BTEC

Lead Examiner Report 2001

January 2020

L3 Qualification in Computing

Unit 1: Principles of Computer Science

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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, at 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 is 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 assessment, because then it would not take accessibility into account.

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

http://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html

Unit 1: Principles of Computer Science

Grade	Unclassified	Level 3			
		N	P	M	D
Boundary Mark	**0**	**11**	**22**	**36**	**51**

Introduction

This was the sixth 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:

Information about problems that they need to solve.

Programming code for them to interpret, analyse or evaluate.

Requirements or designs for a new program that is needed.

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 code to interpret, analyse or evaluate.

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 is similar to the last examination season for this unit. The average mark per candidate has risen slightly which shows that centres are better preparing learners for the rigor of this exam. However, there is still evidence to suggest that there are still a lot of learners who are not fully prepared to take this examination.

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.

While learners did not perform well on some of the longer questions, on the whole the performance on the shorter response questions appears to have improved with many learners picking up some marks on each short answer question. The performance on the extended questions has remained in line with the previous exam season. Learners still do not fully understand the demands of the higher order command words such as discuss, analyse and evaluate. 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.

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 1a (2 Marks)

The majority of learners gained two marks. Most learners were able to identify two reasons why string data type should be used for the item code. Some answers linked the reasons to the scenario, however this was not expect.

Answer ALL questions. Write your answers in the spaces provided.

Please refer to Section 1 of the Information Booklet in order to answer Question 1.

1 A supplies company stores goods in a warehouse.

The items are not stored in a specific order. Section 1 of the Information Booklet shows the storage bays in the warehouse.

Figure 1 shows some example data that the system will store.

(a) Give **two** reasons why a string data type could be used for the item code.

(2)

1 The item code does not need to be used in a calculation. and has no value

2 Strings can hold Numbers letters and Symbols.

2 Marks awarded for:

not used in calculation 1 Mark
strings can hold numbers and symbols 1 Mark

Question 1b (3 Marks)

Most learners gained three marks. Some learners however incorrectly used the item number given in the question as a location code and therefore gained no credit for giving the location as Bay 47, Shelf 85, Section 91.

(b) Identify the location of item 478591.

(3)

Bay: 01

Shelf: 01

Section: 08

3 Marks awarded for:

Bay: 01 (1 mark)

Shelf: 01 (1 mark)

Section: 08 (1 mark)

Question 1c (2 Marks)

Learners often scored 2 marks by identifying the code as a presence check or a form of validation. Some learners did not recognise that it was the **length** of the input being tested and suggested that a numeric value of 0 was not acceptable.

A section of pseudocode to find an item and print its location is given in **Figure 2**.

(c) Explain the purpose of lines 2 to 4 of the code.

(2)

This section of code ensures that the user inputs the required item. As it will keep looping until Item is entered.

2 Marks awarded for:

"ensures that the user inputs the item required" (1 Mark)

"will keep looping until item is entered" (1 Mark)

Question 1d (3 Marks)

Many of the learners managed to score three marks on this question. Common errors included confusing the index with either the item code or the location code. Stronger responses recognized the use of index as a pointer to the elements in the array.

(d) Explain the purpose of the index variable in the pseudocode given in **Figure 2**.

(3)

The idex variable increments by 1 each time the code inside the FOR loop is run, and therefore is used to compare the next index of the array with the item required each loop. The index variable will increment from 0 all the way up to 999, therefore ~~checked~~ comparing every item in the array.

3 Marks awarded for:

"increments each time" (1 mark)

"compares the next index of the array with the item required each loop" (1 mark)

"comparing every item" (1 mark)

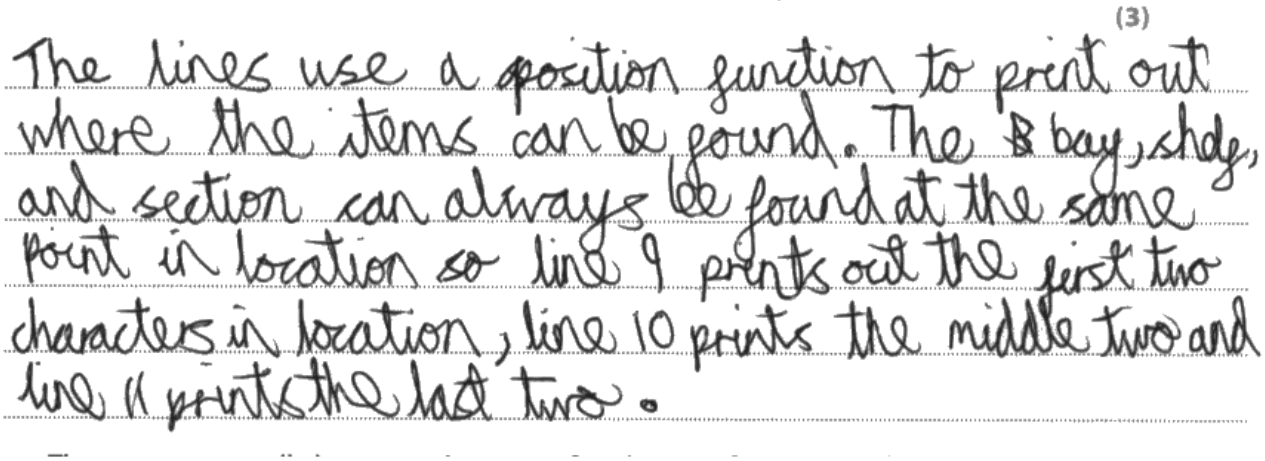
Question 1e (3 Marks)

Some learners were able to score 3 marks on this question, most were able to explain that the string needed to be sliced and that selected characters were then output to show the location.

(e) Lines 9, 10, 11 of the pseudocode output the item's location.

Describe how string handling functions are used to output the item's location.

(3)



3 Marks awarded for:

Demonstrates a clear understanding of the location within the string of the data for bay, shelf, and section. There is a description of how lines 9, 10 and 11 print out the pair of characters. (3 Marks)

Question 1f (3 Marks)

Many learners found this question challenging. Although some learners did score 3 marks.

A significant number of learners only saw 2 items with the same code, normally the two at the bottom of the table. Common misconceptions were:

- The program would stop after the first item
- The program would only print out the last item
- The program would be "confused" by three items

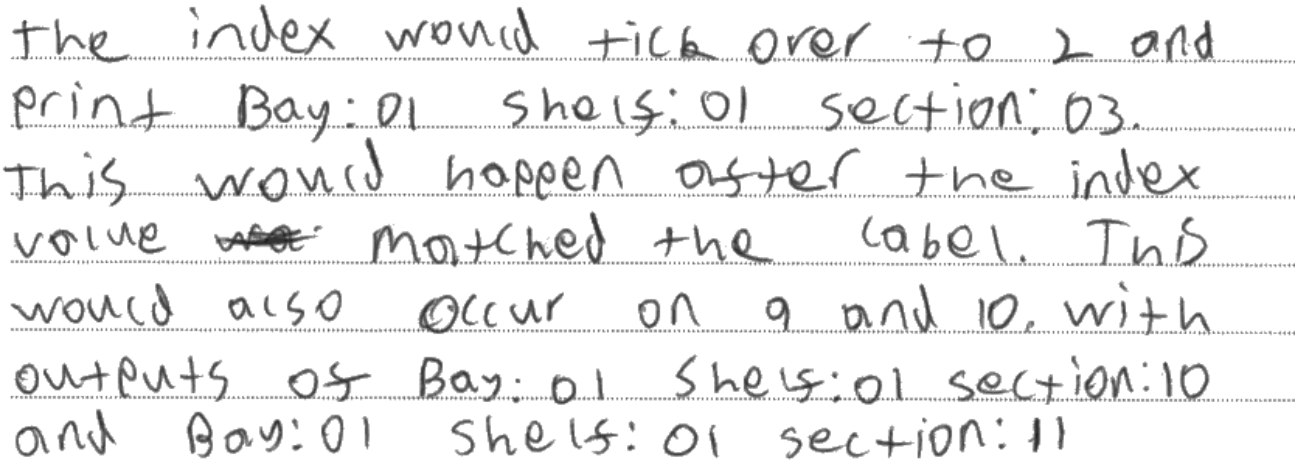
A few candidates noticed that the location of the last item did not exist. However, it was possible to gain full marks without this being recognised.

The company usually has more than one of each type of item in stock.

(f) The data in **Figure 1** is used to test the pseudocode in **Figure 2**.

Describe what would happen if **514832** was entered to locate an item.

(3)



3 Marks awarded for:

The search goes through all locations (1 Mark)

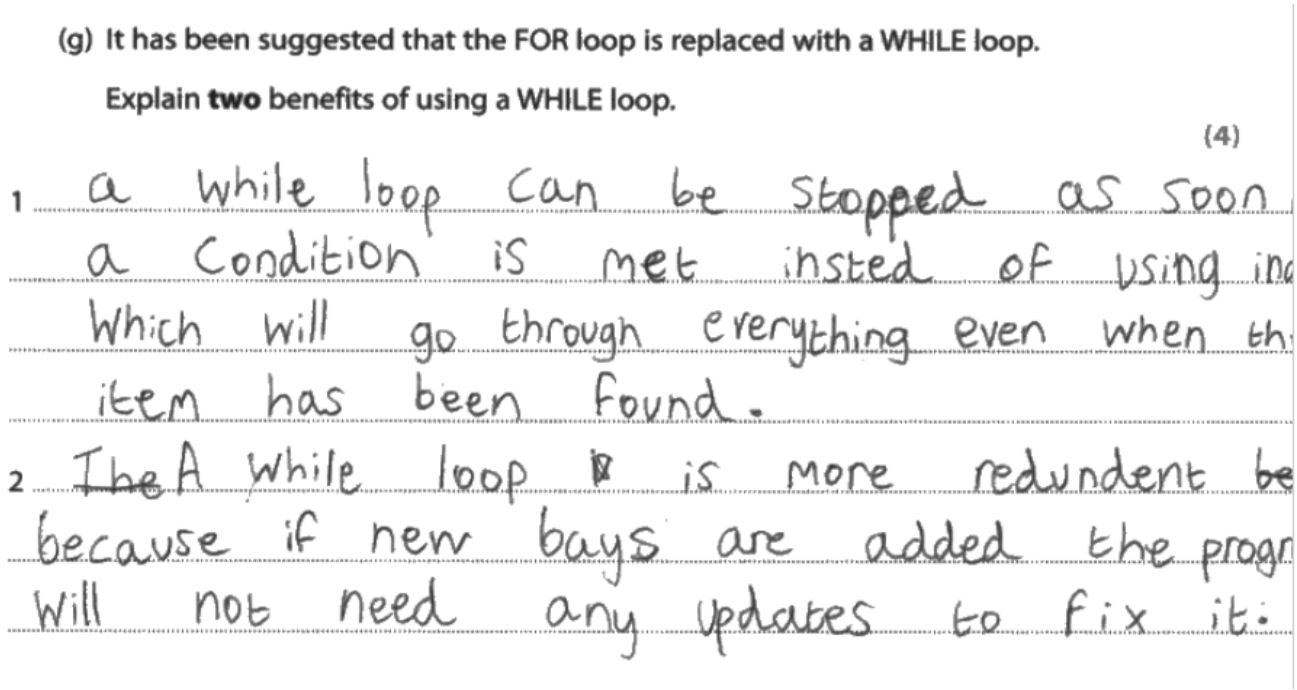
Prints location each time a match is found (1 Mark)

All/three locations will be printed (1 Mark)

Question 1g (4 Marks)

Learners generally did well on this question scoring 3 marks.

The most common answers were exiting the loop when an item was found, not having to search the whole list, and not printing more than one item. A good number of learners recognised that using a while loop could mean that the code did not have to be re-written if more locations were added.



(g) It has been suggested that the FOR loop is replaced with a WHILE loop.

Explain **two** benefits of using a WHILE loop.

(4)

1 a while loop can be stopped as soon a condition is met insted of using in Which will go through everything even when th item has been found.

2 ~~The~~ A while loop is more redundent be because if new bays are added the progr will not need any updates to fix it.

4 Marks awarded for:

Allows the loop to break early (1) because it is a conditional loop (1)

A while loop would be able to cope with new bays/ items/ data being added (1) without updates to the program code (1)

Question 2a (2 Marks)

The majority of learners scored 2 marks on this question. The majority of answers identified mouse clicks and actions controlling a trigger function or running code.

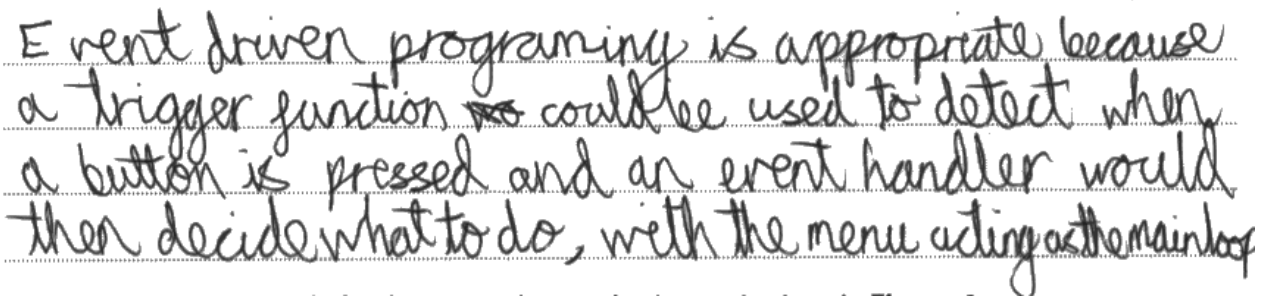
Please refer to Section 2 of the Information Booklet in order to answer Question 2.

2 A teacher has created a program of mathematical games for her students.

The main menu is shown in **Figure 3** in Section 2 of the Information Booklet.

(a) Explain **one** reason why event-driven programming is suitable for creating the main menu.

(2)



2 Marks awarded for:

Uses buttons/ mouse clicks/keyboard interactions (1 Mark)

which could be controlled with a trigger function (1 Mark)

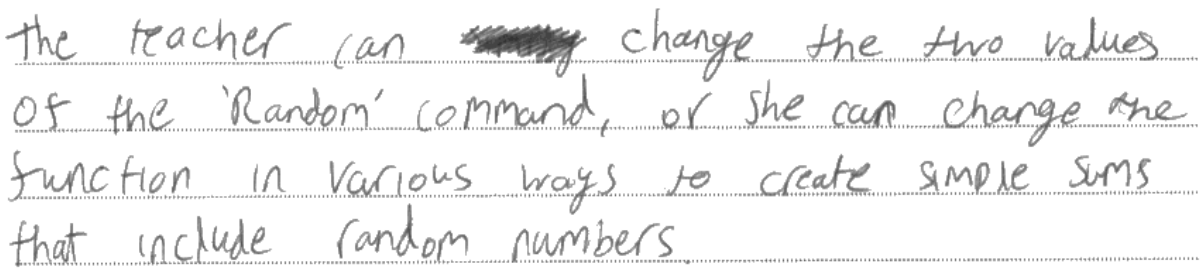
Question 2b (2 Marks)

Many learners were able to score two marks on this question. A common misconception was to refer to changing the number of attempts available.

Part of the pseudocode for the 'Guess the number' game is given in **Figure 4**.

(b) Describe how the teacher could change the range used to generate the number the students have to guess.

(2)



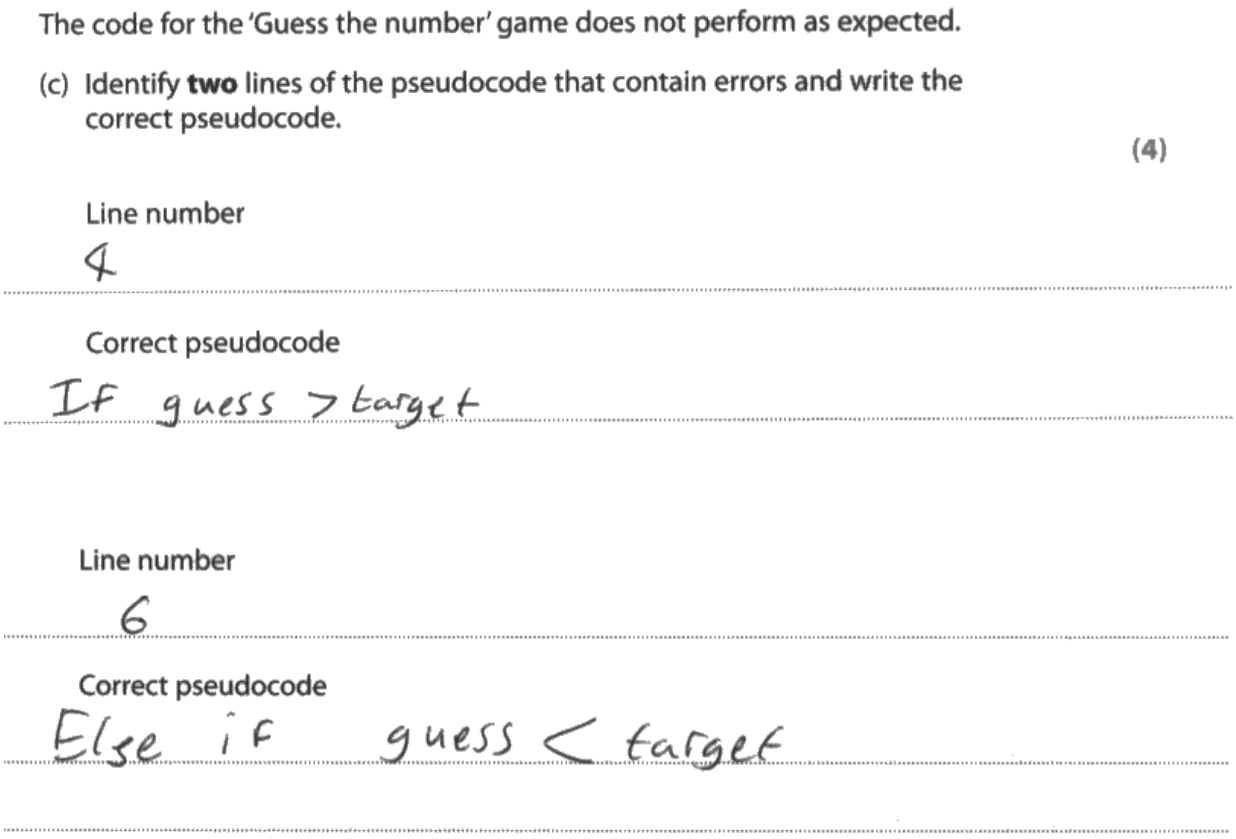
2 Marks awarded for:

Change the parameters/values (1 Mark)

In the random function (1 Mark)

Question 2c (4 Marks)

Most learners scored four marks for this question. Most recognized the logic error in line 4 and were able to give the correct logic, however some learners missed the wrong variable being tested in line 6.



The code for the 'Guess the number' game does not perform as expected.

(c) Identify **two** lines of the pseudocode that contain errors and write the correct pseudocode.

(4)

Line number

4

Correct pseudocode

IF guess > target

Line number

6

Correct pseudocode

Else if guess < target

4 Marks awarded for:

Line number: 4 (1 Mark)

Correction: IF guess > target (1 Mark)

Line number: 6 (1 Mark)

Correction: ELSEIF guess < target (1 Mark)

Question 2d (4 Marks)

Learners generally performed well on this question, being able to complete the table accurately and gain 4 marks. Although one common error was to write 1 – 6 or 1 to 6 in the shaded cell for the counter.

Part of the pseudocode for the 'Number pattern' game is given in **Figure 5**.

(d) The logic of the pseudocode is tested using a 'dry run'.

Complete the shaded cells in the trace table to show how the variables would change if the pseudocode was run as program code.

(4)

line	start	counter	output
1	4		
2			4
3		1	
4	5		
5			5
3		3	
4	8		
5			8
3		5	
4	13		
5			13
6			
7			end

4 Marks awarded for:

All 4 values correct in shaded cells (4 Marks)

Question 2e (8 Marks)

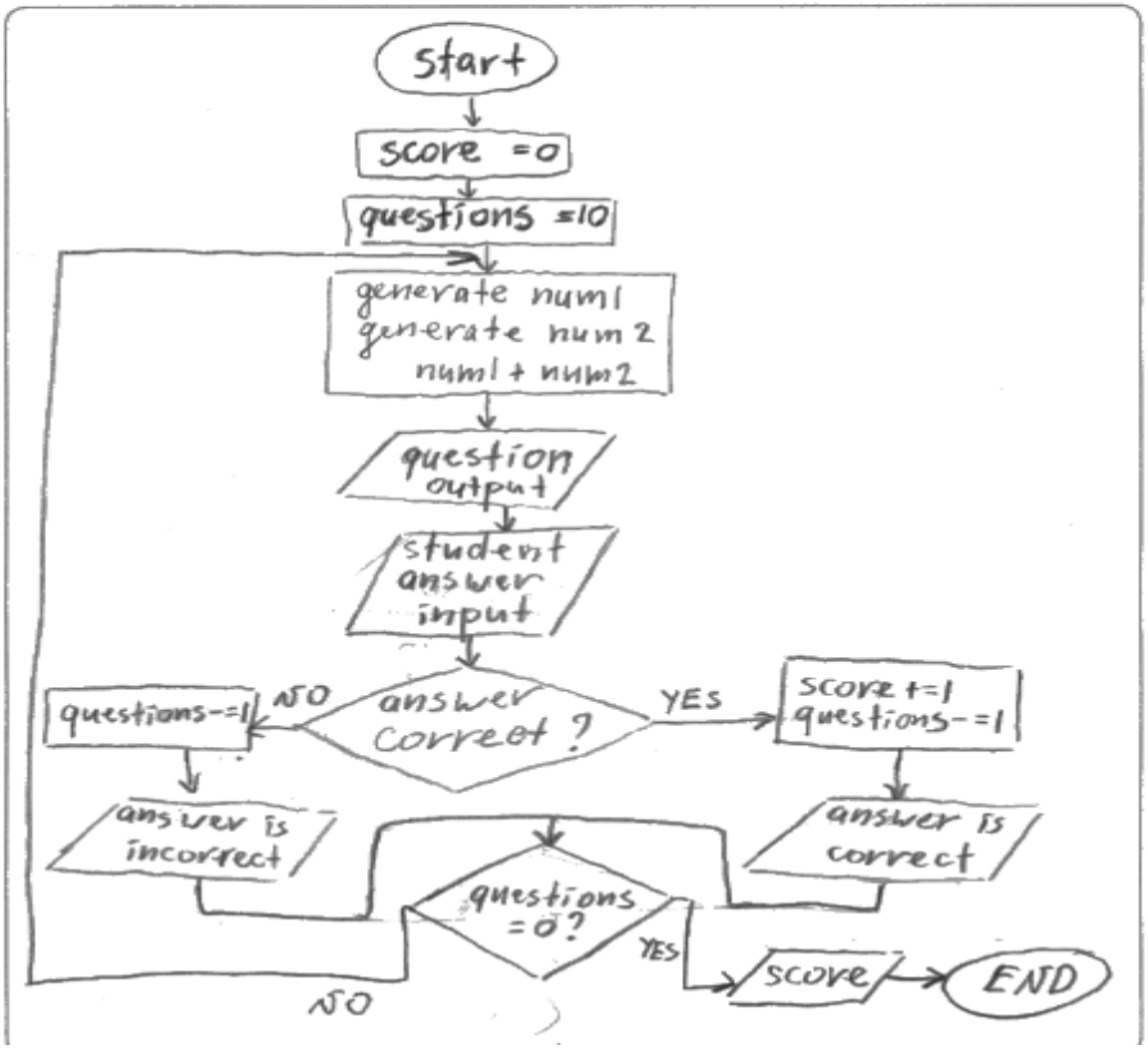
Most learners scored in mark band 1 or 2 for this question, although a good number gained mark band 3. Common reasons for not gaining the higher mark range included logic errors in the score counter or the number of questions counter.

(e) The teacher has developed the rules for the 'Addition' game.

- The game has 10 questions.
- The score starts at zero.
- The score increases by one for each correct answer.
- Two numbers are generated and then added together.
- The addition question is displayed.
- The student enters their answer.
- A message is output to the student telling them if their answer is correct or incorrect.
- At the end of the game their final score is displayed.

Draw a flowchart that meets the requirements of the rules of the game.

(8)



7 Marks awarded for:

Mark band three

Meets all of the criteria for mark band 3. Logic is correct, flow and conventions are correct. The lack of detail on the calculation (i.e. num1 + num2 is not clear that

this is the generated total for the question) means it does not achieve the full marks.

Question 3a (2 Marks)

Most learners gained 2 marks. Most were able to recognise the string values and the errors this would cause in a calculation. A common misconception was to state the £1 would be treated as the value 1 and therefore less than the other values, this type of response missed the fact that the array was of strings.

3 A ticket machine at a bus station prints out a ticket when payment has been made.

The rules for the machine are given in **Figure 6** in Section 3 of the Information Booklet.

(a) A programmer stores the values of the coins to be used in an array:

coins = [10p, 20p, 50p, £1]

Explain **one** problem that would occur when trying to generate a total if this array was used in the code for the machine.

(2)

the values in the array contain non-numerical characters meaning that they must be strings which cannot be mathematically manipulated

2 Marks awarded for:

A total cannot be calculated (1 Mark)

because the data is non numerical (1 Mark)

Question 3b (4 Marks)

Most learners picked up some marks on this question with a lot of learners scoring 1 or 2 marks. Leaners often simply described a loop without relating it to the scenario.

(b) Describe how branches could be used in the code for the machine so that it meets the rules.

(4)

if ~~no~~ more than 50p is inserted, no change is given This is an if statement that only happens if no ~~6~~ more than 50p is inserted. ~~A loop can be used~~ A While Loop can be used to Loop until the button is pressed.

~~The~~ The output only happens once the button has been pressed and all coins are inserted. If the wrong coin is inserted it should display "error".

4 Marks awarded for:

Check total >= 50p (1 Mark) awarded for "if no more than 50p is inserted.....more than 50p is inserted"

Check button pressed (1 Mark) awarded for "until button is pressed"

Print ticket if total is enough (1 Mark) awarded for "and all coins are inserted"

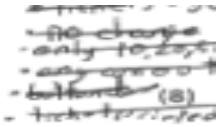
Check value of coin inserted (1 Mark) awarded for “if the wrong coin is inserted it should display error”

Question 3c (8 Marks)

Most learners were placed in mark band 1 or mark band 2 for this question. Most learners had a structure for input of coins, and for testing the values. Most also had a structure to issue a ticket when the button was pressed. Stronger learner responses had structures for dealing with wrong coins, and loops which were conditional on the correct amount or more being placed in the machine.

(c) Develop an algorithm to meet the rules for the ticket machine.

Use pseudocode for your algorithm.



```
BEGIN
total = 0
Cost = 50
INPUT
WHILE cost >0
    INPUT coin
    IF coin = 10p
        Cost = cost - 10
    ELIF coin = 20p
        Cost = cost - 20
    ELIF coin = 50p
        cost = cost - 50
    ELIF coin = £1
        Cost = cost - 100
    ELSE
        output coin
    ENDIF
ENDWHILE
INPUT Button
IF button = pressed
    Output 'date' + 'total' on ticket
ELSE
    Do nothing
ENDIF
END
```

total = total + coin

6 Marks awarded for:

Mark band 2.

A solution that meets most of the requirements with some inefficiencies.

Structure of the algorithm uses mostly appropriate hierarchies/subdivision to provide some clarity and readability.

Variable/object/process names are mostly appropriate but there is some inconsistency.

Logical operations and sequences/structure of processes used with some accuracy. For example, the total is not calculated correctly and there is no loop to check button press.

Accepted conventions have been applied but there are some inconsistencies.

Question 3d (10 Marks)

Most learners were placed in mark band 1 or mark band 2 for this question. The focus of this question was on pattern recognition and problem solving. The majority of answers identified the calculation of change and the need to have a supply of coins in the machine to provide change. The better responses identified the fact that there are only two ways to over pay, £1 or 3 x 20p. These learners often described a process of then rejecting extra coins after a sum greater the 50p was placed in the machine. Learners also gave some good responses based calculation of change.

(d) The rules of the ticket machine need to be modified so that it gives change if more than 50p is inserted.

Analyse the patterns, problems and processes a programmer would need to consider to develop a solution.

(10)

The programmer would have to think about the coins that the user can input and that those are the only coins the machine contains so it would have to use the same ~~coin~~ coins to give the change. This means that the process to ~~p~~ calculate the change ~~wi~~ would then ~~d~~ calculate how to repay the customer using the coins it has available. The pattern would be the coins that the machine can take as it can also only output ~~those~~ those same coins.

A problem would be getting the machine to output the correct coins and also that it must always have coins in order to repay the user. This would require the machine to have a float when it is emptied and for the coins to be ~~s~~ split into their respective amounts so that the float can be topped up.

However another problem could be running out of certain coins e.g. so many people pay with pound the machine runs out of 50p, and 10p, so can no longer pay the customers.

Another process would be ~~a~~ actually giving

the user the £ coins and how they will get their change.

10 Marks awarded for:

Mark band 3.

Addresses the problems associated with calculating and giving change including the need to have coins available in the right value, e.g. if it runs out of 50p and 10p, it can no longer give change for a £1. Addresses processes such as calculating the change and identifies problems with running out of change/coins.

Demonstrates mostly accurate and thorough/detailed knowledge and understanding.

Breaks the situation down into component parts and most of the points made will be relevant to the context in the question.

Displays a well-developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner.

Question 4a (6 Marks)

Most Learners were placed in mark band 1 or mark band 2 for this question.

Stronger responses consider all of the requirements and related the data required to fulfil them each, linking the data needed to each requirement. These learners considered all of the data that needs to be collected from customers, more than just name address as customers might have a different pick up point.

4 The owner of a driving school wants to use a computer program to help improve the administration of the business.

The owner has produced a list of requirements for the computer program. The rules are listed in **Figure 7** in Section 4 of the Information Booklet.

(a) Analyse the data and information that would be needed to meet the owner's requirements.

(6)

You would need to know when the appointments are for a number of reasons. So that you could send reminders so that less appointments are missed and also so you could send the instructors their daily appointments. The programmer would also need to know when learners theorys are valid to so that you know when they should be put in for test by. And which instructors have what type of car so they can be [redacted] offered to clients then assigned that instructor. They would also need where each client lives so that can be sent out to the instructors in their daily appointments and lastly if it is a lesson or a test appointment so that can be told to the instructor also. All of these are nessesiary to meet the program requirements.

4 Marks awarded for:

Mark band two.

The learner has analysed some of the requirements and has suggested the data required. For example, the type of car used by each instructor needs to be matched with the needs of the client (automatic/manual).

They have also noted the need to have the date of the theory test and linked this to not taking a test.

Demonstrates some accurate knowledge and understanding, with few minor omissions/any gaps or omissions are minor.

Breaks the situation down into component parts and some of the points made will be relevant to the context in the question.

Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.

Question 4b (8 Marks)

On the whole this question was not very well answered. Learners did not always focus on the inputs processes and outputs, instead they gave generic descriptions of what a programmer might do with the data. Also some learners did see the difference in the requirements of the question and simply described again the data requirements, without mentioning the processing and the outputs required to meet the desired outcomes.

(b) Discuss what a programmer would need to consider when developing a program that meets the requirements listed in **Figure 7**.

You should consider inputs, processes and outputs in your response.

(8)

The programmer will need to several inputs in order for the program to work. Firstly, an input would be required for the choice of a manual or an automatic car. This could be added from the user of a or drop down or instructor. Additionally, an input per mess also be needed for the details of the client. This should be their name, address and learner number. This will help meet the second to last and third to last requirement.

As well as input, for the programmer also need to consider the process needed to meet the requirements. Firstly, a process for the process of calculating the how much time is used on by tests and lesson appointments will need to be figured out so that a schedule can be created to divide the hours of the day up and assigning appointments to them. Another process that will be required is to calculate when a learner's theory is no longer valid.

Finally, output of the schedule to the instructor and appointment time for the learner which will help reduce the chance of clashes for the learner as they have a reminder. As well as this, an output of the drivers details would be necessary for the instructor to have.

5 Marks awarded for:

Mark band two.

The learner makes some good points about the requirement of data and processes. However, these are not developed for the top of the mark band to be awarded.

Demonstrates some accurate knowledge and understanding, with only minor gaps or omissions.

Some of the points made will be relevant to the context in the question, but the link will not always be clear.

Displays a partially developed discussion which considers some different aspects and some consideration of how they interrelate, but not always in a sustained way.

Question 4c (12 Marks)

Most learners were placed in mark band one or two for this question. The important part of this question was to analyse the use of data structures. The most common answers simply described the data structures listed in the question, without any links to the scenario. Learners need more guidance in how to answer this type of question.

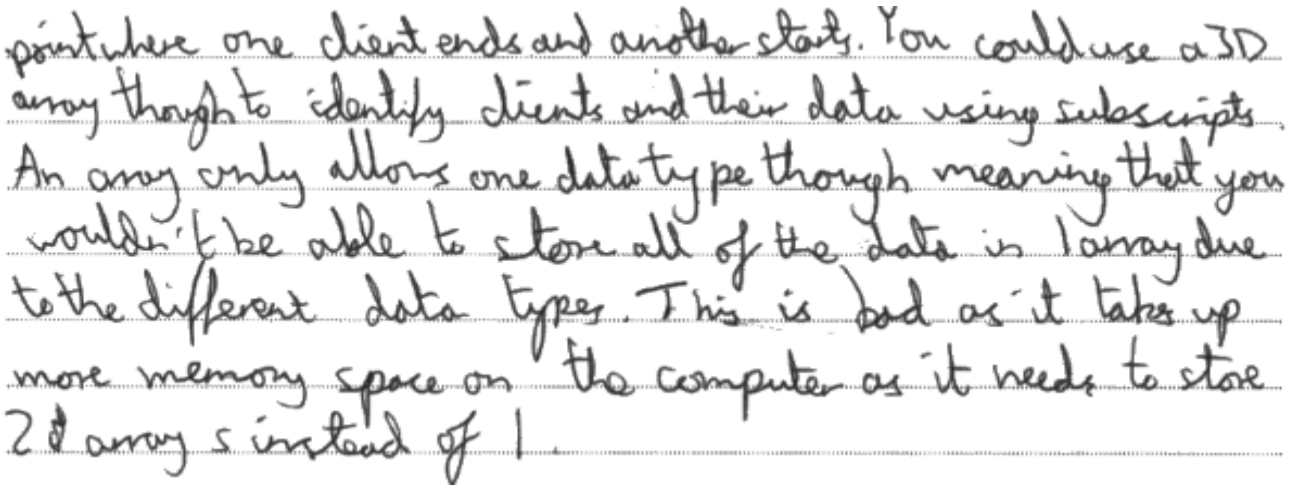
(c) The program uses data structures to store information and produce printed appointments lists for the driving instructors.

Evaluate the use of records, sets, lists and arrays to achieve this.

You should use examples appropriate to the scenario to support your evaluation.

(12)

Records would be effective at this as they contain different fields allowing you to store different data about each client in a database-type structure. Another benefit is that it allows you to store multiple data types meaning that you can store data such as the clients name, DOB etc. all in the same structure. A record also allows you to select each individual element of the user individually and allows you to search the data for a specific user for example. A set means that you wouldn't be able to store any duplicated values which would be bad as you wouldn't be able to have 2 students with the same name. Sets also only allow one data type meaning that you would have to store multiple sets containing different pieces of information. Sets also don't contain their order making it almost impossible to use as even if you do use multiple sets due to the different data types you won't be able to identify which belongs to which. However it is easier to perform searches and calculations such as intersection or union on the data to search for specific data. Lists are dynamic meaning that they new clients can easily be added to them as they aren't a fixed size whereas arrays are. Lists link data together using pointers meaning it would be more confusing to store data as there won't be an obvious



11 Marks awarded for:

Mark band three.

Fluent and accurate technical vocabulary is used to support arguments that are relevant to the issues of the question.

Most of the points made will be relevant to the context in the question, and there will be clear links.

Displays a well-developed and logical evaluation which clearly considers different aspects and competing points in detail, leading to a conclusion that is fully supported.

Summary

Overall learners' performance dropped in this series both in terms of level of knowledge and examination technique.

Based on performance in this examination series, learners are offered the following advice to help continue this improvement:

- Develop understanding of key terminology used in the unit so that you can access the context of the question.
- Ensure that when providing answers/information your response is applied to the given context.
- Continue understanding the requirements of the different command verbs used in the unit so that you can structure your response appropriately and maximise the marks you achieve.
- Further support on the requirements of command verbs can be found in the specification and in training materials published on the Pearson website.
- For shorter response questions (5 marks or less), make note of the number of marks available this will help you identify the number of points you need to make. For example, a 4 mark 'Explain one…' style question would need to make at least four linked points, three of which expand/exemplify understanding of a single point.
- When producing extended writing responses (6 marks or more) ensure you consider a range of points, each of which should be expanded or supported with examples and applied to the given context.
- Do not leave questions blank. If you are struggling, moving on to other questions and working your way through the paper is a good idea. But makes sure you come back and attempt all questions.
- Centres are encouraged to consult the 'Technology Update' which has been published on the BTEC website. This document defines the scope of the technologies that may be used in examinations such as defining the range of 'common protocols', 'input devices' 'utility software' etc. It should also be used in conjunction with the specification when planning and delivering content.

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