CAMBRIDGE IGCSE (0478)

Module K: Algorithm design

Workbooklet · 9 parts · 190 marks

Contents

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	Total	**190**

MODULE K ALGORITHM DESIGN · K1

Sub-systems, abstraction, decomposition, and inputs, processes, outputs and storage

Original practice questions · 21 marks · ~25 minutes · Cambridge 0478 syllabus 7.1 (analysis), 7.2(a), 7.2(b)

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. The total for this worksheet is **21 marks**.

1

Total: 1 mark

(a) Tick (✓) **one** box to show which statement about computer systems is true. **[1]**

	Statement	Tick (✓)
A	A sub-system is only the hardware part of a computer system.	
B	Every computer system is made up of sub-systems, which are made up of further sub-systems.	
C	A sub-system cannot be broken down into any smaller parts.	
D	Only very large computer systems are made up of sub-systems.	

2

Total: 4 marks

A heating system for a house is a computer system. It reads the temperature in each room, lets the owner set a target temperature and a weekly timetable using a phone app, and switches the radiators on and off.

(a) Identify **two** sub-systems that the heating system could be made up of. **[2]**

(b) Choose **one** of your sub-systems from part (a). Identify **two** further sub-systems that it could be made up of. **[2]**

Sub-system chosen: .....

3 **Total: 4 marks**

A ferry company is designing a map of its ship for passengers. The map will be shown on screens on each deck. Passengers use it to find their cabin, the café, the toilets and the lifeboat stations. Abstraction is used in the analysis stage when the map is designed.

(a) Describe what is meant by **abstraction**. **[2]**

(b) Identify **two** details that can be left out of the passengers' map. **[2]**

4 **Total: 4 marks**

A fitness watch is decomposed into its component parts: inputs, processes, outputs and storage.

(a) Tick (✓) **one** box in each row to show which component part each item is. **[4]**

Item	Input	Process	Output	Storage
The number of steps walked today, shown on the watch face				
The heart rate, read from a sensor on the back of the watch				
The step totals for the last 30 days, kept on the watch so the owner can look at them later				
Working out the average heart rate for the day				

5 **Total: 8 marks**

A leisure centre uses a computer system to control the entry gate to its swimming pool. At the start of each day, a lifeguard enters the maximum number of people allowed in the pool. A member scans their membership card at the gate. The system looks up the member's details and checks that their membership has not expired. If the membership is valid and the pool is not full, the gate opens and a screen shows a welcome message with the member's name. Otherwise the screen shows a message explaining why the member cannot enter. The system keeps a record of the date and time of every entry, and adds 1 to the number of people in the pool.

(a) Decompose the entry system into its component parts. Complete the table with **two** inputs, **two** processes, **two** outputs and **two** items of data that must be stored. **[8]**

Component part	**1**	**2**
Inputs		
Processes		
Outputs		
Storage		

Total for this worksheet: 21 marks

MODULE K ALGORITHM DESIGN · K3

Structure diagrams

Original practice questions · 21 marks · ~25 minutes · Cambridge 0478 syllabus 7.1, 7.2(a), 7.2(b), 7.2(c)

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. The total for this worksheet is **21 marks**.

1

Total: 4 marks

(a) Tick (✓) **one** box in each row to show whether each statement about structure diagrams is true or false. **[4]**

Statement	True	False
A structure diagram shows how a system is broken down into sub-systems.		
The box at the top of a structure diagram represents the whole system.		
A structure diagram uses the decision symbol to show a choice between two outcomes.		
A sub-system in a structure diagram can be broken down into further sub-systems.		

2

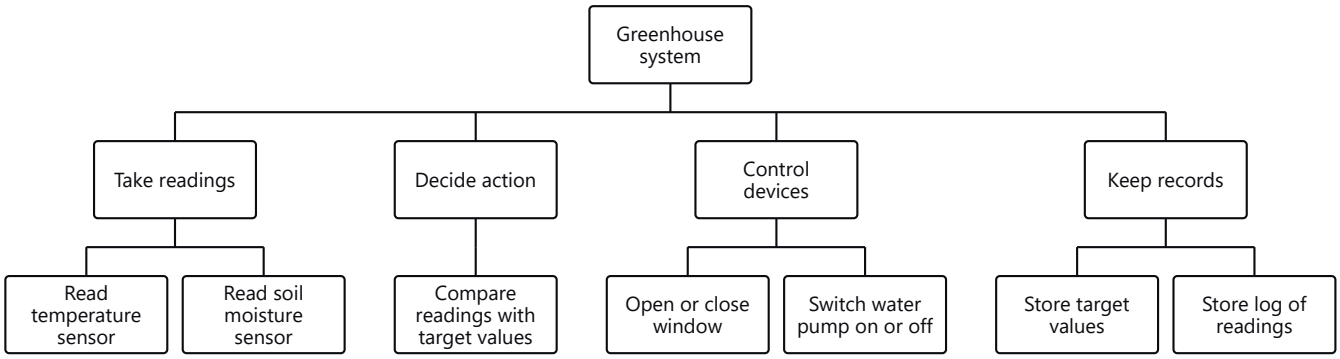
Total: 3 marks

(a) State the stage of the program development life cycle in which structure diagrams are used. **[1]**

(b) Describe what a structure diagram shows. **[2]**

3 **Total: 7 marks**

A grower uses a computer system to look after the plants in a greenhouse. This structure diagram shows the system.



(a) Identify the sub-system that **Compare readings with target values** is part of. **[1]**

(b) A problem can be decomposed into inputs, processes, outputs and storage. Tick (✓) **one** box in each row to show which component part each sub-system is. **[4]**

Sub-system	Input	Process	Output	Storage
Read soil moisture sensor				
Compare readings with target values				
Switch water pump on or off				
Store target values				

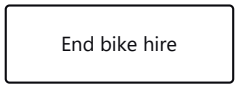
(c) The grower wants the system to also send a text message to their phone when the greenhouse is too hot. Describe how the structure diagram should be changed to show this. **[2]**

4 **Total: 5 marks**

A city council runs a bike hire scheme. Each docking station has a computer system. One part of this system ends a hire when a rider returns a bike. This part of the system:

- identifies the rider: the rider either scans a membership card or types in a membership number
- works out the charge: it calculates the length of the hire, then the cost
- stores the details of the hire
- outputs a receipt: it shows the receipt on the dock screen and also sends it by email.

(a) Draw a structure diagram for this part of the system. The top box has been drawn for you. **[5]**



5 **Total: 2 marks**

(a) Using the bike hire system in Question 4 as an example, explain what is meant by: "every computer system is made up of sub-systems, which are made up of further sub-systems". **[2]**

Total for this worksheet: 21 marks

MODULE K ALGORITHM DESIGN · K4

The program development life cycle

Original practice questions · 21 marks · ~25 minutes · Cambridge 0478 syllabus 7.1 (with 7.2(c))

Name _____ Date _____

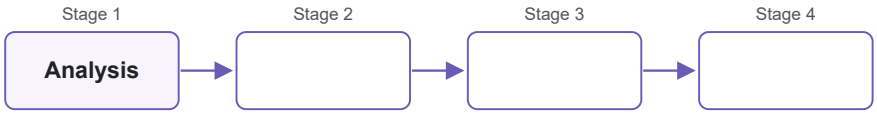
Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. The total for this worksheet is **21 marks**.

An indoor climbing centre asks a programmer to develop a program that books climbing sessions for groups of adult climbers. All the questions on this worksheet are about this program.

1

Total: 3 marks

(a) The program development life cycle has four stages. The first stage is shown. Complete the diagram by writing the name of each missing stage in the correct order. **[3]**



2

Total: 5 marks

(a) The table shows five tasks the programmer carries out. Tick (✓) **one** box in each row to show the stage of the program development life cycle in which each task is carried out. **[5]**

Task	Analysis	Design	Coding	Testing
Asking the centre manager what the program must do				
Writing the program code for the module that works out the cost of a booking				
Drawing a structure diagram of the booking program				
Running the finished program with a group size of 9 to check that it is rejected				
Deciding which details about the climbing centre the program does not need				

3 **Total: 4 marks**

During the analysis stage, the programmer collects these notes from the centre manager.

Centre manager's notes

- A group books a session lasting 1, 2 or 3 hours.
- A group can have from 1 to 8 climbers.
- Every climber must have completed a safety induction before they can be booked in.
- The program must output a booking reference and the total cost of the session.
- The climbing walls were repainted blue last year.
- The centre has a café that sells hot drinks.
- The centre first opened in 2015.

(a) Identify **two** requirements of the booking program from the notes. **[2]**

1

2

(b) The programmer uses abstraction. Identify **two** items of information in the notes that the programmer can leave out of the solution. **[2]**

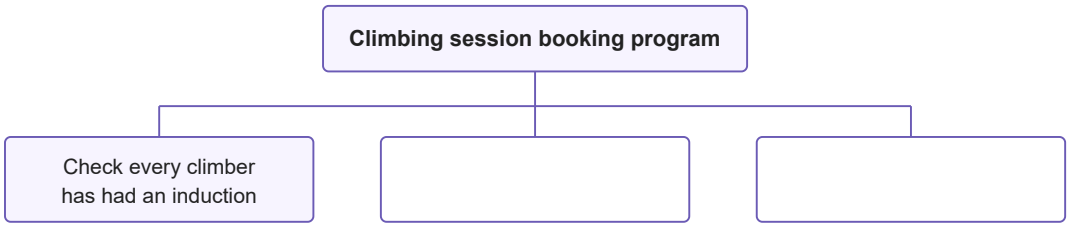
1

2

4 **Total: 4 marks**

In the design stage, the programmer decomposes the problem and starts a structure diagram.

(a) Complete the structure diagram by writing a different sub-problem of the booking program in each empty box. Use the manager's notes in Question 3. **[2]**



(b) Identify **two other** methods the programmer could use in the design stage to set out the steps of the booking algorithm. **[2]**

1

2

5 **Total: 2 marks**

In the coding stage, the programmer writes the program one module at a time, for example the module that works out the total cost of a session.

(a) Describe the iterative testing that the programmer carries out during the coding stage. **[2]**

6 **Total: 3 marks**

All the modules have been written and the program is complete. The programmer now moves on to the testing stage.

(a) Describe how the programmer tests the booking program in the testing stage. Refer to the booking program in your answer. **[3]**

Total for this worksheet: 21 marks

MODULE K ALGORITHM DESIGN · K5

Reading and writing pseudocode

Original practice questions · 20 marks · ~25 minutes · Cambridge 0478 syllabus 7.2(c), 7.3, 7.8, 7.9, 8.1

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. Write all code answers in pseudocode. The total for this worksheet is **20 marks**.

1

Total: 1 mark

(a) Tick (✓) **one** box to show which statement describes pseudocode. **[1]**

Statement	✓
A diagram that breaks a system down into smaller and smaller sub-systems	
A method of designing a solution that uses keywords and structured, code-like statements without the rules of one programming language	
A set of standard symbols joined by flow lines that show the steps of a solution	
A table that records the values of variables at each step of a dry-run	

2

Total: 3 marks

Precision is needed when writing algorithms. Rewrite each condition as a pseudocode condition, using the identifier given.

(a) Complete the table. **[3]**

Condition written in English	Pseudocode condition
`Distance` is greater than 100	
`Answer` is not equal to the character N	
`Hours` is from 1 to 12 inclusive	

3

Total: 2 marks

A coach company's booking program uses the constant `MaxSeats`, which has the value 52, and the variable `SeatsLeft`, which stores a whole number.

(a) Write pseudocode statements to declare the constant `MaxSeats` and the variable `SeatsLeft`. **[2]**

Constant

Variable

4 **Total: 6 marks**

A bakery uses a machine to check its loaves. This algorithm is used by the machine.

```
01 DECLARE Count : INTEGER
02 DECLARE Weight : INTEGER
03 DECLARE Total : INTEGER
04 DECLARE Accepted : INTEGER
05 Total ← 0
06 Accepted ← 0
07 FOR Count ← 1 TO 5
08     OUTPUT "Enter weight of loaf in grams"
09     INPUT Weight
10     Total ← Total + Weight
11     IF Weight >= 400
12       THEN
13         Accepted ← Accepted + 1
14     ENDIF
15 NEXT Count
16 OUTPUT "Total weight: ", Total
17 OUTPUT "Loaves accepted: ", Accepted
```

(a) Describe the purpose of this algorithm. **[2]**

(b) Give the line number of:

(i) the start of a count-controlled loop ..... **[1]**

(ii) a statement where counting takes place ..... **[1]**

(c) State the outputs from the algorithm for this input data: 410, 395, 400, 388, 420 **[2]**

5 **Total: 4 marks**

A museum is open 7 days a week. This algorithm should input the number of visitors on each of the 7 days, find the highest number of visitors on any one day, and output it. There are **four** errors in the algorithm.

```
01 DECLARE Day : INTEGER
02 DECLARE Visitors : INTEGER
03 DECLARE Highest : INTEGER
04 Highest ← 0
05 FOR Day ← 1 TO 6
06     OUTPUT "Enter visitors for day ", Day
07     INPUT Visitors
08     IF Visitors < Highest
09       THEN
10         Highest ← Day
11     ENDIF
12 NEXT Day
13 OUTPUT "Highest number of visitors: ", Visitors
```

(a) Identify the line numbers of the **four** errors and suggest a correction for each error. **[4]**

Line number	Correction

6 **Total: 4 marks**

A cycle-hire scheme records how long each journey takes, as a whole number of minutes.

(a) Write an algorithm using pseudocode to: **[4]**

- input journey times, one at a time, until the value −1 is input
- count the number of journeys that took longer than 30 minutes
- output this count with a suitable message.

You do not need to validate the input.

Total for this worksheet: 20 marks

MODULE K ALGORITHM DESIGN · K6

Flowcharts: symbols and how to read them

Original practice questions · 22 marks · ~25 minutes · Cambridge 0478 syllabus 7.3, 7.7, 7.8, 7.9 and section 4 (flowchart symbols)

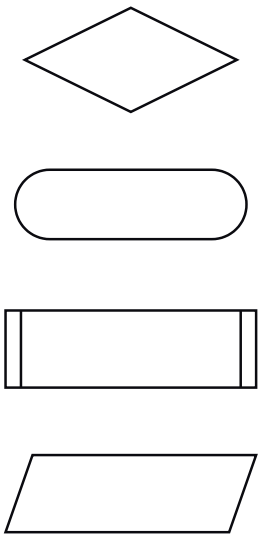
Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. Draw flowcharts in pencil and use the standard flowchart symbols. The total for this worksheet is **22 marks**.

1

Total: 4 marks

(a) Draw **one** line from each flowchart symbol to its correct description. Not all descriptions will be used. **[4]**



Shows data going into, or coming out of, the algorithm

Shows something being performed or done, such as a calculation

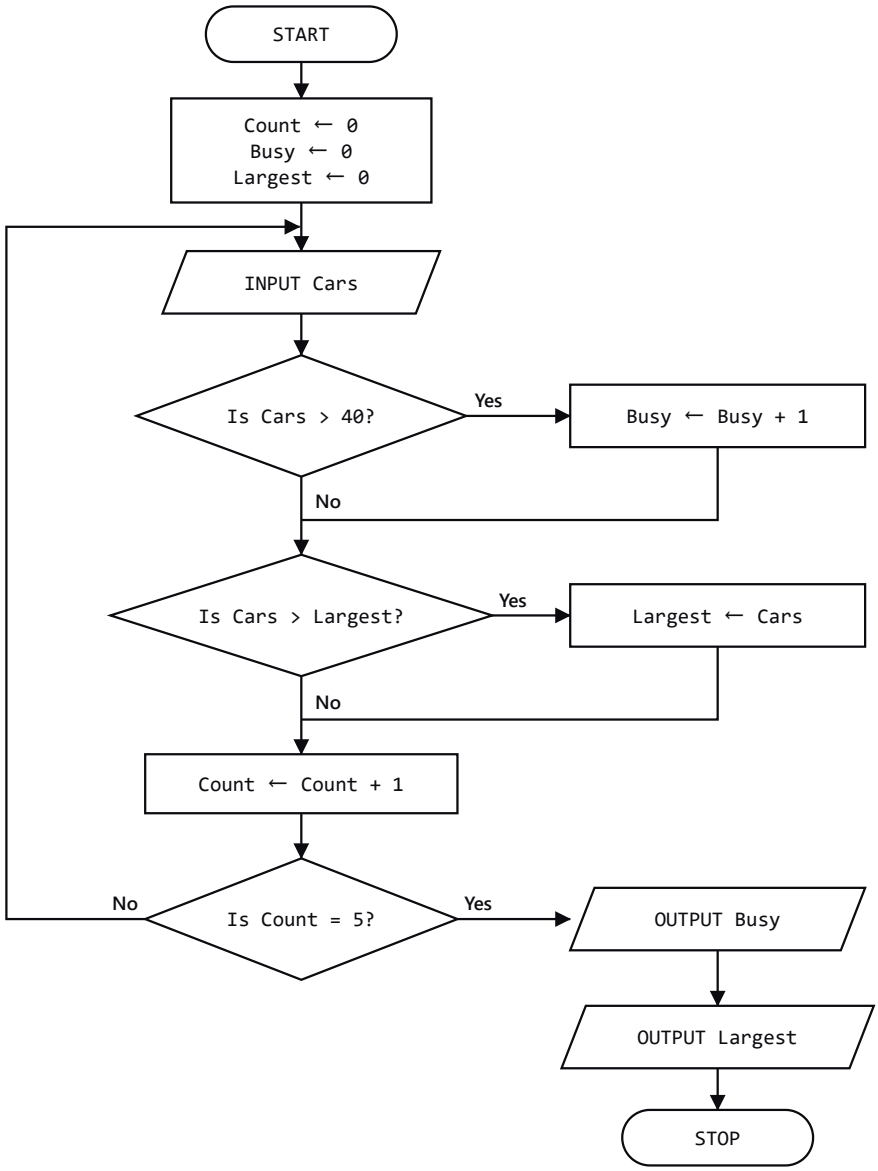
Shows a call to a separate flowchart that is not joined to this one

Shows where the algorithm starts or where it stops

Shows a question with two possible outcomes, such as Yes or No

2 **Total: 7 marks**

The flowchart represents an algorithm used by a ferry company. It inputs the number of cars carried on each of five crossings.



(a) Complete the trace table for the algorithm using this input data: **[5]**

`38, 45, 22, 45, 41`

Count	Cars	Busy	Largest	OUTPUT

(b) Describe the purpose of the algorithm. **[2]**

3

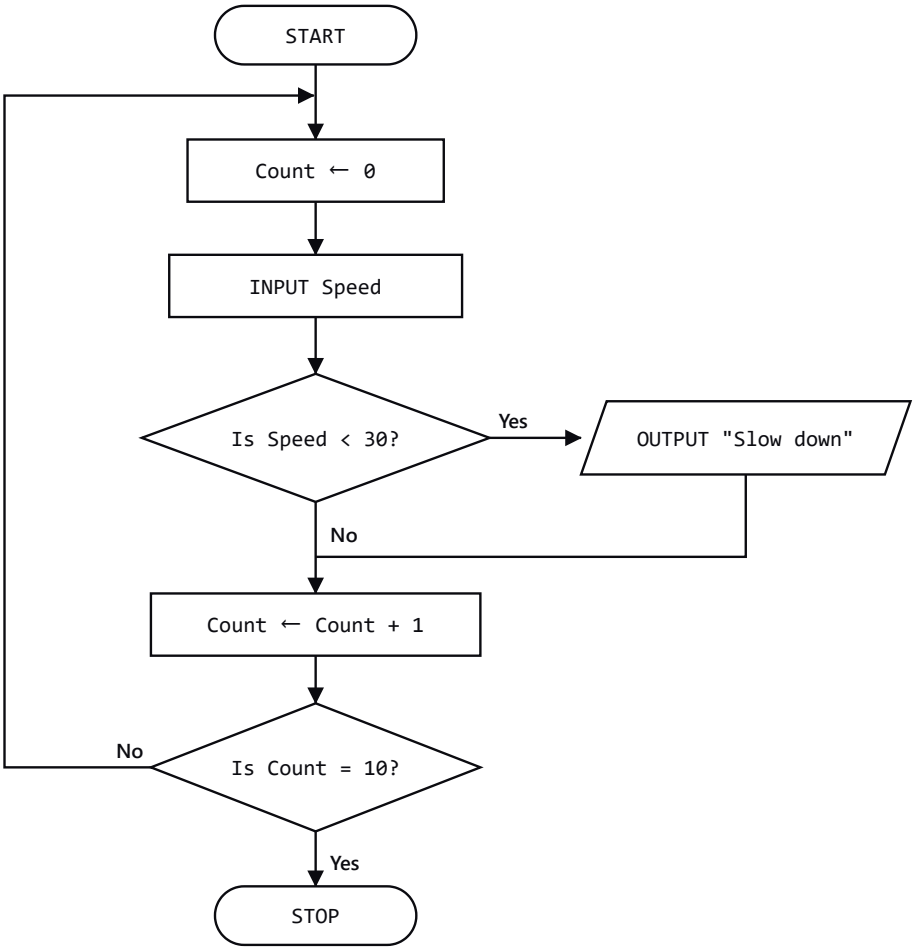
Total: 3 marks

The ferry company also wants the algorithm in Question 2 to output the total number of cars carried on the five crossings.

(a) Explain how the flowchart in Question 2 could be changed to do this. Any pseudocode used must be fully explained. **[3]**

4 **Total: 3 marks**

This flowchart should input the speeds of 10 vehicles passing a roadside sign. For each vehicle with a speed over 30, it should output `"Slow down"`. The algorithm should stop after 10 speeds have been input. The flowchart contains **three** errors.



(a) Identify the **three** errors in the flowchart and suggest a correction for each error. **[3]**

Error	Correction

5 **Total: 5 marks**

A fitness centre gives its members points for exercise.

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

- input the number of minutes a member exercised
- check that the number is between 1 and 180 inclusive and, if it is not, output an error message and input the number again
- calculate the points as the number of minutes divided by 10, using integer division (`DIV`)
- output the points.

Total for this worksheet: 22 marks

MODULE K ALGORITHM DESIGN · K7

Turning a problem into an algorithm

Original practice questions · 22 marks · ~25 minutes · Cambridge 0478 syllabus 7.2, 7.9, 8.1

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. The total for this worksheet is **22 marks**.

1

Total: 7 marks

A coworking office charges its members for printing. The first 30 pages a member prints each day are free. Every page after the first 30 costs 15 cents. An algorithm is needed that takes the number of pages a member has printed today and works out the charge in cents.
For example, a member who prints 45 pages is charged 225 cents.

(a) Complete the table to identify **one** input, **one** process, **one** output and **one** item of data that must be stored for this algorithm. **[4]**

	Description
Input	
Process	
Output	
Storage	

(b) The problem is decomposed into steps. Tick (✓) **one** box in each row to show whether each step uses sequence, selection or iteration. **[3]**

Step	Sequence	Selection	Iteration
Multiply the number of extra pages by 15			
Charge nothing if 30 pages or fewer were printed			
Keep asking for the number of pages until a number from 1 to 500 is entered			

2 **Total: 5 marks**

Draw a flowchart for an algorithm to:

- input the number of pages printed
- calculate the charge in cents, using the rules in Question 1
- output the charge.

You must use the standard flowchart symbols. **[5]**

3 **Total: 3 marks**

The algorithm is amended so that the number of pages input must be from 1 to 500 inclusive.

(a) Write an algorithm using pseudocode to input the number of pages and to keep asking for the number of pages to be input again until a number from 1 to 500 is entered. **[3]**

4 **Total: 7 marks**

A ferry makes 8 crossings each day. At the end of each crossing, a member of the crew inputs the number of passengers who were on board. An algorithm is needed to:

- input the number of passengers for each of the 8 crossings
- total the number of passengers for the day
- count how many crossings had **more than** 150 passengers
- output the total and the count after all 8 crossings have been input.

(a) The algorithm needs two variables. Complete the table to give a suitable identifier and the initial value for each variable. **[2]**

What the variable stores	Identifier	Initial value
The total number of passengers for the day		
The number of crossings with more than 150 passengers		

(b) Write the algorithm described above using pseudocode. You do not need to declare your variables. All outputs must have suitable messages. **[5]**

Total for this worksheet: 22 marks

MODULE K ALGORITHM DESIGN · K8

Trace tables and dry-runs

Original practice questions · 21 marks · ~25 minutes · Cambridge 0478 syllabus 7.7 (with 7.3, 7.8)

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. All algorithms are written in Cambridge pseudocode or as flowcharts. In each trace table, start a new row each time a value changes, and record every output, including user prompts, in the OUTPUT column. You may not need to use all the rows. The marks for each part are shown in brackets [ ]. The total for this worksheet is **21 marks**.

1

Total: 2 marks

(a) Tick (✓) **one** box to show which statement describes a dry-run of an algorithm. **[1]**

Statement	Tick (✓)
Running the program on a computer to see if it crashes	
Working through the algorithm by hand, one step at a time, recording what happens	
Checking that data has been copied correctly from its original source	
Rewriting the algorithm in a high-level programming language	

(b) A trace table records the values of the variables at each step of an algorithm. Give **one** other thing that is recorded in a trace table at each step. **[1]**

_____

2

Total: 4 marks

A box office takes group bookings. The number of seats in each booking is entered. Bookings of more than 20 seats are refused. Booking stops when 50 or more seats have been booked.

```
01 Total ← 0
02 Count ← 0
03 REPEAT
04     OUTPUT "Enter seats"
05     INPUT Seats
06     IF Seats > 20
07       THEN
08         OUTPUT "Too many"
09       ELSE
10         Total ← Total + Seats
11         Count ← Count + 1
12     ENDIF
13 UNTIL Total >= 50
14 OUTPUT "Bookings accepted: ", Count
```

(a) Complete the trace table for the algorithm using this input data: **18, 25, 15, 20, 12** **[4]**
You may not need to use all the input data.

Total	Count	Seats	OUTPUT
0	0		

3

Total: 6 marks

A water company stores six river-level readings, in cm, in the array `Reading`. The array is indexed from 1.

Index	1	2	3	4	5	6
Reading	38	45	31	52	29	40

```
01 Low ← Reading[1]
02 Above ← 0
03 FOR Index ← 1 TO 6
04     IF Reading[Index] < Low
05       THEN
06         Low ← Reading[Index]
07     ENDIF
08     IF Reading[Index] > 40
09       THEN
10         Above ← Above + 1
11     ENDIF
12 NEXT Index
13 OUTPUT "Lowest: ", Low
14 OUTPUT "Above limit: ", Above
```

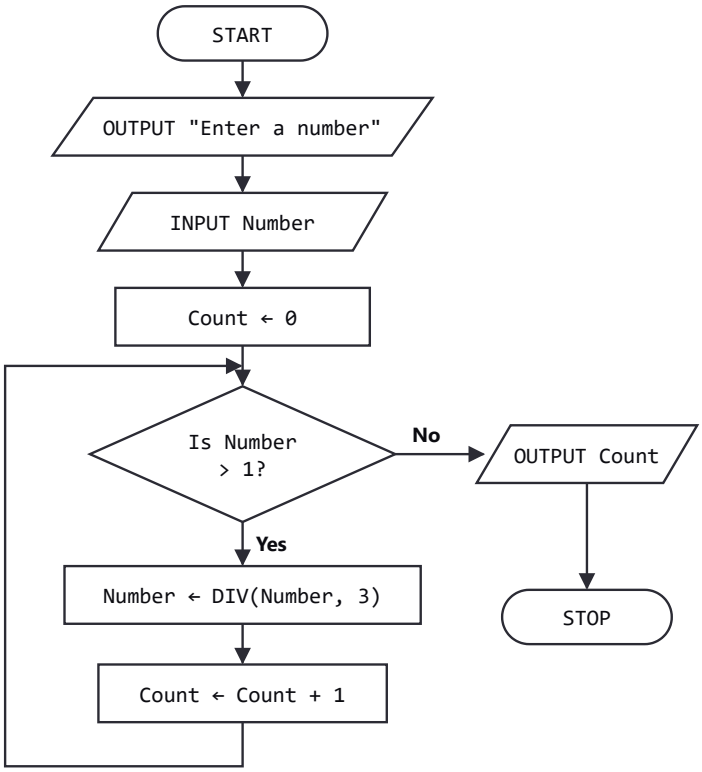
(a) Complete the trace table for the algorithm. The first row has been done for you. **[4]**

Index	Low	Above	OUTPUT
	38	0	

(b) State the purpose of this algorithm. **[2]**

4 **Total: 4 marks**

This flowchart shows an algorithm used by a stock-control system.



(a) Complete the trace table for the algorithm using this input data: **50** **[3]**

Number	Count	OUTPUT

(b) Dry-run the algorithm again using the input data **1**. State the final output. **[1]**

5 **Total: 5 marks**

Four judges at a baking competition each give a score. This algorithm should output the mean (average) of the four scores, but it contains an error.

```
01 FOR Count ← 1 TO 4
02     Total ← 0
03     OUTPUT "Enter score"
04     INPUT Score
05     Total ← Total + Score
06 NEXT Count
07 Average ← Total / 4
08 OUTPUT "Average is ", Average
```

(a) Complete the trace table for the algorithm using this input data: **12, 9, 15, 6** **[3]**

Count	Total	Score	Average	OUTPUT

(b) Identify the line number of the error and suggest a correction so that the algorithm outputs the mean of the four scores. **[2]**

Total for this worksheet: 21 marks

MODULE K ALGORITHM DESIGN · K9

Finding and fixing errors in an algorithm

Original practice questions · 21 marks · ~25 minutes · Cambridge 0478 syllabus 7.8 (with 7.7)

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. Write any corrections using pseudocode. The total for this worksheet is **21 marks**.

1

Total: 4 marks

An algorithm has been written in pseudocode to:
- input 12 monthly electricity readings (in kWh) for an office building
- output the total of the readings
- output the average reading per month
- count and output the number of months with a reading of **400 or more**.

```
01 DECLARE Month : INTEGER
02 DECLARE HighCount : INTEGER
03 DECLARE Reading : REAL
04 DECLARE Total : REAL
05 Total ← 0.0
06 HighCount ← 1
07 FOR Month ← 1 TO 11
08     OUTPUT "Enter the reading for month ", Month
09     INPUT Reading
10     Total ← Total + Reading
11     IF Reading > 400.0
12       THEN
13         HighCount ← HighCount + 1
14     ENDIF
15 NEXT Month
16 OUTPUT "Total used: ", Total
17 OUTPUT "Average per month: ", Total / HighCount
18 OUTPUT "Months of 400 or more: ", HighCount
```

(a) Identify the line numbers of the **four** errors in the pseudocode and suggest a correction for each error. **[4]**

Line number	Correction

2

Total: 7 marks

A running club times five members over a 10 km course, in whole minutes. This algorithm should output the fastest (lowest) time.

```
01 Fastest ← 0
02 FOR Runner ← 1 TO 5
03     INPUT Time
04     IF Time < Fastest
05       THEN
06         Fastest ← Time
07     ENDIF
08 NEXT Runner
09 OUTPUT "Fastest time: ", Fastest
```

(a) Complete the trace table for the algorithm using this input data: **62, 58, 71, 55, 60** **[4]**

Runner	Time	Fastest	OUTPUT

(b) (i) Explain why the algorithm does not output the fastest time. **[1]**

(ii) Write a corrected line 01. **[1]**

(iii) State the output from the corrected algorithm for the same input data. **[1]**

3

Total: 3 marks

A restaurant's booking system should only accept a table booking for **1 to 8** seats. This pseudocode should keep asking until a value in this range is input.

```
01 DECLARE Seats : INTEGER
02 REPEAT
03     OUTPUT "Enter number of seats (1 to 8)"
04     INPUT Seats
05 UNTIL Seats < 1 OR Seats > 8
```

(a) Describe what happens when the value **5** is input. **[1]**

(b) Write a corrected line 05. **[2]**

4 **Total: 4 marks**

A judge at a dog show gives 10 scores. This pseudocode should input the 10 scores and output their total.

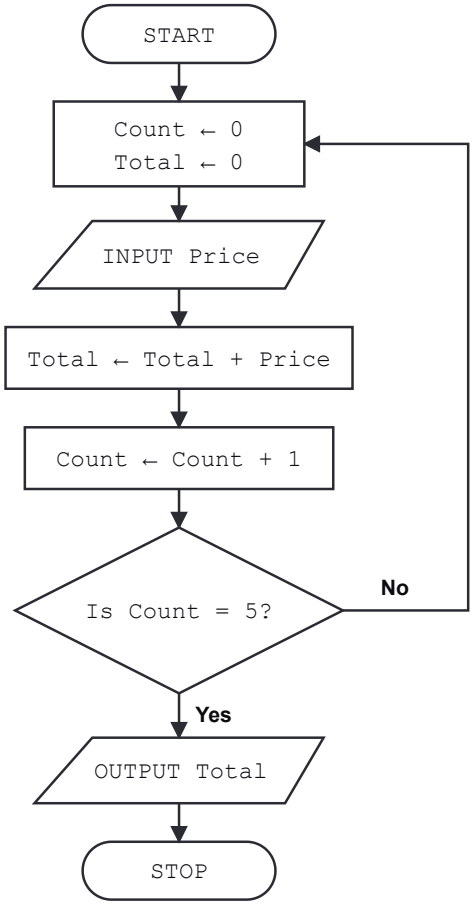
```
01 Count ← 0
02 Total ← 0
03 WHILE Count < 10 DO
04     INPUT Score
05     Total ← Total + Score
06 ENDWHILE
07 OUTPUT "Total score is ", Total
```

(a) Explain why this algorithm never outputs the total. **[2]**

(b) Write the missing pseudocode statement and state where it should be placed. **[2]**

5 **Total: 3 marks**

This flowchart should input the prices of **five** items and output the total price.



(a) Describe the error in the flowchart and its effect. **[2]**

(b) Describe how the flowchart should be corrected. **[1]**

Total for this worksheet: 21 marks

MODULE K ALGORITHM DESIGN · K10

Explaining the purpose of an algorithm

Original practice questions · 21 marks · ~25 minutes · Cambridge 0478 syllabus 7.3, 7.4, 7.5, 7.7

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. All algorithms are written in Cambridge pseudocode or as flowcharts. The total for this worksheet is **21 marks**.

1

Total: 4 marks

A shop stores its takings for each day of one week in the array `Sale[1:7]`. Each pseudocode fragment **A** to **D** is part of an algorithm that processes the array. The variable `Day` is the array index.

(a) Tick (✓) **one** box in each row to show the standard method of solution that each fragment is part of. **[4]**

	Fragment	Totalling	Counting	Maximum	Minimum	Average
A	`Amount ← Amount + Sale[Day]`					

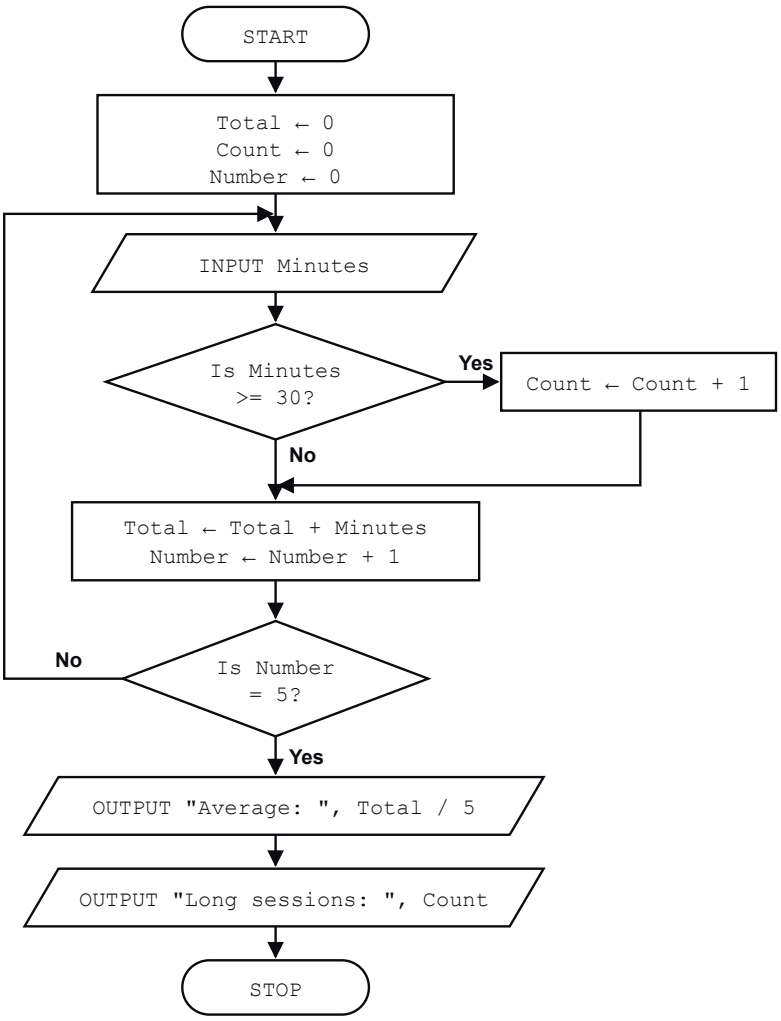
B	`IF Sale[Day] > 100.0`
	`  THEN`
	`  Days ← Days + 1`
	`ENDIF`					

C	`IF Sale[Day] > Top`
	`  THEN`
	`  Top ← Sale[Day]`
	`ENDIF`					

D	`Mean ← Amount / 7`					

2 **Total: 7 marks**

A gym instructor uses this flowchart to process the number of minutes that a member exercised in each of their last five sessions.



(a) Complete the trace table for the input data: **25, 40, 30, 15, 50** **[5]**

Minutes	Count	Total	Number	OUTPUT
	0	0	0	

(b) Explain the purpose of the algorithm shown in the flowchart. **[2]**

3

Total: 6 marks

A hardware warehouse stores the codes of the 500 parts it keeps in the array `PartCode[1:500]`. The array `Bay[1:500]` stores the number of the bay where each part is kept: `Bay[1]` is the bay for `PartCode[1]`, and so on.

```
01 REPEAT
02     OUTPUT "Enter a part code of 6 characters"
03     INPUT Wanted
04 UNTIL LENGTH(Wanted) = 6
05 Found ← FALSE
06 Index ← 1
07 WHILE (Found = FALSE) AND (Index <= 500) DO
08     IF PartCode[Index] = Wanted
09       THEN
10         Found ← TRUE
11       ELSE
12         Index ← Index + 1
13     ENDIF
14 ENDWHILE
15 IF Found = TRUE
16   THEN
17     OUTPUT "Stored in bay ", Bay[Index]
18   ELSE
19     OUTPUT "Part not stocked"
20 ENDIF
```

(a) Describe the processes involved in the algorithm. **[4]**

(b) Identify the standard method of solution used in lines 05 to 14. **[1]**

(c) State the type of validation check carried out in lines 01 to 04. **[1]**

4 **Total: 4 marks**

This algorithm is given a whole number that is 0 or greater.

```
01 INPUT X
02 Y ← 0
03 WHILE X > 0 DO
04     Y ← Y + MOD(X, 10)
05     X ← DIV(X, 10)
06 ENDWHILE
07 OUTPUT Y
```

(a) State the output when the input is **4072**. **[1]**

(b) State the purpose of the algorithm. **[1]**

(c) The input is **0**. State the output and explain why. **[2]**

Total for this worksheet: 21 marks