

1. Question | 0478 Feb-March 2023 P2 V2 Q1

- 1** Tick (✓) **one** box to show which word accurately describes the scope of a variable declared in a procedure.

A Function

☐

B Global

☐

C Local

☐

D Subroutine

☐

[1]

2 (a) **Four** descriptions and **five** pseudocode statements are shown.

Draw **one** line to link each description to its most appropriate pseudocode statement.
Not all pseudocode statements will be used.

Description	Pseudocode statement
a statement to count	FOR Count ← 1 TO 10
a statement to total	Value ← Value + NewValue
a statement to start a pre-condition loop	WHILE Value > 10 DO
a statement to start a post-condition loop	REPEAT
	Value ← Value + 1

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(b) Write an algorithm in pseudocode, using a single loop, to output the average of 50 numbers that have been stored in the array `Number [ ]`

..... [5]

4 Describe how variables and constants are used in programming.

..... [3]

4. Question part 1/2 | 0478 Feb-March 2023 P2 V2 Q10

10 The variables `X`, `Y` and `Z` are used in a program: `X` stores a whole number, `Y` stores a decimal number and `Z` stores a flag that can be set to `TRUE` or `FALSE`

(a) Write pseudocode statements to declare the variables `X`, `Y` and `Z`

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..... [3]

(b) The function `Same (A, B)` returns `TRUE` if the value of `A` is the same as the value of `B` when `B` is rounded to the nearest whole number and `FALSE` otherwise.

- Write pseudocode statements to:
- define the function
 - call the function with `X` and `Y` and store the return value in `Z`

Function definition

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Function call

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..... [6]

(c) State the difference between defining and calling a function.

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11 The one-dimensional (1D) array `TeamName[]` contains the names of teams in a sports league. The two-dimensional (2D) array `TeamPoints[]` contains the points awarded for each match. The position of each team's data in the two arrays is the same. For example, the team stored at index 10 in `TeamName[]` and `TeamPoints[]` is the same.

The variable `LeagueSize` contains the number of teams in the league. The variable `MatchNo` contains the number of matches played. All teams have played the same number of matches.

The arrays and variables have already been set up and the data stored.

Each match can be played at home or away. Points are recorded for the match results of each team with the following values:

- 3 – away win
- 2 – home win
- 1 – drawn match
- 0 – lost match.

Write a program that meets the following requirements:

- calculates the total points for all matches played for each team
- counts the total number of away wins, home wins, drawn matches and lost matches for each team
- outputs for each team:
 - name
 - total points
 - total number of away wins, home wins, drawn matches and lost matches
- finds and outputs the name of the team with the highest total points
- finds and outputs the name of the team with the lowest total points.

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

You do **not** need to declare any arrays, variables or constants; you may assume that this has already been done.

All inputs and outputs must contain suitable messages.

You do **not** need to initialise the data in the arrays `TeamName[]` and `TeamPoints[]` or the variables `LeagueSize` and `MatchNo`

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5. Question part 2/3 | 0478 Feb-March 2023 P2 V2 Q11

[illegible]

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..... [15]

[15]

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6. Question | 0478 May-June 2023 P2 V1 Q2

- 2** Tick (✓) **one** box to show the name of the data structure used to store a collection of data of the same data type.

A Array

☐

B Constant

☐

C Function

☐

D Variable

☐

[1]

- 5 An algorithm has been written in pseudocode to allow some numbers to be input. All the positive numbers that are input are totalled and this total is output at the end.
An input of 0 stops the algorithm.

```
01 Exit ← 1
02 WHILE Exit <> 0 DO
03     INPUT Number
04     IF Number < 0
05         THEN
06             Total ← Total + Number
07         ELSE
08             IF Number = 0
09                 THEN
10                     Exit ← 1
11             ENDIF
12         ENDIF
13 ENDIF
14 OUTPUT "The total value of your numbers is ", Number
```

(a) Identify the **four** errors in the pseudocode and suggest a correction for each error.

Error 1

Correction

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Error 2

Correction

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Error 3

Correction

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Error 4

Correction

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You do **not** need to rewrite the algorithm.

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[4]

6 State **two** features that should be included to create a maintainable program.

Give a reason why each feature should be used.

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8 The function `LENGTH(Phrase)` calculates the length of a string `Phrase`

- (a) Write the pseudocode statements to:
- store the string "The beginning is the most important part" in `Phrase`
 - calculate and output the length of the string
 - output the string in upper case.

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(b) Write the output your pseudocode should produce.

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..... [2]

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11 A one-dimensional (1D) array `Days[]` contains the names of the days of the week. A two-dimensional (2D) array `Readings[]` is used to store 24 temperature readings, taken once an hour, for each of the seven days of the week. A 1D array `AverageTemp[]` is used to store the average temperature for each day of the week.

The position of any day's data is the same in all three arrays. For example, if Wednesday is in index 4 of `Days[]`, Wednesday's temperature readings are in index 4 of `Readings[]` and Wednesday's average temperature is in index 4 of `AverageTemp[]`

The temperature readings are in Celsius to one decimal place. Temperatures can only be from -20.0 °C to +50.0 °C inclusive.

Write a program that meets the following requirements:

- input and validate the hourly temperatures for one week
- calculate and store the average temperature for each day of the week
- calculate the average temperature for the whole week
- convert all the average temperatures from Celsius to Fahrenheit by using the formula $Fahrenheit = Celsius * 9/5 + 32$
- output the average temperature in Celsius and in Fahrenheit for each day
- output the overall average temperature in Celsius and in Fahrenheit for the whole week.

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

You do **not** need to declare any arrays, variables or constants; you may assume that this has already been done.

All inputs and outputs must contain suitable messages.

All data output must be rounded to one decimal place.

You will need to initialise and populate the array `Days [ ]` at the start of the program.

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10. Question part 2/3 | 0478 May-June 2023 P2 V1 Q11

[illegible]

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10. Question part 3/3 | 0478 May-June 2023 P2 V1 Q11

[15]

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11. Question | 0478 May-June 2023 P2 V2 Q5

5 Circle **five** file-handling operations.

- calculate
- close
- count
- create
- input
- open
- output
- print
- read
- sort
- search
- test
- total
- write

[5]

- 6 State **three** different features of a high-level programming language that a programmer could use to make sure that their program will be easier to understand by another programmer. Give an example for each feature.

Feature 1
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Example
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Feature 2
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Example
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Feature 3
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Example
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11 The variables `P` and `Q` are used to store data in a program. `P` stores a string. `Q` stores a character.

(a) Write pseudocode statements to declare the variables `P` and `Q`, store "The world" in `P` and store 'W' in `Q`

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..... [2]

(b) Write a pseudocode algorithm to:

- convert `P` to upper case
- find the position of `Q` in the string `P` (the first character in this string is in position 1)
- store the position of `Q` in the variable `Position`

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(c) Give the value of `Position` after the algorithm has been executed with the data in question 11(a).

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..... [1]

12 A two-dimensional (2D) array `Account[]` contains account holders' names and passwords for a banking program.

A 2D array `AccDetails[]` has three columns containing the following details:

- column one stores the balance – the amount of money in the account, for example 250.00
- column two stores the overdraft limit – the maximum total amount an account holder can borrow from the bank after the account balance reaches 0.00, for example 100.00
- column three stores the withdrawal limit – the amount of money that can be withdrawn at one time, for example 200.00

The amount of money in a bank account can be negative (overdrawn) but **not** by more than the overdraft limit.

For example, an account with an overdraft limit of 100.00 must have a balance that is greater than or equal to –100.00

Suitable error messages must be displayed if a withdrawal cannot take place, for example if the overdraft limit or the size of withdrawal is exceeded.

The bank account ID gives the index of each account holder's data held in the two arrays.

For example, account ID 20's details would be held in:

```
Account[20,1] and Account[20,2]
AccDetails[20,1] AccDetails[20,2] and AccDetails[20,3]
```

The variable `Size` contains the number of accounts.

The arrays and variable `Size` have already been set up and the data stored.

Write a program that meets the following requirements:

- checks the account ID exists and the name and password entered by the account holder match the name and password stored in `Account[]` before any action can take place
- displays a menu showing the four actions available for the account holder to choose from:
 1. display balance
 2. withdraw money
 3. deposit money
 4. exit
- allows an action to be chosen and completed. Each action is completed by a procedure with a parameter of the account ID.

You must use pseudocode or program code **and** add comments to explain how your code works. All inputs and outputs must contain suitable messages.

You only need to declare any local arrays and local variables that you use.

You do **not** need to declare and initialise the data in the global arrays `Account[]` and `AccDetails[]` and the variable `Size`

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14. Question part 2/3 | 0478 May-June 2023 P2 V2 Q12

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14. Question part 3/3 | 0478 May-June 2023 P2 V2 Q12

..... [15]

15. Question | 0478 May-June 2023 P2 V3 Q1

1 Tick (✓) **one** box to complete the sentence.

A constant

- A stores a value that can change at any time during the execution of a program.
- B stores a value that cannot change during the execution of a program.
- C stores values of multiple data types.
- D stores values that must be of the same data type.

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☐

[1]

16. Question | 0478 May-June 2023 P2 V3 Q2

2 Explain the purpose of the library routines MOD and RANDOM

MOD

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RANDOM

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[4]

17. Question | 0478 May-June 2023 P2 V3 Q3

3 Describe what happens when a function is called during the execution of a program.

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..... [3]

18. Question part 1/2 | 0478 May-June 2023 P2 V3 Q6

6 An algorithm has been written in pseudocode to allow 100 positive numbers to be input. The total and the average of the numbers are output.

```
01 Counter ← 100
02 Total ← 0
03 WHILE Counter > 100 DO
04     INPUT Number
05     IF Number > 0
06         THEN
07             Total ← Total + Counter
08             Counter ← Counter + 1
09     ENDCASE
10 ENDWHILE
11 OUTPUT "The total value of your numbers is ", Total
12 OUTPUT "The average value of your numbers is ", Total / 100
```

Correction

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Correction

Correction

Correction

[4]

- You do **not** need to rewrite the algorithm.

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[5]

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9 The variable `Saying` is used to store string data in a program.

..... [1]

- allow a string to be input to the variable `Saying`
- store the content of the variable `Saying` in a text file named `"Quotations.txt"`
- make sure the text file is closed at the end of the algorithm.

[5]

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20. Question part 1/3 | 0478 May-June 2023 P2 V3 Q11

- 11 A two-dimensional (2D) array `Contacts[]` is used to store names and telephone numbers. All the data is stored as strings. The array must have the capacity to store 100 contacts in the form of:
- column 1 – contact names as: last name, first name
for example: Smith, John
 - column 2 – telephone numbers.

The variable `CurrentSize` shows how many contacts are in the array.

Write a program that meets the following requirements:

- display a menu of choices:
 - enter new contact details
 - display all the contact details
 - delete all the contact details
- validate the menu input
- allow up to a maximum of five new contacts to be added to the array at any one time
- do **not** allow more than 100 contacts in total
- after new contacts have been added, sort the array by contact name, as long as there are at least two contacts in the array
- output the whole of the array
- delete the contents of the array.

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

You do **not** need to declare any arrays, variables or constants; you may assume that this has already been done.

All inputs and outputs must contain suitable messages.

You do **not** need to initialise the data in the array `Contacts[]` and the variable `CurrentSize`

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20. Question part 2/3 | 0478 May-June 2023 P2 V3 Q11

[illegible]

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20. Question part 3/3 | 0478 May-June 2023 P2 V3 Q11

[15]

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21. Question | 0478 Oct-Nov 2023 P2 V1 Q1

1 Tick (✓) **one** box to show which operator means less than or equal to.

- | | | |
|----------|----|--------------------------|
| A | OR | ☐ |
| B | < | ☐ |
| C | <= | ☐ |
| D | >= | ☐ |

[1]

22. Question | 0478 Oct-Nov 2023 P2 V1 Q2

2 Tick (✓) **one** box to show how a value can be passed to a procedure.

- | | | |
|----------|------------|--------------------------|
| A | function | ☐ |
| B | parameter | ☐ |
| C | return | ☐ |
| D | subroutine | ☐ |

[1]

23. Question | 0478 Oct-Nov 2023 P2 V1 Q3

3 Four descriptions of data and five data types are shown.

Draw **one** line to link each description to the most appropriate data type.
Not all data types will be used.

Description	Data type
a whole number	BOOLEAN
a single letter	CHAR
a word or phrase	INTEGER
a number with two decimal places	REAL
	STRING

[4]

24. Question | 0478 Oct-Nov 2023 P2 V1 Q4

4 Circle the **three** words representing places where data may be stored.

- array constant dimension input
- output procedure variable

[3]

The theatre has 10 rows of 20 seats. The status of the seat bookings for the evening is held in the two-dimensional (2D) Boolean array `Evening[]`

Each element contains `FALSE` if the seat is available and `TRUE` if the seat is booked.

Up to and including four seats can be booked at one time. Seats are allocated in order from those available. A row or seat number cannot be requested.

The array `Evening[]` has already been set up and some data stored.

Write a program that meets the following requirements:

- counts and outputs the number of seats already booked for the evening
- allows the user to input the number of seats required
- validates the input
- checks if enough seats are available:
 - if they are available
 - changes the status of the seats
 - outputs the row number and seat number for each seat booked
 - if they are **not** available:
 - outputs a message giving the number of seats left or 'House full' if the theatre is fully booked.

You must use pseudocode or program code **and** add comments to explain how your code works. You do **not** need to declare any arrays or variables; you may assume that this has already been done.

You do **not** need to initialise the data in the array `Evening[]`

All inputs and outputs must contain suitable messages.

[illegible]

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25. Question part 2/3 | 0478 Oct-Nov 2023 P2 V1 Q10

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25. Question part 3/3 | 0478 Oct-Nov 2023 P2 V1 Q10

[15]

1 Tick (✓) **one** box to complete the sentence.

Verification is used to make sure that a value entered

A has **not** changed during input.

☐

B is an integer.

☐

C is correct.

☐

D is **not** a string.

☐

[1]

Not all pseudocode uses will be required.

[4]

Write a pseudocode algorithm using a single loop to find the lowest value in this array and output the result only once.

You do **not** need to declare or populate this array.

[4]

5 Explain how variables and constants should be used when creating and running a program.

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..... [3]

- store the string "Learning Never Exhausts The Mind" in Quote
- extract and display the words "The Mind" from the string
- output the original string in lower case.

[5]

8 Explain why a programmer would use procedures and parameters when writing a program.

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31. Question part 1/3 | 0478 Oct-Nov 2023 P2 V2 Q11

- 11 A wood flooring company stores the names of up to 100 customers in a one-dimensional (1D) array `Customers[]`. A two-dimensional (2D) array `Quotations[]` stores details of each customer's quotation:
- length of room (one decimal place)
 - width of room (one decimal place)
 - area of wood required (rounded up to next whole number)
 - choice of wood index (whole number)
 - price of wood required in dollars (two decimal places).

The floor measurements (room length and room width) are taken in metres. All floors are rectangles and room measurements must be between 1.5 and 10.0 inclusive.

The index of any customer's data is the same in both arrays. For example, a customer named in index 4 of `Customers[]` corresponds to the data in index 4 of `Quotations[]`

The wood choices available are:

Index	Wood type	Price per square metre (\$)
1	Laminate	29.99
2	Pine	39.99
3	Oak	54.99

The data are stored in two 1D arrays named `WoodType[]` and `Price[]`. The index of the wood type and price in their arrays share the same index number.

Write a program that meets the following requirements:

- input a new customer's name, room length and room width
- check that each measurement is valid
- output an error message and require the measurement to be re-entered until it is valid
- calculate the area of the room by multiplying together the length of the room and the width of the room
- input the choice of wood and find its price per square metre
- calculate the price of the wood needed
- store all data in the relevant array
- output the customer's quotation to include: the name of the customer, the choice of wood and the calculated price of the wood required
- continue to accept the next customer.

You must use pseudocode or program code **and** add comments to explain how your code works. You do **not** need to declare any arrays or variables; you may assume that this has already been done.

You will need to initialise `WoodType[]` and `Price[]`

All inputs and outputs must contain suitable messages.

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31. Question part 2/3 | 0478 Oct-Nov 2023 P2 V2 Q11

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31. Question part 3/3 | 0478 Oct-Nov 2023 P2 V2 Q11

..... [15]

32. Question | 0478 Oct-Nov 2023 P2 V3 Q2

2 Tick (✓) **one** box to show which library routine returns the remainder of a division.

A DIV

☐

B MOD

☐

C RANDOM

☐

D ROUND

☐

[1]

3 (a) Four pseudocode descriptions and five pseudocode keywords are shown.

Draw **one** line to link each pseudocode description to the most appropriate pseudocode keyword. **Not** all pseudocode keywords will be used.

Pseudocode description	Pseudocode keyword
stores data in a file	OUTPUT
retrieves data from a file	WRITE
displays data on a screen	READ
enters data from a keyboard	OPEN
	INPUT

[4]

(b) Give **two** reasons for storing data in a file.

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2

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[2]

34. Question part 1/2 | 0478 Oct-Nov 2023 P2 V3 Q4

4 A programmer is writing a data entry program for booking theatre seats.
The programmer needs the program to accept only whole numbers that are greater than or equal to one and less than or equal to six.

(a) Give the names of **two** validation checks that are required for this program.

1

2 [2]

(b) Complete this pseudocode to perform your **two** validation checks, using your answers given in (a):

OUTPUT "Please enter the number of seats you want to book "

INPUT Seats

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..... [5]

(c) Give **one** item of test data to use when testing this program.
State the reason for your choice of test data.

Test data

Reason for choice

..... [2]

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7 A program uses both local variables and global variables.

Describe **two** differences between local variables and global variables.

Difference 1
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Difference 2
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36. Question part 1/3 | 0478 Oct-Nov 2023 P2 V3 Q10

The variables `MaxDay`, `MinDay` and `AvDay` are used to store the maximum, minimum, and average temperatures for a day. The variables `MaxWeek`, `MinWeek` and `AvWeek` are used to store the maximum, minimum, and average temperatures for the week.

The array has already been set up and the data stored.

Write a program that meets the following requirements:

- All temperatures output must be rounded to two decimal places.

You must use pseudocode or program code **and** add comments to explain how your code works. All inputs and outputs must contain suitable messages.

You do **not** need to declare any arrays or variables; you may assume that this has already been done.

You do **not** need to initialise the data in the array `Temperatures[]`

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36. Question part 2/3 | 0478 Oct-Nov 2023 P2 V3 Q10

[illegible]

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36. Question part 3/3 | 0478 Oct-Nov 2023 P2 V3 Q10

[15]

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2 (a) Four test data types and five descriptions are shown.

Draw one line to link each test data type to its most appropriate description.

Test data type	Description
abnormal	a value that is accepted
boundary	a value that is the highest or lowest value to be accepted and the corresponding lowest or highest value to be rejected
	a value that is the highest or lowest value to be rejected
extreme	a value that is rejected
normal	a value that is the highest or lowest value to be accepted

[4]

(b) An algorithm has been written to test if an integer that is input is in the range 5 to 10 inclusive. Identify an example of suitable test data for each test data type.

Abnormal

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Boundary

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Extreme

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Normal

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[4]

4 Identify **three** data types used in programming.

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3

[3]

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6 Describe **two** types of iteration that a programmer can use whilst writing a program.

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11 Students in a class are recording the amount of time in minutes spent in front of a screen for each day of the week.

The two-dimensional (2D) array `ScreenTime[]` is used to input the number of minutes on each day spent in front of a screen.

The position of each student's data in the two arrays is the same. For example, the student stored at index 10 in `StudentName[]` and `ScreenTime[]` is the same.

The variable `ClassSize` contains the number of students in the class.

Write a program that meets these requirements:

- allows all the students to enter their daily minutes of screen times for the past week
- calculates the total number of minutes of screen time for each student in the week
- counts, for each student, the number of days with more than 300 minutes of screen time
- calculates the average weekly minutes of screen time for the whole class
- finds the student with the lowest weekly minutes of screen time
- outputs for each student:
 - name
 - total week's screen time in hours and minutes
 - number of days with more than 300 minutes of screen time
- outputs the average weekly minutes of screen time for the whole class
- outputs the name of the student with the lowest weekly screen time.

You must use pseudocode or program code **and** add comments to explain how your code works. All inputs and outputs must contain suitable messages.

Assume that the array `StudentName[]` and the variable `ClassSize` already contain the required data.

You do **not** need to declare any arrays or variables; you may assume that this has already been done.

[illegible]

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41. Question part 2/3 | 0478 Feb-March 2024 P2 V2 Q11

[illegible]

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..... [15]

. [15]

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

2 Four descriptions of programming concepts and five programming concepts are shown.

(a) Draw one line to link each description to the most appropriate programming concept.

Not all programming concepts will be used.

Description	Programming concept
a subroutine that may not return a value	function
a value that is declared and used within a specific procedure	procedure
a value that a procedure expects you to supply when it is called	parameter
a subroutine that will always return a value	global variable
	local variable

[4]

(b) Write the pseudocode to use a procedure named `Average` that passes the values 25 and 50 to the procedure.

.....

..... [2]

(c) Outline the role of procedures and functions in creating a program that is easier to maintain.

.....

.....

.....

.....

.....

..... [3]

3 State what is meant by the data types integer and real.
Give an example of each.

Integer
.....

Example

Real
.....

Example

[4]

- accept the input of a whole number from 1 to 4 inclusive
- use a CASE statement to:
 - output the number (1 to 4 inclusive) that was entered
 - output the word “ERROR” if a 1 to 4 inclusive number was **not** entered.

[5]

7 (a) Outline why it is useful to store data in a file.

.....

.....

.....

..... [2]

(b) The function `LENGTH (X)` calculates the length of a string `X`

Write the pseudocode statements to:

- read the contents of the text file `Quotation.txt` into an appropriate string variable that has been declared
- output the string in upper case and the length of the string.

.....

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..... [4]

10 The one-dimensional (1D) array `Clubs[]` is used to store the names of 12 cricket clubs in a local sports league.

The two-dimensional (2D) array `Statistics[]` is used to store, for each cricket club, the number of:

- matches won
- matches drawn
- matches lost.

The 1D array `Points[]` is used to store the total number of points each cricket club has been awarded.

The position of any cricket club’s data is the same in all three arrays. For example, the data in index 2 of `Statistics[]` and index 2 of `Points[]` belongs to the cricket club in index 2 of `Clubs[]`

The variable `Matches` stores the number of matches played by each team. Each team plays the same number of matches.

Points are awarded for:

- a win – 12 points
- a draw – 5 points
- a loss – 0 points.

Write a program that meets the following requirements:

- allows the number of matches played to be input and stored, with a maximum of 22 matches
- validates the number of matches played
- allows the names of the cricket clubs to be input and stored
- allows the number of matches won, drawn and lost to be input and stored for each team
- validates the number of matches won, drawn or lost against the number of matches played
- asks the user to re-enter the number of matches won, drawn or lost if the total does not match the number of matches played
- calculates and stores the total number of points for each club
- finds the cricket club or clubs with the highest number of points
- outputs the name or names of the winning club or clubs, the number of wins and the total number of points awarded.

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

You do **not** need to declare any arrays or variables; you may assume that this has already been done.

All inputs and outputs must contain suitable messages.

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.....

.....

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46. Question part 2/3 | 0478 May-June 2024 P2 V1 Q10

[illegible]

0478 Computer Science Paper 2 - Programming

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46. Question part 3/3 | 0478 May-June 2024 P2 V1 Q10

..... [15]

4 A program needs to make sure the characters input for a product code meet these rules:

- The product code is six characters in length.
- The first two characters must be “PD”.
- The last four characters must be a number in the range 1000 to 9999 inclusive.

(a) Identify **three** validation checks and state how each check would make sure the product code met one of these rules.

Check 1
.....
.....

Check 2
.....
.....

Check 3
.....
.....

[6]

(b) The program design will include a pseudocode algorithm. Assume that the product code is stored in the variable `Product`

(i) Write the pseudocode to make sure that the product code is six characters in length.

.....
.....
.....
.....
..... [2]

(ii) Write the pseudocode to make sure that the first two characters of the product code are “PD”.

.....
.....
.....
.....
..... [2]

5 A high-level programming language makes use of arithmetic, Boolean and logical operators.

State how each type of operator is used.
Give an example statement, in pseudocode, for each one.

Arithmetic
.....

Example
.....

Boolean
.....

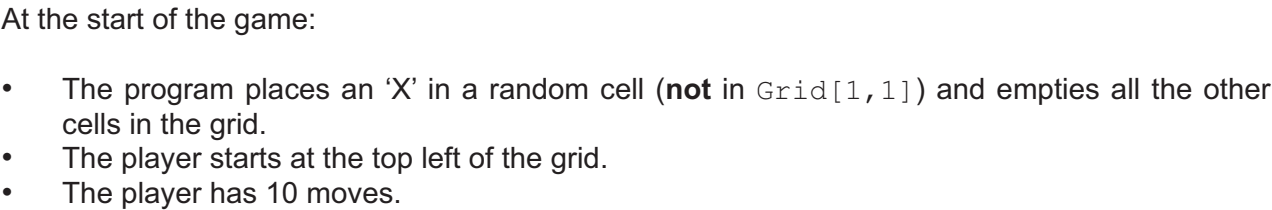
Example
.....

Logical
.....

Example
.....

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11 A one-player game uses the two-dimensional (2D) array `Grid[]` to store the location of a secret cell to be found by the player in 10 moves. Each row and column has 5 cells.



During the game:

- The player can move left, right, up or down by one cell and the move must be within the grid.
- “You Win” is displayed if the player moves to the cell with ‘X’ and has played 10 moves or less.
- “You Lose” is displayed if the player has made 10 moves without finding the ‘X’.

Write a program that meets these requirements.

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

You do **not** need to declare any arrays or variables; you may assume that this has already been done.

All inputs and outputs must contain suitable messages.

[illegible]

Topical questions | 97 questions

[illegible]

Topical questions | 97 questions



9

[illegible]

3 Describe the characteristics of the string and char data types and give an example of each.

String
.....

Example

Char
.....

Example

[4]

51. Question part 1/2 | 0478 May-June 2024 P2 V3 Q4

- 4 This pseudocode algorithm is intended to allow data for up to 50 people to be entered and stored in a two-dimensional (2D) array. The data is their last name, first name and the city in which they live.

```
01 DECLARE People : ARRAY[1:50, 1:3] OF REAL
02 DECLARE Count : INTEGER
03 DECLARE Response : CHAR
04 DECLARE Continue : BOOLEAN
05 FOR I ← 1 TO 50
06     FOR J ← 1 TO 3
07         People[I, J] ← ""
08     NEXT J
09 NEXT I
10 Count ← 100
11 Continue ← TRUE
12 CASE OF
13     OUTPUT "Enter the last name"
14     INPUT People[Count, 1]
15     OUTPUT "Enter the first name"
16     INPUT People[Count, 2]
17     OUTPUT "Enter the city"
18     INPUT People[Count, 3]
19     OUTPUT "Do you want to enter another name (Y or N)?"
20     INPUT Response
21     IF Response = 'N'
22         THEN
23             Continue ← FALSE
24         ELSE
25             Count ← Count + 1
26     ENDIF
27 UNTIL NOT Count
```

(a) Identify the line numbers of the **four** errors in the pseudocode and suggest corrections.

Error 1 line number

Correction

Error 2 line number

Correction

Error 3 line number

Correction

Error 4 line number

Correction

(b) Write the pseudocode that you could add to the end of this algorithm to output the contents of the array. Make sure that the output ends when the data in the array ends.

.....

.....

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.....

.....

.....

.....

..... [4]

(c) Explain how you could alter the original corrected algorithm to make sure that the number of elements being added to the array does not exceed the maximum size of the array (50 elements).

.....

.....

.....

.....

.....

.....

.....

..... [4]

6 A program is to be written that will accept integers that are between the values of 1 and 80 inclusive.

(a) Give examples of normal, abnormal and extreme test data that could be used to make sure the program only accepts valid data.

Normal test data

Abnormal test data

Extreme test data

[3]

(b) Describe what is meant by extreme test data.

.....

.....

.....

..... [2]

7 (a) The string operation `SUBSTRING(FullText, X, Y)` returns a string from `FullText` beginning at position `X` that is `Y` characters long. The first character in `FullText` is in position 1.

Write the pseudocode statements to:

- store the string “IGCSE Computer Science at Cambridge” in `FullText`
- extract and display the words “Computer Science” from the string and store it in a suitable variable
- output the original string in upper case.

.....

.....

.....

.....

.....

..... [4]

(b) Write the pseudocode statements to:

- store the content of the variable you created in part (a) to a text file named `"Subjects.txt"`
- close the text file at the end of the algorithm.

.....

.....

.....

.....

.....

..... [3]

Topical questions | 97 questions

9 A one-dimensional (1D) array `Teams[]` contains the names of 10 football teams in a local league. A two-dimensional (2D) array `Results[]` stores, for each team, the total number of:

- games won
- games drawn
- games lost
- points.

The position of any team's data is the same in both arrays. For example the data in index 3 of `Results[]` belongs to the team in index 3 of `Teams[]`

The array data will be used to find the current leader of the league.

The variable `Played` stores the number of games played by each team. Each team plays the same number of games.

Write a program that meets the following requirements:

- allows the number of games played to be input and stored, with a maximum of 18 games
- allows the names of the teams to be input and stored
- allows the number of games won, drawn and lost to be input and stored for each team
- validates the number of games played and the number of games won, drawn or lost against the number of games played
- calculates and stores the number of points for each team using three points for a win and one point for a draw; there are no points for a loss
- sorts the array `Results[]` into descending order of number of points, ensuring the corresponding parallel array `Teams[]` is kept in the same order
- determines how many teams have the highest number of points
- outputs the name(s) of the winning team(s) along with the number of points achieved.

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

You do **not** need to declare any arrays, variables or constants; you may assume that this has already been done.

All inputs and outputs must contain suitable messages.

[illegible]

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54. Question part 2/3 | 0478 May-June 2024 P2 V3 Q9

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

55. Question | 0478 Oct-Nov 2024 P2 V1 Q1

1 Tick (✓) **one** box to show which check is used for verification when data is input.

- A

length check

☐
- B

range check

☐
- C

type check

☐
- D

visual check

☐

[1]

56. Question | 0478 Oct-Nov 2024 P2 V1 Q3

3 **Four** operators and **three** types of operator are shown.

Draw **one or more** lines from each operator to its correct operator type.

Operator	Operator type
>=	Boolean
AND	Arithmetic
DIV	Logical
+	

[4]

57. Question part 1/2 | 0478 Oct-Nov 2024 P2 V1 Q8

8 A programmer is designing a program to check the length of a password and to check if the password input is the same as the stored password.

The program requirements are:

- input the password, `Password`
- check if there are at least 8 characters in the password
- check that the password is **not** the same as the stored password `OldPass`
- output 'accepted' if both tests are completed successfully
- otherwise, output 'rejected'.

Use the variable names given.

(a) Complete the flowchart for the program.



57. Question part 2/2 | 0478 Oct-Nov 2024 P2 V1 Q8



(b) The accepted password, `Password`, is to be written to the file `MyPassword.txt`

Write pseudocode to:

- open the file
- write the accepted password to the file
- close the file.

.....

.....

.....

.....

..... [3]

(c) Explain why the accepted password needs to be stored in a file.

.....

.....

.....

..... [2]

Topical questions | 97 questions

58. Question part 1/3 | 0478 Oct-Nov 2024 P2 V1 Q11

- The running club awards a small prize to the members who have the top three times. The club also awards certificates to all members with a time under 240 seconds.

Write a program that meets the following requirements:

- allows members' times to be input twice and verifies that the inputs match
- sorts the arrays `MemberTime[]` and `MemberName[]` in ascending order of time
- outputs the member names and times of the members with the top three times and identifies them as First, Second and Third
- stores the names of all the members who will receive a certificate in the array `MemberCertificate[]`
- outputs a message stating the number of certificates to be printed.

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 array `MemberName [ ]`

You do **not** need to declare any arrays or variables; you may assume that this has already been done.

All inputs and outputs must contain suitable messages.

This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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58. Question part 2/3 | 0478 Oct-Nov 2024 P2 V1 Q11

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Topical questions | 97 questions



..... [15]

59. Question | 0478 Oct-Nov 2024 P2 V2 Q2

2 Tick (✓) **one** box to complete this sentence.

A pseudocode example of a selection statement is

- A

CALL Sorting(Value1, Value2)

☐
- B

DECLARE Count : INTEGER

☐
- C

IF X = 7 THEN Y ← 21 ENDIF

☐
- D

WHILE X <> -1 DO

☐

[1]

60. Question | 0478 Oct-Nov 2024 P2 V2 Q6

6 Outline **one** type of verification check that could be used when inputting data.

.....

.....

.....

..... [2]

Write the pseudocode statements to:

- Make sure that any variables used are declared and that both text files are closed after they have been used.

[6]

Topical questions | 97 questions

62. Question part 1/3 | 0478 Oct-Nov 2024 P2 V2 Q12

- 12** A one-dimensional (1D) array `Rooms[]` contains the names of up to 20 rooms in a house. A two-dimensional (2D) array `Dimensions[]` is used to store the length, width and area of each room.

The position of any room's data is the same in both arrays. For example, the data in index 5 of `Dimensions[]` belongs to the room in index 5 of `Rooms[]`

The variable `Number` stores the number of rooms for which data is to be input. There must be at least 3 rooms but no more than 20.

Write a program that meets the following requirements:

- allows the number of rooms for which data is required to be input, stored and validated
- allows the name of the room and the length and width of the room, in metres, to be entered and stored
- allows the area of each room to be calculated as length multiplied by width and stored as square metres rounded to two decimal places
- calculates the average size of all the rooms by area, in square metres, rounded to two decimal places
- finds the largest room and smallest room by area
- outputs the names of all rooms with their dimensions and area
- outputs the names of the largest room and smallest room by area
- outputs the total area of the house and the average size of all the rooms by area.

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

You do **not** need to declare any arrays or variables; you may assume that this has already been done.

All inputs and outputs must contain suitable messages.

[illegible]

0478 Computer Science Paper 2 - Programming

Topical questions | 97 questions

62. Question part 2/3 | 0478 Oct-Nov 2024 P2 V2 Q12

This image shows a full page of a handwriting practice worksheet. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dotted lines, creating a series of uniform gaps for letter height. The entire page is otherwise blank, with no margins, text, or other markings.

Topical questions | 97 questions



[15]

1 Tick (✓) **one** box to show which of the following is used to validate data on input.

A checksum

☐

B double entry check

☐

C type check

☐

D visual check

☐

[1]

64. Question part 1/2 | 0478 Oct-Nov 2024 P2 V3 Q6

- 6 An incomplete algorithm has been written in pseudocode to count the number of values stored in an array and to find their average.
Values have been stored in the array starting at A[1]
All the values to be counted are non-zero.
A value of zero in the array indicates there are no more values stored.

```
01 DECLARE A : ARRAY[1:50] OF INTEGER
02 DECLARE C : INTEGER
03 DECLARE W : INTEGER
04 DECLARE X : INTEGER
05 W ← 0
06 C ← .....
07 WHILE A[C] <> 0
08     W ← .....
09     C ← C + 1
10 ENDWHILE
11 X ← .....
```

- (a) Complete the given pseudocode algorithm. [3]
- (b) Write pseudocode to display, with suitable messages:
- the number of values stored in the array
 - the average of those values stored.

.....

.....

.....

.....

.....

..... [3]



(c) Meaningful identifiers have **not** been used in this algorithm.

Suggest suitable meaningful identifiers for:

The array

A

The variables

C

X

W

[3]

10 An algorithm has been written in pseudocode to check that a password meets a set of rules.

```
01 OUTPUT "Please enter password "  
02 INPUT Password  
03 Accept ← TRUE  
04 IF LENGTH(Password) < 8 OR LENGTH(Password) > 20  
05     THEN  
06         Accept ← FALSE  
07 ENDIF  
08 IF LCASE(Password) = Password OR UCASE(Password) = Password  
09     THEN  
10         Accept ← FALSE  
11 ENDIF  
12 Index ← 1  
13 Found ← FALSE  
14 WHILE NOT Found AND Accept AND Index < LENGTH(Password)  
15     IF SUBSTRING(Password, Index, 1) = '!'  
16         THEN  
17             Found ← TRUE  
18         ENDIF  
19     Index ← Index + 1  
20 ENDWHILE  
21 IF NOT Found  
22     THEN  
23         Accept ← FALSE  
24 ENDIF  
25 IF Accept  
26     THEN  
27         OUTPUT "Accepted"  
28     ELSE  
29         OUTPUT "Rejected"  
30 ENDIF
```

(a) Complete the **three** trace tables using the data shown for each one.

Data: MYWORD

Password	Accept	Index	Found	OUTPUT

65. Question part 2/2 | 0478 Oct-Nov 2024 P2 V3 Q10



Data: M!word

Password	Accept	Index	Found	OUTPUT

Data: My!Hidden

Password	Accept	Index	Found	OUTPUT

[6]

(b) State the rules that the password must meet.

.....

.....

.....

.....

.....

.....

.....

[3]

Topical questions | 97 questions

66. Question part 1/3 | 0478 Oct-Nov 2024 P2 V3 Q12

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Topical questions | 97 questions



[15]

67. Question | 0478 Feb-March 2025 P2 V2 Q2

2 Tick (✓) **one** box to complete this sentence.

The pseudocode to store a hotel name held in the variable `Name` to a text file is

- A

READFILE `Hotels.txt`, `Name`

☐
- B

WRITEFILE `Hotels.txt`, `Name`

☐
- C

WRITEFILE `Name`, `Hotels.txt`

☐
- D

STOREFILE `Hotels.txt`, `Name`

☐

[1]

68. Question | 0478 Feb-March 2025 P2 V2 Q5

5 A program is written to only accept data that contains more than 9 characters. The program needs to be tested. The table, when completed, shows appropriate test data that matches the type of test data and the purpose of the test data.

Complete the table by inserting the missing information.

Test data	Type of test data	Purpose of test data
ABC		
	Boundary	
		to make sure that the program accepts data that is an appropriate length

[6]

- 6 This pseudocode algorithm is intended to allow 1000 positive integers to be input and stored in a one-dimensional (1D) array. The integers are added together as they are input and the highest value is identified. At the end of the algorithm, the highest number, the total and the average of the numbers are output.

```
01 DECLARE Numbers : ARRAY[1:1000] OF INTEGER
02 DECLARE Highest : STRING
03 DECLARE Count : INTEGER
04 DECLARE Total : INTEGER
05 Highest ← 1500
06 Total ← 0
07 FOR Count ← 1 TO 1000
08     INPUT Numbers[Count]
09     Total ← Total + Count
10     IF Numbers[Count] > Total
11         THEN
12             Highest ← Numbers[Count]
13     ENDIF
14 NEXT Count
15 OUTPUT "The highest number is ", Highest
16 OUTPUT "The total is ", Total
17 OUTPUT "The average is ", Average / 1000
```

- (a) Identify the line numbers of **five** errors in the pseudocode and suggest a correction for each error.

Error 1 line number

Correction

.....

69. Question part 2/2 | 0478 Feb-March 2025 P2 V2 Q6



Error 2 line number

Correction

.....

Error 3 line number

Correction

.....

Error 4 line number

Correction

.....

Error 5 line number

Correction

.....

[5]

(b) Write the pseudocode statement to output the average of the numbers, rounded to **two** decimal places.

.....

..... [2]

(c) Explain how you could change the corrected algorithm so that it also finds the smallest number that was input and outputs its value at the end.

Any code used must be fully explained.

.....

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..... [4]

70. Question part 1/3 | 0478 Feb-March 2025 P2 V2 Q10

10 A sports club uses a six-character alphanumeric membership code to identify each member of the club.

The one-dimensional (1D) array `MemberID[]` is used to store the unique membership codes for club members.

The two-dimensional (2D) array `Name[]` is used to store the names of the club members. The first and last name of each member will be stored in separate array elements.

The system can store details for a maximum of 1000 members.

The position of any member’s data is the same in both arrays. For example, the data in index 2 of `MemberID[]` belongs to the member in index 2 of `Name[]`

The variable `NewID` is used to input a new membership code.

Write a program that meets the following requirements:

- Provide a menu that offers the choices: inputting a new member, outputting a list of membership codes and first and last names, or stopping.
- Input and validate a response to the menu.
- When inputting a new member, input a new membership code and check that it contains six characters:
 - If the new code is six characters, check it against all the previously stored membership codes to make sure it is unique.
 - If the code is **not** unique, a new code must be entered and checked.
 - If the code is unique, it is stored in the first available space in the appropriate array and the new member is required to enter their first name and last name, which are also stored in the corresponding location of the appropriate array.
- When outputting a list of membership codes and names, output for each member: their membership code, first name and last name.
- The program will continue until the stop option on the menu is selected.

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

You do **not** need to declare any arrays, variables or constants; assume this has already been done.

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

You do need to initialise any variables or constants used if appropriate.

All inputs and outputs must contain suitable messages.

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Topical questions | 97 questions

3 The following pseudocode algorithm uses a count-controlled loop to read in 10 names and store them in the array `Names [ ]`

Rewrite the algorithm in pseudocode, using a condition-controlled loop instead of a count-controlled loop.

[4]

- (a) Write an algorithm using pseudocode to:

- [5]

72. Question part 2/2 | 0478 May-June 2025 P2 V1 Q4



(b) Explain how you could change the algorithm to repeatedly prompt for the telephone number until the number entered is 13 characters in length.

Any code used must be fully explained.

.....

.....

.....

.....

.....

.....

.....

..... [3]

5 Two library routines used in programming are MOD and DIV.

State the purpose of each of the library routines.
Give **one** example pseudocode statement for each of the library routines.

MOD purpose
.....

Example pseudocode
.....

DIV purpose
.....

Example pseudocode
.....

..... [2]

[illegible]

[6]

Topical questions | 97 questions

11 The one-dimensional (1D) array `CompetitorName[]` contains the names of 25 competitors in a tournament that includes five events.

Another two-dimensional (2D) array `CompetitorScore[]` contains the points scored by each competitor in the five events. The first dimension of this array contains the index of the competitor from `CompetitorName[]` and the second dimension contains their scores.

Each competitor receives a score out of 100 for each event. These scores are manually entered into `CompetitorScore[]`

Medals are awarded to the competitor or the competitors who have:

- the highest points scored in each of the five events
- the highest total points scored for all five events.

The one-dimensional (1D) array `Points[]` stores the total number of points scored for each competitor.

Write a program that meets the following requirements:

- takes as input, valid scores (between 0 and 100), for each competitor in each of the five events
- calculates the highest points scored for each event
- outputs the names of the competitors who receive a medal for the highest points scored
- calculates the highest total points scored for the five events
- outputs the names of the competitors with the highest total points scored for the five events.

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

You do **not** need to declare any arrays or variables.

All inputs and outputs must contain suitable messages.

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

[1]

- Input 10 numbers and store them in the array `Numbers[]`
- Input the same 10 numbers again; as each number is input, compare it with its corresponding number in the array `Numbers[]`
 - if the numbers match, move on to the next number
 - if the numbers do not match, display both numbers and ask for the number to be re-entered
 - store the re-entered number in the corresponding array location and move on to the next number.
- When all the numbers have been checked, display a message to say the check has been completed.

[6]

77. Question part 1/2 | 0478 May-June 2025 P2 V2 Q5

- 5 This pseudocode algorithm should allow 500 names of people and their heights to be entered and stored in two one-dimensional (1D) arrays. The name of a person and the height of that person are in the same index in both the `Names[]` and the `Heights[]` arrays.

The algorithm performs as follows:

- at the start, the following data is entered:
 - name of person
 - height of person in cm
- the data is stored in the relevant arrays
- the heights of the people are totalled
- the shortest person is found
- at the end, the following is output:
 - name of shortest person
 - height of shortest person
 - average height of all 500 people.

```
01 DECLARE Names : ARRAY[1:500] OF REAL
02 DECLARE Heights : ARRAY[1:500] OF REAL
03 DECLARE Shortest : REAL
04 DECLARE Total : REAL
05 DECLARE Counter : INTEGER
06 DECLARE Index : INTEGER
07 Shortest ← 500
08 Index ← 0
09 Total ← 100
10 FOR Counter ← 1 TO 500
11     INPUT Names[Index]
12     INPUT Heights[Counter]
13     Total ← Counter + Heights[Counter]
14     IF Heights[Counter] < Shortest
15         THEN
16             Shortest ← Heights[Counter]
17             Index ← Counter
18     ENDIF
19 NEXT Counter
20 OUTPUT "The shortest height is ", Heights
21 OUTPUT "The shortest person is ", Names[Index]
22 OUTPUT "The average height is ", Total / 500
```

- [5]

- [2]

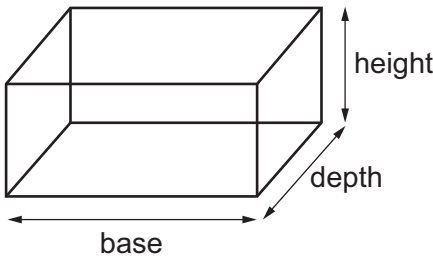
- [4]

78. Question part 1/3 | 0478 May-June 2025 P2 V2 Q10

10 A program is required to allow students to calculate the volume of a number of standard three-dimensional shapes. It will use functions to allow other shapes to be added in the future.

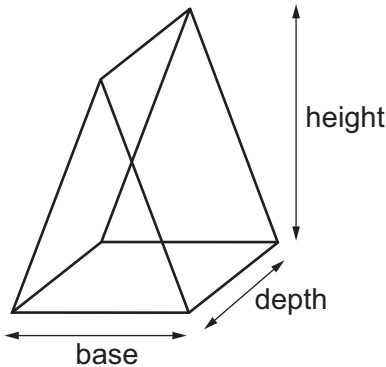
Cuboid

volume = base × depth × height



Triangular prism

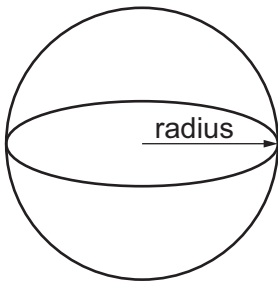
volume = 1/2 × base × depth × height



Sphere

volume = 4/3 × Pi × radius × radius × radius

Pi is a constant with value 3.142



Write a program that meets the following requirements:

- Output a menu to ask the user for an input to indicate the shape for which a volume needs to be calculated, from the three shapes given or if they want to stop the program. The program must validate the input.
- Input the data needed to calculate the volume of the chosen shape, based on the given formulae.
- Create one function for each shape to calculate and return the volume using the given formulae. Each function uses the input data as parameters.
- Output the volume in the main program, rounded to two decimal places.

The program continues until the user inputs the stop option from the menu.

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

All variables and constants used must be declared for this algorithm.

All inputs and outputs must contain suitable messages.

.....

.....

.....

0478 Computer Science Paper 2 - Programming

Topical questions | 97 questions

78. Question part 2/3 | 0478 May-June 2025 P2 V2 Q10

[illegible]

Topical questions | 97 questions



..... [15]

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

2 **Three** uses of arithmetic operators and **four** results are shown.

Draw **one** line from each use of arithmetic operator to the correct result.
Not all results will be used.

Use of arithmetic operator	Result
355 DIV 10	5
355 / 10	355
355 MOD 10	35
	35.5

80. Question part 1/2 | 0478 May-June 2025 P2 V3 Q3

3 The purpose of this pseudocode algorithm is to carry out a bubble sort to sort, in descending order, 1000 numbers stored in a one-dimensional (1D) array.

```
01 DECLARE Values : ARRAY[1:1000] OF REAL
02 DECLARE Index : CHAR
03 DECLARE Stop : BOOLEAN
04 DECLARE Hold : REAL
05 Stop ← FALSE
06 WHILE NOT Stop DO
07     Stop ← FALSE
08     FOR Index ← 1 TO 50
09         IF Values[Index + 1] > Values[Index]
10             THEN
11                 Hold ← Values[Index]
12                 Values[Index] ← Values[Index + 1]
13                 Values[Index + 1] ← Hold
14                 Stop ← FALSE
15             ENDIF
16     NEXT Index
17 NEXT Stop
```

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

Error 1 line number
Correction
.....

Error 2 line number
Correction
.....

Error 3 line number
Correction
.....

Error 4 line number
Correction
.....

80. Question part 2/2 | 0478 May-June 2025 P2 V3 Q3



(b) The swap section in lines 11 to 13 of the existing code are to be changed to a call statement for a procedure. This procedure will include two parameters representing the indexes of the array elements to be swapped.

(i) Complete the pseudocode for PROCEDURE Swap

```
PROCEDURE Swap ( ..... )  
  
    DECLARE Hold : REAL  
  
    Hold ← Values[ ..... ]  
  
    .....  
  
    .....  
  
ENDPROCEDURE
```

[4]

(ii) Write the pseudocode to transfer control to PROCEDURE Swap

.....
..... [2]

(c) Explain the difference between global variables and the variable declared in **3(b)(i)**.

.....
.....
.....
..... [2]

81. Question part 1/3 | 0478 May-June 2025 P2 V3 Q8

- 8 A collector needs a video library system for a collection of videos stored on 4K Blu-ray discs, standard Blu-ray discs, DVD, or as digital downloads.

The two-dimensional (2D) array `Video[]` is used to store, for each video item, the title, the format of the video (4K Blu-ray disc, standard Blu-ray disc, DVD, or digital download), the year it was released stored as a string and a storage code to represent where the video can be found in the collection, for example:

```
Video[1,1] is "Macbeth"
Video[1,2] is "digital download"
Video[1,3] is "2015"
Video[1,4] is "DG276"
```

The two-dimensional (2D) array `Results[]` is used to store the results of a search to find a specific video. The search uses the video title, and if the video is found, its data is copied from the array `Video[]` to the array `Results[]`. The search continues and if other videos with the same title are found, this data is also copied to the array `Results[]`. The search ends when the end of the data is reached.

Write a program that meets the following requirements:

- The video library array needs to be initialised with the null string (`""`), allowing for up to 10000 records. The array `Results[]` must be initialised before every search with the null string and must be able to hold up to 20 search results with the same title.
- Create a menu to add a new video to the library to search for an existing video by title, or to stop, with validation of the input.
- When the user enters a new video, the following data is stored in the first available location of the relevant array:
 - video title
 - format (4K Blu-ray disc, standard Blu-ray disc, DVD, digital download)
 - year of release as string
 - storage code.
- Allow input of data for another video if required.
- When searching for an existing video, if a match is found, transfer all the data for that video into the array `Results[]`, and continue to search until all videos with the same title have been found.
- Output the results from the array `Results[]`
- If the video title is not found, output a suitable message.
- The system returns to the menu after completing the input or the output, until the user chooses to stop.

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

You do **not** need to declare any arrays, variables or constants. You may assume that this has already been done.

All inputs and outputs must contain suitable messages.

.....

.....

.....

.....

82. Question | 0478 Oct-Nov 2025 P2 V1 Q2

2 Identify **three** different types of test data that can be used to test a program.

- 1
- 2
- 3

[3]

83. Question | 0478 Oct-Nov 2025 P2 V1 Q3

3 Tick (✓) **one** box to identify the operator that returns the quotient of a calculation with the fractional part discarded.

- A

/

☐
- B

DIV

☐
- C

^

☐
- D

MOD

☐

[1]

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84. Question part 1/2 | 0478 Oct-Nov 2025 P2 V1 Q4

- 4 (a) A restaurant offers a fixed priced menu. A meal for an adult costs \$9.99 and a meal for a child costs \$6.99.

If there are 6 or more people at a table, a 15% discount is applied to the total cost of the order.

Write an algorithm in pseudocode to:

- input the number of adults and the number of children at a table
- calculate the total cost of the order with the discount, if this applies
- output the final cost of the order.

[5]

- (b)** The final cost of the order after the discount may have more than 2 decimal places.

Write a pseudocode statement to set the final cost of the order to 2 decimal places. You do **not** need to rewrite the whole algorithm.

..... [2]

84. Question part 2/2 | 0478 Oct-Nov 2025 P2 V1 Q4



(c) The restaurant offers a discount on a meal if the person ordering is either a student or is 65 years or older. The discount (**X** = 1) can only be given if the amount of the order is \$20.00 or over.

rule A	a student	0
	not a student	1
rule B	under 65 years old	0
	65 years or older	1
rule C	under \$20.00	0
	\$20.00 or over	1

(i) Write the logic expression for this problem.
..... [2]

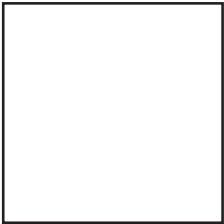
(ii) Draw a logic circuit for this logic expression.
Each logic gate must have a maximum of **two** inputs.
Do **not** simplify this logic expression.



[3]

(d) Draw the NAND logic gate symbol **and** complete the truth table for it.

NAND logic gate symbol:



Truth table:

A	B	X
0	0	
0	1	
1	0	
1	1	

[2]

85. Question part 1/2 | 0478 Oct-Nov 2025 P2 V1 Q6

6 A check digit is one method to validate a 5-digit number.

The check digit for a 5-digit number is calculated as follows:

- Each digit is multiplied by its position (the first digit on the left is in position 1).
- The result of each multiplication is totalled.
- $\text{MOD}(\text{Total}, 11)$ is used to calculate the check digit.
- If the result of the MOD function is 10, the check digit is 'X'.

For example:

The calculation of the check digit for the 5-digit number 30475 is as follows:

Multiply each digit by its position and total the results:

$$(3 * 1) + (0 * 2) + (4 * 3) + (7 * 4) + (5 * 5) = 68$$

Calculate the check digit with $\text{MOD}(\text{Total}, 11)$

$$\text{MOD}(68, 11) = 2$$

The check digit for 30475 is 2

This pseudocode algorithm should calculate and output the check digit of a 5-digit number:

```
01 DECLARE Total : INTEGER
02 DECLARE Digit : INTEGER
03 DECLARE CheckDigit : CHAR
04 Total ← 0
05 FOR Count ← 1 TO 10
06     OUTPUT "Please enter digit ", Count
07     INPUT Digit
08     Total ← Total + (Digit / Count)
09 NEXT Count
10 CheckDigit ← MOD(Total, 11)
11 IF CheckDigit = 10
12     THEN
13         OUTPUT "The check digit is X"
14     ELSE
15         OUTPUT "The check digit is ", Count
16 ENDIF
```

85. Question part 2/2 | 0478 Oct-Nov 2025 P2 V1 Q6



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

Error 1 line number

Correction

.....

Error 2 line number

Correction

.....

Error 3 line number

Correction

.....

Error 4 line number

Correction

.....

[4]

(b) Explain how you could modify the pseudocode to validate that each input is a single digit.

Any code must be fully explained.

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.....

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[3]

(c) The 5-digit number needs to be entered as a single input.

Describe **one** verification method that could be applied to the input of the 5-digit number.

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[2]

10 The variables `Seconds` and `Minutes` are used in a program. `Seconds` holds the number of seconds as a whole number and `Minutes` holds the number of minutes as a whole number.

(a) Write pseudocode statements to declare the variables `Seconds` and `Minutes`

.....

.....

..... [1]

(b) The procedure `Time(TotalSeconds)` takes the number of seconds as a parameter. The procedure converts the value held in the parameter into minutes and seconds and outputs the result.

Write this procedure in pseudocode.

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..... [4]

11 The scores for each competitor in an archery competition are recorded.

The one-dimensional (1D) array `CompetitorName[]` is used to store the names of the competitors.

The maximum number of competitors is 30.

There are 10 rounds in the competition with a maximum score of 30 per round.

The two-dimensional (2D) array `CompetitorScore[]` stores the score in each of the 10 rounds for each competitor.

The first index of the array `CompetitorScore[]` is the same as the index of the competitor in `CompetitorName[]`

After the 10 rounds have been completed, the highest score and the lowest score for each competitor are discarded.

The overall score for each competitor is the total of the remaining 8 scores (after discarding the highest and lowest scores) .

A competitor with an overall score of 210 or more moves onto the next competition. A competitor with an overall score between 180 and 209 inclusive becomes a reserve competitor. A competitor with an overall score below 180 does not qualify.

Write a program that meets the following requirements:

- inputs the total score (out of 30) for each competitor in each round
- validates each input is between 0 and 30 inclusive
- calculates the overall score for each competitor discarding the highest and lowest scores
- outputs the name of each competitor and if they move onto the next competition, are a reserve or do not qualify
- calculates and outputs the number of competitors who:
 - have qualified for the next competition
 - are reserve competitors
 - do **not** qualify.

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

You do **not** need to declare any arrays or variables; assume that this has already been done.

All inputs and outputs must contain suitable messages.

.....

.....

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.....

.....

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87. Question part 2/4 | 0478 Oct-Nov 2025 P2 V1 Q11

[illegible]

87. Question part 4/4 | 0478 Oct-Nov 2025 P2 V1 Q11



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.....

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.....

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..... [15]

88. Question | 0478 Oct-Nov 2025 P2 V2 Q1

1 Tick (✓) **one** box to complete this sentence.

The result of the arithmetic operation 4^2 is

- | | | |
|----------|----|--------------------------|
| A | 2 | ☐ |
| B | 8 | ☐ |
| C | 16 | ☐ |
| D | 42 | ☐ |

[1]

- 2 This pseudocode algorithm is intended to input a first name from a user and search for it in a two-dimensional (2D) array. If the name is found, the algorithm outputs all the remaining details for that name. The algorithm will continue to allow other names to be entered for searching, until the user input stops it.

```
01 DECLARE Contacts : ARRAY[1:500, 1:4] OF REAL
02 DECLARE Row : INTEGER
03 DECLARE Column : INTEGER
04 DECLARE Continue : BOOLEAN
05 DECLARE Stop : BOOLEAN
06 DECLARE FirstName : STRING
07 Continue ← TRUE
08 Stop ← FALSE
09 WHILE Continue
10     Row ← 1
11     OUTPUT "Enter a first name "
12     OUTPUT FirstName
13     REPEAT
14         IF Contacts[Row, 1] = FirstName
15             THEN
16                 FOR Column ← 1 TO 4
17                     OUTPUT Contacts[Row, 1]
18                 NEXT Column
19                 Stop ← TRUE
20             ELSE
21                 Row ← Row + 1
22             ENDIF
23     NEXT Stop OR Row > 500
24     OUTPUT "Search for another name? (Y or N) "
25     INPUT Answer
26     IF Answer = 'N' OR Answer = 'n'
27         THEN
28             Continue ← TRUE
29     ENDIF
30 ENDWHILE
```

- (a) Identify the line numbers of **five** errors in the pseudocode and suggest a correction for each error.

Error 1 line number

Correction

.....

89. Question part 2/3 | 0478 Oct-Nov 2025 P2 V2 Q2



Error 2 line number

Correction

.....

Error 3 line number

Correction

.....

Error 4 line number

Correction

.....

Error 5 line number

Correction

.....

[5]

(b) A procedure `NewData` allows data for new contacts to be entered and stored in the 2D array `Contacts[]`. A parameter, `Number`, is used to pass values from the main algorithm to the procedure for the number of new contacts. Next, four pieces of contact data for each new contact are entered and stored at the start of the array.

(i) Complete the pseudocode for `PROCEDURE NewData`

```
PROCEDURE NewData (.....)

    FOR Row ← 1 TO .....

        FOR Column ← 1 TO 4

            INPUT .....

            .....

            .....

        ENDPROCEDURE
```

[4]

(ii) Write the pseudocode to input the number of new contacts and to use procedure `NewData`. A variable declaration is **not** required.

.....

.....

.....

.....

[2]

89. Question part 3/3 | 0478 Oct-Nov 2025 P2 V2 Q2



(c) A first name is used as the search key in the algorithm on page 2. If the name is found, all the data for that name is output and the algorithm stops searching.

(i) Explain why the given algorithm may **not** always give the expected results.

.....

.....

.....

..... [2]

(ii) Explain how you could improve the algorithm so that the search is more likely to find the required results.

.....

.....

.....

..... [2]

..... [1]

[6]

91. Question part 1/3 | 0478 Oct-Nov 2025 P2 V2 Q8

8 A program is required to test the fairness of the random number generator.

The one-dimensional (1D) array `RandomNumber[]` is used to store 100 000 random integers.

The two-dimensional (2D) array `CountedNumber[]` is used to store the integers 1 to 10, inclusive, and the frequency of each integer (the number of times each integer was generated).

Write a program that meets the following requirements:

- Generate 100 000 random integers between 1 and 10, inclusive.
- Store each integer in the appropriate array.
- Calculate the frequency of each of the integers 1 to 10 and store these values in the appropriate array.
- Sort the contents of the counted number array in **descending order** of frequency.
- Calculate the chance of generating each of the integers 1 to 10, rounded to four decimal places.
Use the formula: $\text{chance} = \text{frequency} / 100000$
- Output each of the integers 1 to 10 in the order they are stored in the counted number array, along with the chance of generating them.

The following is an example of an algorithm that sorts a 2D array in an ascending order:

```
F ← TRUE
WHILE F DO
  F ← FALSE
  FOR I ← 1 TO 9
    IF A[I, 2] > A[I + 1, 2]
      THEN
        T1 ← A[I, 1]
        T2 ← A[I, 2]
        A[I, 1] ← A[I + 1, 1]
        A[I, 2] ← A[I + 1, 2]
        A[I + 1, 1] ← T1
        A[I + 1, 2] ← T2
      F ← TRUE
    ENDIF
  NEXT I
ENDWHILE
```

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

All arrays, variables or constants used must be declared for this algorithm.

All inputs and outputs must contain suitable messages.

.....

.....

.....

.....

.....

.....

92. Question | 0478 Oct-Nov 2025 P2 V3 Q1

1 Give **three** ways of creating a maintainable program.

- 1
- 2
- 3

[3]

93. Question | 0478 Oct-Nov 2025 P2 V3 Q2

2 **Four** descriptions of programming techniques and **five** programming techniques are given.

Draw **one** line from each description to the relevant technique. **Not** all techniques will be used.

Description	Programming technique
adding up a set of numbers	output
displaying the result of a calculation	selection
executing a set of instructions based on a condition	totalling
executing the same set of instructions multiple times	iteration
	counting

[4]

94. Question | 0478 Oct-Nov 2025 P2 V3 Q3

3 Tick (✓) **one** box to identify the most appropriate data type to store 'M'

A integer

☐

B char

☐

C real

☐

D Boolean

☐

[1]

95. Question part 1/2 | 0478 Oct-Nov 2025 P2 V3 Q7

7 An algorithm has been written in pseudocode to:

- input a whole number between 1 and 255 inclusive
- convert the input to an 8-bit binary number
- store each bit of the binary number in an array.

For example, if the denary number 127 was input, the binary number 01111111 would be stored in the array.

```
01 DECLARE BinaryArray : ARRAY[1:8] OF INTEGER
02 DECLARE DenaryNumber : CHAR
03 OUTPUT "Please enter a whole number between 1 and 255 inclusive "
04 INPUT DenaryNumber
05 FOR Count ← 7 TO 1 STEP -1
06     BinaryArray[Count] ← MOD(DenaryNumber,3)
07     DenaryNumber ← DIV(DenaryNumber,2)
08 NEXT Count
```

(a) Identify the line numbers of the **three** errors in the pseudocode and suggest a correction for each error.

Error 1 line number

Correction

.....

Error 2 line number

Correction

.....

Error 3 line number

Correction

.....

95. Question part 2/2 | 0478 Oct-Nov 2025 P2 V3 Q7



(b) Identify **one** programming technique used in the algorithm.

..... [1]

(c) (i) The algorithm can accept a number between 1 and 255 inclusive as input.
Two validation checks that could be applied to `DenaryNumber` are a presence check and a type check.

Identify **one** other validation check that could be applied to `DenaryNumber`

..... [1]

(ii) Write the pseudocode to implement the validation check you identified in (c)(i).

You do **not** need to rewrite the whole algorithm.

.....
.....
.....
.....
.....
..... [3]

96. Question | 0478 Oct-Nov 2025 P2 V3 Q9

9 The variables `Name`, `Age` and `Found` are used in a computer program.
`Name` holds the name of a person. `Age` holds the age of a person as a whole number.
`Found` holds a flag that can be set to `TRUE` or `FALSE`

(a) Write pseudocode statements to declare the variables `Name`, `Age` and `Found`

.....

.....

..... [3]

(b) The procedure `StoreData (Name)` stores the name of a person in the file `People.txt`

(i) Write pseudocode statements to:

- define the procedure with the parameter
- store the name of the person in the file.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

(ii) Write the pseudocode that uses the procedure `StoreData ()` to store the name ‘Suella’ in the file `People.txt`

.....

.....

..... [2]

Topical questions | 97 questions

10 A number game has two players. Random whole numbers are generated for each player. The numbers are compared and players are given points based on the result of the comparison.

The game is played as follows:

- Write a program that meets the following requirements:

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

You do **not** need to declare any arrays or variables; assume that this has already been done.

All outputs must contain suitable messages.

This image shows a blank sheet of white paper with ten horizontal dashed lines spaced evenly apart, resembling notebook paper. The lines are thin and black, extending across the full width of the page. There is no handwriting or other markings on the paper.

Topical questions | 97 questions

This image shows a full page of a handwriting practice worksheet. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dashed lines, creating a series of uniform gaps for letter height. The lines are evenly spaced across the entire page, providing a guide for consistent letter formation. There is no text or other markings on the page.

Topical questions | 97 questions



[15]