2.4.1 Programming

Oct/NOV 2005

4. (a) When software is written, the code will probably contain errors.

Describe three methods or tools available for identifying program errors. **[6]**

May/June 2012. P21/22

1 Anna wants to find out about her fellow students' reading habits. It will be part of her Literature coursework.

She will ask questions online, so starts by designing a screen layout. The first four questions will ask for:

- student's first name
- date of birth
- type of book they prefer (printed, audio-book or e-book)
- whether student reads novels (yes/no)

(a) Draw a suitable screen layout. **[4]**
(b) Justify the design of your screen layout in (a). **[3]**
(c) The responses from each student will be stored as a record consisting of the following fields:

- FirstName
- DateOfBirth
- BookType
- ReadsNovels

(d) Anna is to write a program to analyse the responses. Using nested IF...THEN statements, complete the pseudocode to calculate the totals for each BookType (printed, audio-book or e-book).
(e) Anna will want a report that shows these totals.

Design a printed report that shows for each BookType:

- the total for that type
- the percentage for that type **[3]**

May/June 2012. P23

1 Anna wants to find out about her fellow students' sporting activities. It will be part of her Sports Studies coursework.

She will ask questions online, so starts by designing a screen layout. The first four questions will ask for:

• student's first name

• age (16,17,18 or 19)

• favourite sport

• whether student is a member of a sports club (yes/no)

(a) Draw a suitable screen layout. **[4]**

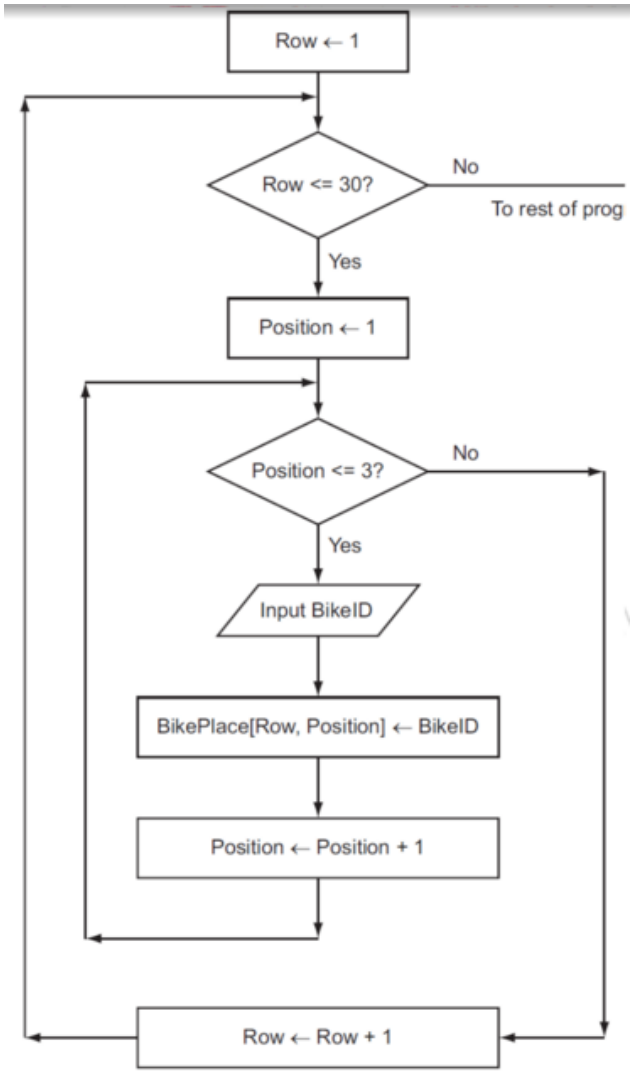
(b) Justify the design of your screen layout in (a). **[3]**

Oct/NOV 2012 P21

2 The company stores the bikes in bike racks. The bike racks are in 30 rows, each with 3 places. Each bike is always kept in the same place.

The array BikePlace[30,3] stores the bike ID.

Soni uses a flowchart to help him design a module to populate the array with bike IDs.



(d) There are a number of debugging tools associated with high-level languages.

Describe how a variable check is used. **[2]**

3 Super Bikes will need a report each month that shows how many times the 5 most used bikes have been hired that month, the income each generated and any repairs needed.

Design the layout of the report. **[7]**

Oct/NOV 2012 P22

2 Super Cars owns a rectangular car park with 25 rows; each row has 4 parking spaces.

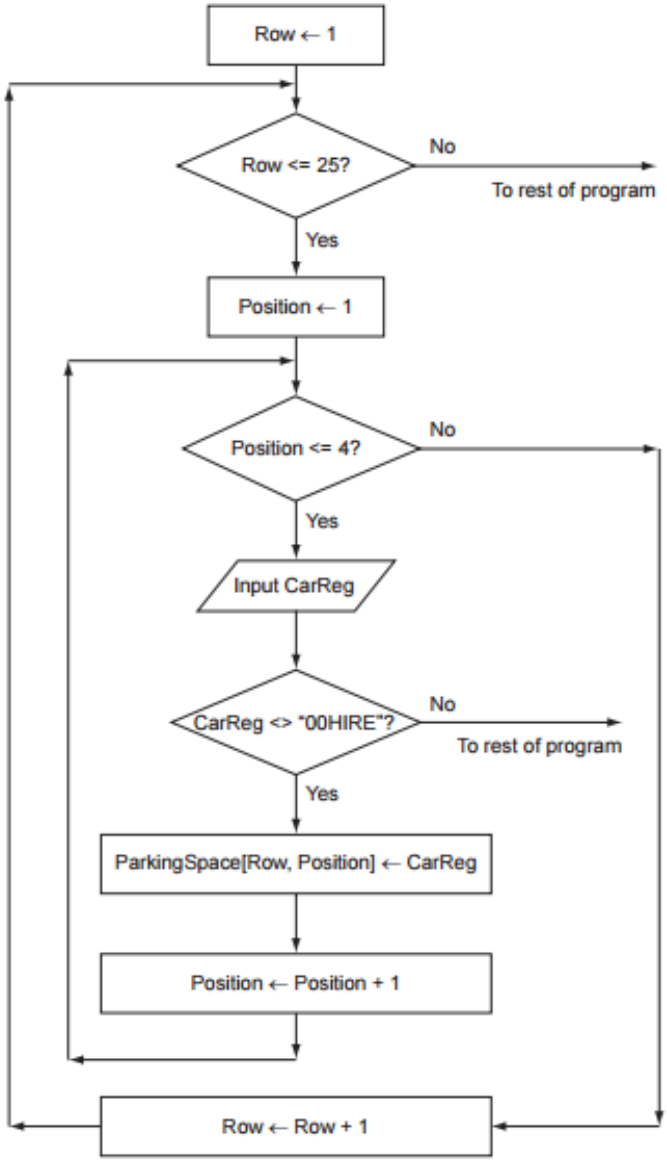
Each car is always parked in the same space.

The array `ParkingSpace[25,4]` stores the car registrations.

Soni uses a flowchart to help him design a module to populate the array with the car registrations.

Input is terminated using the rogue value "`00HIRE`".

2.4.1 Programming



(d) There are a number of debugging tools associated with high-level languages.

Describe how breakpoints and stepping can be used when developing a program. **[4]**

4 Super Cars will need a printed report that shows how many times the top 10 cars have been hired in a given month, and the income that each generated.

Design the layout of the report. **[6]**

2.4.1 Programming

Oct/NOV 2012 P23

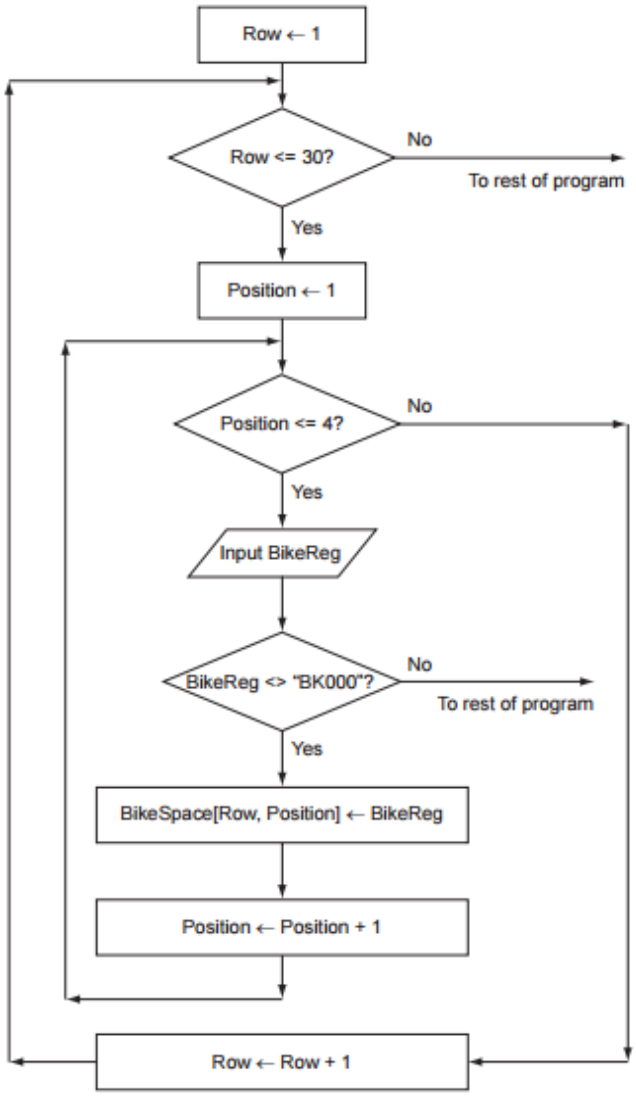
2 Super Bikes owns a rectangular parking area with 30 rows; each row has 4 bike spaces.

Each bike is always parked in the same space.

The array `BikeSpace[30,4]` stores the bike registrations.

Soni uses a flowchart to help him design a module to populate the array with the bike registrations.

Input is terminated using the rogue value "`BK000`".



(d) There are a number of debugging tools associated with high-level languages.

Describe how breakpoints and a variable watch can be used when developing a program. **[4]**

2.4.1 Programming

3 Super Bikes will need a printed report that shows all the hires made in a given month, grouped by insurance rating (A, B or C) and the income each hire generated. The report should include the total income figure for each insurance group.

Design the layout of the report. **[7]**

May/June 2013. P21/22

4 (a) Meena invites her friends to use her program. When designing the user interface.

State three design features she can incorporate when one of her friends has a sight impairment. **[3]**

May/June 2013. P23

4 (a) Meena hopes some of her friends will use her program. When designing the user interface, state three design features she can incorporate if one of her friends has a sight impairment. **[3]**

(b) Design the interface. It must allow for entry of marks and the output of the average mark. Remember, one of her friends has a sight impairment. **[6]**

Oct/Nov 2013.P21

3 (a) An interface is to be designed to add a new resource. The user must:

- enter the name of the resource
- choose the type of the resource
- select the purchase date
  The program generates and displays:
- a new resource ID
- where the resource is kept
  The user must be able to save the data, clear/cancel the input, and move on to entering another resource.

Design a graphical user interface (GUI). Pay particular attention to layout and effective use of the controls you would expect to find in a GUI.

2.4.1 Programming

Add new resource(s)

[6]

(b) A report will show all the items that have been entered on a particular day.

It will show each resource ID and where the resource is kept. The resources will be grouped by type.

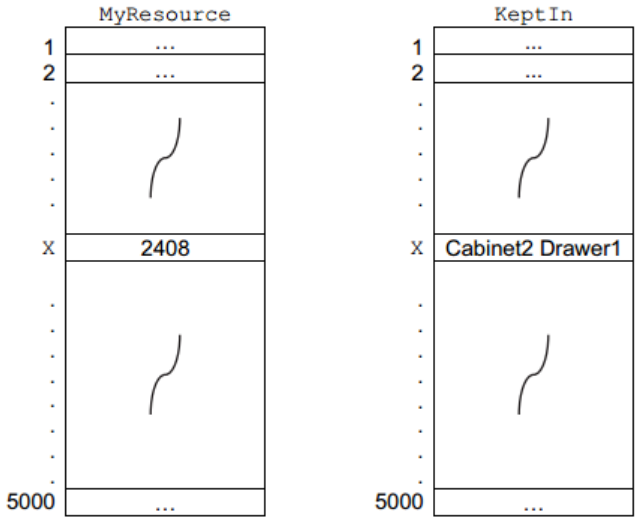
Design the report layout. **[5]**

An array, `MyResource`, size 5000, data type `INTEGER`, is used to store the resource IDs.

An array, `KeptIn`, size 5000, data type `STRING`, is used to store where a resource is kept.

A resource with resource ID `MyResource[X]` is kept at `KeptIn[X]`, where X is an integer variable.

2.4.1 Programming



Juan writes the pseudocode that searches `MyResource` for a given resource ID and outputs where the resource is kept.

```
flag ← 0
INPUT P
FOR X ← 1 TO 5000
IF myresource[X] = P
THEN
OUTPUT keptin[X]
flag ← 1
ENDIF
NEXT
IF flag = 0
THEN
OUTPUT "Not Found"
ENDIF
```

(e) (ii) Juan has written his program and one module appears not to work.

Explain how Juan can use a break point and stepping to debug his program. **[3]**

2.4.1 Programming

Oct/Nov 2013.P22

3 Aisha wants to write a program that checks the password to her personal computer. The program should check each attempt to enter the password correctly and should terminate after three wrong attempts.

She wants the log-in screen to display:

- a prompt to enter the password
- space to enter the password
- how many attempts have been made
- if the log-in has been successful or not
- a means of cancelling the log-in process

(a) Draw a suitable layout for the screen.

Aisha's log-in screen

[5]

Oct/Nov 2013.P23

3 (a) An interface is to be designed to add a new piece of equipment.

The user will:

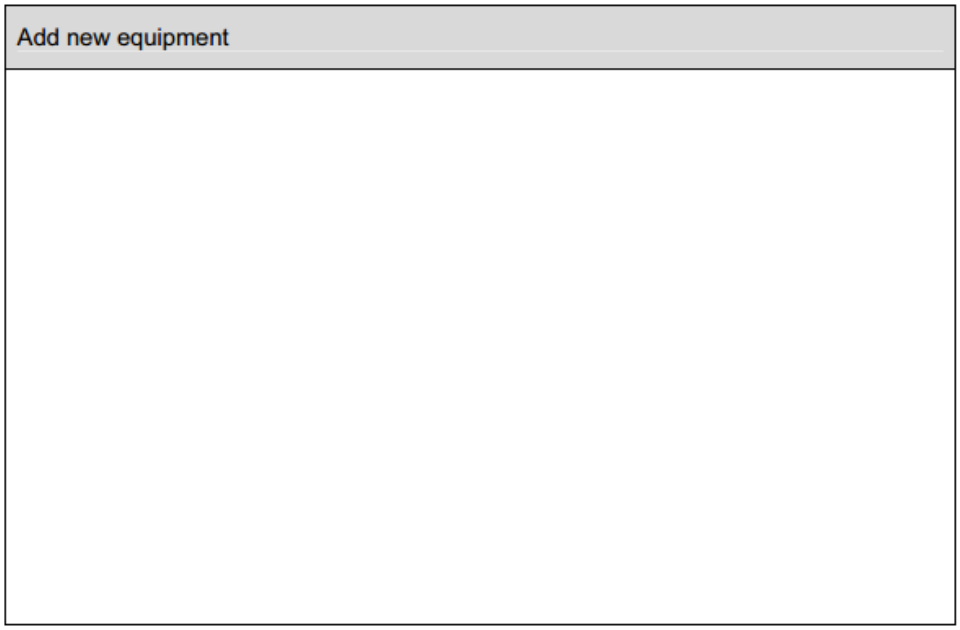
- enter the name of the equipment
- choose the science subject it will be used in
- if Chemistry, indicate if secure storage is necessary
- select the purchase date

2.4.1 Programming

The program generates and displays:

- a new equipment ID
- where the equipment is to be kept

The user must be able to save the data, clear/cancel the input, and move on to entering another piece of equipment. Design a graphical user interface (GUI). Pay particular attention to layout and effective use of the controls you would expect to find in a GUI.



[8]

(b) A report will show all the items that have been entered on a particular day.

It will show each equipment ID and where the equipment is kept. Equipment for the same science subject will be grouped together.

Design the report layout. **[5]**

May/June 2014. P21/P22

1 A teacher wants to write a program to help young children learn their multiplication tables.

(a) (i) Draw a suitable layout for the initial screen to let a child choose which multiplication table between 1 and 10 they want to learn. **[3]**

(ii) Explain how the child can choose a number using your screen design in part (a)(i). **[1]**

2.4.1 Programming

May/June 2014.P23

2 Sheena wants to set up a business selling home-made cakes. She wants customers to order online. She needs to know:

- customer's name
- customer's contact telephone number
- the date the cake is to be ready
- the type of cake
  - fruit cake
  - victoria sponge
  - Gateau
  - cheesecake
- whether the cake is to be delivered or not.

(a) (i) Draw a suitable screen layout for a customer to order a cake online. **[4]**

(ii) Justify one feature of your design above. **[1]**

Oct/Nov 2014.P21/P23

1 Rema surveys the students in her class to find out which is the most popular sport.

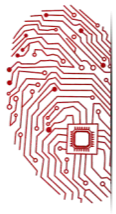
She draws a tally chart:

1	Cricket	\\\\\\\
2	Football	\\
3	Tennis	\\\
4	Swimming	\\\\\\

Rema plans to collect sport data from students in the whole school. She designs a program to:

- input the number of the sport a student likes best (1, 2, 3 or 4)
- repeatedly ask for input until the input is 0 (zero)
- keep a count of each choice
- on completion of data entry, print out the results as a tally chart (as shown above)

Rema's first attempt is the following pseudocode:



2.4.1 Programming

```
Cricket ← 0
Football ← 0
Tennis ← 0
Swimming ← 0
REPEAT
    INPUT Choice
    CASE Choice OF
        1: Cricket ← Cricket + 1
        2: Football ← Football + 1
        3: Tennis ← Tennis + 1
        4: Swimming ← Swimming + 1
    ENDCASE
UNTIL Choice = 0
OUTPUT "Cricket ", Cricket
OUTPUT "Football ", Football
OUTPUT "Tennis ", Tennis
OUTPUT "Swimming ", Swimming
```

Her friend Aisha suggests that the pseudocode could be improved by:

- using a one-dimensional array, Tally, instead of four variables to store the counts
- modularising the design. The main program should just consist of three procedure calls:
  `InitialiseArrayCounts`
  `InputStudentChoices`
  `OutputTallyChart`

(e) (i) All programs should be maintainable. Rema has followed good practice in writing her pseudocode. She used some features of maintainable programs.

List three such features. **[3]**

(ii) Give one further feature that Rema has not used in her solution so far. **[1]**

2.4.1 Programming

3 Ahmed runs his own business. He lays floor tiles in rooms for customers. Ahmed wants a program that calculates how many tiles he needs when he inputs the measurements of the length and width of the room he is working on.
(a) (i) Draw a screen design that is suitable for the following:

- to enter the length of the room in cm
- to enter the width of the room in cm
- to display the number of tiles required.

(ii) Explain how Ahmed can enter the data using your screen design in part (i). **[1]**

Oct/Nov 2014.P22

1 A sports club in a town organises an annual sports day for competitors aged 8 to 18. The organiser wants these competitors to enter the sports day events online.

(a) To enter an event, each competitor needs to supply the following information:

- Competitor name
- Age in years
- Whether or not they are a sports club member
- The letter code for the single event they want to enter:
  - A 50 m race
  - B 100 m race
  - C Long jump
  - D High jump
  - E 5 km cycle race
  - F 25 m swimming

The competitor confirms that their details are correct. Their computer calculates and displays the entry fee. Entries are free for sports club members.

(i) Draw a suitable screen layout.

Annual Sports Day Entry Form

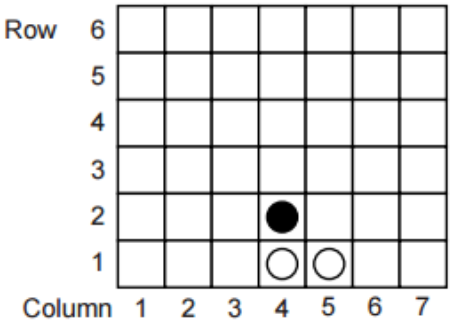
[6]

(ii) Justify the design of your screen layout in part (i). **[2]**

Oct/Nov 2014.P22

3 A game is played by two players. Player A uses white tokens (◯). Player B uses black tokens (●). The players take turns dropping tokens into a vertical grid. The tokens fall straight down and occupy the next available space in the chosen column. The aim of the game is to connect four of one's own colour tokens. This must be done in a vertical, horizontal or diagonal line.

Here is one example after Player A has had 2 turns and Player B has had 1 turn:



Nathan wants to write a program to allow two users to play the game on the computer.

The program will display a simplified version of the above grid which is redrawn after every turn.

(d)
```
01 REPEAT
02     INPUT ChosenColumnNumber
03 UNTIL ColumnNumberValid( ……)

04 Row ← 1          // start with bottom row and find first empty row
05 WHILE Grid[Row, ChosenColumnNumber] <> ……
06     ……
07 ENDWHILE
08 IF ……
09   THEN
10     Grid[Row, ChosenColumnNumber] ← ……
11   ELSE
12     Grid[Row, ChosenColumnNumber] ← ……
13 ENDIF
```

(f) All programs should be maintainable.

List **three** features of maintainable programs used in the pseudocode in part (d). **[3]**

May/June 2015.P21/P22

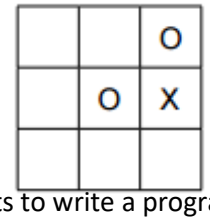
3 A board game is designed for two players, O and X.

At the beginning, all cells of a 3 x 3 grid are empty.

The players take turns in placing their marker in an empty cell of the grid; player O always starts.

The game ends when one player completes a row, column or diagonal or the grid is full.

Here is one example after three turns:



Ali wants to write a program to play the game.

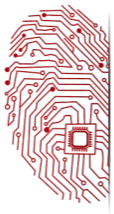
(g) Design a suitable form-based screen interface for the current player to input the row number and column number to place their marker when it is their turn. **[4]**

May/June 2015.P23

3 (a) Meena has written the algorithm below and wants to check that it works correctly.

```
FOR i ← 1 TO 4
  FOR j ← 1 TO 4
    IF Numbers[j] > Numbers[j + 1]
     THEN
       w ← Numbers[j]
       Numbers[j] ← Numbers[j + 1]
       Numbers[j + 1] ← w
    ENDIF
  ENDFOR
ENDFOR
```

(b) Meena has written the algorithm with some features that make it easier to understand.



2.4.1 Programming

(i) State one such feature. **[1]**

(ii) State one other feature that Meena could introduce to this algorithm to make it easier to understand. **[1]**

Oct/Nov 2015.P21/P23

3 Ravi and Alia want to use debugging tools available in their program development environments.
(a) Explain how each of the following are used:
- (i) Breakpoint **[2]**
- (ii) Stepping **[2]**
- (iii) Variable check / watch **[2]**

(b) Name the type of testing that is performed with such debugging tools. **[1]**

Oct/Nov 2015.P21/P23

2 A programmer uses an Integrated Development Environment (IDE) for all program development.
- (i) Describe what is meant by an IDE. **[2]**
- (ii) Name **three** features you would expect to be available in an IDE to help initial error detection or debugging. **[3]**

Oct/Nov 2016. P21/P23

4 A company employs Ahmed as a programmer.

(a) At College, before joining the company, Ahmed used two items of software for programming.
- a text editor
- a compiler

Describe how he could have developed programs using these software tools.
Include in the description the terms 'object code' and 'source code'. **[3]**

(b) Ahmed now uses an Integrated Development Environment (IDE) for programming.
- **(i)** State **one** feature an IDE provides to help with the identification of syntax errors. **[1]**
- **(ii)** State **one** feature an IDE provides to carry out white box testing. **[1]**

May/June 2018. P21

2 The following is a function design in pseudocode.
Line numbers are given for reference only.

2.4.1 Programming

```
01  FUNCTION StringClean(InString : STRING) RETURNS STRING
02
03     DECLARE NextChar : CHAR
04     DECLARE OutString : STRING
05     DECLARE Counter : INTEGER
06     DECLARE MyString : STRING
07
08     OutString ← ""
09
10     FOR Counter ← 1 TO LENGTH(InString)
11
12        NextChar ← MID(InString,Counter,1)
13        NextChar ← LCASE(NextChar)
14
15        IF (NextChar >= 'a') AND (NextChar <= 'z')
16
17           THEN
18
19              OutString ← OutString & NextChar
20
21        ENDIF
22
23     ENDFOR
24
25     RETURN OutString
26
27  ENDFUNCTION
```

(a) (i) This pseudocode includes features that make it easier to read and understand.
State **four** such features. **[4]**
(ii) State **one** feature that could be added to make the pseudocode easier to understand. **[1]**

5 A golf club holds information about its members. When a member completes a round of golf, their score is stored along with their membership number and the date of the round.
(b) Editing functions such as cut, copy and paste are features provided by an Integrated Development Environment (IDE).
Give **two** additional features of an IDE that are helpful when **coding** a program. **[2]**