Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

COMPUTER SCIENCE **0478/21**

Paper 2 Problem-solving and Programming **May/June 2018**

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.

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 approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages and **1** blank page.

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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

A computer shop will build a computer from components to meet a customer's requirements. For each request for a computer to be built, an estimate of the cost is produced. The component stock level is checked; if all the components are in stock, a firm order to build the computer can be placed. A program is required to work out the cost of the computer, update the stock levels and provide a daily summary of orders for the shop owner.

Write and test a program or programs for the computer shop owner.

- Your program or programs must include appropriate prompts for the entry of data.
- 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 – Produce an estimate.

Write a program for TASK 1 to calculate the cost of building a computer using these components.

Component	**Choices**	**Prices in $**
Processor	p3 / p5 / p7	100 / 120 / 200
RAM	16 GB / 32 GB	75 / 150
Storage	1 TB / 2 TB	50 / 100
Screen	19" / 23"	65 / 120
Case	Mini Tower / Midi Tower	40 / 70
USB ports	2 ports / 4 ports	10 / 20

The customer makes a choice for each component and an estimate is produced. The estimate must show a unique estimate number, the components chosen and the price of each component. The estimate must also show the total cost of the computer, which is calculated as the sum of the cost of the components chosen plus 20%.

TASK 2 – Place an order.

Using your estimate from TASK 1, check if the components required are in stock. If all the components are in stock then update the stock levels. Add the unique estimate number to the list of order numbers. Add the customer's details and today's date to the estimate details to finalise the order. Print two copies of the order, one for the customer and one for the shop.

TASK 3 – Summarise the day's orders.

Extend TASK 2 to provide an end of day summary showing the number of orders made, the total number of each component sold and the value of the orders.

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

(i) You recorded information for the estimate of the cost of building a computer in **Task 1**. Give a data structure that you created for **Task 1**, its name, data type and use.

Data structure ....Array........

Name ....Processor........

Data type ....String........

Use ....To store the type of processors........

........currently available........ [4]

(ii) Describe the data structures that you have used in **Task 2** to record the customer details. Include sample data in the description.

Data structures used are Arrays example

ProcessorSelected to hold the type of processor

selected. This would be string datatype

example ProcessorSelected [23]

Variable can also be used to hold the cost of

the components selected example

Total Cost ← Totalcost + (Totalcost × 0·2)

This would be of integer data type. [4]

(b) Explain how your program for **Task 1** produces a unique estimate number.

It would ask for the date combined with the

time to make a unique number example

22June2021 10·35

.... [2]

(c) Write an algorithm for part of **Task 2** to check that the chosen **processor** and chosen **RAM** are in stock, using **either** pseudocode, programming statements **or** a flowchart. Assume that **Task 1** has been completed. Do **not** check the other components or produce the order.

```
ProcessorFound ← False
RamFound ← False

Output "Select desired Processor"
Input ProcessorSelected.

For x ← 0 to 2
    If ProcessorSelected = Processor[x]
        Then ProcessorFound ← True
    endIF
Next x

Output "Enter the RAM You Want"
INPUT RamSelected

For R ← 0 to 1
    If RamSelected = RAM[R]
        Then RamFound ← True
    endif
Next R

Output ProcessorFound
Output RamFound
```

[5]

(d) Explain how your program completes **Task 3**. Any programming statements used in your answer must be fully explained.

Include variables TotalNumberofComponents and
TotalOrders.
Check if an order has been completely actualized
to add to the totalNumber of orders
IF an order has been actualized add the
number of components to the number of
components sold.
Add the amount of the ordered components
to the grand total value of orders

[5]

Section B

2 **(a)** Write an algorithm to input 1000 numbers. Count how many numbers are positive and how many numbers are zero. Then output the results. Use **either** pseudocode **or** a flowchart.

```
PosCount ← 0
ZeroCount ← 0

FOR x ← 1 TO 1000
    Output "Please enter a number"
    Input Num
    If Num > 0 Then
        posCount ← PosCount +1
    endif
    If Num = 0 Then
        ZeroCount ← ZeroCount +1
    endif
Next x

Output "The number of positive numbers is",
    posCount
Output "The number of Zero Numbers is",
    ZeroCount
```

[6]

(b) Give one change you could make to your algorithm to ensure initial testing is more manageable.

Reduce the number of iterations so you dont have to input data 1000 times [1] to test the algorithm

Question 3 starts on page 8.

3 The global trade item number (GTIN-8) barcode has seven digits and a check digit.
This pseudocode algorithm inputs seven digits and calculates the eighth digit, then outputs the GTIN-8.
DIV(X,Y), finds the number of divides in division for example **DIV(23,10)** is 2.
MOD(X,Y), finds the remainder in division for example **MOD(23,10)** is 3.

```
FOR Count ← 1 TO 7
   INPUT Number
   Digit(Count) ← Number
NEXT
Sum ← (Digit(1)+Digit(3)+Digit(5)+Digit(7))*3+Digit(2)+Digit(4)+Digit(6)
IF MOD(Sum,10) <> 0
   THEN Digit(8) ← DIV(Sum,10)*10 + 10 - Sum
   ELSE Digit(8) ← 0
ENDIF
OUTPUT "GTIN-8"
FOR Count ← 1 TO 8
   OUTPUT Digit(Count)
NEXT
```

(a) Complete the trace table for the input data: 5, 7, 0, 1, 2, 3, 4

Digit(1)	Digit(2)	Digit(3)	Digit(4)	Digit(5)	Digit(6)	Digit(7)	Digit(8)	Sum	OUTPUT
5	7	0	1	2	3	4	6	44	GTIN-8
									57012346

Complete the trace table for the input data: 4, 3, 1, 0, 2, 3, 1

Digit(1)	Digit(2)	Digit(3)	Digit(4)	Digit(5)	Digit(6)	Digit(7)	Digit(8)	Sum	OUTPUT
4	3	1	0	2	3	1	0	30	GTIN-8
									43102310

[5]

(b) Explain how you would change the algorithm to input eight digits (seven digits and the check digit) and output if the check digit entered is correct or not.

Increase the count loop to go till 8

Include in your algorithm a check to see if the

8th digit entered is equal to the one calculated

from all the other 7 digits

Include a message to be displayed if

the digit is wrong

.... [3]

Question 4 starts on page 10.

4 A programmer has written a routine to check that prices are below $10.00. These values are used as test data.

10.00 9.99 ten

Explain why each value was chosen.

10.00 Boundary data to test if the program will reject this data.

9.99 Extrem data - to test the upper acceptable limit of the data

ten Abnormal data to test if the program will reject this value

[3]

5 Explain the difference between the programming concepts of **counting** and **totalling**. Include an example of a programming statement for each concept in your explanation.

Counting is a concept that increament a count variable by 1 depending on a condition

Totaling is a concept that adds values to the totaling variable. It gets the cummulative sum of a calculation.

Counting

```
While count <10 DO
        Count ← Count +1
endWhile
```

Totaling

```
for x ← 1 to 20
    input num
    Total ← total +num
endfor
```

[4]

6 A database table, PERFORMANCE, is used to keep a record of the performances at a local theatre.

Show Number	Type	Title	Date	Sold Out
SN091	Comedy	An Evening at Home	01 Sept	Yes
SN102	Drama	Old Places	02 Oct	No
SN113	Jazz	Acoustic Evening	03 Nov	No
SN124	Classical	Mozart Evening	04 Dec	Yes
SN021	Classical	Bach Favourites	01 Feb	Yes
SN032	Jazz	30 Years of Jazz	02 Mar	Yes
SN043	Comedy	Street Night	03 Apr	No
SN054	Comedy	Hoot	04 May	No

(a) State the number of fields and records in the table.

Fields .... 5 ....

Records .... 7 ....

[2]

(b) Give **two** validation checks that could be performed on the **Show Number** field.

Validation check 1 .... length check ....

....

Validation check 2 .... format check ....

....

[2]

(c) Using the query-by-example grid, write a query to identify jazz performances that are not sold out. Only display the date and the title.

Field:		Sold Out	Type	Date	Title
Table:	Performance	Performance	Performance	Performance	Performance
Sort:					
Show:	□	□	□	☑	☑
Criteria:		= No	="Jazz"		
or:					

[4]