Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0123456789

COMPUTER SCIENCE **2210/02**

Paper 2 Algorithms, Programming and Logic **For examination from 2023**

SPECIMEN PAPER B **1 hour 45 minutes**

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [ ].
- No marks will be awarded for using brand names of software packages or hardware.

This document has **16** pages. Any blank pages are indicated.

1 A range check is used to check that a value input is above 10 and below 20.

Tick (✓) **one** box to show which value would be accepted.

A 10 ☐

B 15 ☐

C 20 ☐

D 30 ☐

[1]

2 Four programming concepts and four descriptions are shown.

Draw **one** line to connect each programming concept to the most appropriate description.

Programming concept	Description
Library routine	A subroutine that may **not** return a value.
Structure diagram	A standard subroutine that is available for immediate use.
Procedure	A subroutine that can be used in an assignment statement.
Function	An overview of a program or subroutine.

[3]

3 A program checks if the weight of a baby is at least 2 kilograms.

Give, with reasons, **two** different values of test data that could be used for the baby's weight. Each reason must be different.

Value 1 .....

Reason .....

.....

Value 2 .....

Reason .....

.....

[4]

4 **(a)** Circle the **two** actions that a program needs to take to store data in a file.

activate calculate close open output

print read search sort write

[2]

(b) A program halted unexpectedly with the error message '`File not found`' whilst trying to read data from a file.

Outline the actions that the program needs to take to prevent this error occurring.

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..... [2]

5 **(a)** Draw a flowchart for an algorithm to:

- allow numbers to be input
- ignore any numbers that are negative
- count how many numbers are positive
- output the count of positive numbers when zero is input and end the algorithm.

[6]

(b) Explain the changes you will make to your algorithm to **also** count the negative numbers.

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..... [2]

6 This section of program code asks for 80 numbers between 100 and 1000 inclusive to be entered. The pseudocode checks that the numbers are in the correct range and then stores the valid numbers in an array. It counts how many of the numbers are larger than 500 and then outputs the result when finished.

```
01 Count ← 0
02 FOR Index ← 1 TO 80
03     INPUT "Enter a number between 100 and 1000 ", Number
04         WHILE Number <= 99 AND Number >= 1001
05         INPUT "This is incorrect, please try again", Number
06     ENDWHILE
07     Num[80] ← Number
08     IF Number > 500 THEN Count ← Count + 1 ENDIF
09 UNTIL Index = 80
10 PRINT Index
11 PRINT "numbers were larger than 500"
```

There are **four** lines of code that contain errors.

State the line number for each error and write the correct code for that line.

Error 1 Line Number .....

Correct Code .....

Error 2 Line Number .....

Correct Code .....

Error 3 Line Number .....

Correct Code .....

Error 4 Line Number .....

Correct Code .....

[4]

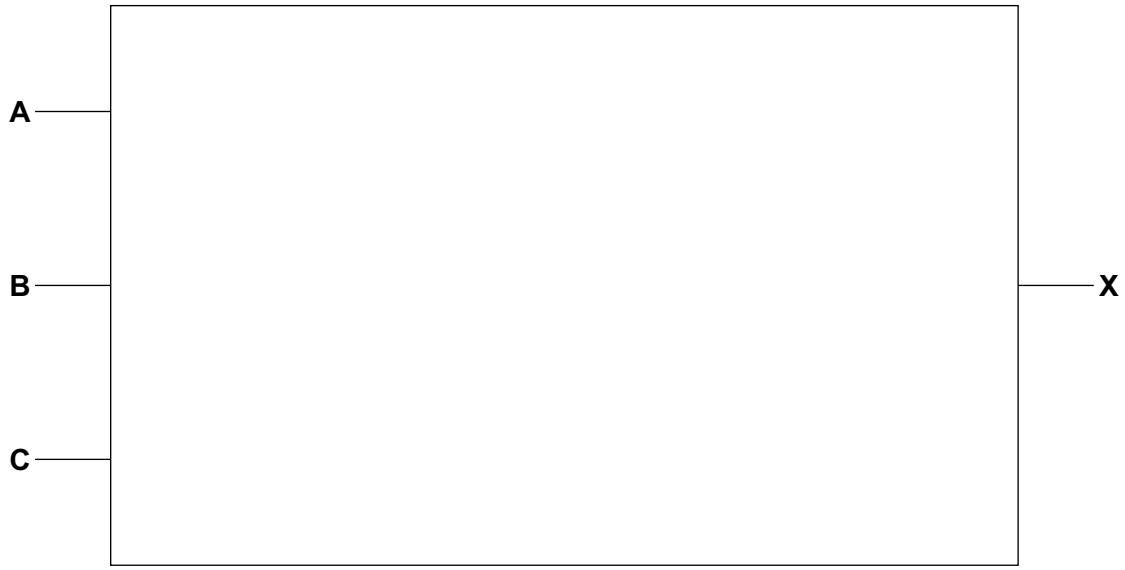
7 Consider the truth table:

A	B	C	X
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

(a) Draw a logic circuit to represent the given truth table.

Each logic gate should have maximum of **two** inputs.

Do **not** simplify the logic circuit.



[6]

(b) Write a logic expression for the given truth table.
Do **not** simplify the logic expression.

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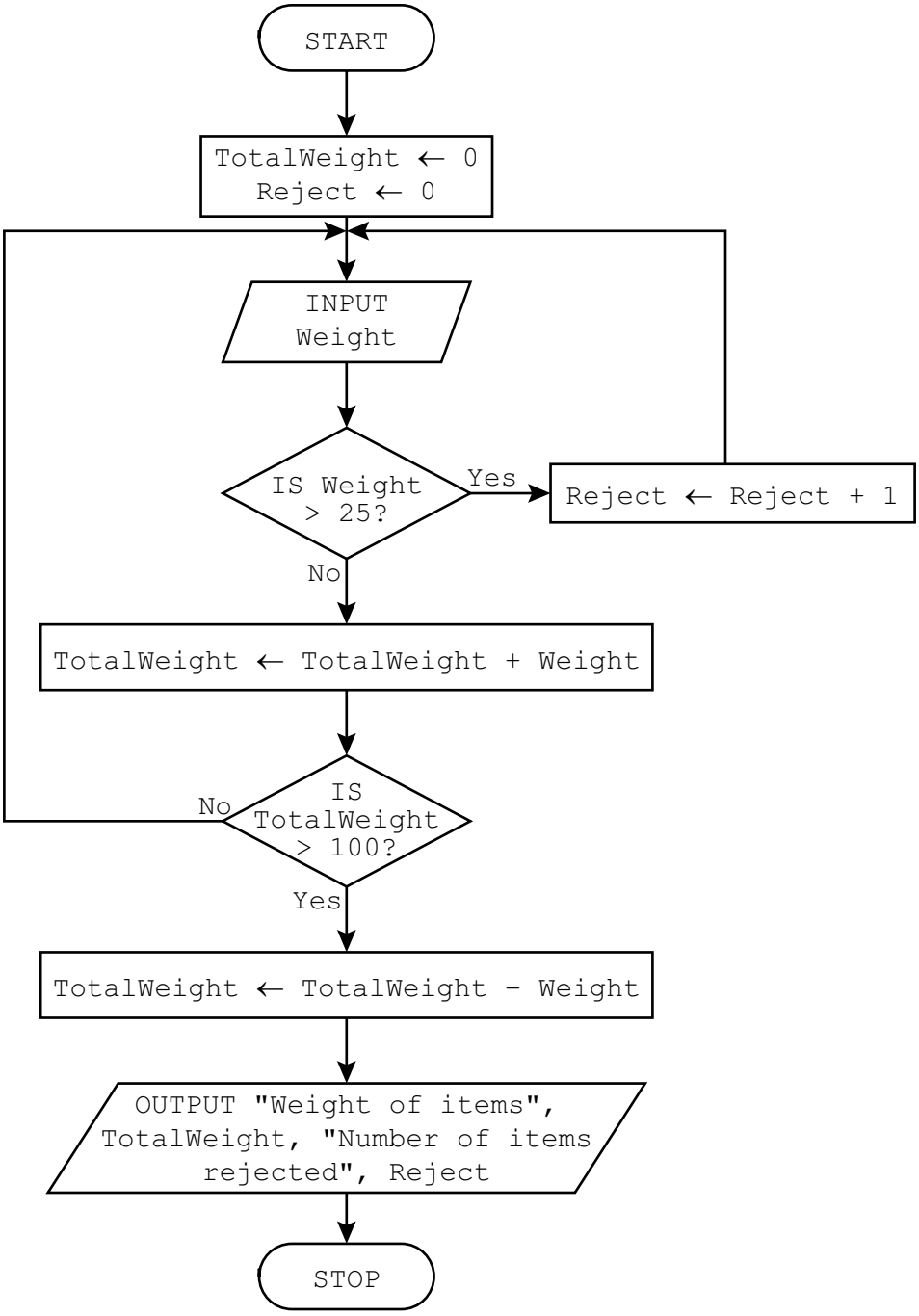
..... [3]

8 This flowchart inputs the weight of items, in kilograms, to be loaded on a trailer. Any item over 25 kilograms is rejected. The trailer can take up to 100 kilograms.



Complete the trace table for the input data:

13, 17, 26, 25, 5, 10, 15, 35, 20, 15

Weight	Reject	TotalWeight	**OUTPUT**

[5]

9 Verification checks can be made on input data.

Tick (✓) **one** box to show which check is a verification check on input data.

A checksum ☐

B double entry check ☐

C echo check ☐

D parity check ☐

[1]

10 A function `LENGTH(X)` finds the length of a string `X` and a function `SUBSTRING(X,Y,Z)` finds a substring of `X` starting at position `Y` and `Z` characters long. The first character in the string is position 1.

(a) Show the value of the variable after each pseudocode statement has been executed.

```
01  P ← "Computer Science"
02  Q ← LENGTH(P)
03  R ← SUBSTRING(P,10,7)
04  S ← LENGTH(R)
05  T ← SUBSTRING(R,1,3)
```

[5]

(b) Write a pseudocode statement to extract the word `Computer` from `P` and store it in the variable `F`.

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..... [2]

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

ShowNumber	Type	Title	Date	SoldOut
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 .....

Records .....
[2]

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

Validation check 1 .....

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Validation check 2 .....

.....
[2]

(c) Show the output that would be given by this structured query language (SQL) statement:

```
SELECT Date, Title
FROM PERFORMANCE
WHERE NOT SoldOut AND Type = "Jazz";
```

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..... [2]

12 **(a)** Rewrite this pseudocode algorithm using a `WHILE … DO … ENDWHILE` loop.

```
B ← FALSE
INPUT Num
FOR Counter ← 1 TO 12
    IF A[Counter] = Num
        THEN
            B ← TRUE
    ENDIF
NEXT Counter
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..... [4]

(b) Identify the purpose of the algorithm in **(a)**.

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..... [1]

(c) Explain the difference between a `WHILE … DO … ENDWHILE` and a `REPEAT … UNTIL` loop.

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..... [3]

13 The names of patients are stored in the one-dimensional (1D) array `Patient[]` of type string. A separate two-dimensional (2D) array `Readings[]` stores the latest data recorded about each patient. The array **already** contains the readings taken by a nurse for each patient:

- temperature measured to one decimal place
- pulse rate, a whole number.

Temperature readings should be in the range 31.6 to 37.2 inclusive.
Pulse readings should be in the range 55.0 to 100.0 inclusive.

The hospital number given to the patient is used for the index on both arrays, this is a value between 1 and 1000 inclusive.

When the data for a patient is checked a warning is given if any of the readings are out of range. If both readings are out of range, then a severe warning is given.

Write a procedure, using pseudocode or program code, that meets the following requirements:

- takes the hospital number as a parameter
- checks if the number is valid
- outputs an error message and exits the procedure if the number is **not** valid
- if the hospital number is valid:
  - output the patient's name
  - output 'Normal readings' if both the readings are within range
  - output 'Warning' and the name of the reading e.g. 'Pulse' if one reading is out of range
  - output 'Severe warning' and the names of the two readings 'Pulse and temperature' if both readings are out of range
  - exits the procedure.

You must use pseudocode or program code **and** add comments to explain how your code works.

You do **not** need to initialise the data in the arrays.

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