Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

2526751721

COMPUTER SCIENCE **0478/22**

Paper 2 Problem-solving and Programming **May/June 2019**

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

DO NOT ATTEMPT TASKS 1, 2 AND 3 in the pre-release material; these are for information only.

You are advised to spend no more than **40 minutes** on **Section A** (Question 1).

No marks will be awarded for using brand names of software packages or hardware.

Any businesses described in this paper are entirely fictitious.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

The maximum number of marks is 50.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **13** printed pages and **3** blank pages.

DC (LT/JG) 193974/3

Cambridge Assessment International Education

[Turn over

Section A

You are advised to spend no longer than 40 minutes answering this section.

Here is a copy of the pre-release material.

DO NOT attempt Tasks 1, 2 and 3 now.

Use the pre-release material and your experience from attempting the tasks before the examination to answer Question 1.

Pre-release material

An auction company has an interactive auction board at their sale rooms, which allows buyers to place bids at any time during the auction. Before the auction starts, the sellers place their items in the sale room with a unique number attached to each item (item number). The following details about each item need to be set up on the interactive auction board system: item number, number of bids, description and reserve price. The number of bids is initially set to zero.

During the auction, buyers can look at the items in the sale room and then place a bid on the interactive auction board at the sale room. Each buyer is given a unique number for identification (buyer number). All the buyer needs to do is enter their buyer number, the item number and their bid. Their bid must be greater than any existing bids.

At the end of the auction, the company checks all the items and marks those that have bids greater than the reserve as sold. Any items sold will incur a fee of 10% of the final bid to be paid to the auction company.

Write and test a program or programs for the auction company.

- Your program or programs must include appropriate prompts for the entry of data, data must be validated on entry.
- Error messages and other output need to be set out clearly and understandably.
- All variables, constants and other identifiers must have meaningful names.

You will need to complete these **three** tasks. Each task must be fully tested.

Task 1 – Auction set up.

For every item in the auction the item number, description and the reserve price should be recorded. The number of bids is set to zero. There must be at least 10 items in the auction.

Task 2 – Buyer bids.

A buyer should be able to find an item and view the item number, description and the current highest bid. A buyer can then enter their buyer number and bid, which must be higher than any previously recorded bids. Every time a new bid is recorded the number of bids for that item is increased by one. Buyers can bid for an item many times and they can bid for many items.

Task 3 – At the end of the auction.

Using the results from TASK 2, identify items that have reached their reserve price, mark them as sold, calculate 10% of the final bid as the auction company fee and add this to the total fee for all sold items. Display this total fee. Display the item number and final bid for all the items with bids that have not reached their reserve price. Display the item number of any items that have received no bids. Display the number of items sold, the number of items that did not meet the reserve price and the number of items with no bids.

1 **(a)** All variables, constants and other identifiers must have meaningful names.

Describe the data structures you have used in **Task 1** to record the items for sale. Include some sample data for each data structure you have described.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

(b) Explain how your program for **Task 1** ensures the item number is unique.

.....

.....

.....

..... [2]

(c) Write an algorithm for the part of **Task 2** that allows the buyer to add a new bid, using **either** pseudocode, programming statements **or** a flowchart. Assume that **Task 1** has been completed and that the item details have already been found.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

(d) Explain how your program for **Task 2** checks that a new bid is higher than previous bids for an item.

.....

.....

.....

.....

.....

..... [3]

(e) Explain how your program identifies the items that have reached their reserve price, then calculates and displays the total auction company fee for all sold items as part of **Task 3**. Any programming statements used in your answer must be fully explained.

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

.... [5]

Section B

2 **(a)** An algorithm has been written in pseudocode to input 100 numbers, select and print the largest number and smallest number.

```
Count ← 1
INPUT Number
High ← Number
Low ← Count
REPEAT
  INPUT Number
  IF Number > High
    THEN
      High ← Number
  ENDIF
  IF Number > Low
    THEN
      Low ← Number
  ENDIF
  Count ← Count + 1
UNTIL Count = 99
PRINT "Largest Number is ", Number
PRINT "Smallest Number is ", Low
```

Find the **four** errors in the pseudocode and suggest a correction for each error.

Error 1.....

Correction .....

.....

Error 2.....

Correction .....

.....

Error 3.....

Correction .....

.....

Error 4.....

Correction .....

.....

[4]

(b) Show how you would change the corrected algorithm to total the numbers and print the total. Use a variable `Total`.

.....

.....

.....

.....

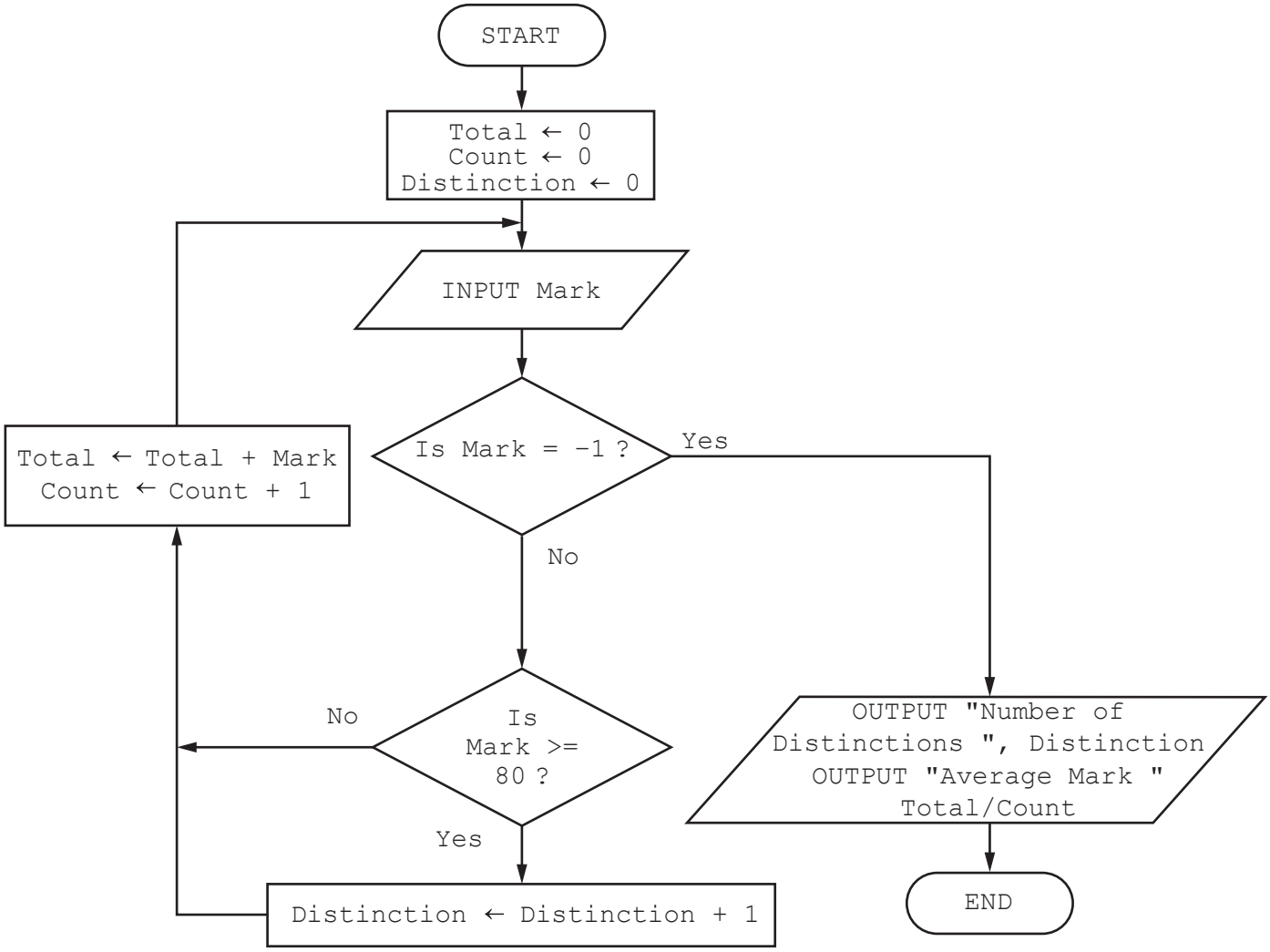
.....

.....

.....

..... [4]

3 This flowchart inputs the marks gained in an examination. An input of –1 ends the routine.



Complete the trace table for the mark input data: 50, 70, 65, 30, 95, 50, 55, 85, 65, 35, –1, 45

Total	Count	Distinction	Mark	**OUTPUT**

[4]

4 For each of the **four** groups of statements in the table, place a tick in the correct column to show whether it is an example of **Selection** or **Repetition**.

Statements	Selection	Repetition

`FOR A ← 1 TO 100`
`  B ← B + 1`
`NEXT A`		

`CASE A OF`
`  100: B ← A`
`  200: C ← A`
`ENDCASE`		

`IF A > 100`
`THEN`
`  B ← A`
`ENDIF`		

`REPEAT`
`  A ← B * 10`
`UNTIL A > 100`		

[4]

5 Explain what is meant by **validation** and **verification**.
Give an example for each one.

Validation .....

.....

.....

.....

Example .....

.....

.....

Verification .....

.....

.....

.....

Example .....

.....

.....

[6]

6 A database table, FLIGHT, is used to keep a record of flights from a small airfield. Planes can carry passengers, freight or both. Some flights are marked as private and only carry passengers.

Flight number	Plane	Notes	Departure time	Passengers
FN101	Caravan 1	Private passenger flight	08:00	Y
CN101	Caravan 2	Freight only	08:30	N
CN102	Piper 1	Freight only	09:00	N
FN104	Piper 2	Passengers only	09:20	Y
FN105	Piper 1	Freight and passengers	10:00	Y
FN106	Caravan 1	Passengers only	10:30	Y
CN108	Caravan 2	Freight only	08:00	N
CN110	Lear	Private passenger flight	08:00	Y

(a) State the field that could have a Boolean data type.

Field ..... [1]

(b) A query-by-example has been written to display just the flight numbers of all planes leaving after 10:00 that only carry passengers.

Field:	Flight number	Passengers	Departure time	
Table:	FLIGHT	FLIGHT	FLIGHT	
Sort:				
Show:	☐	☑	☐	☐
Criteria:		= Y	= 10:00	
or:				

Explain why the query-by-example is incorrect, and write a correct query-by-example.

Explanation .....

.....

.....

.....

.....

Field:				
Table:				
Sort:				
Show:	☐	☐	☐	☐
Criteria:				
or:				

[7]

BLANK PAGE

BLANK PAGE

BLANK PAGE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

COMPUTER SCIENCE **0478/22**

Paper 2 **May/June 2019**

MARK SCHEME

Maximum Mark: 50

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 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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
	Section A	
1(a)	4 marks for: Data Structure(s) **max 2** • Arrays • Variable(s) for // data entry such as reserve price // index / constant for minimum number of items Further description **max 3** • Data type(s) one or more • Use(s) one or more • Name(s) one or more e.g. `Item_Number`, `NumberBids`, `Description`, `Reserve Price` • Sample data for appropriate arrays e.g. 1234, 0, vase, 20.00 // Sample data for variable or constant e.g. 10 1 mark for: • At least four appropriate named arrays with sample data	**5**
1(b)	• Keep a counter/number • Add one every time a new item is added or • Keep a list of numbers used • Using a loop check number is not already in the list before a new item number is added	**2**

Question	Answer	Marks

1(c)	**Five** from:
	MP1 Enter Buyer Number
	MP2 Check if buyer number valid
	MP3 Enter new bid
	MP4 Check if new bid less than or equal to current highest bid …
	MP5 … if so reject
	MP6 … Otherwise store the bid entered as new highest bid
	MP7 Increase number of bids by one
	MP8 Store Buyer Number
	
	Sample answer
	
	`REPEAT`
	`  PRINT "Enter Buyer Number"`
	`  INPUT BuyerNumber`
	`UNTIL BuyerNumber >= BuyerLow and BuyerNumber <= BuyerHigh`
	`REPEAT`
	`  PRINT "Enter Bid -99 to exit"`
	`  INPUT Bid`
	`  IF Bid > HighestBid(item)`
	`  THEN`
	`  HighestBid(item) ← Bid`
	`  NumberBids(item) ← NumberBids(item) + 1`
	`  ENDIF`
	`UNTIL Bid > HighestBid(item) OR Bid = -99`
	`IF Bid <> -99`
	`  THEN`
	`  BuyerItem(item) ← BuyerNumber`
	`ENDIF`
	
	There are many possible correct answers, this is an example only.
		5

1(d)	**Three** from: MP1 Using index number of item, to find if any bids for item exist MP2 Using IF/UNTIL/WHILE (statement) to compare new bid with highest/latest bid recorded MP3 Use an assignment (statement) to replace current highest bid, if new bid greater than current highest bid MP4 … else reject bid // using a (REPEAT/WHILE) loop ask for bid to be re-entered MP5 If number of bids / highest bid = zero add bid (provided greater than zero)	**3**

Question	Answer	Marks
1(e)	Explanation of how the candidate's program performed the following. **Five** from: MP1 Method to search item arrays MP2 Conditional statement used to check for the successful bids MP3 … equal to / greater than reserve price MP4 Method used to calculate 10% percent of successful bid (for each item) MP5 …and add to auction company total fee MP6 Method used to display total fee with a suitable message All programming statements used must be explained.	**5**

Question	Answer	Marks
	Section B	
2(a)	1 mark for each error identified + suggested correction • `Low ← Count` should be `Low ← Number` • `Number > Low` should be `Number < Low` • `UNTIL Count = 99` should be `UNTIL Count > 99` or `UNTIL Count = 100` or `UNTIL Count >= 100` // `Count ← 1` should be `Count ← 0` • `PRINT "Largest Number is ", Number` should be `PRINT "Largest Number is ", High`	**4**

2(b)	MP1 Add `Total ← 0` // `Total ← Number`
	MP2 Add `Total ← Total + Number`
	MP3 Add `PRINT "Total is ", Total`
	MP4 All positioning explained / seen
	
	`Count ← 1`
	`INPUT Number`
	`High ← Number`
	`Low ← Number`
	`Total ← Number`
	`REPEAT`
	`  INPUT Number`
	`  Total ← Total + Number`
	`  IF Number > High`
	`  THEN`
	`  High ← Number`
	`  ENDIF`
	`  IF Number < Low`
	`  THEN`
	`  Low ← Number`
	`  ENDIF`
	`  Count ← Count + 1`
	`UNTIL Count > 99`
	`PRINT "Largest Number is ", High`
	`PRINT "Smallest Number is ", Low`
	`PRINT "Total is ", Total`
		4

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3</td><td>
<table>
<tr><th>Total</th><th>Count</th><th>Distinction</th><th>Mark</th><th>OUTPUT</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>50</td><td></td></tr>
<tr><td>50</td><td>1</td><td>0</td><td>70</td><td></td></tr>
<tr><td>120</td><td>2</td><td>0</td><td>65</td><td></td></tr>
<tr><td>185</td><td>3</td><td>0</td><td>30</td><td></td></tr>
<tr><td>215</td><td>4</td><td>0</td><td>95</td><td></td></tr>
<tr><td>310</td><td>5</td><td>1</td><td>50</td><td></td></tr>
<tr><td>360</td><td>6</td><td>1</td><td>55</td><td></td></tr>
<tr><td>415</td><td>7</td><td>1</td><td>85</td><td></td></tr>
<tr><td>500</td><td>8</td><td>2</td><td>65</td><td></td></tr>
<tr><td>565</td><td>9</td><td>2</td><td>35</td><td></td></tr>
<tr><td>600</td><td>10</td><td></td><td>–1</td><td>Number of Distinctions 2</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Average Mark 60</td></tr>
</table>
1 mark for Total and Count columns both correct.
1 mark for each correct column apart from Total and Count.
If no marks awarded allow 1 mark for initialisation of Total, Count and Distinction, set to zero.
</td><td>4</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4</td><td>
<table>
<tr><th>Statements</th><th>Selection</th><th>Repetition</th></tr>
<tr><td><pre>FOR A ← 1 TO 100
   B ← B + 1
NEXT A</pre></td><td></td><td>✓</td></tr>
<tr><td><pre>CASE A OF
   100: B ← A
   200: C ← A
ENDCASE</pre></td><td>✓</td><td></td></tr>
<tr><td><pre>IF A > 100
   THEN
      B ← A
ENDIF</pre></td><td>✓</td><td></td></tr>
<tr><td><pre>REPEAT
   A ← B * 10
UNTIL A > 100</pre></td><td></td><td>✓</td></tr>
</table>
1 mark for each correct row
</td><td>4</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>5</td><td>
Validation
Two from:
• automated checking
• checking that data is reasonable / of a certain type
• checking that data meets certain criteria

Example 1 mark
• range check // length check // type check // check digit etc.

Verification
Two from:
• checking that data has not changed…
• … during input to a computer
• … during transfer between computers / devices

Example 1 mark
• double entry // checking against original // visual check // use of checksum etc.
</td><td>6</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(a)</td><td>Passengers</td><td>1</td></tr>
<tr><td>6(b)</td><td>Explanation
Three from:
• Flight number not displayed
• Passengers displayed when should not be
• Departure time = not >
• "Freight and passengers" flight not excluded

Revised QBE – answers shown are examples only
1 mark per bullet
• correct field and table names (either 3 or 4 columns) must include Notes, Flight number and Departure time
• correct show
• correct time criteria for the candidate’s QBE grid
• use of criteria to select planes with passengers only

<table>
<tr><td>Field:</td><td>Flight number</td><td>Passengers</td><td>Departure time</td><td>Notes</td></tr>
<tr><td>Table:</td><td>FLIGHT</td><td>FLIGHT</td><td>FLIGHT</td><td>FLIGHT</td></tr>
<tr><td>Sort:</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Show:</td><td>☑</td><td>☐</td><td>☐</td><td>☐</td></tr>
<tr><td>Criteria:</td><td></td><td>=Y</td><td>>10:00</td><td><> "Freight and passengers"</td></tr>
<tr><td>or:</td><td></td><td></td><td></td><td></td></tr>
</table>
OR
<table>
<tr><td>Field:</td><td>Flight number</td><td>Departure time</td><td>Notes</td></tr>
<tr><td>Table:</td><td>FLIGHT</td><td>FLIGHT</td><td>FLIGHT</td></tr>
<tr><td>Sort:</td><td></td><td></td><td></td></tr>
<tr><td>Show:</td><td>☑</td><td>☐</td><td>☐</td></tr>
<tr><td>Criteria:</td><td></td><td>>10:00</td><td>= "Passengers only"</td></tr>
<tr><td>or:</td><td></td><td>>10:00</td><td>="Private passenger flight"</td></tr>
</table>
</td><td>7</td></tr>
</table>