPUT Vote       UNTIL Vote &gt;= 1 and Vote &lt;= 5       TotalCS ← TotalCS + Vote     REPEAT       OUTPUT "Enter preference for D"       INPUT Vote       UNTIL Vote &gt;= 1 and Vote &lt;= 5       TotalDS ← TotalDS + Vote     REPEAT       OUTPUT "Enter preference for E"       INPUT Vote       UNTIL Vote &gt;= 1 and Vote &lt;= 5       TotalesES ← TotalesES + Vote</pre>	

Question	Answer	Marks
1(b)	<pre> Student[Number] ← 1 ELSE OUTPUT "Enter your number" INPUT Number IF staff[number] = 0 THEN REPEAT OUTPUT "Enter preference for A" INPUT Vote UNTIL Vote &gt;= 1 and Vote &lt;= 5 TotalAS ← TotalAS + Vote REPEAT OUTPUT "Enter preference for B" INPUT Vote UNTIL Vote &gt;= 1 and Vote &lt;= 5 TotalBS ← TotalBS + Vote REPEAT OUTPUT "Enter preference for C" INPUT Vote UNTIL Vote &gt;= 1 and Vote &lt;= 5 TotalCS ← TotalCS + Vote REPEAT OUTPUT "Enter preference for D" INPUT Vote UNTIL Vote &gt;= 1 and Vote &lt;= 5 TotalDS ← TotalDS + Vote REPEAT OUTPUT "Enter preference for E" INPUT Vote UNTIL Vote &gt;= 1 and Vote &lt;= 5 Totales ← Totales + Vote Staff[Number] ← 1 ENDIF </pre>	



Question	Answer	Marks
1(b)	OUTPUT "Option    Students    Staff    Total " OUTPUT "A ", TotalAS, TotalAF, (TotalAS + TotalAF) OUTPUT "B ", TotalBS, TotalBF, (TotalBS + TotalBF) OUTPUT "C ", TotalCS, TotalCF, (TotalCS + TotalCF) OUTPUT "D ", TotalDS, TotalDF, (TotalDS + TotalDF) OUTPUT "E ", TotalES, TotalEF, (TotalES + TotalEF)	
1(c)	Any <b>two</b> from: MP1    Change the maximum preferences constant to 6 MP2    Change the input prompt to show six options MP3    Change the loop counter MP4    Change the number of inputs for each person to six MP5    Add another array/variable to store/total the new option votes	<b>2</b>
1(d)	Explanation Any <b>three</b> from: MP1    Initialise count variables/array for each option MP2    Using a conditional statement to identify preference 1 in at least one option (in the input/stored data) MP3    ... identify preference 1 in all options MP4    ... and adding 1 to the appropriate option count in at least one option MP5    ... for students only MP6    ... using a loop to cycle through the whole array/set of inputs for each option	<b>3</b>

Question	Answer	Marks										
<b>Section B</b>												
2	<p><b>Three</b> marks for three or four correct <b>Two</b> marks for two correct <b>One</b> mark for one correct</p> <table border="0" style="width: 100%;"><thead><tr><th style="text-align: center;">Data Type</th><th style="text-align: center;">Description</th></tr></thead><tbody><tr><td style="text-align: center; border: 1px solid black;">Real</td><td style="text-align: center; border: 1px solid black;">Must be a whole number</td></tr><tr><td style="text-align: center; border: 1px solid black;">String</td><td style="text-align: center; border: 1px solid black;">Must be one of two values</td></tr><tr><td style="text-align: center; border: 1px solid black;">Integer</td><td style="text-align: center; border: 1px solid black;">May be any number</td></tr><tr><td style="text-align: center; border: 1px solid black;">Boolean</td><td style="text-align: center; border: 1px solid black;">May contain any combination of characters</td></tr></tbody></table>	Data Type	Description	Real	Must be a whole number	String	Must be one of two values	Integer	May be any number	Boolean	May contain any combination of characters	3
Data Type	Description											
Real	Must be a whole number											
String	Must be one of two values											
Integer	May be any number											
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Question	Answer	Marks
3	<p><b>One</b> mark per mark point for each piece of test data (3 × two marks)</p> <ul style="list-style-type: none"> <li>• Correct validation check name</li> <li>• Correct use identified</li> </ul> <p><b>Example answers</b></p> <p><b>ld27@cambridgeuniversity.com</b></p> <ul style="list-style-type: none"> <li>• Validation check name      Length (check)</li> <li>• Use                                      Counts the number of characters in the data to make sure it isn't too long (max length 320 characters).</li> </ul> <p><b>2021</b></p> <ul style="list-style-type: none"> <li>• Validation check name      Range (check)</li> <li>• Use                                      Checks that the number entered fits within given parameters</li> </ul> <p><b>Ericson-Bower</b></p> <ul style="list-style-type: none"> <li>• Validation check name      Type (check)</li> <li>• Use                                      Checks the type of data entered (in this case) to make sure no numbers are present</li> </ul>	<b>6</b>

Question	Answer	Marks
4(a)	<p><b>One</b> mark for error identified and suggested correction</p> <p>Line 3 – should be <code>FullScore ← 0</code>  Line 7 – should be <code>FullScore ← FullScore + Score</code>  Line 8 – should be <code>NEXT Allow ENDFOR //</code> alternatively Line 5 could be <code>REPEAT</code> with <code>StoreLoop ← 0</code> just above it and <code>StoreLoop ← StoreLoop + 1</code> between lines 7 and 8.  Line 11 – should be <code>INPUT Another</code></p> <p><b>Correct Algorithm 1</b></p> <pre> 1  Count ← 0 2  REPEAT 3    FullScore ← 0 4    INPUT Number 5    FOR StoreLoop ← 1 TO Number 6      INPUT Score 7      FullScore ← FullScore + Score 8    NEXT 9    OUTPUT "The full score is ", FullScore 10   OUTPUT "Another set of scores (Y or N)?" 11   INPUT Another 12   IF Another = "N" 13     THEN 14       Count ← 1 15   ENDIF 16 UNTIL Count = 1 </pre>	4

Question	Answer	Marks
4(a)	<p><b>Correct Algorithm 2</b></p> <pre> 1  Count ← 0 2  REPEAT 3    FullScore ← 0 4    INPUT Number       StoreLoop ← 0 5    REPEAT 6      INPUT Score 7      FullScore ← FullScore + Score       StoreLoop ← StoreLoop + 1 8    UNTIL StoreLoop = Number 9    OUTPUT "The full score is ", FullScore 10   OUTPUT "Another set of scores (Y or N)?" 11   INPUT Another 12   IF Another = "N" 13     THEN 14       Count ← 1 15   ENDIF 16 UNTIL Count = 1 </pre>	

Question	Answer	Marks
4(b)	<p><b>One mark per mark point (Max 4)</b></p> <p>MP1 After line 6 // replace line 6</p> <p>MP2 ScoreArray[StoreLoop] ← Score // INPUT ScoreArray[StoreLoop]</p> <p>MP3 between lines 8 and 10</p> <p>MP4 AverageScore ← FullScore/Number</p> <p>MP5 OUTPUT "The average score is ", AverageScore</p> <p>Example correct algorithm for reference from part 4(a)</p> <pre> 1  Count ← 0 2  REPEAT 3    FullScore ← 0 4    INPUT Number 5    FOR StoreLoop ← 1 TO Number 6      INPUT Score 7      FullScore ← FullScore + Score 8    NEXT 9    OUTPUT "The full score is ", FullScore 10   OUTPUT "Another set of scores (Y or N)?" 11   INPUT Another 12   IF Another = "N" 13     THEN 14       Count ← 1 15   ENDIF 16 UNTIL Count = 1 </pre>	4

Question	Answer	Marks																																																																																															
5(a)	<p><b>One</b> mark for each correct column</p> <table border="1"> <thead> <tr> <th>Op</th> <th>Value1</th> <th>Value2</th> <th>Ans</th> <th>OUTPUT</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>87</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>14</td> <td>101</td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>30</td> <td>60</td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>10</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>6</td> <td></td> <td>Input Error</td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>10</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>2</td> <td>5</td> <td></td> </tr> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Op	Value1	Value2	Ans	OUTPUT	1						87						14	101		3						2						30	60		5						10						6		Input Error	4						10						2	5		0																														5
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Question	Answer	Marks
5(b)	To work as a calculator // to add, subtract, multiply or divide a pair of numbers	1
5(c)	To output/store the result/the value of Ans // Adding prompts for data entry.	1

Question	Answer	Marks							
6(a)	<p><b>Two</b> marks for six correct field names <b>One</b> mark for at least three correct field names</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Field name</th> </tr> </thead> <tbody> <tr> <td>LicenceNo</td> </tr> <tr> <td>Mileage</td> </tr> <tr> <td>TyreFLft</td> </tr> <tr> <td>TyreFRgt</td> </tr> <tr> <td>TyreRLft</td> </tr> <tr> <td>TyreRRgt</td> </tr> </tbody> </table>	Field name	LicenceNo	Mileage	TyreFLft	TyreFRgt	TyreRLft	TyreRRgt	2
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Question	Answer						Marks																																										
6(b)	<p> <b>One</b> mark for correct fieldnames  <b>One</b> mark for correct table names and show fields  <b>One</b> mark for correct sort  <b>One</b> mark for correct search criteria in all columns                 </p> <table border="1"> <tr> <td>Field:</td> <td>LicenceNo</td> <td>Mileage</td> <td>TyreFLft</td> <td>TyreFRgt</td> <td>TyreRLft</td> <td>TyreRRgt</td> </tr> <tr> <td>Table:</td> <td>TREAD</td> <td>TREAD</td> <td>TREAD</td> <td>TREAD</td> <td>TREAD</td> <td>TREAD</td> </tr> <tr> <td>Sort:</td> <td colspan="6">Ascending</td> </tr> <tr> <td>Show:</td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Criteria:</td> <td colspan="2"></td> <td>&lt;2</td> <td>&lt;2</td> <td>&lt;2</td> <td>&lt;2</td> </tr> <tr> <td>or:</td> <td colspan="6"></td> </tr> </table>						Field:	LicenceNo	Mileage	TyreFLft	TyreFRgt	TyreRLft	TyreRRgt	Table:	TREAD	TREAD	TREAD	TREAD	TREAD	TREAD	Sort:	Ascending						Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Criteria:			<2	<2	<2	<2	or:							<b>4</b>
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