Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Thursday 16 May 2019

Afternoon (Time: 2 hours) | Paper Reference **1CP1/02**

Computer Science

Paper 2: Application of Computational Thinking

You must have:
Pseudocode command set (enclosed)

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Use of a calculator is **prohibited**.

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 5 6 2 2 5 A 0 1 3 2

Pearson

Answer ALL questions. Write your answers in the spaces provided.

Questions in this paper are based on a scenario.

Margaret's Ice Cream Kiosk

Margaret runs an ice cream kiosk in a seaside town. She makes and sells ice cream. She also sells sweets, hot and cold drinks, and cookies.

1 Margaret has developed her own recipes for different flavours of ice cream. The recipes use only natural ingredients.

Here is Margaret's recipe for strawberry ice cream.

Margaret's Ice Cream Kiosk
Strawberry ice cream ingredients

0.8 litres – Full fat milk
0.9 litres – Cream
0.3 kilograms – Sugar
12 Whole eggs
1.4 kilograms – Strawberries
15 millilitres – Vanilla

She stores all her recipes on a computer. One variable is needed to hold the amount of fruit and another is needed to hold the number of eggs.

(a) State **two** additional variables that need to be created to store the recipes for ice cream.

(2)

1 .....

.....

2 .....

.....

(b) State the data type needed to store values for the weight of fruit and the number of eggs in a recipe.

(2)

Weight of fruit

.....

.....

Number of eggs

.....

.....

(c) The process for making a single batch of ice cream is shown in the table.

Action	Time in minutes
Pre-freeze the ice cream maker	10
Add ingredients	5
Churn the ingredients into ice cream	30
Transfer the ice cream to tubs	5
Clean the machine	15

The ice cream maker must be sterilised at the end of each day. This takes 20 minutes.

Construct a general expression to show how many batches of ice cream can be made in any number of hours.

(2)

.....

.....

.....

.....

(Total for Question 1 = 6 marks)

2 When stocks of items sold in the kiosk are low, they are reordered from the supplier. Any items that have passed their sell-by date are disposed of.

(a) A computer program can be used to determine when to dispose of or reorder cookies.

Complete the table to show an input, a process and an output, using the following information:

- each pack of cookies has a sell-by date
- there must always be at least 10 packs of each type of cookie in stock
- quantity ordered must bring the number of packs of each type up to 10.

(3)

Input	Process	Output
	Determine if the sell-by date is passed	Yes, dispose of pack of cookies No, keep pack of cookies
Number of packs of this type of cookie	Determine if number of packs < 10	
Number of packs of this type of cookie to reorder		Reorder this number of packs of this type of cookie

(b) Data about each item is encoded into text and is stored by a computer program as data type STRING. The format is the same for every item (DD MMM YYYY).

The data for chocolate chip cookie is shown.

L6041 8653 14 NOV 2019 L1017

Indexing is used to reference each location in the string.

State the indexing expression for the first character and the last character of the sell-by date.

(3)

First character

.....

Last character

.....

(c) The pseudocode for an infinite loop is shown.

```
2  WHILE (True) DO
3      SET count TO count + 1
4      SEND count TO DISPLAY
5  END WHILE
```

(i) Identify the pseudocode that makes this an infinite loop.

(1)

.....

.....

(ii) State how the user would stop this code running when it is executing on a computer.

(1)

.....

.....

(Total for Question 2 = 8 marks)

3 Margaret needs to know when to open the ice cream kiosk.

The pseudocode for an algorithm that determines opening times is shown.

The values for *month* are 1 = January, 2 = February … 12 = December.

The values for *day* are 1 = Monday, 2 = Tuesday … 7 = Sunday.

```
IF (month = 1) THEN
    SEND ("Do not open") TO DISPLAY
ELSE
    IF (month >= 5) AND (month <= 9) THEN
        IF (day >= 1) AND (day <= 5) THEN
            SEND ("12:00 to 18:30") TO DISPLAY
        ELSE
            IF (day = 6) OR (day = 7) THEN
                SEND ("12:00 to 20:00") TO DISPLAY
            ELSE
                SEND ("High season day error") TO DISPLAY
            END IF
        END IF
    ELSE
        IF (month >= 2) AND (month <= 12) THEN
            IF (day >= 1) AND (day <= 5) THEN
                SEND ("13:00 to 17:00") TO DISPLAY
            ELSE
                IF (day = 6) OR (day = 7) THEN
                    SEND ("13:00 to 18:00") TO DISPLAY
                ELSE
                    SEND ("Low season day error") TO DISPLAY
                END IF
            END IF
        ELSE
            SEND ("Month error") TO DISPLAY
        END IF
    END IF
END IF
```

(a) Complete the table to show the output of the pseudocode algorithm, based on the given inputs.

(3)

Input		Output displayed
month	**day**	
1	5	
6	4	
3	7	

(b) The pseudocode algorithm needs to be tested.

Construct test data to meet the requirements set out in the table.

(3)

Requirements	Input	
	month	**day**
A condition generating '12:00 to 20:00'		
A condition generating 'Month error'		
A condition generating 'Low season day error'		

(Total for Question 3 = 6 marks)

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4 Margaret needs to keep track of how much money she makes. She collects the sales figures on a weekly basis.

(a) The pseudocode of an algorithm is shown.

```
2 w = 0 REPEAT SET w TO w + 1 SEND w TO DISPLAY UNTIL w = 52
```

In some programming languages, if a program is written like this, it could be translated and executed.

Discuss the suitability of this code for humans and how it could be improved.

(6)

(b) A pseudocode algorithm that manipulates sales figures is shown.

```
 2  SET num TO 0
 3  SET x TO 999
 4  SET y TO 0
 5
 6  FOR EACH num FROM "SalesFile.txt" DO
 7      IF (num < x) THEN
 8          SET x TO num
 9      IF (num > y) THEN
10          SET y TO num
11  END FOREACH
12
13  SEND x & " " & y TO DISPLAY
```

(i) The first four inputs from the file to the algorithm are 355, 554, 199, and 409.

Complete the trace table showing the execution of the pseudocode with these four inputs. You may not need to fill in all the rows in the table.

(6)

num	x	y	Display

(ii) State the purpose of this algorithm.

(1)

.....

.....

(Total for Question 4 = 13 marks)

5 Errors are revealed when program code is translated and executed.

(a) Here is an error that a programmer received when writing and testing some code.

Explain this type of error.

(2)

.....

.....

.....

.....

(b) Margaret is having a new decorative banner fitted around her kiosk. The kiosk is a rectangle 5 metres long and 3 metres wide. The door and serving window take up one of the shorter sides, so it does not need the banner.

The pseudocode for an algorithm that determines the length of banner needed is shown.

```
2 SEND "Enter length: " TO DISPLAY
3 RECEIVE length FROM (INTEGER) KEYBOARD
4 SEND "Enter width: " TO DISPLAY
5 RECEIVE width FROM (INTEGER) KEYBOARD
6 SET totalWidth TO 2 * width
7 SET totalLength TO 2 * length
8 SET total TO totalWidth * totalLength
9 SEND "The amount needed is: " & total TO DISPLAY
```

Line 6 and line 8 have logic errors.

Identify the error in each line and construct new lines of code that will correct the errors.

(4)

	Error	Correction
Line 6		
Line 8		

(Total for Question 5 = 6 marks)

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6 Margaret uses a program to help her determine the selling price for each batch of ice cream based on the production cost, profit and tax.

(a) The pseudocode for an algorithm to calculate the selling price of ice cream is shown. The items TAX and PROFIT are constants.

```
CONST REAL TAX
SET TAX TO 0.20
CONST REAL PROFIT
SET PROFIT TO 0.06

SEND "Welcome to the selling price calculator" TO DISPLAY
# input the production cost
SEND "Enter production cost:" TO DISPLAY
RECEIVE costProd FROM (REAL) KEYBOARD

# add 6% to production cost
SET profit TO PROFIT * costProd

# add 20% tax to total cost
SET tax TO TAX * (costProd + profit)

# calculate total selling price
SET sellingPrice TO costProd + tax + profit

# print total cost, production cost, profit, tax
SEND "Your calculation is shown below" TO DISPLAY
SEND "Price: " & sellingPrice TO DISPLAY
SEND "Production: " & costProd TO DISPLAY
SEND "Profit: " & profit TO DISPLAY
SEND "Tax: " & tax TO DISPLAY
```

Explain why it is good programming practice to define values as constants, rather than as fixed values in the code.

(2)

(b) The partially completed pseudocode for a different algorithm to calculate the selling price of ice cream is shown. It uses a subprogram.

```
SET message TO "Welcome to the selling price calculator"

_____________________ calcProfitAndTax (_____________________)
BEGIN _____________________
    SET message TO "Your calculation is shown below"
    # add profit to production cost
    SET profit TO inProfit * inProd

    # add tax to total cost
    SET tax TO inTax * (inProd + profit)

    # calculate total selling price
    SET sellingPrice TO inProd + tax + profit

    # print total cost, production cost, profit, tax
    SEND message TO DISPLAY
    SEND "Price: " & sellingPrice TO DISPLAY
    SEND "Production: " & inProd TO DISPLAY
    SEND "Profit: " & profit TO DISPLAY
    SEND "Tax: " & tax TO DISPLAY
END _____________________

SEND message TO DISPLAY
# input the production cost, required profit, and tax rate
SEND "Enter production cost:" TO DISPLAY
RECEIVE costProd FROM (REAL) KEYBOARD
SEND "Enter required profit:" TO DISPLAY
RECEIVE reqProfit FROM (REAL) KEYBOARD
SEND "Enter tax rate:" TO DISPLAY
RECEIVE rateTax FROM (REAL) KEYBOARD
_________________________

```

(i) Complete the pseudocode by supplying values for the blanks.

(5)

Line 8

.....

.....

Line 9

.....

Line 26

.....

Line 36

.....

(ii) Explain how the correct value for the variable message is chosen on line 21.

(2)

.....

.....

.....

.....

(iii) The user enters the value for tax rate on line 35. Tax is a percentage, for example, 0.03 is 3% tax. The entered value needs to be validated.

Construct **two** validation tests. Test data for Test 1 is provided.

Give an example of invalid test data for Test 2.

(3)

Test	Validation test	Test data
Test 1		-0.03
Test 2		

(Total for Question 6 = 12 marks)

7 Margaret has introduced a loyalty scheme for the ice cream kiosk customers.

(a) Each month, Margaret emails a statement to the loyalty scheme members. An example statement is shown.

> Member Number: 987654
>
> Dear Tom,
>
> You have made 123 visits to the ice cream kiosk. You have spent £246.31. You have collected 210 points in total and have redeemed 75 points. Your current balance is 135 points.
>
> Thank you for visiting Margaret's Ice Cream Kiosk.

Draw a diagram of a data structure suitable for storing this data. Include data for at least **two** members of the loyalty scheme.

(3)

(b) Margaret wants to send out vouchers to every member of the loyalty scheme. A logical looping construct is needed in the programming code to make this happen.

State the most appropriate type of loop and justify your choice.

(2)

Type of loop

.....

.....

Justification

.....

.....

.....

.....

(c) An algorithm that displays information about the number of members in the loyalty scheme is shown.

The use of multiple selection statements in this algorithm is inefficient.

```
SET numMembers TO 300

IF (numMembers >= 100) THEN
    SEND "100+" TO DISPLAY
END IF
IF (numMembers >= 50) AND (numMembers <= 99) THEN
    SEND "50-99" TO DISPLAY
END IF
IF (numMembers >= 25) AND (numMembers <= 49) THEN
    SEND "25-49" TO DISPLAY
END IF
IF (numMembers < 25) THEN
    SEND "Less than 25" TO DISPLAY
END IF
```

Explain how the algorithm should be amended to address this inefficiency.

(3)

(Total for Question 7 = 8 marks)

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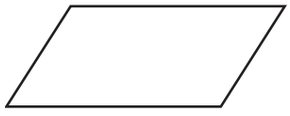
8 Margaret is making some special offers to customers.

(a) Customers can get a money off voucher for their favourite item.

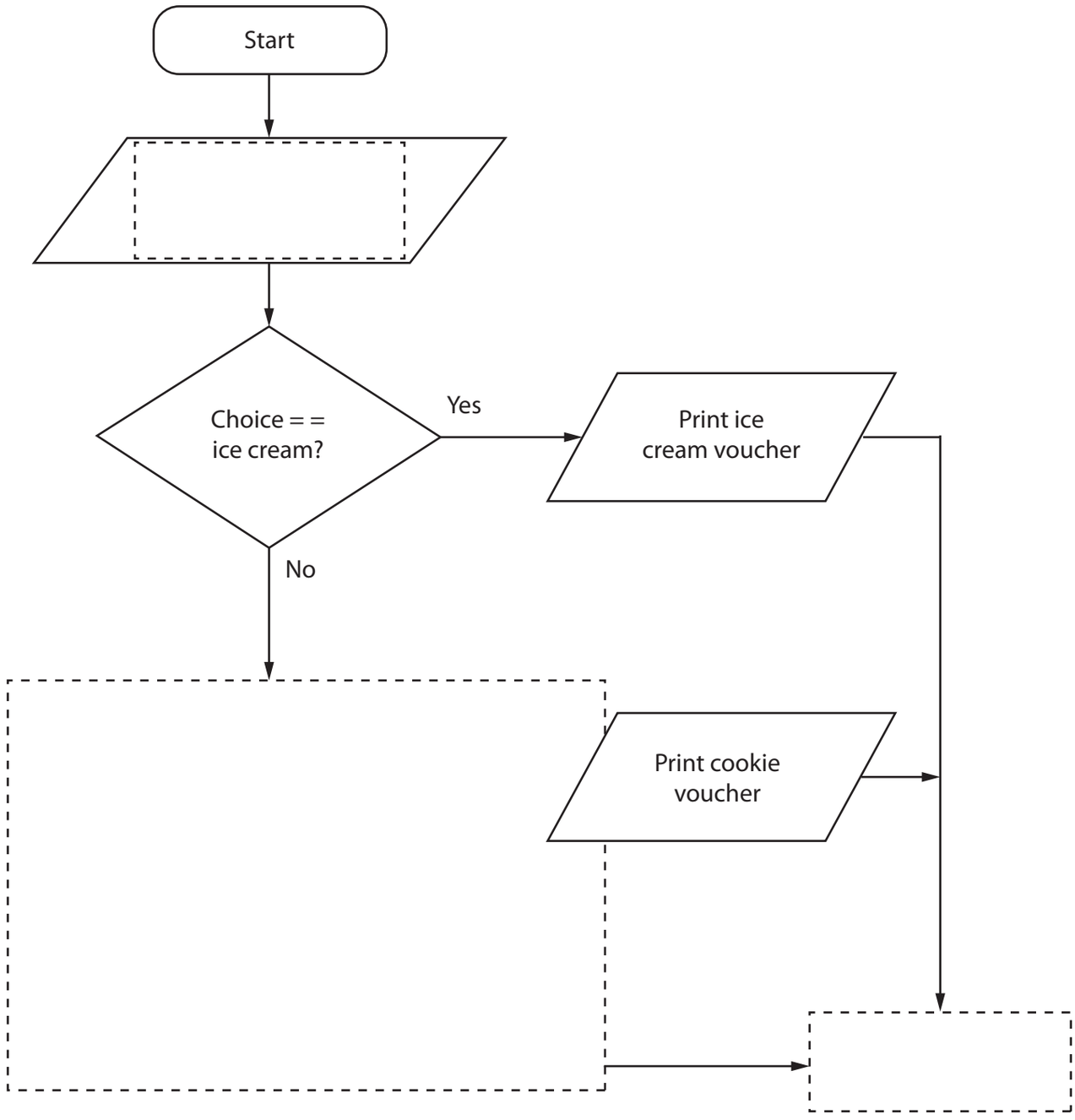
- Customers whose favourite item is ice cream get a money off voucher for ice cream.
- Customers whose favourite item is cookies get a money off voucher for cookies.
- Customers who do not choose either get a money off voucher for drinks.



This shape represents input or output.

Complete the flowchart to show this process.

(6)

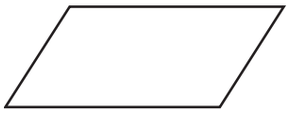


(b) Some customers can get a free cookie when they buy a hot drink.

A program needs to tell Margaret which customers qualify for a free cookie. She gives a free cookie to the first 10 customers who buy a hot drink.

A subprogram called waitForPurchase() pauses the program until the next customer makes a purchase.

A call to this subprogram is denoted in the flowchart as 



This shape represents input or output.

Draw a flowchart to display a 'Free cookie' message so that the first 10 customers who buy a hot drink also get a free cookie.

Please draw your flowchart on pages 25, 26 and 27. You may not need all of this space for your answer.

Please draw a line through any work you do not want to be marked.

(6)

(Total for Question 8 = 12 marks)

9 The ice cream kiosk has a set of freezers for storing ice cream. If a freezer malfunctions, then Margaret needs to be informed.

- The perfect temperature for storing ice cream is -18°C.
- A permissible temperature tolerance is plus or minus one degree Celsius.
- An output message must be displayed to show the number and temperature of any freezer falling outside tolerance.
- The output message for each freezer must be on a single line.
- No other messages should be displayed.
- A global data structure holding the temperatures is provided and must be used as part of the solution.

  SET freezers TO [-20, -19, -18, -17, -16, 0, 1]

- The solution should work even if the number of freezers in the data structure is changed.

An example output is shown.

```
Freezer 0 is out of tolerance:  -20
Freezer 4 is out of tolerance:  -16
Freezer 5 is out of tolerance:  0
Freezer 6 is out of tolerance:  1
```

Write an algorithm to inform Margaret if any of the freezers are faulty. Use pseudocode or a programming language with which you are familiar.

Please write your algorithm on pages 29, 30 and 31. You may not need all of this space for your answer.

Please draw a line through any work you do not want to be marked.

(9)

SET freezers TO [-20, -19, -18, -17, -16, 0, 1]

(Total for Question 9 = 9 marks)

TOTAL FOR PAPER = 80 MARKS

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