



Examiners' Report Lead Examiner Feedback

January 2022

Pearson BTEC L3 Nationals
In Computing (31768H)
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>

Awarding BTEC qualifications in 2022

Ofqual has [set out their plans](#) for awarding qualifications in 2022 and intend to return to a normal, pre-pandemic, approach to grading standards over by 2023. They have confirmed that 2022 will be a transition year, to reflect that we are in a pandemic recovery period and students' education has been disrupted.

Our guiding principle and approach to awarding BTEC qualification results in 2022 will be to ensure parity in relation to the approach being taken for GCSE and A level learners. BTEC courses have a different structure and design to academic qualifications - BTECs are modular qualifications (with assessments taking place throughout the course) compared to GCSEs and A levels which are linear (assessed and awarded at the same time at the end of the year), and therefore our approach needs to be different.

In 2022 we will return to the usual method of calculating BTEC qualification results, however adaptations including, U-TAGs and reduced internal assessment, are in place to provide a comprehensive package of support for students.

The basis of our awarding approach to BTECs this year is to ensure it is as fair as possible for all learners. We will use a range of evidence to set grade boundaries for the external units. Part of this evidence will be to closely monitor learner performance in all assessments that contribute to learners' final qualification grade, to ensure parity with A level and GCSEs.

Further information can be found [on our website](#) and via our Social Media channels.

31768H: Principles of computer science

Grade	Unclassified	Level 3			
		N	P	M	D
Boundary Mark	0	9	19	33	47

Introduction

This was the 8th 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 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.

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 was slightly poorer than the previous series for this unit. It was evident throughout the range of responses that many learners had not covered the specification in full and subsequently were not fully prepared for the assessment. This was particularly evident in questions that required learners to apply their knowledge.

It is expected that learners will apply their knowledge and respond with answers that are related to each scenario of the assessment. In order for learners to apply their knowledge, learners must be confident with the basic understanding of programming principles. However, in many cases this was not evident in questions that required learners to discuss, analyse or evaluate. In many instances learners were not able to meet the demands of these higher order command verbs, which resulted in many learners achieving lower marks.

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.

Individual Questions

Question 1a

Most learners gained at least 2 marks for this question, where they were able to identify the correct lines of code for calculation and branching. However, in many instances learners were not able to identify the correct line of code for placing an item on the stack.

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 darts player has written an application (app) to keep score of a darts game.

(a) **Figure 2** on Page 4, in Section 1 of the Information Booklet shows part of the pseudocode for the app.

(i) Identify a line of code that performs a calculation.

3

(1)

(ii) Identify a line of code that uses branching.

8

(1)

(iii) Identify a line of code that places an item on a stack.

18

(1)

All lines of code have been correctly identified for each part.

3 marks awarded

Question 1b

Most learners picked up at least 2 marks for this question. Most were able to identify loops and comments would improve the pseudocode.

(b) Identify **three** ways that the pseudocode in **Figure 2** could be improved.

- (3)
1. Instead of repeating code, use loops to minimize code.
 2. Include comments to explain each distinct part.
 3. Use more proper names (score instead of s).

- 1- Loops - 1 mark
- 2- comments - 1 mark
- 3- Proper names - 1 mark (meaningful variable names)

3 marks awarded

Question 1c

This was a very accessible question, and most learners gained the full 2 marks.

(c) State **two** inputs the app needs to calculate the total score for each turn.

- (2)
1. The input of the stack "s"
 2. Each player's pre-existing score.

- 1- implies input of dart score - 1 mark
- 2- starting score - 1 mark

2 marks awarded

Question 1d

This question could cause some confusion with the learners as quite a lot mixed up stacks with queues. Rather than saying it is LIFO, learners were commenting on a stack being FIFO which is more associated with a queue.

The app uses a stack.

(d) Describe how stacks handle data.

(2)

A stack ^{handles} ~~stores~~ data on a last in first out basis which means data on the top must be removed first to access data at the bottom of the stack.

1- last in first out - 1 mark

2- data on the top must be removed first - 1 mark

2 marks awarded

Question 1e

This question was poorly answered as most learners did not understand the concept of using a loop within pseudocode. The answer needed to set score to zero at start, loop 3 times, remove value from the stack and add value to the total. Most learners simply removed one item of data and used this to provide a total.

(e) The score for each dart thrown during a player's turn is held in a stack.

Write a section of pseudocode that will produce the total score using the three scores held in the stack.

You should make sure that your pseudocode is as efficient as possible.

(4)

START

total_score = 0

POP 3

output

OUTPUT = ("Your total score is", total_score)

END

1- Remove value from stack – 1 mark.

1 mark awarded

(e) The score for each dart thrown during a player's turn is held in a stack.

Write a section of pseudocode that will produce the total score using the three scores held in the stack.

You should make sure that your pseudocode is as efficient as possible.

(4)

totalScore = 0

FOR i FROM 1 to 3 DO # Loop three times

~~score~~ POP score # Pop an item from the stack into variable, "score"

totalScore = totalScore + score

END FOR

PRINT (totalScore) # Not necessary, but still nice.

- 1- Zero score at start (1)
- 2- Uses a Loop to retrieve data (from stack) (1)
- 3- Remove value from stack (1)
- 4- Add value to total (1)

4 marks awarded

Question 1f

Some learners picked up marks for this question with a lot of learners scoring 1 or 2 marks. Many learners were able to identify that the trigger function responds to an input but most failed to expand on this.

Figure 1 in Section 1 of the Information Booklet shows the screen interface for the app.

The screen interface was created using an event-driven programming language.

(f) Explain the meaning of the term 'trigger function'.

(3)

A trigger function is code that responds to input. This input can be either from the system or user. The code would then execute a certain instruction dependent on that input.

- 1- Code responds to input (1 mark)
- 2- from the system user (1 mark)
- 3- code would then execute a certain instruction dependent on that input (1 mark for decides on what code to run)

3 marks awarded

Question 1g

This question was poorly answered. A lot of learners simply commented on general programming concepts such as loops and IF statements. This question was focusing on features of Event Driven Programming but demonstrated that learners lacked the knowledge of this programming language.

(g) The interface uses a trigger function for the update score button.

Explain **one other** feature of event-driven programming that could be used in the app.

(3)

Event driven programming has loops as the structures., which makes it very efficient
Mainly uses for GUI (graphical user interface) which is perfect for the darts program.
Could be easily developed and modified.
Helps user to interact with the program easily through keyboard, buttons or mouse.

No rewardable material.

0 marks awarded

(g) The interface uses a trigger function for the update score button.

Explain one other feature of event-driven programming that could be used in the app.

(3)

event handlers ~~is~~ could be used to pass specific code on to be executed in response to specific events, for example the ~~or~~ double button pressed event could trigger a function to carry out the appropriate calculation this would negate the need for if statements within the code. Event handlers receive a trigger from event listeners in response to an event. In turn carrying out code.

- 1- event handlers - 1 mark
- 2- could be used to pass specific code on to be executed - 1 mark
- 3- in response to specific events, for example the double button pressed - 1 mark

3 marks awarded

Question 2a

Many learners had managed to successfully pick up marks for this question.

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

2 A petrol station uses a computer system to manage the fuel pumps and the digital price sign.

(a) Section 2 of the Information Booklet shows details of the LED display units and how they work.

Complete 'Array 3' and 'Array 4' to show how 115.8 would be stored.

(2)

Array 1

off	on	on	off	off	off	off	off
-----	----	----	-----	-----	-----	-----	-----

Array 2

off	on	on	off	off	off	off	off
-----	----	----	-----	-----	-----	-----	-----

Array 3

on	off	on	on	off	on	on	off
----	-----	----	----	-----	----	----	-----

Array 4

on	on	on	on	on	on	on	off
----	----	----	----	----	----	----	-----

Arrays 3 & 4 match the mark scheme.

2 marks awarded

Question 2b

Many learners managed to pick up marks for this question, where the majority of responses were related to a presence check.

(b) Describe **one** validation technique that could be used for the array.

(2)

A presence check, checks if an input
has been inputted. Checks whether on or
off has been inputted.

- 1- presence check - 1 mark for identification
- 2- checks if an input has been inputted - 1 mark for expansion

2 marks awarded

Question 2c

This question was not very well answered as most learners picked up on variables from the question and focused on these, rather than what was required from the question.

(c) Code needs to be developed to control the processes for dispensing fuel and charging customers.

The programmer has identified the variables that would be needed.

State **four other** parts of the system that need to be identified to solve the problem.

(4)

- 1 Input
- 2 Output
- 3 Repeated ~~Process~~ Process
- 4 Key Process

- 1- inputs - 1 mark
- 2- outputs - 1 mark
- 3- repeated processes - 1 mark
- 4- key processes - 1 mark

4 marks awarded

- (c) Code needs to be developed to control the processes for dispensing fuel and charging customers.

The programmer has identified the variables that would be needed.

State **four other** parts of the system that need to be identified to solve the problem.

(4)

- 1 Calculating the amount of fuel to be dispensed
- 2 Working out how much the fuel is ~~needed~~
- 3 Charging the customer the money that the fuel costs.
- 4 Dispensing the fuel amount.

1- Calculating the amount of fuel to be disposed - calculation - 1 mark

1 mark awarded

Question 2d

Majority of the learners had either achieved 1 or 0 marks for this question. Learners did not fully read the second part of the question, which asked for an integer rather than the full decimal number.

The computer stores the volume of fuel in litres dispensed by four pumps for the last 10 customers.

The array shows an example of this data. The data is stored in row major order.

62.4	8.7	88.8	55.1	23.2	81.6	97.0	77.0	23.7	10.3
66.4	20.7	25.7	79.4	62.0	55.5	12.1	40.3	91.3	63.6
29.2	33.3	42.8	28.3	51.8	32.9	5.8	95.6	20.7	35.5
50.8	6.3	83.9	7.7	19.7	51.7	28.5	57.8	31.1	74.9

- (d) Give the output generated by the given pseudocode statements.

(2)

Output item (2,3)

28.3

Output integer (item (1,2))

25.7

1- 28.3 - 1 mark

1 mark awarded

Question 2e

Most learners achieved at least half marks for this question which is pleasing to see. Some didn't fully understand how to truncate the number and simply removed the whole decimal point rather than the second decimal point.

This can be achieved by using rounding or truncation.

The volume measured by the pump is 23.56 litres.

(i) State the result of rounding the volume.

(1)

would round up to 23.6

(ii) State the result of truncating the volume.

(1)

would shorten to 23.5

(iii) Explain **one** possible drawback for the petrol station if the programmer chooses truncation as the method.

(2)

Loss of money
~~would be a~~ as it ~~reduces~~ ^{makes} the
number smaller meaning a customer
would pay for less

- 1- (i) correct result - 1 mark
- 2- (ii) correct result - 1 mark
- 3- (iii) loss of money - 1 mark
- 4- (iii) a customer would pay for less - 1 mark

4 marks awarded

Question 2e

This question was poorly answered. Most learners did not understand the concept of using nested loops to calculate the volume of fuel used. Loops are a major part of the computing specification but is a weak area for a lot of learners so more work is needed on this topic.

(f) A program is needed to find the total volume of fuel sold in the example data.

Write pseudocode to calculate the total volume of fuel sold. The results should be rounded to the nearest litre.

(6)

Start
~~fuelAmount = INPUT fuel amount~~
~~fuelType = INPUT fuel type~~
 PumpOne = ([0,0] + [0,1] + [0,2] + [0,3] + [0,4] +
 [0,5] + [0,6] + [0,7] + [0,8] [0,9])
 PumpTwo = ([1,0] + [1,1] + [1,2] + [1,3] + [1,4] + [1,5] + [1,6]
 + [1,7] + [1,8] + [1,9])
 PumpThree = ([2,0] + [2,1] + [2,2] + [2,3] + [2,4] +
 [2,5] + [2,6] + [2,7] + [2,8] + [2,9])
 + [3,0] + [3,1] + [3,2] + [3,3] + [3,4] +
 [3,5] + [3,6] + [3,7] + [3,8] + [3,9])
 TotalFuel = PumpOne + PumpTwo + PumpThree + PumpFour
~~PumpFour = [~~
 OUTPUT TotalFuel, "Litres"
 END

Response retrieves data from the array using indexes and then calculates a total. This response demonstrates some understanding of retrieving data from an array. This response is sufficient to award mark band level 2.

3 marks awarded

Pump1 = [62, 9, 89, 55, 23, 82, 97, 77, 24, 10]
 Pump2 = [66, 21, 26, 79, 62, 56, 12, 40, 91, 64]
 Pump3 = [29, 33, 43, 28, 52, 33, 6, 96, 21, 36]
 Pump4 = [50, 6, 84, 8, 20, 52, 29, 58, 31, 75]

~~Pump1TOT = Pump1[0] + Pump1[1] + Pump1[2]~~

Pump1TOT = Pump1 [0+1+2+3+4+5+6+7+8+9]

Pump2TOT = Pump2 [0+1+2+3+4+5+6+7+8+9]

Pump3TOT = Pump3 [0+1+2+3+4+5+6+7+8+9]

Pump4TOT = Pump4 [0+1+2+3+4+5+6+7+8+9]

FuelTOT = Pump1TOT + Pump2TOT + Pump3TOT +
 Pump4TOT

This response is not suitable to retrieve data from the array. The solution should be accessing a pre-existing array and retrieving the data, this solution creates an array and then tries to add up the data which demonstrates a lack of understanding.

0 marks awarded

Write pseudocode to calculate the total volume of fuel sold. The results should be rounded to the nearest litre.

(6)

```
FOR row IN RANGE (9)
  FOR column IN RANGE (3)
    total fuel = total fuel + array [row] [column]
  ENDFOR
ENDFOR
// Loops through every element of the array and adds to
// the total

total fuel = ROUND (total fuel)
IF ((total fuel * 10) MOD 10) < 5
  total fuel = TRUNC (total fuel)
ELSE
  total fuel = TRUNC (total fuel) + 1
```

Nested loops used to retrieve data from array. Calculation for total fuel is suitable, round has been calculated using IF statement. Variable names are suitable. The solution is complete and efficient so full marks awarded.

6 marks awarded

Question 3a

This question was answered well with most learners achieving the full three marks.

- 3 A school keeps records for school visits and trips. The staff use a database to store all the information about pupils, payments and costs.

The database will be available online to help parents and pupils keep track of their records.

Each user will have a user ID and a password.

- (a) The user ID must be between 5 and 30 characters.

Complete the IF statement used to test the user ID length.

(3)

```
IF length(userid) >= 5 AND 
  Output 
ELSE
  Output 
ENDIF
```

Condition for IF statement is correct.
Both outputs are fine.

3 marks awarded

Question 3b

This question was not answered very well which is surprising. A lot of learners confused platform independence with only having the database available on one device. This question should be been very accessible for the learners but there were a lot of zero marks awarded.

(b) Explain the importance of 'platform independence' for users of the online database.

(3)

This allows their information and data to be stored separately and with privacy. This is as ~~other parents~~ ^{users} ~~students~~ won't be able to see other users' data. This provides a level of security for each user and can prevent data leaks. Users are able to access all their information.

0 marks awarded

Platform independence would allow users to ~~access~~ ^{access} access the online database from virtually any device (smartphone, laptop, etc.) regardless of its size or operating system. This allows more users to reach the ~~database~~ database as ~~every~~ ^{nearly} every modern device contains a web browser which can display the HTML, CSS, and process JavaScript in (ideally) same way, which allows users to have a similar experience across their devices.

- 1- access the online database from virtually any device - 1 mark
- 2- this allows more users to reach the database - 1 mark can be given for widely accessible
- 3- which allows users to have a similar experience across their devices - 1 mark

3 marks awarded

Question 3c

Responses to extended answer questions are marked using levels-based mark schemes, with the quality of the response determining the level. There are four levels; level 0 where there is no rewardable material presented and then levels 1, 2 and 3; the higher the level the better the quality of response.

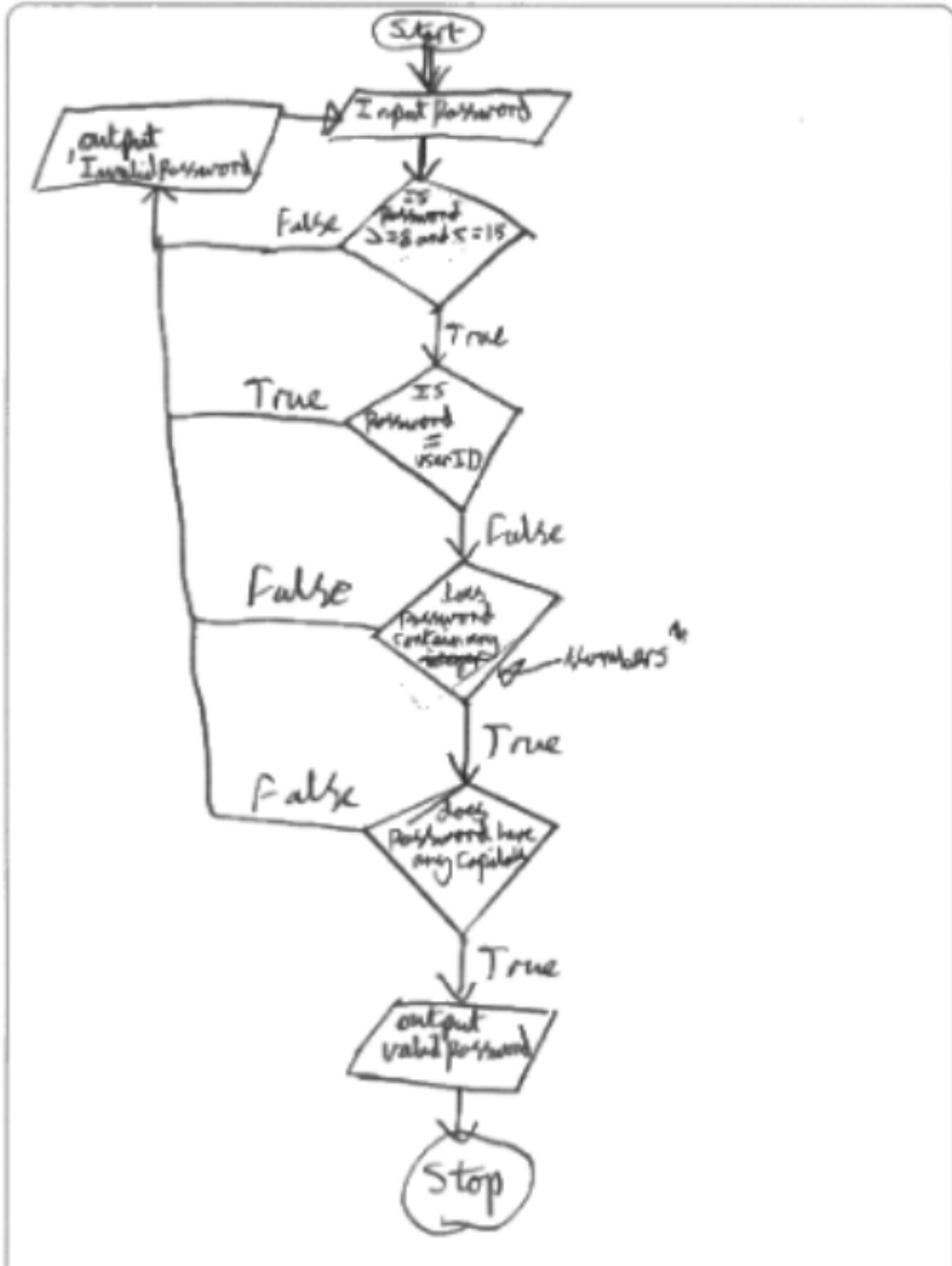
Compared to previous exam series this flow chart question was answered very well with a lot of learners achieving top of mark band 2 or mark band 3.

Marks are given for structure of the flowchart, appropriate variable names, logical operations and meeting the requirements.

(c) Users of the database must create a password. **Figure 5** in the Information Booklet shows the rules for an acceptable password.

Draw a flowchart that shows the process of checking that a user's password meets the rules.

(8)



6 marks awarded

Correct symbols used and the flowchart provides a logical sequence, which includes an error message.

To access the level 3-mark band, we would expect the process of checking for uppercase and numbers to be broken down and more meaningful error message.

The flowchart meets all of the requirements of level 2 on the mark scheme:

Structure of the flowchart 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.

Accepted conventions have been applied but there are some inconsistencies.

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

Question 3d

Performance on this question was quite poor with many learners not providing sufficient quality of response to gain credit. The main issue with learner responses was interpretation of the question. The majority of answers were generic IT security issues, rather than security issues of implementing code on a web platform such as SQL injection etc...

(d) Code is needed to allow users to access the database through the school website.

Analyse the security implications of implementing code that will manipulate the database on a web platform.

Your answer should include possible security issues and ways in which these could be reduced.

(10)

Database can hold Confidential data which is often a target of hackers or malicious users who try to gain access to it through malware or brute force, manipulating a database can leave it vulnerable to attempts to breach into it, using things like firewalls placed within code or encryption can greatly minimise the threat of exterior users

There is reference to some general internet security issues but it is very brief. If learner only mentions general internet issues in their response, they cannot go any higher than level 1-mark band.

Responses should focus on implementation of the code.

1 mark awarded

Question 4a

Responses to extended answer questions are marked using levels-based mark schemes, with the quality of the response determining the level. There are four levels; level 0 where there is no rewardable material presented and then levels 1, 2 and 3; the higher the level the better the quality of response.

This question was not answered well by the learners, it is clear they are not being taught any in-depth knowledge of why programmers would develop new code and the impact this would have on organisations.

(a) The hire shop must change the existing code so that it will run on new hardware.

Discuss the implications of developing the new code and the impact this will have on the hire shop.

(6)

The development of new code is a lengthy process and this could have a negative affect on the shop. It could mean that the shop would have to close whilst the code is built, meaning that the shop won't make money.

The code may not work properly and important data, like what equipment has been hired, could be lost or isn't secure and can be tampered with.

The new code may allow for more efficient storing of hire data and can help the shop manage equipment better.

There is a mention of data being lost and also a positive comment which may allow for more efficient storage. The rest of the response is not valid as the shop would not close when it is being developed. This response meets the level 1-mark band descriptors.

2 marks awarded

Question 4b

Responses to extended answer questions are marked using levels-based mark schemes, with the quality of the response determining the level. There are four levels; level 0 where there is no rewardable material presented and then levels 1, 2 and 3. The higher the level the better the quality of response.

This question uses the command verb discuss. This requires learners to examine a topic in detail, breaking it down into its component parts and discussing how effective each part of the pseudocode is and what improvements could be made.

This question was not well answered by the learners. A lot of the responses referred to general pseudocode readability improvements such as comments, blocks of code etc. The focus of this question was for the learners to demonstrate an understanding of the pseudocode and suggest some possible improvements for example a loop.

(b) Equipment hire and return dates need to be validated. The pseudocode used to do this is shown in **Figure 6** of the Information Booklet.

Discuss the effectiveness of the code and any improvements that could be made.

(8)

An effective part of this code is the IF statements such as "IF month > 12 OR month < 01". This is an effective line of code because it makes sure that the user does not input a number bigger than 12 or smaller than 1 for the month date.

A part of this code that could be improved is the OUTPUT statements such as "OUTPUT "date not valid"". I think this could be improved by being more user friendly and more colonial. An example ~~could~~ could be "the date is not valid, please try again!".

A part of this code that could be improved is the layout and readability of the pseudocode. Having the day, month and year blocks of code sectioned off with a line in between may improve the readability of the pseudocode.

One key point described such as, the code check for range for the month field to ensure a valid number is entered. Improvements have been discussed such as, an output message when a valid date has been entered and readability improvement. However, the expansion of the output message paragraph has only limited discussion and the points made about readability are not relevant to the question.

3 marks awarded

Question 4c

Responses to extended answer questions are marked using levels-based mark schemes, with the quality of the response determining the level. There are four levels; level 0 where there is no rewardable material presented and then levels 1, 2 and 3; the higher the level the better the quality of response.

This question was not answered well by the learners, it is clear they are not being taught any in-depth knowledge of server-side or client-side processing/scripting. Centres are encouraged to teach all aspects of the specification in-depth so the learners have knowledge of all topics.

Serverside processing is done on the server of the shop, whereas client side processing is done on the clients computers. The site itself will be hosted on a server but the client will have to load the webpage onto their computer which will open and run a client side script. The ~~database~~ client would try to log in and it would send a signal to the server side database. The server will then try find the information and check for a match. If it matches, the server will send back a request and load up the web page with the client

This response just demonstrates some understanding of client side and server side without linking it back to the question. This can only be placed in level 1 as the response must be linked back to the question to be put at higher level.

2 marks awarded

Summary

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

- 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.
- More emphasis is needed on the more technical parts of the units such as loops and branching.
- 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.
- 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.
- 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 3 mark 'Explain one...' style question, learners would need to make at least three 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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