



January 2018

**Level 3 National in
Computing**

**Unit 1: Principles of Computer
Science (31768H)**

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January 2018

Publications Code 31768_1801_ER

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Grade Boundaries

What is a grade boundary?

A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade, Distinction, Merit and Pass.

Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the external assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark should be for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in external assessments

Each external assessment we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each test, because then it would not take into account that a test might be slightly easier or more difficult than any other.

Grade boundaries for this, and all other papers, are on the website via this link:

<http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx>

Unit 1: Principles of Computer Science (31768H)

Grade	Unclassified	Level 3		
		Pass	Merit	Distinction
Boundary Mark	0	21	36	51

Introduction

This was the second examination season for Level 3 BTEC Computing Unit 1 Principles of Computer Science 31768.

This unit is assessed through a single written examination which is two hours in length and the number of marks available is 90.

This unit is a mandatory unit for all learners studying the extended certificate, foundation diploma, all diplomas and the extended diploma.

The examination for this unit will always contain four sections and each section will have a scenario that will be used throughout the whole of that section. The scenario will be clearly stated at the beginning of each section.

Each section is broken down into sub-questions which will then test learners on different areas of the specification and learners should be expected to apply their knowledge to the scenario.

Learners will be given an information booklet. They will be instructed to look at individual parts / sections of this during the examination in order to answer questions.

The information booklet **may** give learners:

1. Information about problems that they need to solve.
2. Programming code for them to interpret, analyse or evaluate.
3. Requirements or designs for a new program that is needed.
4. An algorithm for them to interpret, analyse or evaluate.

At no point during the examination will learners be expected to write code in a particular language. Learners will only be given small pieces of code to interpret, analyse or evaluate. Any code given to learners in the examination or information booklet will be written in C Family, Visual Basic, Python 3.4 or HTML 5.

All sections of the examination paper provide differentiation at all attainment levels and the paper is designed to be ramped in difficulty so that a larger percentage of higher grade marks are allocated to the later stages of the paper.

Introduction to the Overall Performance of the Unit

The overall performance of learners has increased since the last exam season for this unit. It was evident that learners were better prepared for the rigour of this exam. The performance on the shorter response questions has massively improved with many learners picking up some marks on each short answer question. The number of blank responses was also significantly less.

However there is still evidence to suggest that some learners are still not covering the full specification in depth. It is worth noting that the recommended Guided Learning Hours (GLH) for this unit is 120. It is recommended that centres ensure that this amount of time is used to ensure that learners are equipped with the knowledge to allow them to answer a range of different questions covering the whole specification.

Learner performance on the extended writing response questions was still poor and very similar to the last exam season. This was evident in questions that required learners to discuss, analyse or evaluate. Most learners were not able to meet the demands of these higher order command verbs which resulted in many learners achieving lower marks on the extended questions.

The vast majority of learners are still struggling to create algorithms. Most learners were not able to use logic to be able to solve computations problems. This therefore resulted in learners achieving very low marks on both the flowchart and pseudocode algorithm questions.

Common Misconceptions:

Below is a list of common misconceptions that lots of learners have and it is therefore advised that learners address these misconceptions during their exam preparation.

- Many learners thought that saving a value as an integer would round the value up. This is incorrect as saving a value as an integer would remove / truncate the values after the decimal point.
- Many learners seemed to confuse different control structures (e.g. sequential, conditional and iterative) with programming paradigms (e.g. procedural, object orientated and event driven programming).
- Many learners thought that a data type validation check is used to make data input accurate. However, validation does not always improve accuracy as data can still be inaccurate but pass data validation rules.
- Many learners seemed to confuse the use of programming statements with code comments. A lot of learners thought that a statement was 'extra information provided to explain what each line of code does' rather than a statement being a line of code that will provide actions/tasks for the code to execute.
- Many learners seemed to confuse standard search algorithms with sorting algorithms.
- Many learners thought that a binary search can only search binary numbers that are 0 and 1. This is incorrect as a binary search can search all numbers within a

list.

- Many learners thought that a house number would be stored as an integer data type rather than a string. This is incorrect because house numbers can contain letters (e.g. 11a) and house names.
- Many learners thought that the time would be stored as a float data type. This is incorrect as the most suitable data type for storing the time would be 'time.'
- Many learners thought that the median of three approach to choosing a pivot for a quick sort will only sort three numbers into order.

Individual Questions

The following section considers each question on the paper, providing examples of learner responses and a brief commentary of why the responses gained the marks they did. This section should be considered with the live external assessment and corresponding mark scheme.

Question 1

The scenario for question 1 was based around an individual who would like a program that will allow him to calculate how much his gas and electric energy bill will cost each week.

Question 1(a) (4 marks)

The vast majority of learners gained between 3 and 4 marks. Most learners were able to use the requirements given within the information booklet to identify reasons why the given pseudocode did not meet these requirements.

Identify **four** reasons the algorithm will not work as expected.

(4)

Reason 1

"ElectricNightUsed" has not been defined

Reason 2

it output "ElectricBill" when it needs to output "TotalBill"

Reason 3

The standard daily charge for electric has not been added.

Reason 4

the discount hasn't been included.

4 marks awarded for:

- 'ElectricNightUsed has not been defined' (1)
- 'It output "electricBill" when it needs to output "TotalBill" (1)
- 'Standard daily charge for electric has not been added' (1)
- 'The discount hasn't been included' (1)

Identify **four** reasons the algorithm will not work as expected.

(4)

Reason 1

Doesn't output the total bill.

Reason 2

Hasn't included standard daily charge for the electric bill.

Reason 3

Hasn't subtracted the discount from the total.

Reason 4

Doesn't need to include Gas used and ElectricDayused.

3 marks awarded for:

- 'Doesn't output the total bill' (1)
- 'hasn't included standard daily charge for the electric bill' (1)
- 'hasn't subtracted the discount from the total' (1)

Question 1(b) (3 marks)

This question was generally well answered with most learners gaining between 1 and 2 marks. Most learners were able to identify that the TotalBill would be storing currency and therefore requires decimal spaces. Some learners had knowledge that saving the variable as an integer would remove the decimal spaces and therefore reduce the accuracy of the variable.

Misconception: A lot of learners stated that saving the variable as an integer would round the variable value up. This is incorrect as saving the variable as an integer would remove / truncate the values after the decimal point.

(b) Explain why Oscar should declare the variable 'TotalBill' as a float data type instead of an integer.

(3)

the float a float type variable would be more accurate var for this program as it allows you to use decimal places, as we are dealing with money it would make sense that the total charge would not be a float number but it would be a real number aka a floating point number

3 marks awarded for:

- 'float data type variable would be more accurate' (1)
- 'as it allows you to use decimal spaces' (1)
- 'as we are dealing with money' (1)

(b) Explain why Oscar should declare the variable 'TotalBill' as a float data type instead of an integer.

(3)

The numbers used to calculate the total bill are all floats so it would make sense to have a float result. Also, it is used to pay his bills so the value signifies a currency value that will not be rounded so he pays the correct amount.

2 marks awarded for:

- 'the value signifies a currency value' (1)
- 'so he pays the correct amount' (1) - just enough here for the learner to show understanding that a float will increase the accuracy of the variable.

Additional guidance: 'Value that will not be rounded' - there is not enough here to show evidence of truncation.

Question 1(c) (3 marks)

Most learners answered this question incorrectly. Very few learners knew what a control structure was and therefore were not able to state the correct control structure used within the pseudocode or give reasons why it was used.

Most learners that did know what a control structure gained between 1 and 2 marks. Learners still picked up marks for giving correct reasons (e.g. all lines are executed) even though they were not able to state the control structure.

Misconception: A lot of learner seemed to confuse different programming paradigms (e.g. procedural, object orientated and event driven programming) with different control structures (e.g. sequential, conditional and iterative). The question required learners to state a sequential control structure.

(c) Identify the control structure of Oscar's pseudocode and describe how this would affect the way the code is executed.

(3)

Control structure

~~then~~ Sequence

Description

The control structure is sequential as it does not loop or ask for any condition to be met to continue. Instead it goes down one by one till it encounters an error or ends at the last line of code.

3 marks for:

- 'sequence' (1)
- 'does not loop or ask for any condition' (1) - stated 2 good valid points here however both are under the same marking point so only 1 mark can be awarded. Mark point 3.
- 'it goes down one by one' (1) – even evidence to suggest that the code is executed in order.

Control structure

~~Sequential~~ Procedural

Description

the program starts at the beginning and follows line after
line sequentially,

2 marks awarded for:

- 'follows line after line' (1) - mark point 2.
- 'sequentially' (1) - although this is not written under the 'Control Structure' heading it is still worthy of a mark. If the answers within the mark scheme are present within the answer as a whole then credit will always be given.

Question 1(d) (3 marks)

This question was generally well answered with most learners gaining between 1 and 2 marks. Most learners were able to identify that a data type validation check was required because the user input needs to be of a numerical value. Alternative wordings of numerical value such as 'the input needs to be a float / integer' were also given credit. Some learners were able to take this further and identify further reasons such as to ensure calculations can take place and to reduce errors.

Many learners stated that the use of the data type check would ensure 'the input is the right type / data type.' Although this is correct, this does not show understanding as to why this data validation rule is used within the context.

Misconception: A lot of learners seemed to think that a data type check is used to ensure that the data input is accurate. However, validation does not always improve accuracy as data can still be inaccurate and pass data validation rules.

(d) Oscar intends to use a data type validation check in the final program.

Explain why this check is suitable for Oscar's program.

A data-type check is used to ensure ~~the correct~~ a valid ⁽³⁾ value is put into a variable. This is useful for Oscar's program since he is doing mathematical calculations, ~~that check should be used to ensure~~ and does not want a string to be entered as one of the values since ~~it~~ ^{they} cannot be used in maths operations.

2 marks awarded:

- 'a valid value is put into a variable' – enough understanding to show that a value is a numerical value
- 'this is useful for Oscar's program since he is doing mathematical operations' - mark point 3. 'Cannot be used in math operations' - this is a repeat of mark point 3.

(d) Oscar intends to use a data type validation check in the final program.

Explain why this check is suitable for Oscar's program.

This is needed to make sure every ⁽³⁾ piece of data Oscar has used is correct to get reliable and correct answers.

1 mark awarded for:

- 'to get reliable and correct answers' (1) enough evidence to suggest that the output from the program is more reliable. The mark is awarded here as the learner is showing understanding of improved reliability when a data type check is used.

Question 1(e) (7 marks)

A lot of learners copied the requirements given in the question into boxes which did not show sufficient understanding for credit to be given. It is worth noting that when drawing flowcharts, learners should use the correct BSC symbols for start/stop, input, output and processes as stated in the specification.

Learners generally scored some marks for creating a flowchart that meets requirements 1 to 3 from the question. Most learners used the correct logic to allow the user to input the amount of electric used on day 1 and day 2 (requirement 1). Most learners also used the correct logic to determine which value was the lowest (requirement 2) and then store the lowest value as a variable (requirement 3). These learners were generally placed within the first mark band.

However a lot of learners struggled to create a flowchart to meet the requirements of requirement 4 to 6. Students either used incorrect logic to meet these requirements or repeated the instructions in their flowchart for each of the remaining 5 days which therefore led learners to creating inefficient solutions. If learners managed to create a flowchart that met all of the requirements, however their solution was inefficient then learners were placed into mark band 2.

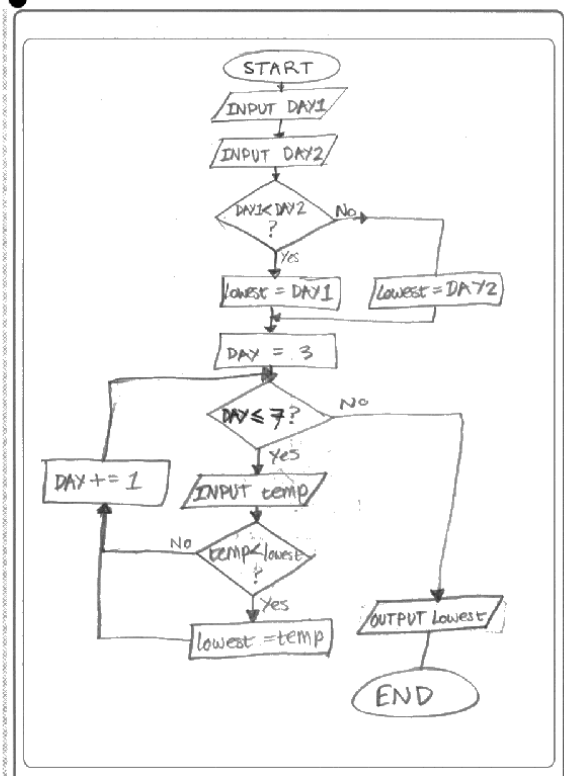
It is worth noting that the example solution in the mark scheme is only an example and other correct ways of solving the problem were given credit.

Oscar's energy provider is offering a promotion that will mean he will not pay for gas on the day he uses the least number of units.

The requirements for an algorithm to find the least number of units are:

- Allow the user to enter:
 - the number of units used on day one
 - the number of units used on day two
- Compare the values for days one and two
- Store the lowest of the two values
- Allow the user to enter the number of units used for days three to seven
- Compare the values for days three to seven against the current lowest value as they are entered and store the lowest of the two values
- Output the lowest value when all values have been entered.

(e) Draw a flowchart that meets the requirements for the algorithm. (7)



This answer represents mark band 3 and would be awarded 7 marks.

Structure – The flowchart is structured from top to bottom. Decision symbols show good use of hierarchy and yes/no branches. The flowchart is easy to follow and the flow of data throughout the program is clear.

Variables/objects/process – The variables are clearly defined (e.g. Day 1, Day 2) which are used consistently throughout. Sensible variable names have been used throughout.

Logical operations – The learner correctly assigns the lowest value from day 1 and 2 in the lowest variable. The learner has then made correct use of logic to compare this against the values for each of the remaining days in the week.

Conventions – The learner has used good use of contentions throughout. There is good use of < symbols to find the lowest value out of two different days. There is good use of = to assign the lowest value to the lowest variable. There is good use += to add 1 to the count after the values for each day are entered.

Overall solution – The learner has clearly identified that a loop can be used to make the code more efficient. The learner has provided full and efficient solution.

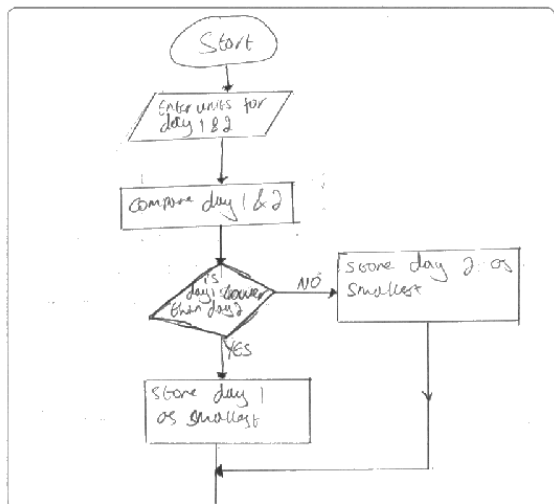
Oscar's energy provider is offering a promotion that will mean he will not pay for gas on the day he uses the least number of units.

The requirements for an algorithm to find the least number of units are:

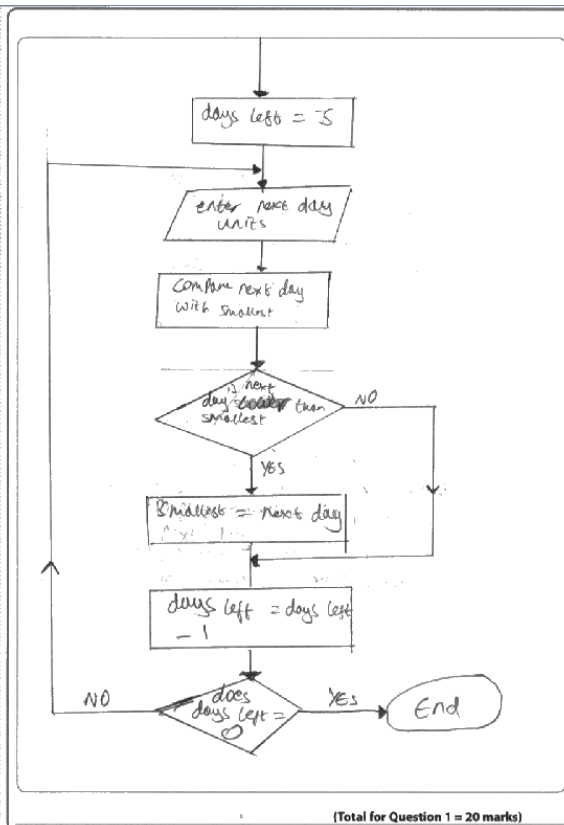
- Allow the user to enter:
 - the number of units used on day one
 - the number of units used on day two
- Compare the values for days one and two
- Store the lowest of the two values
- Allow the user to enter the number of units used for days three to seven
- Compare the values for days three to seven against the current lowest value as they are entered and store the lowest of the two values
- Output the lowest value when all values have been entered.

(e) Draw a flowchart that meets the requirements for the algorithm.

(7)



Continue your flowchart on the next page



(Total for Question 1 = 20 marks)

This answer represents mark band 2 and would be awarded 5 marks.

Structure – The flowchart makes correct use of the top down approach. The learner has made correct use of flowchart symbols in most places. Decision symbols make correct use of yes/no actions. The flowchart is generally easy to follow and interpret.

Variables/objects/process – Variable names are not clearly defined. For example, the learner has said 'enter units for day 1 and 2' but not specifically declared these as variables. Although the learner is using a 'smallest' variable, this is not clearly declared in the flowchart. However where variable names are used, they are used consistently (e.g. days left)

Logical operations – Not all symbols are required within the solution (e.g. compare 1 & 2). The learner has made good use of decision symbols to compare two different values to determine the lowest value. There is good use of logic to repeat the flowchart to ensure a value for each day is entered.

Conventions – There are some standard conventions used (e.g. daysleft=leftleft-1 and daysleft = 5). However no use of conventions are used in other places (e.g. enter units for day 1 and 2, rather than input day 1, input day 2).

Overall solution – The learner has provided an almost complete solution. The learner has made use of a loop to make the flowchart more efficient to repeat code for each day of the week. The logic used is clear in some cases but this is not consistent throughout.

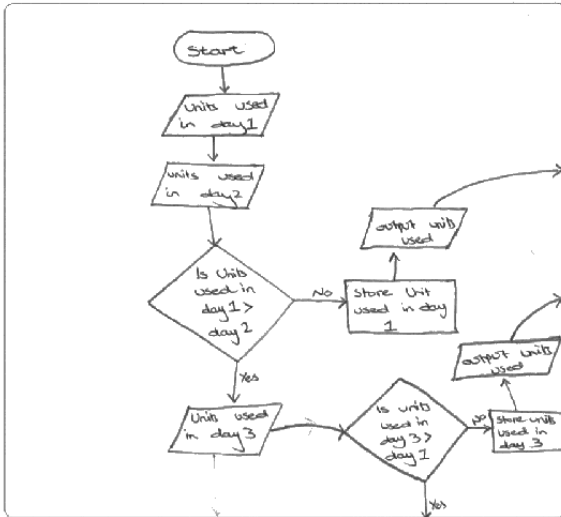
Oscar's energy provider is offering a promotion that will mean he will not pay for gas on the day he uses the least number of units.

The requirements for an algorithm to find the least number of units are:

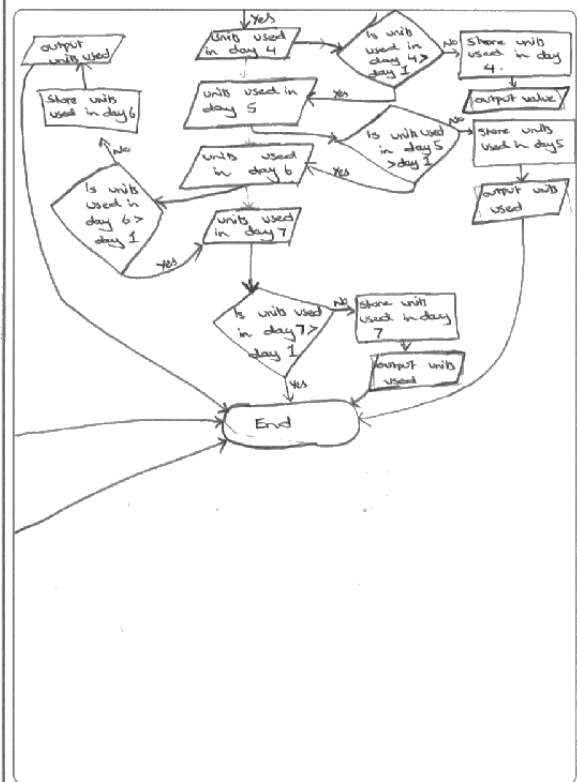
- Allow the user to enter:
 - the number of units used on day one ✓
 - the number of units used on day two ✓
- Compare the values for days one and two ✓
- Store the lowest of the two values ✓
- Allow the user to enter the number of units used for days three to seven ✓
- Compare the values for days three to seven against the current lowest value as they are entered and store the lowest of the two values ✓
- Output the lowest value when all values have been entered. ✓

(e) Draw a flowchart that meets the requirements for the algorithm.

(7)



Continue your flowchart on the next page



(Total for Question 1 = 20 marks)

This answer represents mark band 1 and would be awarded 1 mark.

Structure - There is very limited structure. Although the learner makes a reasonable start with the first 4 symbols (e.g. start / units used in day1 / units used in day2 / is units used in day 1 > day 2) and used correct symbols, the rest of the flowchart is not well structured and difficult to follow.

Variables/objects/process - Variables are not clearly defined using appropriate conventions. However there is consistent use of names throughout (e.g. day1, day2, day3 etc are used consistently).

Logical operations - The sequence and structure of the instructions are not appropriate. The flowchart does not follow the top down approach and some process symbols have 2 arrows coming out of them.

Conventions - There is very limited use of accepted conventions. For example the learner has made use of > within decision symbols, however there is no use of variable names or use of assigning data to variables. It's not always clear in the input/output symbols if data is being input or output.

Overall solution - The overall solution is very inefficient and largely inaccurate. The learner has not made use of iterative structures to make the code more efficient. The learner has managed to provide a partial solution as the learner has used some correct logic to determine which is the lowest value from day 1 and day 2, however this is not continued for the rest of the days.

Question 2

The scenario for question 2 was based around an individual who runs a bingo evening at a local village hall. She has created programming code that generates and stores bingo numbers between 1 and 90 in an array using Visual Basic.

Question 2(a) (3 marks)

Most learners scored between 1 and 2 marks for this question. The vast majority of learners were able to identify that a statement is a line of code. A lot of learners were also able to identify that a statement will provide instructions / tasks / actions. Alternative wordings such as statements will give the code 'rules / commands' were also given credit. A lot of learners were also able to provide an example. Both written examples and coded examples were given credit.

Misconception: A lot of learner seemed to confuse the use of statements with code comments. A lot of learners thought that a statement was 'extra information provided to explain what each line of code does' rather than a statement being a line of code that the program will execute.

Please refer to the Information Booklet in order to answer Question 2.

2 Alison runs a bingo evening at a local village hall once a week. She has created programming code that generates and stores bingo numbers in an array using Visual Basic. The programming code must ensure that the numbers between 1 and 90 are only output once.

(a) Explain what is meant by the term 'statement' when creating program code.

(3)

A statement is a certain line of code which does something in the code like conditional statement will see if a condition is true or false. Also a print statement in Python would print to the console.
A statement is just a line of code which performs an action.

3 Marks Awarded for:

- 'a statement is a certain line of code' (1) - Learner shown evidence that a statement is a single line within code.

- 'which does something in the code' (1) - Learner shown enough evidence that statements carryout tasks within the code.
- 'like a conditional statement will see if a condition is true or false' (1) - The learner has given an example use of a statement.

Please refer to the Information Booklet in order to answer Question 2.

2 Alison runs a bingo evening at a local village hall once a week. She has created programming code that generates and stores bingo numbers in an array using Visual Basic. The programming code must ensure that the numbers between 1 and 90 are only output once.

(a) Explain what is meant by the term 'statement' when creating program code.

(3)

Statement is a fact told to the programme
 like 'numbers only to appear once' and
 be between '1 and 90'

Statement is a Command.

1 Mark Awarded for:

- 'Statement is a command' (1) - Although a very limited response, the learner has just shown enough evidence to suggest that statements are used to carryout actions.

Question 2(b) (3 marks)

A lot of learners managed to score 1 mark on this question. Most learners that scored a mark were generally able to state that an array is used as it is only storing numbers. It was pleasing to see that some learners had knowledge of how indexing could be used to search the array and that arrays are more efficient than creating a separate variable for each bingo number.

However the vast majority of learners were not able to gain more than 1 mark. This is because learners did not manage to apply the use of arrays to the question and give their answers in the context.

(b) Alison has setup an array within the programming code.

The programming code can be seen in Section 2 of the Information Booklet.

Explain why Alison has defined 'previousNumbers' as a single dimensional array.

(3)

Alison only wants the array to store used/previous numbers. ~~because~~ This data does not have to be stored aside any other data so a single dimensional array is all that is required. An array can store multiple values of the same data type under the same name and each value can be addressed individually so Alison's programme can see every number stored.

3 Marks Awarded For:

- 'Can store multiple values of the same data type' (1)
- 'under the same name' (1) - Evidence to suggest the learner knows what arrays store values under a single identifier.
- 'each value can be addressed individually' (1)

(b) Alison has setup an array within the programming code.

The programming code can be seen in Section 2 of the Information Booklet.

Explain why Alison has defined 'previousNumbers' as a single dimensional array.

(3)

PreviousNumbers has a range of 0 to 79 and it
stores that range as integers.

2 marks awarded for:

- 'has a range of between 0 to 79' (1) - the learner has shown understanding that the array is a fixed length.
- 'stores that range as integers' (1)

Question 2(c) (4 marks)

Most learners managed to achieve between 1 and 2 marks. Some learners managed to state the correct line of code that contains the error. Learners were still given marks for explaining correct reasons why the error would occur even though they identified the incorrect line of code. A lot of learners were able to identify that the code generates 90 numbers although the array will only store 80 numbers.

However many learners incorrectly stated line 11 (for $y = 0$ to 89) or line 19 (for $l = 0$ to 89) as the line that contained an error. Learners often incorrectly stated that these lines of code contained an error because 'they only generate 89 numbers' rather than 90 numbers.

Misconception: Learners often seem to misunderstand how arrays make use of indexes. For example a lot of learners seemed to think that an array that is declared between 0 and 89 elements would only store 89 numbers. However many learners did not understand that 0 is used as the first index to store the first number because indexes refer to where the item is placed in the memory. Therefore an index of 0 means that the first number that is stored in the array is 0 elements away (in the memory).

This message is displayed when the programming code is run.

Exception thrown 'System.IndexOutOfRangeException' in BingoCaller.exe

(c) Identify which line in the programming code contains an error and explain why this error has occurred.

(4)

Line of code

12

Explanation

The length of the array is set to be between 0 and 79, however the loop is asking for index values from 0 to 89, which means that once the index value hits 80, the code would output the error above.

3 Marks awarded for:

- 'The length of the array is set between 0 to 79' (1) - Enough evidence to suggest that the learner is aware that the array has 80 elements.

- 'however the loop is asking for index values from 0 to 89' (1) - Enough evidence to suggest that the learner is aware that the code is trying to write 90 elements to the array.
- 'which means that once the index value hits 80, the code would output the error above' (1) - there is just enough evidence to suggest that the learner is aware that there are too many numbers to fit in the array.

Exception thrown 'System.IndexOutOfRangeException' in BingoCaller.exe

(c) Identify which line in the programming code contains an error and explain why this error has occurred.

(4)

Line of code

Dim previousNumbers (0 To 79) As Integer

Explanation

*it is setting 0 - 79 as Integer but then generated from
0 - 89*

2 Marks Awarded for:

- 'Dim previousNumber (0to79) as Integer' (1) - The learner has copied the code from line 3 that contains an error and therefore credit is always be given for this.
- 'but then generated from 0-89' (1) - Enough evidence to suggest that the learner is aware that the code is generating 90 numbers.

0 Marks Awarded for:

- 'it is setting 0-79 as integer' – This is a very vague answer because it is not clear that this is referring to the array.

Question 2(d) (2 marks)

Some learners managed to gain 1 mark but very few scored 2 marks on this question. Many learners simply copied out the code on line 7 without actually saying the purpose of the code. Some learners managed to gain a mark for saying that it creates a loop / iterates code, however lot of learners then went on to incorrectly extend their answer by staying '89 times' rather than 90 times (including the first index at 0).

(d) Describe the purpose of the statement on line 7 of the programming code.

(2)

The statement makes all the code indented inside of it to be repeated up to 90 times (0 - 89), passing a variable that increments each time the code is executed 'x'. This is to make the code repeat but with slightly changing conditions.

2 Marks Awarded for:

- 'Repeated' (1)
- 'Up to 90 times' (1) - Learner has shown awareness that code is being repeated 90 times

(d) Describe the purpose of the statement on line 7 of the programming code.

(2)

This creates a for loop, which will loop a block of code, in this case, up to 89.

1 Mark Awarded for:

- 'This creates a for loop' (1) - Awareness that there is loop on line 7.
- 'which will loop a block of code, this this case, up to 89' - this is incorrect because the code is being repeated 90 times

Question 2(e) (2 marks)

The vast majority of learners scored at least 1 mark on this question with many scoring full marks. Most learners were able to identify that the purpose of the code on lines 11 to 15 was to check a newly generated number against those already created and then if the number had already been created then the code will create another number.

(e) Describe the purpose of the code in lines 11 to 15 of the program.

(2)

If the new number called is in the array, it has been called before, so it goes back to the start to generate another number if it has already been called.

2 Marks For:

- 'if the new number called is in the array(1) - Evidence suggests the learner is aware that the generated number is being checked against those in the array.
- 'it goes back to the start to generate another number' (1) - Evidence suggests the learner knows that another number is generated.

(e) Describe the purpose of the code in lines 11 to 15 of the program.

(2)

This code is preventing a number coming up a second time

1 Mark for:

- 'Code is preventing a number coming up from a second time' (1) - Evidence suggests that the learner is aware that the generated number is checked to see if it is already generated.

Question 2(f) (6 marks)

Most learners gained marks on this question. It was evident that most learners knew that numbers must be in order for a binary search to work. It was also evidence that learners knew that binary searches are better suited to larger lists and therefore a linear/serial search would have been better.

However few learners had an understanding that binary searches split the list into 2 parts and then discard the half that doesn't contain the search item, therefore discarding the wrong half that contains the number 70.

Misconception: Many learners seemed to think that a binary search can only search binary numbers that are 0 and 1 rather than a search that can search all numbers by splitting a list of numbers into 2 parts and then continually discarding the part until the search item is found.

Misconception: Many learners seemed to confuse search algorithms with sorting algorithms. Many learners incorrectly stated that other algorithms such as bubble sorts would be better suited to finding the number 70.

(f) These numbers have been generated and added to the array.

11	6	70	46	12	18	74
----	---	----	----	----	----	----

A player stops the game to ask if the number 70 has been generated.

Explain why a binary search may not be suitable for this task.

(6)

With a binary search the numbers ~~most~~ must be in order as it searches using a more than/less than function. If the numbers aren't in order it can't find it at all.

11 6 70 46 12 18 74

Binary Search looks at the center number and compares it with the searched item since 70 is larger it would get rid of all the number to the left that in the program are seen as smaller.

11, 6, 70, 46 are all got rid of, also due to the unsorted number and it only being a short array a linear search would be used as it doesn't need to be sorted meaning overall it might take less time.

5 marks awarded for:

- 'with a binary search the numbers must be in order' (1)
- '11,6,70,46' are all got rid of (1) - learner knows that the half of the array with 70 is discarded.
- 'also due to unsorted number and a short array' (1) - learner knows that a binary search is not suitable for a short list.
- 'it is only being a short array' (1) - the learner is showing understanding that a binary search is not ideal on short lists.
- 'a linear search would be used as it doesn't need to be sorted' (1) - learner knows that a linear search would work better.

(f) These numbers have been generated and added to the array.

11	6	70	46	12	18	74
----	---	----	----	----	----	----

A player stops the game to ask if the number 70 has been generated.

Explain why a binary search may not be suitable for this task.

(6)

One of the requirements for binary search is for that the list must be already sorted from smallest ordered from smallest to biggest or the other way around. This list is not ordered and therefore binary search will not work here. Another requirement for binary search to work properly is that the list must be shorter than the current one. That is because of the way binary search works. It will find the middle number, check if that's the number it is looking for and if it is, the program will stop. If the middle number in the list is not the one it is looking for then the search will use the middle number as a pivot and to split the list in two separate lists. Then it will keep going through them until it finds the right number. One more requirement for binary search that would've made binary search more suitable for this list is if the number was in the middle.

2 marks awarded for:

- 'one of the requirements for a binary search is that the list must be already ordered.' (1)
- 'The list is not ordered' (1) – learner has clearly linked answer to the randomness in the bingo caller.

The majority of this answer is how a binary search works and not why it's not suitable for the given data.

(f) These numbers have been generated and added to the array.

11	6	70	46	12	18	74
----	---	----	----	----	----	----

A player stops the game to ask if the number 70 has been generated.

Explain why a binary search may not be suitable for this task.

(6)

Binary search would not be suitable for this task since the data set is completely unsorted. This is a problem because for binary search to be used, the array values must first be ⁱⁿ a sorted order.

In addition to this, in the array, 70 is closer to the beginning of the array. This means it would be

In addition to ~~the~~ this, it is a ~~fairly~~ fairly small data set. This means that in this case it would be more efficient to use a linear search since there are only 7 values to search through.

4 marks awarded for:

- 'the data set is completely unsorted' (1) - learner has clearly their linked answer to the randomness in the bingo caller.
- 'for a binary search to be used the array values must first be in a sorted order' (1)
- 'it is a fairly small data set' (1) - learner knows that a binary search is not suitable for a short list.
- 'this means it would be more efficient to use a linear search' (1) - learner knows that a linear search would work better.

Question 3

The scenario for question 3 was based around a taxi company that has a computer program that handles a large volume of bookings every day from customers. The company owner would like to expand his program so that he can track the status of each booking.

Question 3(a) (3 marks)

Some learners managed to score marks for this question however it was generally poorly answered. A lot of learners talked about event driven languages in general with many simply stating what events and event handlers are. A lot of learners also focused on their answers on why event driven languages were suitable for developing user interfaces. However very few learners focused their answer on 'time driven features' as stated in the question. Learners that did pick up marks generally tended to say that the status could be automatically updated but very few managed to take this further and within the context of the scenario.

Please refer to the Information Booklet in order to answer Question 3.

- 3** Siad manages a taxi company. He has a program that handles a large volume of bookings every day from customers. He would like to expand his program so that it will track the status of a booking.

The requirements and the design for the booking screen can be seen in Section 3 of the Information Booklet.

- (a) Siad will expand his program using an event driven programming language.

Explain a benefit to Siad of using time driven features in his program.

(3)

A benefit of using time driven features is that the program will automatically start a timer when the submit button is pressed and will keep checking the status of the time and update the status if the taxi hasn't arrived for the declared times.

3 Marks Awarded for:

- 'Program will automatically start a timer when the submit button is pressed' (1) - Learner knows that the timer is set so the main loop can constantly monitor it.
- 'will keep checking the time' (1) - The learner has shown awareness that the time is constantly being monitored.
- 'and update the status if the taxi hasn't arrives' (1) - The learner knows that the status can be updated based on the time.

Please refer to the Information Booklet in order to answer Question 3.

- 3** Siad manages a taxi company. He has a program that handles a large volume of bookings every day from customers. He would like to expand his program so that it will track the status of a booking.

The requirements and the design for the booking screen can be seen in Section 3 of the Information Booklet.

- (a) Siad will expand his program using an event driven programming language.

Explain a benefit to Siad of using time driven features in his program.

(3)

he can add event listeners to the ~~send~~ submit button where when the user presses submit the time can be automatically stored because the event of pressing the button will trigger a callback function to store the time making it the booking screen easy to use by the user.

2 Marks Awarded For:

- 'when the user presses submit the time can be automatically stored' (1) - Learner knows that the time is logged so the main loop can constantly monitor it.
- 'will trigger a callback function' (1) learner has linked the use of time functions and callback functions.

Question 3(b) (3 marks)

Most learners scored between 1 and 2 marks for this question with few scoring full marks. Most learners were able to link the idea of a queue data structure to the First In First Out (FIFO) approach. Many learners also stated that customers who book first (before other customers) should be given priority.

(b) Explain why a queue data structure should be used to store booking requests.

(3)
A queue data structure ~~would~~ should be used to store booking requests as the queue data structure uses the principle of 'first in first out' or 'FIFO' so the first booking request should be the first to be carried out by a taxi and the last booked request will be the last to be carried out.

2 Marks Awarded for:

- 'First In First Out' (1)
- 'The first booking request should be the first to be carried out and the last booked require will be the last to be carried out' (1) – Although the learner has not specially said it, this implies that the bookings are executed in order.

(b) Explain why a queue data structure should be used to store booking requests.

(3)
a queue data structure should be used for requests because it will be fair to the customer ~~due~~ ^{system} to the first in first out ~~system~~. Another reason would be that a stack data structure

1 Mark Awarded for:

- 'first in first out' (1)
- 'it will be fair to the customer' - there is not enough understanding here to award the mark against mark point 2. Learners need to show that they understand that those earlier in the queue would be prioritised.

Question 3(c) (10 marks)

Most learners picked up some marks for this question, however the vast majority of learners were placed in mark band 1 therefore scoring a maximum of 3 marks. The vast majority of learners focused their answers on the variable names with many correctly stating that the variable names are not suitable. However few learners were able to take this further and give the implications of these variable names in the program code with many learners saying that it would create problems. Some learners did manage to give valid reasons such as it may make the program code difficult to expand in the future, more difficult to debug and may make it difficult when others look at the code.

Some learners did discuss the use of global variables with some learners managing to discuss the impact that these have on the accuracy and integrity of the variables.

Lots of learners did attempt to cover the variable data types and many did state that some of the data types were incorrect. However most of the time, the alternative data types provided by learners were incorrect.

Misconception: Many learners incorrectly stated that a house number would be stored as an integer data type rather than a string. This is incorrect because house numbers can contain letters (e.g. 11a) and also house names.

Misconception: Many learners incorrectly thought that the time would be stored as a float. While the stated string data type (in the information booklet) is incorrect, the most suitable data type for storing the time would be 'time.'

(c) Figure 3b shows the variables Siad plans to use when he writes the code for the program.

Discuss the implications of using the variables as defined in Figure 3b. (10)

All of the variables have been defined as a String data type, this would imply that no conversions of data types will be needed, and none of them will need to be used in mathematical operations.

All variables have been given names that do not hold any connection to what the variable holds or what it is used for, which is considered a bad practice in programming as it makes the code a lot harder to read, as well as write.

As the data types of the surname and time are both String, they can easily be used in string manipulation to develop the booking ID.

Furthermore, most variables are local which means they will only be needed in certain functions which is good for structure and readability. There is a global variable which must mean it is used across functions and must be available to the whole program.

This would be placed in Band 3 and awarded 8 marks.

Technical vocabulary – The learner has made good use of their own vocabulary outside of what is given in figure 3b. For example they have mentioned ‘mathematical operations,’ ‘string manipulation’ and ‘functions’ and they are mostly accurately used and in some depth.

Balance - The learner has covered variable names, variable data types and local/global variables.

Chains of reasoning – There are some chains of reasoning. The learner has made good points such as ‘all variables have been given names that do not hold any connection to what the variable holds’.....’which is considered bad practice’.....’as it makes the code to read and write’ however gives no reasons why to give this answer full marks.

Scenario – The learner has made indirect links to the scenario but these are not explicit. For example, creating a booking ID.

(c) Figure 3b shows the variables Siad plans to use when he writes the code for the program.

Discuss the implications of using the variables as defined in Figure 3b.

(10)

Local variables are quite helpful to have if each of the inputs are always empty when someone uses them, it allows you to put every thing in one function and store it only there. Although a big problem of the code is that his variable naming conventions are not right, the name 'Variable 1' does not give any information about what this should hold which would make the code prone to misinterpretation and ~~also~~ So someone may put wrong data in there, this would also make a problem for code maintainability as they would also confuse other than the writer would be able to understand what the variables do unless they were commented.

Local variable 6 would not make use of the binary data features of the program as its data type would be string and not boolean, this would cause errors if he had planned to track the binary.

Having the horse number be a string was a wise choice as horse numbers sometimes have other characters to them like horse 42B.

if the data type was an integer, there would be either problems with the input only allowing numbers which may make a text go to the wrong horse or cause the code to error and stop. Variable 7 should also be a local variable so that it can not affect any thing outside the function and would be connected to variable 6 in terms of when it changes.

This would be placed in Band 2 and awarded 6 marks.

Technical vocabulary – The learner has made some use of their own vocabulary outside of what is given in figure 3b. For example 'naming conventions,' 'code maintainability,' 'function,' 'code comments'

Balance – The learner has covered a broad range including local/global queries, naming conventions and data types.

Chains of reasoning – There are some chains of reasoning. For example 'variable naming conventions are not right' then backed up with 'does not give an information about what this should hold' and then backed up with 'would make the code prone to misinterpretation' and then backed up with 'makes problems with code maintainability' etc.

Scenario – There is not always a direct link with the scenario. For example the learner says 'the code is prone to misinterpretation' but it's not clear what the implications are in the scenario. The learner has said 'local variables does not affect anything outside the function' but it's not clear what the implications are in the scenario.

(c) **Figure 3b** shows the variables Siad plans to use when he writes the code for the program.

Discuss the implications of using the variables as defined in **Figure 3b**.

(10)

it's a good method doing what siad has done and would be really effective, but it looks as if with the data type he hasn't really thought much about for example someones house number will always be a whole number so the data type of that could be an integer. calling them Variable_1 etc is also a bit risky, they should all have a solid name which they can be remembered by. customers post code may not always be 10000 either especially if they have to drop people off at a different location than they expected.

This would be placed in Band 1 and awarded 1 mark.

Technical vocabulary – The response is largely superficial and inaccurate. The learner spends the first part describing how a customer's house number is always a whole number which is inaccurate. The learner says that the variable names should be changed and how its 'risky' which is correct but then goes on to say 'so they can be remembered by customers' which is not relevant.

Balance – The learner has inaccurately covered data types and variable names in very limited detail.

Chains of reasoning – No chains of reasoning are given.

Scenario – There is mention of the taxi company such as dropping customers off etc however these have no relevance at all the variables.

Question 3(d) (8 marks)

This question was generally poorly answered by most learners and the vast majority of learners were placed in mark band 1 therefore scoring a maximum of 3 marks. Some learners did have an understanding of how a quick sort works which was pleasing to see. However many learners did not have an understanding of what a pivot was or how the choices of a pivot can impact the performance of the sort. Although some students knew that the left/right most value was the least efficient and the median of 3 value was the most efficient many learners did not take this further with valid reasons.

It was pleasing to see that some learners had an understanding that the left/right most value most would create a larger list of numbers to be sorted while the median of three would create more balanced subsets therefore increasing the efficiency. However this level of knowledge was seen by very few learners.

Misconception: Many learners incorrectly thought that the median of three approach to choosing a pivot for a quick sort will only sort three numbers into order rather than sorting all numbers into order.

- (d) Siad's taxi drivers are awarded performance points each month. The drivers' scores at the end of one month are shown in this list.

0	1	2	3	4	5	6	7	8
25	37	49	44	54	70	74	73	96

Siad uses a quick sort to put the scores into order.

He could use the **Leftmost/Rightmost Element** or the **Median of Three** method to choose a pivot.

Analyse how these methods of choosing a pivot would affect the performance of the sort.

(8)

If Siad was to pick the leftmost value he would have a hard time sorting as all the values would be sorted to the right (as the numbers would constantly be bigger than each other). If Siad used the rightmost value the same thing would occur but all the numbers would be smaller (on the left) creating a really long chain of numbers to put back together.

By using the median of three he gets a much nicer ^{for his pivot} distribution of numbers which will make the algorithm much more efficient at breaking down and putting back together the sorted numbers.

This would be placed in Band 2 and awarded 4 marks.

Technical vocabulary – The learner has shown some good understanding. The learner has shown understanding of how the pivot will change the list subsets and that the pivot will split the numbers up into groups, sort them and then put them back together.

Chains of reasoning – The learner has made a good point 'leftmost value...all the values would be sorted to the right' and then backs this up with 'as the numbers would constantly be bigger than each other.' This statement is partially correct because the numbers will be on the right but they will not be fully sorted. However the learner then goes on to say 'creating a really long chain of numbers to put back together' which is a fantastic point.

Another example is 'by using the media of three, he gets a nicer distribution of numbers' then taken further with 'which will make the algorithm more efficient at breaking down and putting back together the sorted numbers.'

Scenario – The answer that the learner has provided is linked to the list given in the question. They know that the leftmost value will place values on right and the rightmost value will place values on the left.

(d) Siad's taxi drivers are awarded performance points each month. The drivers' scores at the end of one month are shown in this list.

0	1	2	3	4	5	6	7	8
25	37	49	44	54	70	74	73	96

Siad uses a quick sort to put the scores into order.

He could use the **Leftmost/Rightmost Element** or the **Median of Three** method to choose a pivot.

Analyse how these methods of choosing a pivot would affect the performance of the sort.

(8)

Depending on how unsorted the array is will determine how efficient these methods are. The quicksort will put the lower numbers on one side of the pivot and higher on the other side and repeat until it's sorted. The median of ~~three~~ three will be more reliable but also slow.



Choosing the leftmost element will likely be much worse as it may already be one of the smallest / largest numbers leading to more pivots. Not having to calculate to find the median can be more efficient in some cases though.

This would be placed in Band 1 and awarded 2 marks.

Technical vocabulary – The learner has shown that they are aware that depending on how unsorted the array is will determine the efficiency. They have shown that the median of three will be slower. The learner is aware that if they choose the leftmost value then it may already be the smallest/longest number. While these are all very good points, the learner does not backup their points with technical vocabulary.

Chains of reasoning – Although the learner has made a lot of very good points, they are all made in isolated. The learner states points but then moves onto other points without fully exploring their answers.

Scenario –Their answer is not always linked as the learner says that the leftmost pivot may already be one of the smallest/longest numbers. While this is correct, it is not specific to the scenario.

(d) Siad's taxi drivers are awarded performance points each month. The drivers' scores at the end of one month are shown in this list.

0	1	2	3	4	5	6	7	8
25	37	49	44	54	70	74	73	96

Siad uses a quick sort to put the scores into order.

He could use the **Leftmost/Rightmost Element** or the **Median of Three** method to choose a pivot.

Analyse how these methods of choosing a pivot would affect the performance of the sort.

(8)

A leftmost/Rightmost element would be suitable as it would give too high of a difference. So it would not be the most accurate of the options.

The median of three would also be suitable for the code as it would give a ~~not~~ less of a difference therefore making the code more accurate.

No marks would be awarded for this answer.

Although the learner has made a good attempt, their answer is very inaccurate. The learner states 'give too high of a difference' and 'give less of a difference' but it's not clear what this means.

No awardable content here.

Question 4

The scenario for question 4 was based around an individual who is a DJ and wants a program that will automatically generate a playlist of songs for a particular event. He would like to display the generated playlist on his website so that customers can add additional songs before an event.

Question 4(a) (4 marks)

This question was poorly answered by most learners. Some learners did have an understanding of what server side processing was however did not understand why it would be used in the context. Many learners simply stated that server side processing would allow customers to add songs to the playlist. While this would allow this functionality, client side processing would also do this. Therefore learners did not focus on their answers specifically on why server side processing was used. Learners who did gain marks gained them for stating that customers will be able to access the most up-to-date playlist and that it reduces duplication of songs.

Please refer to the Information Booklet in order to answer Question 4.

- 4 Paul is a DJ and wants a program that will automatically generate a playlist of songs for a particular event.

Paul would like to display the generated playlist on his website so that customers can add additional songs before an event.

- (a) Explain why server side processing would be used to allow the customers to add songs to a playlist.

(4)
Server side processing would be used so that Paul can save these new songs for the event. This is because if the alternative client-side processing was used then the new songs would only be saved temporarily ~~and~~ and only on the clients computer. This means Paul would not be able to access these additions. Therefore serverside processing is better. In addition to this serverside processing has increased security.

2 Marks Awarded for:

- 'Paul can save these new songs before an event' (1) - the learner has given an example of Paul managing his business.
- 'client-side processing was used then the new songs would only be saved temporarily on the client' computer' (1) - the learner has shown that if server side

processing is not used it will make it difficult for people to see the playlist in real time.

Please refer to the Information Booklet in order to answer Question 4.

- 4 Paul is a DJ and wants a program that will automatically generate a playlist of songs for a particular event.

Paul would like to display the generated playlist on his website so that customers can add additional songs before an event.

- (a) Explain why server side processing would be used to allow the customers to add songs to a playlist.

(4)

Server side processing would show the customer the songs that Paul and other customers have entered into the playlist. The songs put into the playlist. Server side processing would allow customers to add songs to the playlist by

1 Mark Awarded for:

- 'would show the customer the songs that Paul and other customers have entered into the playlist' (1) – the learner has shown knowledge that when a change is made, this can be accessed by all customers.

Question 4(b) (10 marks)

This question was generally poorly answered by most learners and the vast majority of learners were placed in mark band 1 therefore scoring a maximum of 3 marks. Learners struggled to come up with a solution to the problem outlined in the information booklet. Although some learners were able to use some logic to meet requirement 1, very few learners managed to go beyond this with the other requirements.

It is worth noting that examiners are aware that there are different variations in writing pseudocode and these are taken into account when marking pseudocode questions. Credit will be given for the correct use of logic.

It is also worth noting that the example solution in the mark scheme is only an example and other correct ways of solving the problem were given credit.

Learners would benefit from being more prepared to write pseudocode questions. It's recommended that algorithms are taught alongside the whole unit which increase in difficulty overtime.

```

(b) A selection of songs that Paul has stored and the rules that should be followed
when generating a playlist, can be seen in Section 4 of the Information Booklet.

Develop an algorithm using pseudocode that meets the rules to generate a
playlist. (10)

BEGIN
  INPUT PlaylistLength
  PlaylistLength2 = PlaylistLength - (PlaylistLength / 4)
  FOR SongID = 1 to 12 :
    IF Rating == 5 :
      FiveStarList = FiveStarList + SongID
      TotalLength3 = TotalLength3 + Length
    ELSEIF Rating == 4 :
      FourStarList = FourStarList + SongID
      TotalLength4 = TotalLength4 + Length
    ELSEIF Rating == 3 :
      ThreeStarList = ThreeStarList + SongID
      TotalLength5 = TotalLength5 + Length
    ENDIF
  ENDFOR
  ORDER FiveStarList BY 'Last Selected'
  ORDER FourStarList BY 'Last Selected'
  ORDER ThreeStarList BY 'Last Selected'
  FiveStarList = FiveStarList(SongID)
  IF TotalLength3 < (PlaylistLength / 4) THEN REPEAT UNTIL TotalLength3 < (PlaylistLength / 4)
  TotalLength5 = TotalLength5 - Length
  ENDFOR
  REPEAT : TotalLength5 - Length
  UNTIL : TotalLength5 < (PlaylistLength / 4)
  ENDFOR

```

```

REPEAT : TotalLength4 = (PlaylistLength / 3) - Length
UNTIL : TotalLength4 < (PlaylistLength / 3)
ENDREPEAT
REPEAT : TotalLength3 = TotalLength3 - Length
UNTIL : TotalLength3 < (PlaylistLength / 3)
ENDREPEAT

```

This answer represents mark band 3 and would be awarded 8 marks.

The learner has correctly inputted the duration which meets requirement 1 as stated in the information booklet. The learner has also used correct logic to calculate the playlist time which meets requirement 2. The learner has then used a FOR loop to examine each song (12 in total) and if the rating is = 5, 4 or 3 then the song IDs will be added to separate lists.

When the songs are separated into different lists, the learner has used logic to put them into order by 'Last Selected' which meets requirement 4. The learner then goes through the lists and add songs from the list. However, the logic used to ensure the correct % of the playlist contains the correct ratings of songs, is poor so requirement 3 is partly met. Requirement 5 is not met because the learner has not created any pseudocode to change the last selected to 0.

```

(b) A selection of songs that Paul has stored and the rules that should be followed
when generating a playlist, can be seen in Section 4 of the Information Booklet.
Develop an algorithm using pseudocode that meets the rules to generate a
playlist.
(10)

BEGIN
Duration = input float(60)
DurationLeft = float(45)
5Star = DurationLeft * 0.45
4Star = DurationLeft * 0.3
3Star = DurationLeft * 0.25
While 5Star > 0:
  SELECT Greatest Last selected
  IF 5Star < 0:
    REMOVE last song added.
  END IF
  BREAK
  4Star = 4Star - 4Star Greatest
  Last selected song
While 4Star > 0:
  + SELECT 4Star Greatest Last selected
  IF 4Star < 0:
    REMOVE last song added.
  END IF
  BREAK
  3Star = 3Star - 3Star Greatest
  Last selected
  length
While 3Star > 0:
  SELECT 3Star Greatest Last Selected
  IF 3Star < 0:
    REMOVE last song added.
  END IF
  BREAK

```

```

END IF
BREAK
Playlist = 4StarSongs + 3StarSongs + 5StarSongs + Customers
END
Greatest last selected = 0
5StarSongs = Greatest last selected
+ Greatest last selected = 0
Δ Greatest last selected > 0
Customers = Customer
requested songs

```

This answer represents mark band 2 and would be awarded 5 marks.

Requirement 1 and requirement 2 as stated in the information booklet are partly met. This is because the learner has set the duration time to 60 and the duration left time to 45. However, the user should be able to input a duration time which will therefore affect the duration left time.

The learner has used correct logic to calculate how much of the playlist should be for 5*, 4* and 3* and although there is some evidence of selecting songs, the logic used is very poor and therefore requirement 3 is partly met. The learner has attempted to sort the songs by the 'last selected' but the logic is poor and therefore requirement 5 is partly met. The learner has attempted to set the 'last selected' to 0 after it has been added to a playlist but the logic is poor and therefore requirement 6 is partly met.

(b) A selection of songs that Paul has stored and the rules that should be followed when generating a playlist, can be seen in Section 4 of the Information Booklet.

Develop an algorithm using pseudocode that meets the rules to generate a playlist.

(10)

```
BEGIN
  INPUT Duration
  INPUT songs = (Duration stars * duration)
  INPUT stars NewSong = input " "
  IF songs = (Duration stars * duration)
    song <= 5
  OUTPUT 45% 45% - Duration
  ELIF song <= 4
    OUTPUT 30% - Duration
  ELSE IF song <= 3
    OUTPUT 25% - Duration
  ELSE!
    OUTPUT Disallowed.

  LastSelect == 1
  IF newSong = 3, 4, 5
  END
```

This answer represents mark band 1 and would be awarded 1 mark.

The learner has inputted the duration on line 2 which meets requirement 1 as stated in the information booklet. However, the solution provided by the learner does not calculate the playlist duration time or use the song list from figure 4 to automatically add songs.

The solution appears to be outputting songs, but it not clear where they are coming from and what logic is used to select them. The vast majority of this solution is not correct and will not meet requirements 2, 3, 4 and 5 as stated in the information booklet.

Question 4(c) (12 marks)

This question was poorly answered by most learners. Some learners gave general vague answers such as 'he must ensure he keeps all payment data safe' however learners did not go into detail with reasons why. Although some learners did have an understanding of areas such as HTTPS, Encryption, Firewalls, APIs etc, very often learners were not able to take these further and provide further chains of reasoning.

<p>(c) Paul would like to add a payment feature to his website to allow customers to pay for an event. He wants to ensure his customers' data is secure. Evaluate how this will affect Paul's choices when creating the code for the website. (12)</p> <p>When creating the website the first thing he will need to do is make sure he is using HTTPS instead of HTTP as it will encrypt all website transmission and will keep things much more secure.</p> <p>Paul will also need to make sure he adds in encryption to all data that he is transmitting and receiving about a customer's payment info so if they were intercepted by hackers the info will not be readable. Make sure to not add any authentication details on frontend code and also try hide it in the backend server side code.</p> <p>Another crucial thing Paul must do is to secure all</p>	<p>the forms or elements on the website which communicates with server side code so he can prevent any SQL injection attacks or others like see that.</p> <p>Access to Paul's server side code should also be absolutely locked down and secured so that no one can see it, edit it or access ^{influence} it in any way, shape or form as that could lead to hackers gaining insight on how your system works and how it works to exploit it. They can also modify server code to get access to everything such as your database and encryption type.</p> <p>Further code implications may mean you use a framework or some sort of third party API to help make sure your transaction are more secure and you can let someone else deal with the server side code for payments. This will save time and effort of securing server, database and code.</p> <p>Finally, he would also need a lot of verification and error handling to verify cards and make sure correct data is received and correct money is taken.</p> <p>(Total for Question 4 = 26 marks)</p>
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This answer represents mark band 3 and would be awarded 12 marks.

Technical vocabulary – The learner has brought in a variety of key technical vocabulary such as 'HTTPS,' 'Encryption,' 'Interception,' 'Authorisation,' 'Backend Server Side Code,' 'SQL Injection' and 'API' which are all suitable for the question.

Balance – The learner has covered a range of areas and provided some detail.

Chains of reasoning – The learner has made some good points. For example 'HTTPS instead of HTTP' and then backed this up with 'which will encrypt all website transmission.'

In another example, the learner has said 'Encryption to all the data that he is transmitting' and then linked this to payment info so it cannot be intercepted by hackers.

In another example the learner has talked about the use of 'framework API' and then backed this up with 'this will save time and effort of securing server, database and code'

Scenario – The answer is well linked to the scenario and the learner has started to talk about the actual code.

Examiners will always take a holistic view when marking essay type questions and will bear in mind the limited time students are given in the exam to write this answer.

(c) Paul would like to add a payment feature to his website to allow customers to pay for an event.

He wants to ensure his customers' data is secure.

Evaluate how this will affect Paul's choices when creating the code for the website.

(12)

He has to make that is coding is perfect and will also need to add the data protection act which will fully ensure that people's personal details are fully safe and they're in no risk of actually getting their personal details stolen and easily accessed by somebody else. Now if he does choose to do this will need to test it multiple times himself to make sure it's perfect with no risk of losing out because if it's a failure it could mess his whole career up.

This answer represents mark band 2 and would be awarded 2 marks.

Technical vocabulary – The learner has used some key technical terms such as the 'Data Protection Act' and 'testing.' However, these are very minimal and not fully explored.

Balance – The learner has covered the legal implications that Paul should consider and the increased testing that Paul will need to carry out. However there is no real depth to these and it's therefore difficult to see if the learner has a full understanding of the security issues.

Chains of reasoning – There is minimal chains of reasoning. For example....'Data Protection' and then 'which will fully ensure that people's personal details are safe.' Other points are generally made in isolation.

Scenario – The answer provided by the learner is generic and not always specific to the scenario. The link to security is not clear and the learner has not talked about how the actual website code could be used to increase security.

(c) Paul would like to add a payment feature to his website to allow customers to pay for an event.

He wants to ensure his customers' data is secure.

Evaluate how this will affect Paul's choices when creating the code for the website.

(12)

One benefit to this is that it will make his code more ~~a~~ rigorously thought out. The benefit to this is that he is then likely to make ~~such~~ ^{so} there are next to no ways of the system being hacked and reduce the chances of it going down.

One drawback to this is that it will take longer to develop the code for the website. This is because the additional security features need to be factored into the ~~the~~ design of the program.

This answer represents mark band 1 and would be awarded 1 mark.

Technical vocabulary – No technical vocabulary is used within the answer provided by the learner.

Balance – It is not clear what the learner is actually getting at in the first paragraph. The learner has briefly covered development time and how the additional security features will be factored into the design.

Chains of reasoning - No chains of reasoning have been used. There are no actual expansions to cover the actual website code.

Scenario – The second paragraph is related to the scenario (data security) but is it very brief so it difficult to assess if the learner has a real understanding of the implications on the code.

Summary

Based on performance in this examination series, learners are offered the following advice:

- Address the misconceptions given in the 'Introduction to the Overall Performance of the Unit' section and throughout this report as this will help in all areas of the unit and in preparation for this exam.
- Develop a better understanding of logic and have more practice at being able to come up with solutions to complex problems. Being able to create effective algorithms will help in all learning aims in this unit. Learners should be familiar with developing algorithms using both flowcharts and Pseudocode. It may be best for learners to do this alongside this unit which increases in complexity over time rather than being taught in one go.
- Apply their knowledge to as many different scenarios as possible. The exam paper will always contain 4 different scenarios and therefore this will prepare learners to be able to provide answers to the given context under exam conditions.
- For shorter response questions (5 marks or less), learners should be encouraged to note the number of marks available as this will help them identify the number of points they need to make. For example, in a 4 mark 'Explain one...' style question, learners would need to make at least four linked points that expand/exemplify understating of a single point
- When producing extended writing responses (6 marks or more) learners should ensure that they consider a range of points, each of which should be expanded or supported with examples and applied to the given context.

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