Mark Scheme (Results)

Summer 2019

Pearson Edexcel GCSE In Computer Science (1CP1)
Paper 02: Application of Computational Thinking

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Additional Guidance	Mark
1(a)	Any **two** from: ● Quantity of milk ● Quantity of cream ● Type of milk/cream ● Quantity/type of sugar ● Type of ice cream [sorbet, gelato, gluten free, sugar] ● Flavour	● Accept meaningful variable names tied to the scenario, e.g. amtVanilla ● Mark not awarded for sell-by date	**2**

Question Number	Answer	Additional Guidance	Mark
1(b)	● Real/float/double ● Integer	Accept ‘Decimal’ for mp1	**2**

Question Number	Answer	Additional Guidance	Mark
1(c)	Any **one** from: ● (n hours * 60 min per hour) – 20 min ● Division by (10 + 5 + 30 + 5 + 15) Any **one** from: ● FLOOR, INTEGER, ROUNDDOWN **only** if used as part of an expression as per the first or second example ● DIV **only** if used in the correct location in an expression as per the third example ● ⌊ ⌋ **only** if used as part of an expression as per the fourth example Examples: ● Batches = ROUNDDOWN (((n * 60) – 20) / 65) ● INT ((n * 60) – 20 / (10 + 5 + 30 + 5 + 15)) ● Batches = ((n * 60) – 20) DIV 65 $\lfloor \frac{(n \times 60) - 20}{10 + 5 + 30 + 5 + 15} \rfloor$	● Units not required ● Accept any equivalent expression ● Single ⌋ or ⌊ is accepted **Do not accept:** ROUND() without direction	**2**

Question Number	Answer	Additional Guidance	Mark
2(a)	● Sell-by date/sell-by date and today's date (1) ● Yes, reorder this type of cookie/No, do not reorder cookies (1) ● Do calculation 10 – number of packs in stock (1)		**3**

Question Number	Answer	Additional Guidance	Mark
2(b)	• [11] • [21] First character index: 11 (1) Last character index: 21 (1) Correct use of square brackets on both (1)	• Do not award brackets (), as candidates will have pseudo-code document • Award second mark if distance from first character to last character is 10 • Award negative indexing, although not supported in all languages or pseudo-code [-17], [-7]	**3**

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	WHILE (True) (1)	● 'WHILE' alone is not sufficient	**1**

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	Any one from: ● Crashing it / breaking it / interrupting it from the console / killing the process (1) ● Ctrl-Z / Ctrl-C / Ctrl-break / break key / using the task manager to stop it (1)	● Any key combination that would crash the execution ● Do not award 'pause' key	**1**

Question Number	Answer	Additional Guidance	Mark
3(a)	• Do not open (1) • 12:00 to 18:30 (1) • 13:00 to 18:00 (1)		**3**

Question Number	Answer	Additional Guidance	Mark
3(b)	A cell needs to contain a single example of the required item. Each correct row is awarded one mark.		**3**

month	**day**
5, 6, 7, 8, 9	6, 7
<1 or >12	Any numeric value / null / blank
2, 3, 4, 10, 11, 12	<1 or >7

Question Number	Answer	Additional Guidance	Mark
4(a)	Indicative content: ● This pseudo-code is not suitable for humans to read and understand / running all the individual instructions together on a single line makes this pseudo-code difficult for humans to read **but** algorithm is short and understandable in this form ● Use of English command words makes it easier to understand for humans ● To make this pseudo-code easier for humans to read and understand: o the variable name 'w' could be changed to something more meaningful, such as 'week' o comments could be used to explain what the code is doing / using # or // for comments o each instruction could be placed on a new line o indentation could be used to show the blocking of the constructs / ending words could show blocking of the code o additional white space / lines could be used to show blocks of code	Rewritten pseudo-code can be used as a supportive example	**6**

Level	Mark	Descriptor
	0	No rewardable content
Level 1	1-2	Basic, independent points are made showing elements of knowledge and understanding of key concepts/principles of computer science. The discussion will contain basic information with little linkage between points made.
Level 2	3-4	Demonstrates adequate knowledge and understanding of key concepts/principles of computer science. The discussion shows some linkages and lines of reasoning with some structure.
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting relevant knowledge and understanding of key concepts/principles of computer science to support the discussion being presented. The discussion shows a well-developed, sustained line of reasoning which is clear, coherent and logically structured.

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>4(b)(i)</td><td>One mark for initialising all variables and one mark for each correct pass through the loop.

<table>
<tr><th>num</th><th>x</th><th>y</th><th>Display</th><th></th></tr>
<tr><td>0</td><td>999</td><td>0</td><td></td><td>(1)</td></tr>
<tr><td>355</td><td>355</td><td>355</td><td></td><td>(1)</td></tr>
<tr><td>554</td><td></td><td>554</td><td></td><td>(1)</td></tr>
<tr><td>199</td><td>199</td><td></td><td></td><td>(1)</td></tr>
<tr><td>409</td><td></td><td></td><td></td><td>(1)</td></tr>
<tr><td></td><td></td><td></td><td>199 554</td><td>(1)</td></tr>
</table></td><td>● Award alternative versions of the trace table if correct, for example, copying of values that do not change.
● Passes are incorrect if display is indicated.
● Display must be after the final pass (on a separate line in the table)</td><td>6</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	To identify the minimum/lowest number and the maximum/highest number (1)		**1**

Question Number	Answer	Additional Guidance	Mark
5(a)	An explanation that makes reference to the following point: ● This is a runtime error (1) Plus **one** from: ● Because it occurs when the computer tries to execute the code (1) ● Because the (translated) code cannot be executed (1) ● Because it crashes/stops (1) (the computer when attempting to execute) ● Occur intermittently, depending on the data that is encountered (1) ● Can be caused when a user inputs data of the wrong type (1)		**2**

Question Number	Answer	Additional Guidance	Mark
5(b)	Line 6 ● Error: Only one short side is needed/two added to width (1) ● Correction: SET totalWidth TO width (1) Line 8 ● Error: Lengths of the sides are multiplied (1) ● Correction: SET total TO totalWidth + totalLength (1)	● Do not penalise syntax errors as long as discernible	**4**

Question Number	Answer	Additional Guidance	Mark
6(a)	● The constants TAX and PROFIT cannot be changed by accident or error (1) so code that uses them should be more robust (1) than using the numbers instead. ● The constants TAX and PROFIT use meaningful names (1) instead of numbers, which make their purpose more clear (1) when used in the code. ● If the value of a constant, such as VAT, does have to be altered (1) only one change is required. (1)	● Do not award part of response indicating that constants can only be set once. This is in the pseudo-code document that accompanies the paper	**2**

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	● Subprogram identified as PROCEDURE on 3 lines; o Line 8: PROCEDURE calcProfitAndTax (..., ..., ...) o Line 9: PROCEDURE o Line 26: PROCEDURE ● Input parameters use local variable names o Line 8: calcProfitAndTax (inProd, inProfit, inTax) ● Calling subprogram by name o Line 36: calcProfitAndTax (...) ● Three parameters with names matching main code o Line 36: calcProfitAndTax (costProd, reqProfit, rateTax) ● Order of parameters in call match order of parameters in definition Both lines in the correct order for 1 mark o Line 8: (inProd, inProfit, inTax) o Line 36: (costProd, reqProfit, rateTax)	● Order of parameters in Line 8 and Line 36 may differ from those given here for MP2 and MP5	**5**

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	● Message on line 21 is a local variable / has local scope (1) because it is declared inside the subprogram (1) on line 10.		**2**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>6(b)(iii)</td><td>One mark for each correct validation test (1) maximum of 2.
One mark for each appropriate corresponding test data (1) maximum of 1.

The mark for test data identified must be linked with the associated data validation test.

Note: inTax must be between 0 and 1. For example, 0.03 is 3% tax.
Example

<table>
<tr><th>Validation test</th><th>Test data</th></tr>
<tr><td>rateTax >= 0</td><td>-0.03</td></tr>
<tr><td>rateTax <= 1</td><td>0.12</td></tr>
<tr><td>Presence check</td><td>“” / null / empty string</td></tr>
<tr><td>Type check</td><td>ABC</td></tr>
<tr><td>Range check >= 0 AND <= 1 / 1.00</td><td>1.55</td></tr>
</table>
</td><td>● Do not penalise syntax
● Accept appropriate alternative values for the test data</td><td>3</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>7(a)</td><td>

2 or more rows of data (1)
6 columns minimum (1)
Data types must be obvious and appropriate (1)

Integer: MemberNumber, Visits, CollectedPoints, RedeemedPoints
Decimal/Real: TotalSpend
Text: email, Name

Example:
<table>
<tr><th>MemberNumber</th><th>EmailAddress</th><th>FirstName</th><th>Visit</th><th>TotalSpend</th><th>CollectedPoints</th><th>RedeemedPoints</th></tr>
<tr><td>987654</td><td>TomS@123.com</td><td>Tom</td><td>123</td><td>246.31</td><td>210</td><td>75</td></tr>
<tr><td>654321</td><td>SarahS@123.com</td><td>Sarah</td><td>8</td><td>22.98</td><td>16</td><td>0</td></tr>
</table>
</td><td>

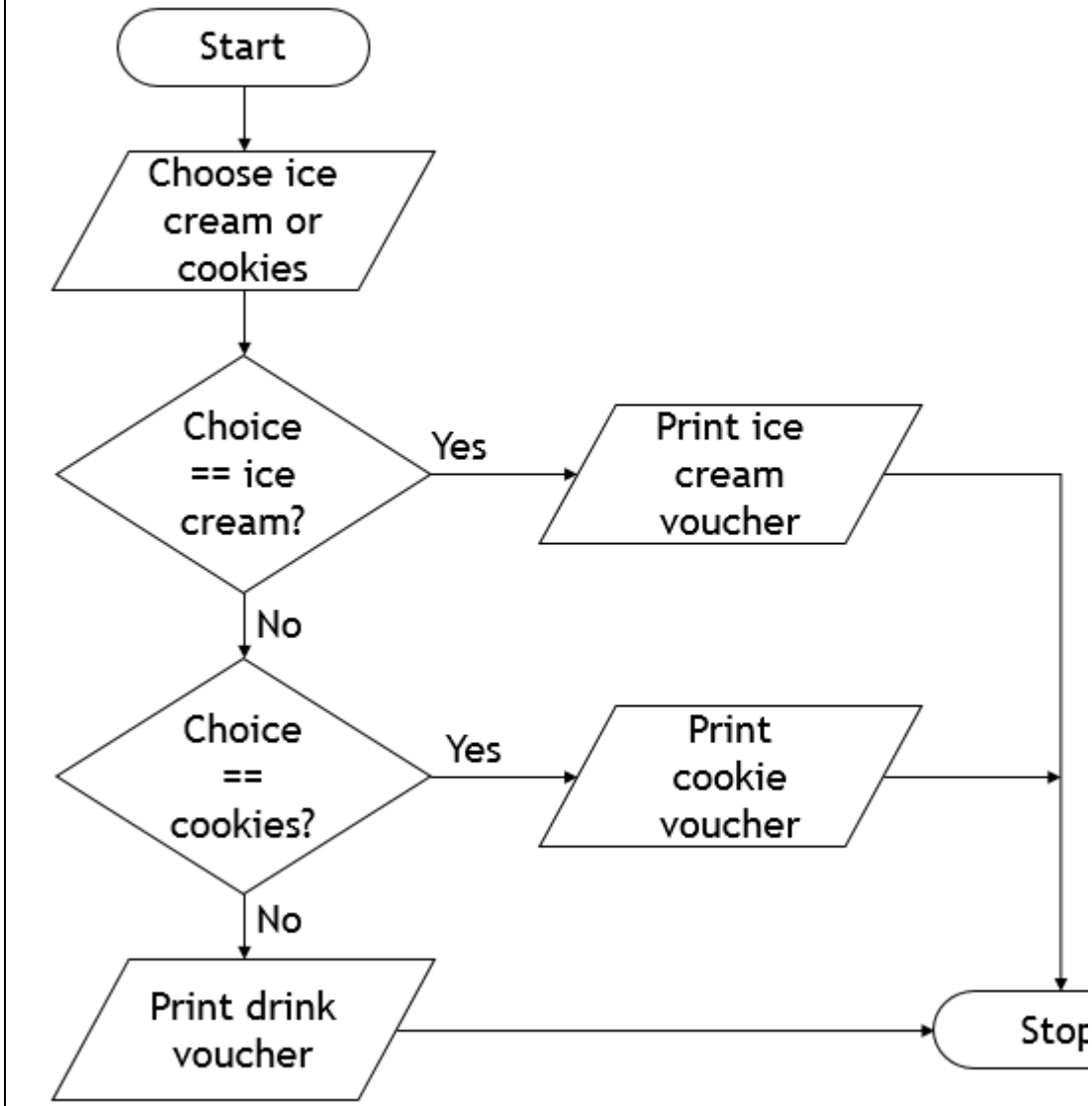
Column headings, if included, must be clearly distinguishable from the data
TotalSpend column allow £ sign (with value to two decimal places).
Do not penalise inclusion of the ‘Balance’ column, although it can be calculated and should not be stored, or incorrect calculation if included.
Do not penalise an omission of ‘email’ or invalid email address formatting
Accept appropriate data types instead of example data

</td><td>3</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
7(b)	Type (one from): ● Count controlled loop (1) ● For loop (1) Justification (one from): ● The number of loop passes is known in advance (1) ● The loop executes for a known number of times (1) ● The loop executes for exactly the number of members (1)	● Award marks independently	**2**

Question Number	Answer	Additional Guidance	Mark
7(c)	● Nested ifs / if else / if elseif (1) should be used so that the tests stop executing (1) as soon as a true one is encountered (1).	● 1 mark should be awarded for an appropriately amended algorithm	**3**

Question Number	Answer	Additional Guidance	Mark
8(a)	● Correct message in output box acting as a prompt for the user (1) ● Correct diamond symbol for decision (1) ● Correct test 'choice == cookies?' for decision (1) ● Correct label 'yes' on right arrow AND Correct label 'no' on bottom arrow (1) ● Correct output symbol with suitable message (1) ● Correct ellipse symbol and 'stop' for terminator (1)	● Symbol and contents are awarded independently ● Award 'End', 'Stop', 'Start', and 'Begin' as text for terminator symbols ● Award '==' and '=' used for equivalence inside decision symbol, but not in process symbol	**6**


Start
Choose ice cream or cookies
Choice == ice cream?
Yes
Print ice cream voucher
No
Choice == cookies?
Yes
Print cookie voucher
No
Print drink voucher
Stop

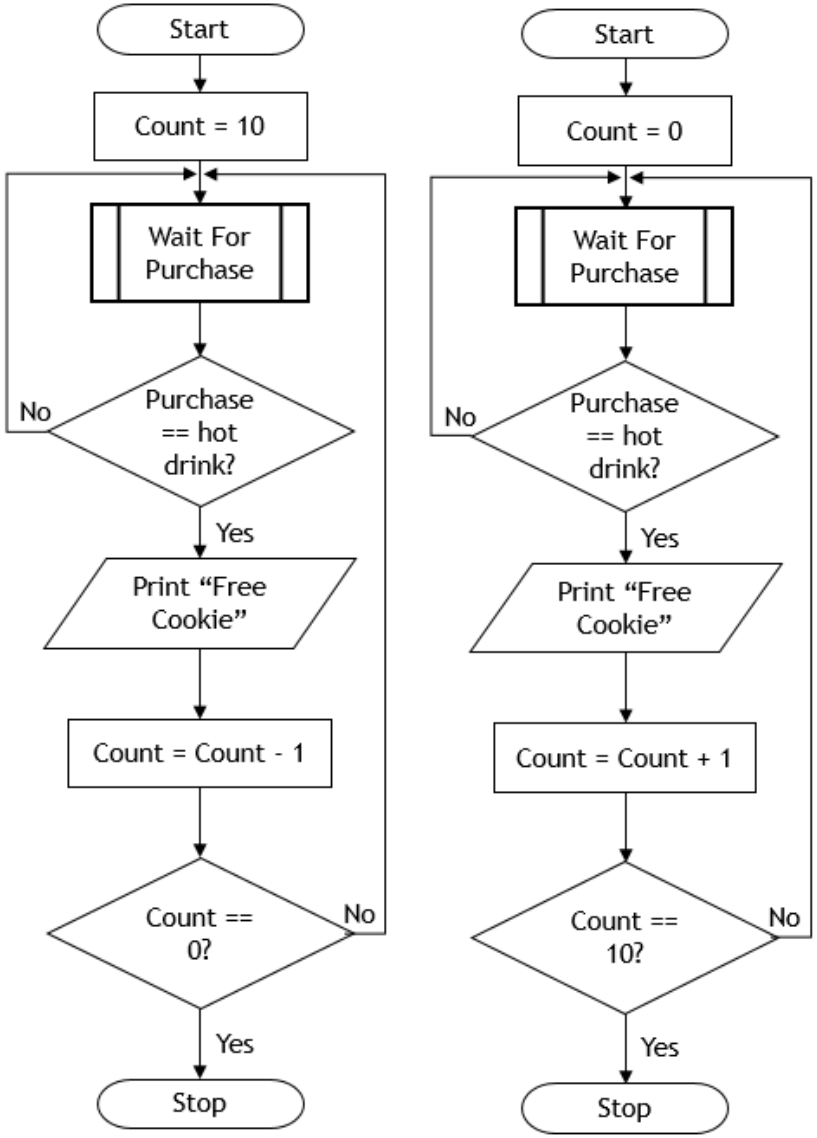
<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>8 (b)</td><td>
<table>
<tr><th rowspan="2">Aspect of Solution</th><th colspan="4">Marks</th></tr>
<tr><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Functionality</td><td>No awardable content</td><td>There are significant errors in logic, leading to an overall solution that is non-functional.</td><td>There are minor errors in logic, leading to an overall solution that is not completely functional.</td><td>There are no errors in logic, leading to an overall solution that is fully functional.</td></tr>
<tr><td>Accuracy of Notation</td><td>No awardable content</td><td>Notation follows a broadly unrecognisable convention that is applied inconsistently, although aspects of it are discernible.</td><td>Notation follows a recognisable convention that is broadly discernible but is applied inconsistently.</td><td>Notation follows a recognisable convention and is applied consistently throughout.</td></tr>
</table>

There are a maximum of 3 marks for functionality.
There are a maximum of 3 marks for accuracy of notation.
The marks for functionality and accuracy are awarded independently.

Example:</td><td>

Do not penalise use of plain rectangle instead of input/output flow chart symbol, if discernible
Award ‘End’, ‘Stop’, ‘Start’, and ‘Begin’ as text for terminator symbols
Award ‘==’ and ‘=’ used for equivalence inside decision symbol, but not in process symbol
Notation must include correct ‘wait for purchase’ symbol for 3 marks.

</td><td>6</td></tr>
</table>


Start
Count = 10
Wait For Purchase
Purchase == hot drink?
No
Yes
Print “Free Cookie”
Count = Count - 1
Count == 0?
No
Yes
Stop
Start
Count = 0
Wait For Purchase
Purchase == hot drink?
No
Yes
Print “Free Cookie”
Count = Count + 1
Count == 10?
No
Yes
Stop

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>9</td><td>
<table>
<tr><td rowspan="2">Aspect of Solution</td><td></td><td>Marks</td><td></td><td></td></tr>
<tr><td>0</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>Functionality</td><td>No awardable content</td><td>There are significant errors in logic, leading to an overall solution that is non-functional.</td><td>There are minor errors in logic, leading to an overall solution that is not completely functional.</td><td>There are no errors in logic, leading to an overall solution that is fully functional.</td></tr>
<tr><td>Accuracy of Notation</td><td>No awardable content</td><td>Notation follows a broadly unrecognisable convention that is applied inconsistently, although aspects of it are discernible.</td><td>Notation follows a recognisable convention that is broadly discernible but is applied inconsistently.</td><td>Notation follows a recognisable convention and is applied consistently throughout.</td></tr>
<tr><td>Efficiency, Appropriateness, and Accuracy of Solution</td><td>No awardable content</td><td>There are significant errors in the selection and accurate use of appropriate techniques.</td><td>Techniques have been selected and used with some accuracy, although the techniques may not be the most appropriate.</td><td>Techniques have been selected and used accurately and appropriately throughout to demonstrate an efficient solution.</td></tr>
</table>

There are a maximum of 3 marks for functionality.
There are a maximum of 3 marks for accuracy of notation.
</td><td></td><td>9</td></tr>
</table>

	There are a maximum of 3 marks for efficiency, appropriateness, and accuracy of solution. Each row is awarded independently.		

Pseudo-code example:

```
SET freezers TO [-20, -19, -18, -17, -16, 0, 1]
SET index TO 0
WHILE (index < length (freezers)) DO
   SET temperature TO freezers [index]
   IF ((temperature < -19) OR (temperature > -17)) THEN
      SEND ("Freezer" & index & " is out of tolerance: " & temperature)
   END IF
   SET index TO index + 1
END WHILE

SET freezers TO [-20, -19, -18, -17, -16, 0, 1]
SET reqTemp TO -18
SET index TO 0
FOR EACH temp FROM freezers DO
        IF (temp > reqTemp + 1) OR (temp < reqTemp – 1) THEN
                SEND ‘Freezer ‘ & index & ‘ is out of tolerance: ‘ & temp
        END IF
        SET index TO index + 1
END FOR EACH
```

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