

2 Data is a global 1D array containing 30 elements of type `STRING`

An algorithm will output:

- all non-blank elements (elements that do **not** contain an empty string)
- the final total of the number of elements output.

Complete the program flowchart to represent the algorithm:

START

END

①

[5]

2 Data is a global 1D array containing 20 elements of type `REAL`

An algorithm will:

- input a sequence of real values, one at a time
- assign each value to consecutive array elements, starting from index 1
- end when the value 99.9 is input, or all 20 elements have been assigned (the value 99.9 must **not** be stored in the array).

Complete the program flowchart to represent the algorithm:

START

END

②

[5]

2 (a) A program contains a global 1D array of type `STRING` containing 65 elements.

An existing text file is used to store the data in the array. Only non-blank elements (those that do **not** contain an empty string) are written to the text file.

An algorithm will:

- write the first element of the array as a new line in the text file
- continue until all elements have been written, each to a new line of the text file.

Stepwise refinement is applied to the algorithm.

Describe up to **six** steps for this algorithm that could be used to produce pseudocode.

Do **not** use pseudocode statements in your answer.

Step 1

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Step 2

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Step 3

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Step 4

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Step 5

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Step 6

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[6]

(b) Iteration is one programming construct.

Identify **one** other programming construct that will be required when the algorithm from part **(a)** is converted into pseudocode and explain how it is used.

Construct

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Use

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[2]

3 A student has been asked to create a simple guessing game program. This program will generate a random integer value between 1 and 100. It will then repeatedly prompt the user to input an integer value until they input the randomly generated value.

The student has written a structured English description:

step 1 – randomly generate an integer value between 1 and 100 inclusive

step 2 – prompt the user to input an integer value

step 3 – output an appropriate message if the value input was too high; then repeat from **step 2**

step 4 – output an appropriate message if the value input was too low; then repeat from **step 2**

step 5 – output an appropriate message if the value input was the same value that was randomly generated; then end the program.

Write a pseudocode algorithm from this structured English description.

Assume no input validation is needed.

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..... [8]

2 A program to calculate the pay of employees working for a company is being designed.

(a) Stepwise refinement has been used in the design of the program.

Describe stepwise refinement.

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..... [2]

(b) One of the program modules used to calculate employees' weekly bonus pay has been completed. The amount of bonus pay they receive is based on the number of hours worked and the value of sales made as shown in the table.

Bonus pay and value of sales are both in dollars.

Hours worked	Value of sales	Bonus pay
between 1 and 40 inclusive	2000 or less	0
between 1 and 40 inclusive	above 2000	50
above 40	2000 or less	10
above 40	above 2000	100

(i) The module is tested using white-box testing.

State **two** tests, using valid data, that can be used to test different paths through the program.

Test one:

Hours worked

Value of sales

Bonus pay

Test two:

Hours worked

Value of sales

Bonus pay

[2]

(ii) The program to calculate pay uses a number of modules which are each called from different places in the program.

The program is to be tested using stub testing before all the program modules have been completed.

Describe stub testing.

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..... [2]

(iii) The program has been completed and compiles successfully.

The program is tested using black-box testing.

Identify and describe **one** type of error that black-box testing could detect.

Type of error

Description

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..... [2]

If both integers output are negative, a third random integer between 30 and 35 inclusive will be generated and output.

[8]

END

- 4 A programmer is developing a new stock control program for a shop owner to produce sales reports.

(a) A text file `Sales.txt` stores strings representing the number of items sold.

The file contains 52 lines, each representing the number of items sold in each week of the year.

For example:

File line number	File data
1	"350"
2	"502"
3	"434"
	
49	"492"
50	"872"
51	"772"
52	"201"

The example shows that 502 items were sold in week 2.

The owner requires a module to output all week numbers where the number of items sold is greater than 500.

Describe an algorithm that produces the required module.

Do **not** include pseudocode statements in your answer.

Describe the walkthrough method and explain how it can be used to identify errors.

[3]

1. prompt and input a sequence of 100 integer values, one at a time
2. sum the positive integers
3. output the result of the sum.

You must declare all variables used in the algorithm.

[5]

Use

[2]

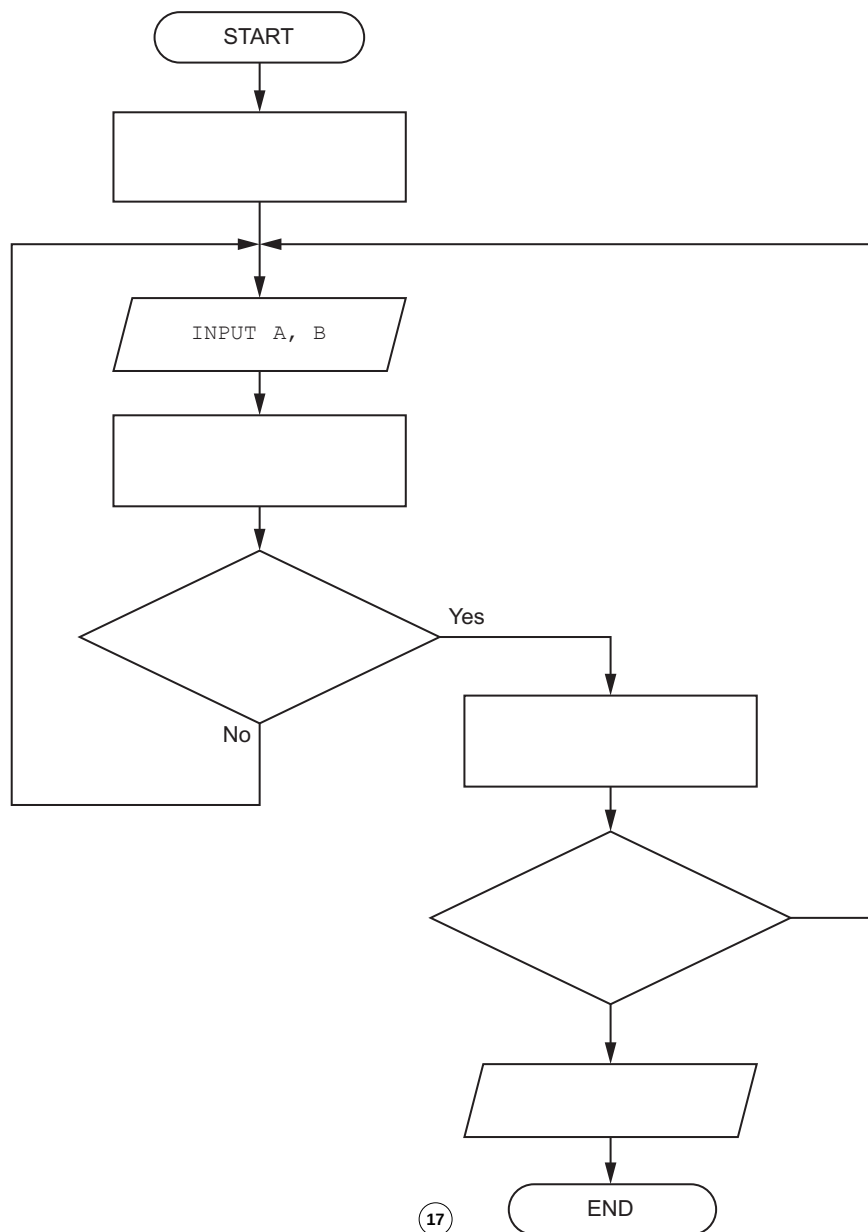
- 15

- 16

2 An algorithm has three steps. It will:

1. repeatedly input a pair of numeric values A and B
2. count the number of pairs that are input until A has been greater than B 10 times
3. output the number of pairs that were input.

(a) Complete the program flowchart.



(b) Step 1 of the algorithm is changed.

A variable `ThisSequence` is used to enter a sequence of 10 pairs of numeric values, using a single input statement.

Following the input of `ThisSequence` the revised algorithm will extract the pairs of numbers.

Describe the variable `ThisSequence` and how the numbers are extracted.

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