L3 Lead Examiner Report 1901

January 2019

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		
		P	M	D
Boundary Mark	0	21	36	51

Introduction

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

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 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 in the January series was similar to the 1801 examination series for this unit. The average mark per candidate has risen very 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, overall 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.

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. These should also be read in conjunction with those stated in previous lead examiner reports for this unit.

- Many learners seemed to get confused between a bubble sort and quick sort which gave many learners difficulty with the two questions associated with sorting.
- While learners generally had good knowledge of For loops and the exit command, many learners did not take account of the fact that that a FOR loop would repeat a set number of times.
- Many learners confused the simple mathematical operators, less than and greater than.

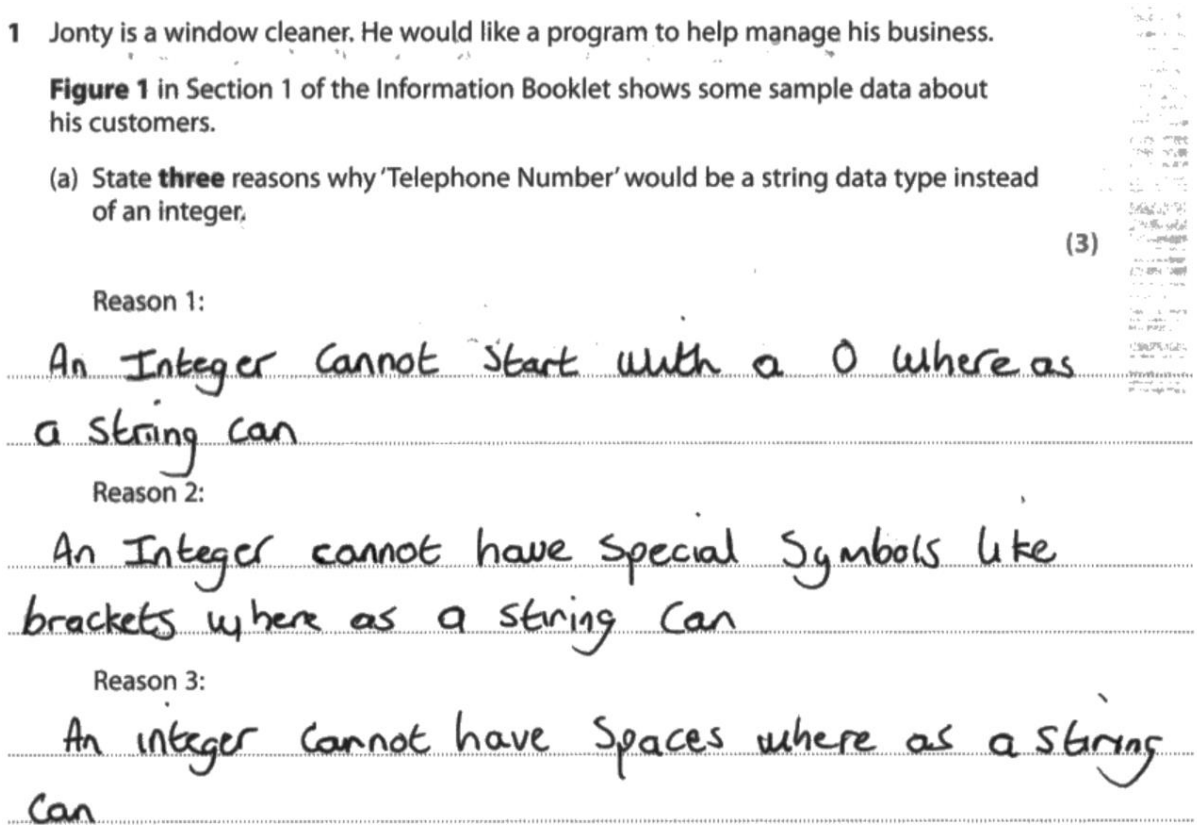
Individual Questions

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 (3 Marks)

The majority of learners gained three marks. Most learners were able to identify reasons why telephone number show in the information booklet would need to be stored as a string going to type.

Some learners however struggled to find a third reason is often suggesting that an integer could not hold enough digits, or almost a string would be easier to store in memory



1 Jonty is a window cleaner. He would like a program to help manage his business.

Figure 1 in Section 1 of the Information Booklet shows some sample data about his customers.

(a) State **three** reasons why 'Telephone Number' would be a string data type instead of an integer.

(3)

Reason 1:

An Integer Cannot start with a 0 where as a string can

Reason 2:

An Integer cannot have special Symbols like brackets where as a string can

Reason 3:

An integer Cannot have Spaces where as a string can

3 Marks awarded for:

"Cannot start with zero" 1 Mark

"Special symbols like brackets" 1 Mark

"Integer cannot have spaces" 1 Mark

When marking, examiners are reminded to look for answers holistically across the whole of the question.

Question 1b (2 Marks)

Most learners gained two marks. Most were able to accurately able to interpret the reason use of date of birth by stating that age changes and date of birth does not. Some learners went further and extended the answer to incorporate the discount being given when the person passes their 65th birthday

Jonty would like to offer customers over the age of 65 a 25% discount.

(b) Explain why Jonty would store a customer's date of birth rather than storing their age.

(2)

~~because~~ This is because an age will change whereas a date of birth will not, this means a customer can be offered a 25% discount on/from their ~~birthda~~ 65th birthday

2 Marks awarded for:

"age will change whereas a date of birth not" (1 mark)

"means a customer can be offered 25% discount on/from 65th birthday" (1 mark)

Question 1c (2 Marks)

Most learners gained two marks. The question wording was "fewer than two" therefore less than two was the requirement. However, many learners used incorrect numerical operator in the if line using the greater than (>) sign rather than less than. Another common error was to use of less than equals (<=).

2 Marks awarded for:

(c) Jonty would like to give each customer a status depending on the number of missing payments.

A customer's status is set to "Continue" when they have fewer than two missing payments. Otherwise the status is set to "Stop".

Complete this algorithm so that it meets these rules.

(2)

```
BEGIN
If MissingPayments < 2
    Status = "Continue"
ELSE
    status = "Stop"
ENDIF
END
```

2 Marks awarded for:

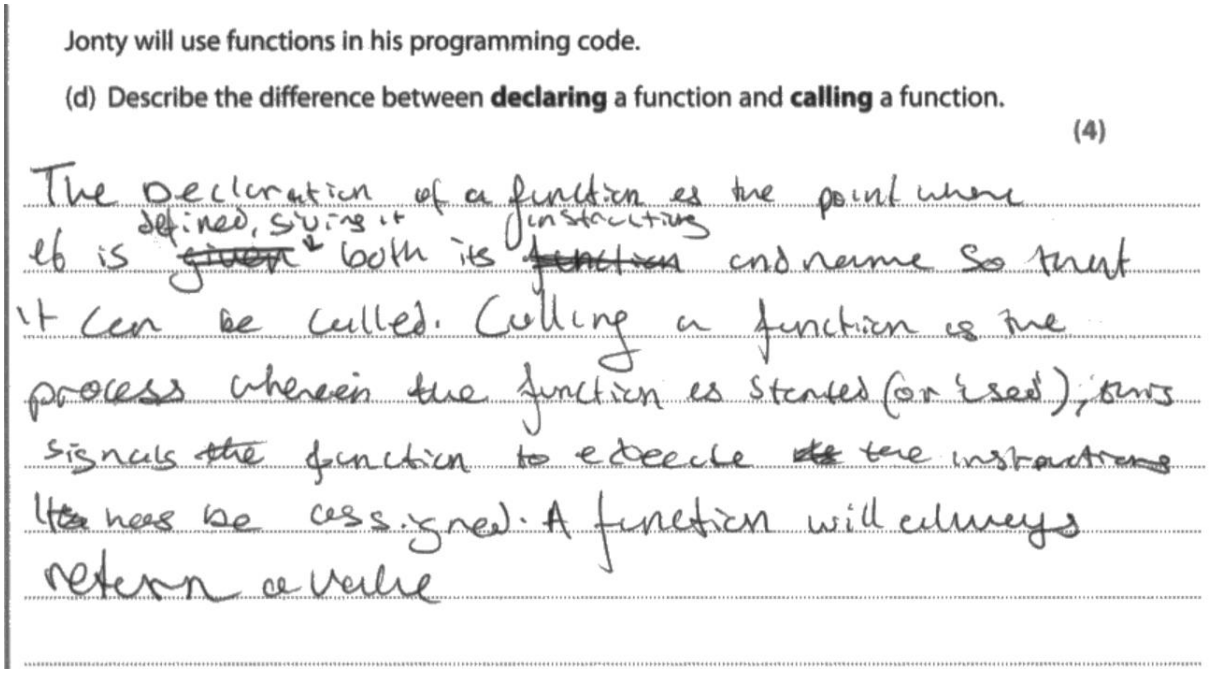
"Correct condition" (1 mark)

"Status = continue" (1 mark)

Question 1d (4 Marks)

Many learners managed to score four marks on this question. Most describe the difference between calling and declining function. However only a few referred to the execution of code or the multiple use of a function within the main code.

A common error was simply to define the meaning of a function.



Jonty will use functions in his programming code.

(d) Describe the difference between **declaring** a function and **calling** a function.

(4)

The declaration of a function is the point where it is defined, giving it both its instructions and name so that it can be called. Calling a function is the process wherein the function is stated (or used), this signals the function to execute the instructions it needs to process. A function will always return a value

4 Marks awarded for:

"declaring a function create the codes/defines what it will do" (1)

"(declaring) gives it a name/identifier" (1)

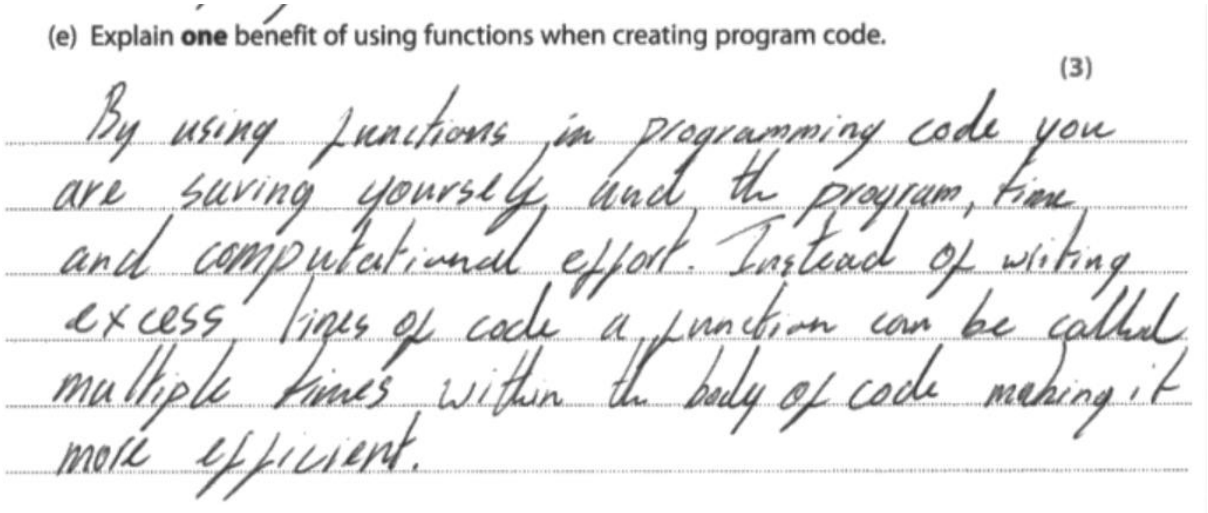
"calling the function executes the code" (1)

"(a called function possibly) returns a value" (1)

Question 1e (3 Marks)

Most learners picked up two or three marks for this question. The third mark was often missed as learner did not expand on the points they were making clearly. Most learners were able to state that a function could be defined ones are used many times but were unable to expand on this too clearly explain the benefits, such as increasing performance or reducing the time taken to write the code.

Very few learners referred to the use of functions which were stored as separate files which could be loaded as needed.



(e) Explain **one** benefit of using functions when creating program code.

(3)

By using functions in programming code you are saving yourself and the program, time and computational effort. Instead of writing excess lines of code a function can be called multiple times within the body of code making it more efficient.

3 Marks awarded for:

"saving yourself...time" (1 mark) - reduce development time

"can be called multiple times" (1 mark)

"making it more efficient" (1 mark) - alternative wording "increase the performance of the code"

Question 1f (8 Marks)

Many learners found this question challenging. Most learners picked up some marks with a lot of learners scoring 3 marks or more. Most managed to solve the main part of the problem and followed the requirements given in the table.

Most learners had the initial loop to validate the area number however they were unable to draw a loop to work through customer records. This was sometimes written as one large process such as 'go through all customers in the area'.

Learners were given credit for partial working solutions or solutions that met part of the requirements.

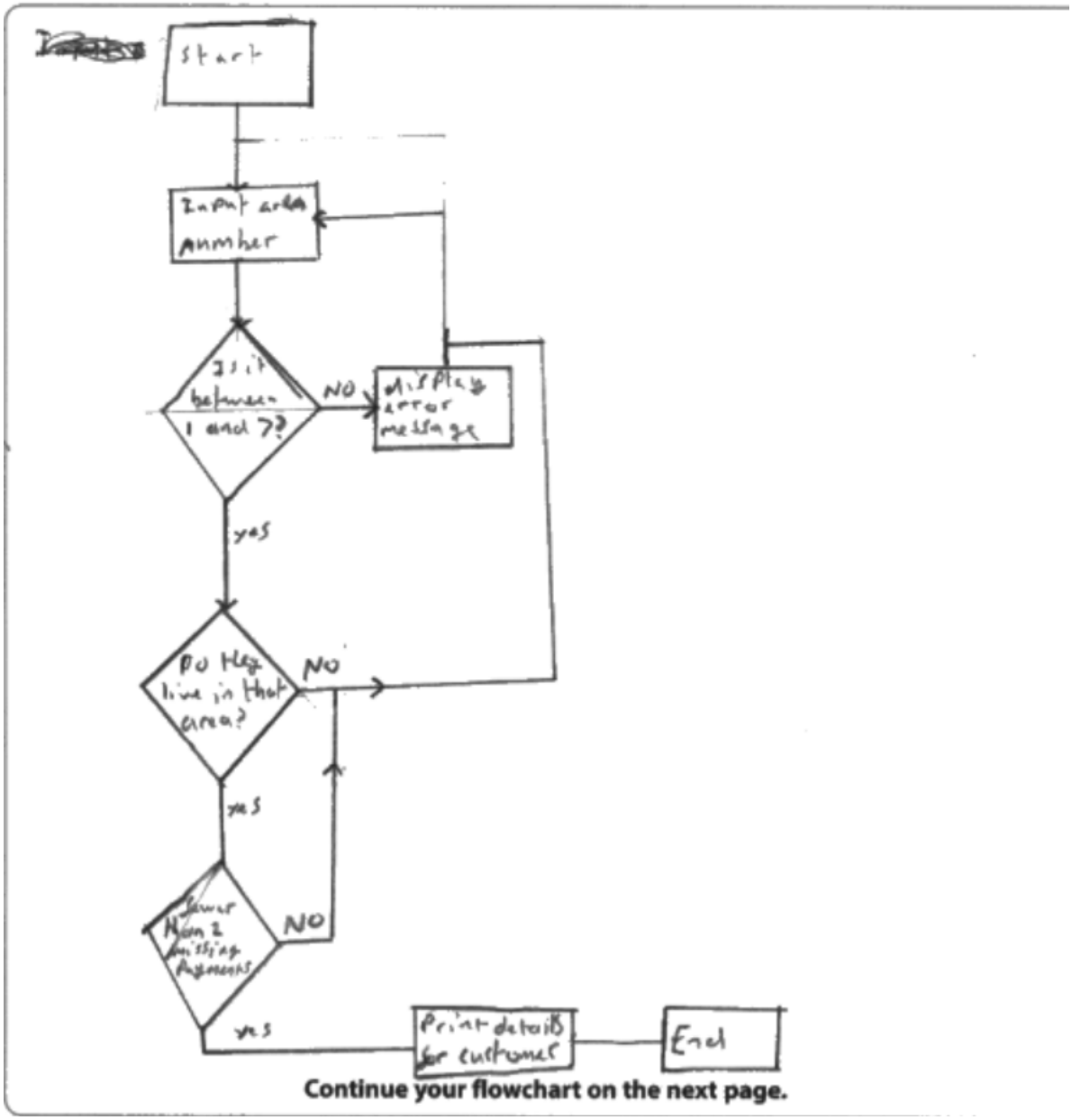
(f) Every morning Jonty will print a list of customers who will have their windows cleaned that day. They must live in the same area.

The requirements for his program are:

1. input an area number (e.g. 2)
2. display an error message if the area number is not between 1 and 7
3. search for customers who:
   - live in that particular area
   - have fewer than two missing payments
4. print the details of each customer who meets both of these criteria
5. it should repeat steps 3 and 4 until all customers have been checked.

Draw a **flowchart** that meets the requirements for the algorithm.

(8)



Continue your flowchart on the next page.

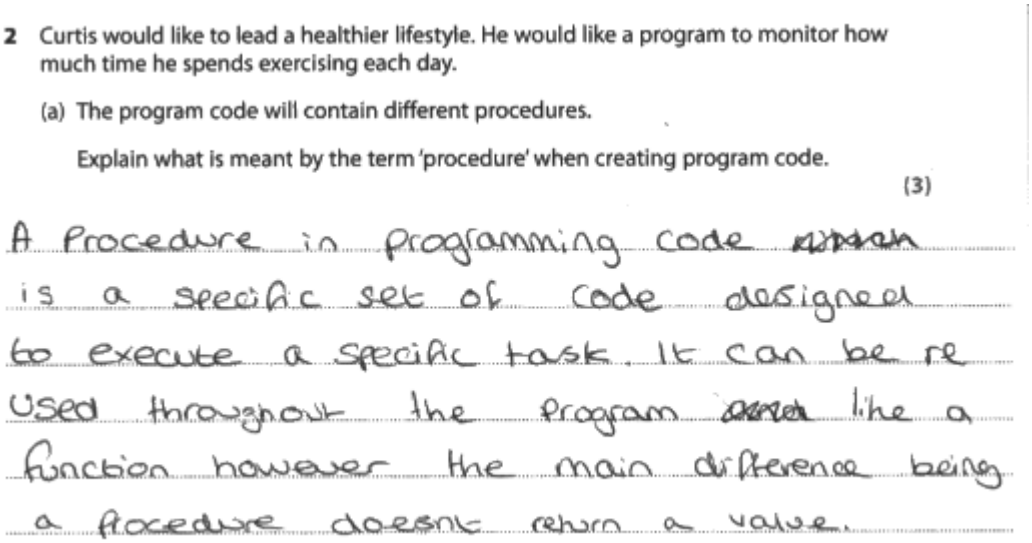
5 Marks awarded for:

Response was placed in mark band 2.

The flowchart provides an almost complete solution that matches the requirements. Some conventions are met, loops are used to control the verification of the area and missing payments.

Question 2a (3 Marks)

The majority of learners scored one or two marks for this question, most stated that a procedure was a block of code for a specific task, however did not become the third mark



2 Curtis would like to lead a healthier lifestyle. He would like a program to monitor how much time he spends exercising each day.

(a) The program code will contain different procedures.

Explain what is meant by the term 'procedure' when creating program code.

(3)

A Procedure in programming code is a specific set of code designed to execute a specific task. It can be re used throughout the program like a function however the main difference being a procedure doesnt return a value.

3 Marks awarded for:

A block (set) of code (1)

Designed to complete a specific task (1)

May not return a value (unlike a function) (1)

Question 2b (4 Marks)

Many learners were able to score four marks on this question. However, a number of learners did not address the main part of the question which was the relationship between the loop and the break statement. A common feature of

many answers was to explain that the break called the loop to end but did not link this with the passwords matching.

(b) Curtis will use a password to access his program. He has written an algorithm to compare a stored password with a user input. This is written in pseudocode.

```
BEGIN

storedPassword = ComputerScience1#

INPUT enteredPassword

FOR count = 1 TO 3

    IF storedPassword = enteredPassword THEN
        BREAK
    ELSE
        INPUT enteredPassword
    ENDIF
NEXT count
ENDFOR

END
```

Explain the relationship between the **FOR** loop and **BREAK** statement in the pseudocode.

(4)

The For Loop is there to ensure that the user ~~has~~ has 3 attempts at entering the password. If the user fails an input, then the counter increases. The break is there so that any correct password attempt breaks the cycle and allows the user to ~~procede~~ proceed.

4 Marks awarded for:

'has 3 attempts at entering the password' – (1 mark)

'user fails an input the counter increases' (1 mark)

'correct password attempt breaks the cycle' (loop) (1 mark)

'allows the user to proceed' – (1 mark)

Question 2c (4 Marks)

Most learners scored three or four marks for this question. Where learners did not score four marks it is often due to the condition used. Once again using the wrong arithmetic operator learners is confused less than with greater than.

Some learners clearly mixed the answer to this question with the code from the previous question.

(c) Curtis would like to expand his program to make sure a new password is a minimum length.

The rules for the algorithm are:

1. check the password is at least eight characters long
2. only continue if the password is of the correct length
3. when the password is the correct length print "Accepted".

Develop an algorithm that meets the given rules.

Write your answer using pseudocode.

(4)

```
BEGIN
    REPEAT
        INPUT Password
    UNTIL Password.Length >= 8
    ENDREPEAT
OUTPUT "Accepted"
END
```

4 Marks awarded for:

LOOP used - 1 mark

Suitable LOOP condition - 1 mark

Suitable logic for entering the new password - 1 mark

Suitable logic for printing the "accepted" message - 1 mark

Question 2d (5 Marks)

Learners generally did not perform very well on this question, many did not know how a quick sort works. The most common error was to describe or demonstrate a bubble sort. Learners frequently failed to clearly identify the pivot value. Successful candidates almost always demonstrated the recursive solution with very few examples of the inplace solution used.

Curtis has recorded the number of minutes he has exercised each day over a seven-day period.

He wants to sort this data into order from lowest to highest. He will use a standard sorting algorithm.

(d) Demonstrate how a **quick sort** can put the data in order from the lowest number to the highest number.

Use the **left-most value** for the pivots.

(5)

44	75	23	12	55	43	33

original 44 - 75 - 23 - 12 - 55 - 43 - 33

first → 23 - 12 - 33 - 43 - 44 - 75 - 55

at first it will move all the variables that are lower than 44 to the left of 44 then it will find another pivot in the left side

then → 12 - 23 - 33 - 43 - 44 - 75 - 55

since 33 is the pivot is 33 and it is in the correct place it will check the numbers to the left and sorts them

then → 12 - 23 - 33 - 43 - 44 → 55 - 75

it then returns to original pivot and since it is all sorted to the left it will find a pivot to the right and sorts them by swaping 55 and 75 and the the numbers are all sorted

4 Marks awarded for:

From the 2nd line of numbers, it is clear that 44 is the pivot (1 mark)

To the left of 44 are unsorted numbers less than 44 (1 mark)

To the right of 44 are unsorted numbers greater than 44 (1 mark)

Incorrect pivot shown in the 3rd line of numbers 23 and 33 should not be sorted at this stage, so mark point 4 **not** awarded. However, following through with this error, gives mark point 5 because the learner has correctly applied the process based on incorrect pivots from previous stage (1 mark).

Question 2e (4 Marks)

Most learners picked up some marks on this question with a lot of learners scoring 2 or 3 marks. Learners were able to describe the process of checking through the list making comparisons to the adjacent value followed by the swap if needed. Most however, failed to mention the need for nested loop and the final loop making sure the numbers are in the correct order.

Curtis could use a bubble sort to put the data in order from the lowest number to the highest number.

The exercise times are shown again here for your reference.

44	75	23	12	55	43	33

(e) Describe how a bubble sort would use **loops** to sort the exercise times into order.

(4)

Bubble sorts repeat the same code over and over until no more swaps are made. A FOR loop would be used to compare and examine ~~each~~ each item with the next, and swap the data if the left-most is larger than the right-most. A count (set to 0 ~~at the start of each~~ before the for loop) will count how many swaps were made. A WHILE loop will loop the FOR loop until no swaps are made (a WHILE loop loops until a condition is met) thus meaning the data is sorted.

4 Marks awarded for:

- make use of 2 loops (1)
- inner loop will iterate code a set number of times (1)

- to check each adjacent value / swap if needed (1)
- outer loop will make sure there is the correct number of passes / until data is sorted (1)

Question 3a (4 Marks)

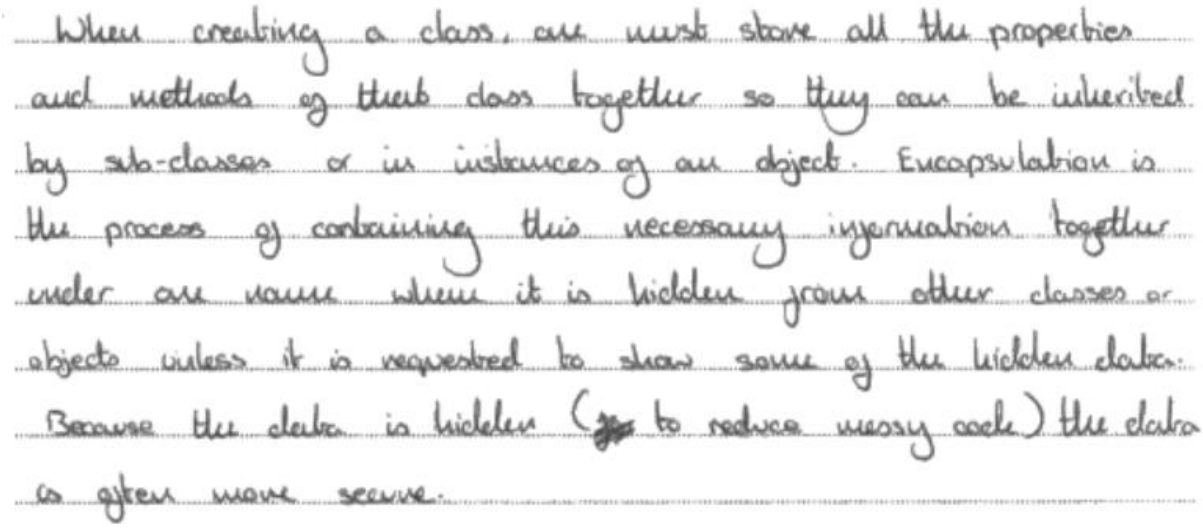
Most learners achieved two or three marks for this question, most of answers showed a very limited understanding of encapsulation. Frequently Learners would attempt a description of object orientated programming or described some features of object orientated programming. Such answers gained little credit.

Please refer to Section 2 of the Information Booklet in order to answer Questions 3(b) and 3(c).

3 Theo owns a restaurant. He would like a program to manage his table bookings. The programming code will be written using an object-oriented programming language.

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

(4)


When creating a class, one must store all the properties and methods of that class together so they can be inherited by sub-classes or in instances of an object. Encapsulation is the process of containing this necessary information together under one name where it is hidden from other classes or objects unless it is requested to show some of the hidden data. Because the data is hidden (to reduce messy code) the data is given more security.

3 Marks awarded for:

- "Joins/wraps data and functions together" (1)
- "Run using an identifier/name" (1)
- "Contents are kept hidden from outside an object" (1)

Question 3b (8 Marks)

Most learners picked up some marks on this question with a lot of learners scoring marks in bands 1 and 2. However, leaners often misunderstood the question and produce answer on various validation techniques to be used rather than post check actions. Learners' responses were often limited in depth and detail for the demand of the question. The question requires learners to discuss which requires a detail response.

(b) **Figure 2a** shows the design of the screen that will be used to enter the details of bookings in the restaurant.

Theo will use data validation rules to check if the data entered by users is reasonable.

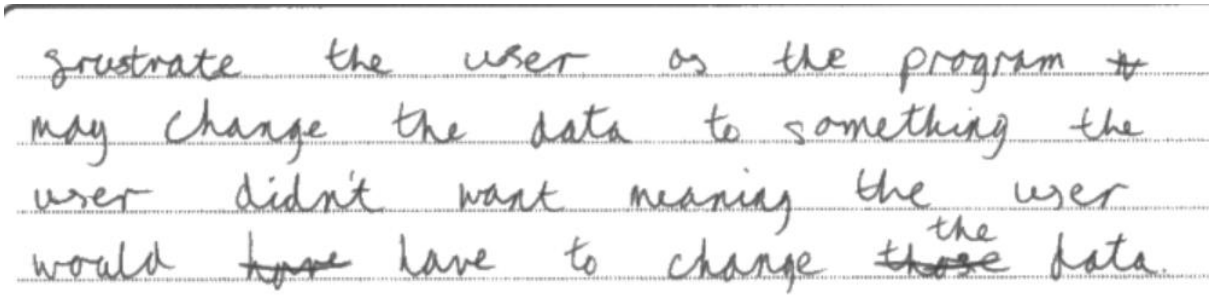
If data entered is not reasonable the program will use **post-check** actions to either alert the user or attempt to modify the entered data.

Discuss different **post-check** actions that could be used.

(8)

One post check action that can be used is ~~pulling~~ putting ticks and crosses next to the ~~the~~ entered data depending on is they're reasonable or not reasonable. Another method can be telling ~~a~~ the user through an on-screen message and telling the user what they need to change or is it's all been accepted. ~~It~~ The message would be better as the user would know what to change instead of leaving them confused or ~~and~~ making the program do it.

The program can also modify the data such as changing ~~first~~ the first letter of a name to a capital ~~if~~ is it's lower case and changing the seating option is one isn't selected. However, this could



4 Marks awarded for:

Response is placed in mark band 2
The learner identifies a number of suitable post-check actions and makes some attempt to link them to the given scenario.
Chains of reasoning are limited; the response is primarily descriptions of an action but with no explanation of suitability or use.

Question 3c (10 Marks)

Most learners were placed in mark band 1 or mark band 2 for this question. The majority of learners simply described the 3 types of control structures only a few students managed to tie this in to the scenario which is needed to achieve full marks.

(c) **Figure 2b** shows the plan of Theo's restaurant and the rules that are followed to find a table.

Theo will structure his code using a combination of sequence, conditional and iterative control structures.

Analyse how Theo could use these control structures in his program code to meet the rules given in **Figure 2b**.

(10)

Conditiond Cotrol ~~Structures~~ Structure Could be used, to chect if the option selected by the user is available. Sequence Could then be used to Search for the most space efficient table for the custom for example the program could first check the Selected table, and use a conditiond Statement to check weather this table is large enough for this Customer. Iteration Could then be used to repeat this for all tables in the Selected area of the resterant. Another way in which Sequence could be used would be to ~~the~~ ensure that the program is Coded in a logical way for example the user must ~~the~~ enter the amount of seats needed before the program attempts to find a available table. Iteration can also be used to ensure that there is any tables available by looping a process which would check the Status of each table, and find if any are availble. This would also be used in Sequence as if no tables are available this Could be outputted to the user before they attempt to Select a table.

7 Marks awarded for:

Response is placed at the top of mark band 2.

The technical vocabulary is used to support arguments in this response but not always accurate for example, the learner talks about using sequence to search which is not technically correct however their analysis of how selection and iteration can be used are very good.

While the quality of the iteration and selection parts of the response show characteristics of the top mark band, because of the inaccuracies of the first part of the response it is limited to the middle mark band.

Question 4a (6 Marks)

Most learners were able to write about interfaces, and described buttons, their uses and how they might provide an easy to use interface. Some went on to write about event driven programming however most focused only on event triggers. Many learners therefore produced limited responses relating to the buttons or how to use selection and if statements in the code

A few learners presented information on features of event driven program however they failed to link this to the scenario.

4 Poppy is preparing for her GCSE exams. She would like a program that will help her to organise her revision time for each subject.

Figure 3a in Section 3 of the Information Booklet shows the first design for the main menu.

(a) Analyse how the features of event driven programming would make it suitable to create the main menu in **Figure 3a**.

(6)

Event driven programming is suitable to create the menuse as shown in figure 3a because the programming environment provides a main loop that will continuously look for an event to occur within the program. For example if the mouse pointer is hovered on the 'subject list' box then a pop up will appear to tell the user what kind of input is acceptable (as a hint). Also she could have an 'on click' event to create the timetable as soon as all of the mandatory details are filled in. The exit button could also make use of such event when clicked. In event driven programming, you could also have a time driven object that responds to the actual time of the day so that she could set the time table and a reminder would be set alongside it as well (like an alarm).

A trigger function and event handlers are mostly available in the programming environment inside the library of code so coding-wise it would be pretty simple as you only need to set the variables. A callback function will allow the codes to be ran in the background when an event occur and return the value when it's done.

5 Marks awarded for:

Response is placed at the bottom of mark band 3.

The Learner has referred to the program:

Making use of a user interface and therefore the program will respond to user interacts.

A mouse / get focus event could be setup for when the user clicks on the individual buttons with the mouse.

A hover event could be setup to display messages when the user moves the mouse cursor over individual items on the user interface.

A time driven function can be used

Event Handlers will be assigned to the events and will run when an event takes place.

Question 4b (8 Marks)

On the whole, this question was not very well answered. Only a few learners knew the meaning of abstraction, answers often comprised of a few lines defining abstraction. Very little was written as to how this applied to the scenario.

As a result, many learners were placed in mark band 1 for this question.

Figure 3b in Section 3 of the Information Booklet shows the rules that should be followed when producing a revision timetable.

Figure 3c in Section 3 of the Information Booklet shows an algorithm that Poppy has developed.

(b) Analyse how Poppy has made use of **abstraction** when designing her program.

You should refer to **Figure 3b** and **Figure 3c** in your response.

(8)

Abstraction was used effectively as everything was separated into 'layers' and can be easily understood. The Rules were easy to understand as everything had been decomposed into simple ~~exmple~~ sections then later on Abstracted into parts, they were all arranged into the same type of data shown in 3c. They're all arranged in a Pattern in 3b or sequence to allow further efficiency and a better use in abstraction. The breakdown of the tasks and dates in figure 3c shows a separation of dates in line 3 to line 9. line 2 shows a comment meaning they're all labelled into different sections which makes it easier to understand.

The term use of layers can be seen in 3c as its all separated into different areas, each area having data relevant to each other, rather than having a disorganised code. This shows abstraction was used as everything was simplified and easy to comprehend

4 Marks awarded for:

Response is placed in the top of mark band 1.

The response shows some understanding of the process of abstraction. There is some linking to the scenario. Chains of reasoning are not clear and are superficial.

Question 4c (12 Marks)

Most lenders were placed in mark band one or two for this question. On the whole, the question was not well answered with many superficial answers simply pointing out errors in the code.

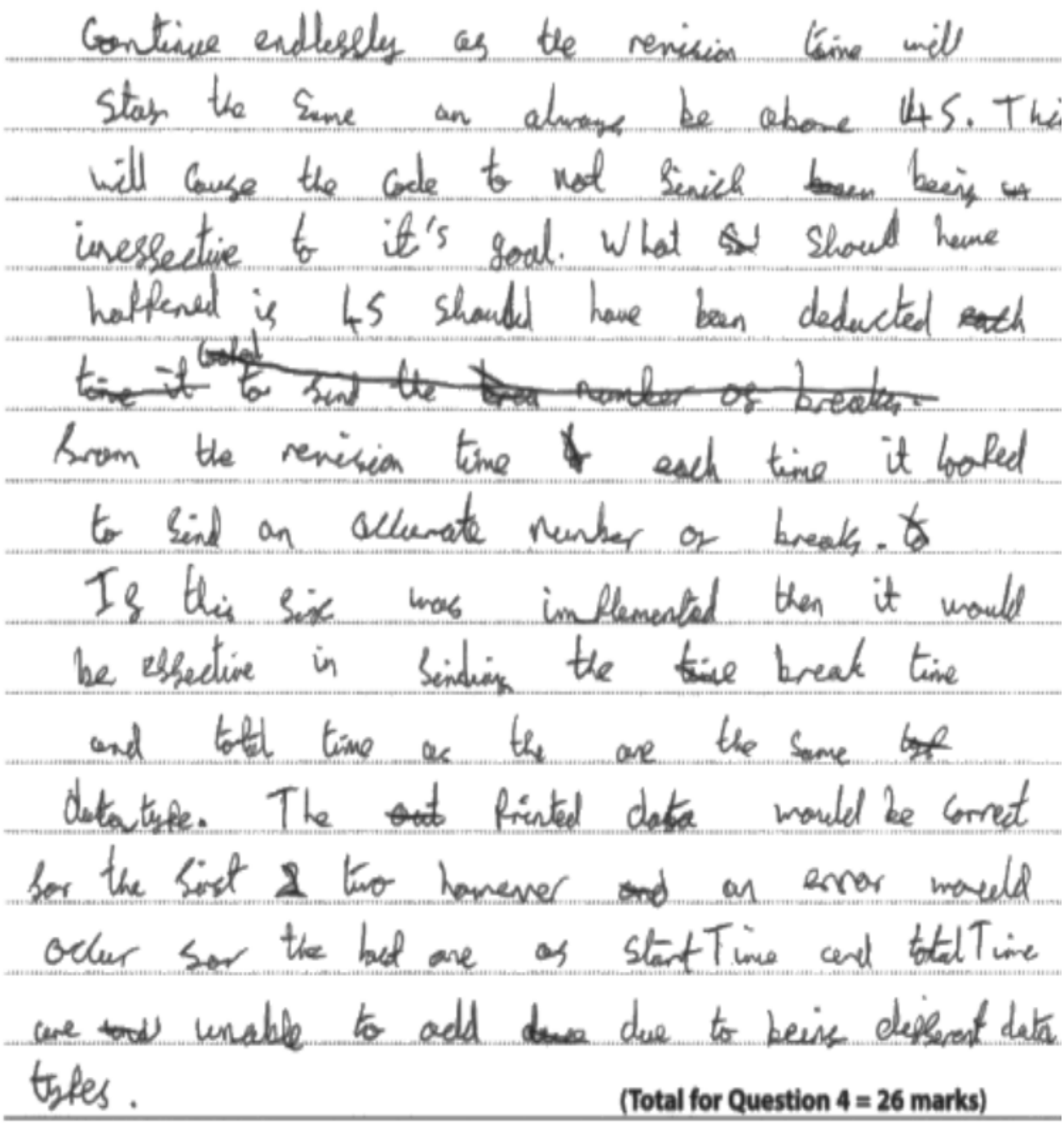
Learners tended to write a critique of the algorithm concentrating on the few errors in the code with little other discussion there were very few comments on efficiency, structure, comments or variables.

(c) Evaluate the extent to which the algorithm meets the algorithm rules.

Your evaluation should cover the effectiveness and accuracy of the algorithm.

(12)

Section A is effective as this allows for the number of subjects be calculated by the the user only having to enter the date instead of the subjects matching the first rule. Section B is effective as it made all the variables needed to come from the code and meet the rules. The second rule is met as the user is able to enter the time within the algorithm and is set a string variable. The for loop meets rules 3 as this accurately ~~ok~~ allows the number of subjects to be counted. However rule 4 is not meant as 3c Section D shows the equation used is ~~as~~ to workout revision time is number of subjects / 60 while the rules state that revision time would be calculated by number of subjects multiplied by 60 meaning the answer will no longer be accurate ~~as~~ or efficient. ~~when it~~ When it comes to calculating breaks me can see that it would cause the loop to ~~so~~



Continue endlessly as the revision time will stay the same an always be above 45. This will cause the code to not finish being as ineffective to it's goal. What should have happened is 45 should have been deducted each time it looked to find the next number of breaks from the revision time & each time it looked to find an alternate number of breaks. If this fix was implemented then it would be effective in finding the time break time and total time as the are the same data type. The printed data would be correct for the first 2 two however and an error would occur for the last as startTime and totalTime are unable to add due to being different data types.

(Total for Question 4 = 26 marks)

7 Marks awarded for:

Response is placed in mark band 2

The response shows a good evaluation of the errors in the program and how it meets the given rules. It evaluates the impact of the errors and draws some conclusions within each section. However, these are not drawn together to bring a final conclusion.

Summary

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

- Ensure that learners make full use of the information booklet when answering the exam questions. When candidates are referred to the information booklet, they should make sure that their answer is specific to the information / program code / rules or other stimulus given.
- 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.
- 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.
- 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.

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