Pearson
BTEC

Examiners' Report
Lead Examiner Feedback

June 2022

Pearson BTEC Nationals
In Computing (31769H)
Unit 2: Fundamentals of Computer Systems

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June 2022
Publications Code 31768H_2206_ER

Introduction

The BTEC L3 Nationals in Computing unit 2 (Fundamentals of Computer systems) became available for first teaching in September 2016.This is the ninth time in total the examination has been sat by learners. This is the first full summer series following the disruption caused by the global pandemic. Examination opportunities will continue to be available for this unit twice a year in January and May/June. This unit is a mandatory unit for all learners studying either the Extended Certificate (360 GLH), Foundation Diploma (510 GLH) or Extended Diploma (1080 GLH).

This unit, along with Unit 1 (Principles of Computer Science), are assessed through a written examination paper. The examination is designed to test learners' understanding of computer systems within a range of contexts. The paper is divided into four main questions, each with a number of sub parts. Each main question is based around a unique scenario; each scenario is outlined at the beginning of that question and additional information and/or stimulus is provided with individual parts as required.

While appropriate credit is given for learners who demonstrate appropriate 'stand-alone' knowledge, more successful learners can apply their understanding to the scenarios provided in the question.

The paper is designed to assess the full grade range of the qualification; as such the paper is ramped so that it gradually increases in difficulty as the questions progress with a higher percentage of 'Pass' targeted marks in the earlier parts of the paper and the higher-grade questions towards the end.

Introduction to the Overall Performance of the Unit

Whilst detailed analysis of specific questions in the paper appears later in this report, it should be noted that overall learner performance, in terms of average (mean) mark, was broadly in line with the previous comparable series (Summer 2019).

Understanding of the basic subject knowledge and vocabulary was an area identified as a cause for concern in previous examinations, and for many learners this still continues to be a hurdle to accessing the paper and achieving higher marks. Many learners' responses still show significant gaps in knowledge from the core content of the specification. Many learners had significant number of blanks in their responses, with some of the more technical areas of the specification resulting in quite poor learner performance across the entire cohort.

Generally, learners demonstrated an understanding of the requirements of different command verbs. However, many learners still do not demonstrate the depth of knowledge or application to make maximum benefit of more extended responses. In particular, in response to the larger explain/describe questions (three or four marks), learners often do not provide sufficient detail or linked responses to gain maximum marks. This is an area centres are encouraged to explore further with learners. Application to the scenario is also often lacking, while many learners can recall key facts and information, often this is not effectively applied to the given context.

In the comparable series (Summer 2019) progress had been made in the quality of the quality of responses in the extended writing questions (6, 8, 10 and 12 marks). In January 2022, there was significant performance issues here. This series (June 2022) there have been some clear improvements. Whilst there are improvements to be made with the coverage and understanding of the unit specification, this was particularly apparent with Q3b and Q3c which performed quite poorly, some of the responses seen for the extended questions displayed good understanding, where these learners were able to access the full range of marks and expected outcomes across the ability range.

Centres are encouraged to look at the sample assessment materials, previous papers and sample marked learner work with learners, to ensure they are familiar with the design and expectation of the paper. Ensuring that learners are aware of the requirements of particular

command verbs, definitions of which can be found in the specification for this unit, would greatly improve learner performance.

Though it was clear that some centres have made use of a range of support materials, such as the sample assessment materials, there was still many learners repeating answers verbatim from sample materials/past papers when presented with similar topics. While these learners were able to demonstrate some understanding and were duly credited, these responses were often not applied to the given scenario and therefore often only demonstrated superficial understanding.

Centres are encouraged to work with learners in exploring Computing use in a range of scenarios and adapting responses to suit these scenarios.

Individual Questions

Question 1a

Learner performance on this question was quite disappointing. Many learners were not able to provide an example of an appropriate feature form a database, many responses either conflated spreadsheets and databases, or provided uses/definitions of databases rather than features they provide. Where learners did provide examples of features typically they were able to identify the ability to create queries (searches) and often how they can provide centralised data storage.

Question 1b

Majority of learners were not able to provide correct responses for this question. Learners across the attainment spectrum either did not provide an answer, or provided an answer that was incorrect. It would appear this area of the specification (Binary Coded Decimal) has been neglected, with only a very small percentage of learners being able to access the content.

Question 1c

Performance on this question was generally good, with most learners able to access marks, and the majority of those able to access all three marks. Although there were some learners that appeared to not be able to access the specification area, where marks were mostly lost was due to minor transcription of addition errors.

Question 1d

Most learners were not able to provide a response that was able to gain credit. Looking at this question along with 1b and 1c, it would appear that this is an area of the specification that has been neglected in some centres. There have been many disruptions to teaching and delivery over the last 2 years, so some gaps in knowledge are to be expected.

Centres are encouraged however to ensure the full range of the specification is covered.

Where learners did access marks, typically responses showed an understanding of the upper limit of an 8 bit binary number. Few learners were able to apply this to the context.

Q1d Example response :

(d) Explain **one** drawback of using standard 8-bit binary numbers to store the quantity and total for the warehouse system.

(3)

using 8bit doesnt allow for values bigger than 255 which while each item may be kept below that number the total would likely not either way this limits the amount of stock the system can track

Lead examiner commentary:

'doesn't allow for values bigger than 255' (1).
'while each item may be below...the total would likely not' (1) – shows understanding of appropriateness for the total/task.
Limits the amount of stock the system can track (1).

3 marks total

Question 1e

Learner performance in this question was generally very poor, with only a small number of learners accessing marks. The performance here is reflective of a larger trend in the paper, in that many learners did not have appropriate understanding of key terminology, specifically in technical areas of the specification. In this question many learners did not understand the difference between a connection type (e.g. Wi-Fi, USB cable) and a communication channel (e.g. Simplex, Duplex).

Question 1f

Learner performance on this question was generally very pleasing with a wide range of outcomes seen that reflect ability range of the cohort. Most learners were able to gain at least 2 marks with a significant number gaining 3 and 4 marks.
Typically, learners were able to identify the improved input speed and increased accuracy of data input from a scanner as opposed to a keyboard. Where learners were less successful, they were not able to provide a suitable linked, contextual expansion.

Q1f Example response:

(f) The item code can also be entered using a keyboard.

Explain **two** reasons why a barcode scanner might be a more suitable input device.

(4)

Reason 1

It's more efficient as you can quickly scan the item which is almost instantly found instead of typing a long/complicated code which would take some time

Reason 2

While entering the code manually there's a high chance of miss typing the code as it's long and complicated, then you would have to start over again which is inefficient and time consuming, the scanner removes the risk of miss

Lead examiner commentary:

Reason 1

"more efficient" (1) .
"scan item…instead of typing in long complicated code" (1) – this is the reverse of expansion for MKPT2 of the mark scheme.

Reason 2

'manually there is a chance of mis typing' (1) Scanner removes the risk of mistyping (1). Th is the reverse of MKPT1 in the mark scheme.

4 marks total

Question 1g

Learner performance on this question was generally poor with many learners not accessing any marks. As highlihted in some other questions in this report, there appear to be some signifcant gaps in knoweldge, partiuclarly in more technical aspects of the specificaiton, across the cohort. Where learners did provide mark worthy repsonses, often these only showed a superficial understing of the checksum process and typically only gained 1 out of the 3 marks available.

Question 2a

Learner performance on this question was broadly in line with expectations. Most learners were able to provide at least 1 additional cost with the majority of learners gaing at least 2 out of the 3 marks.

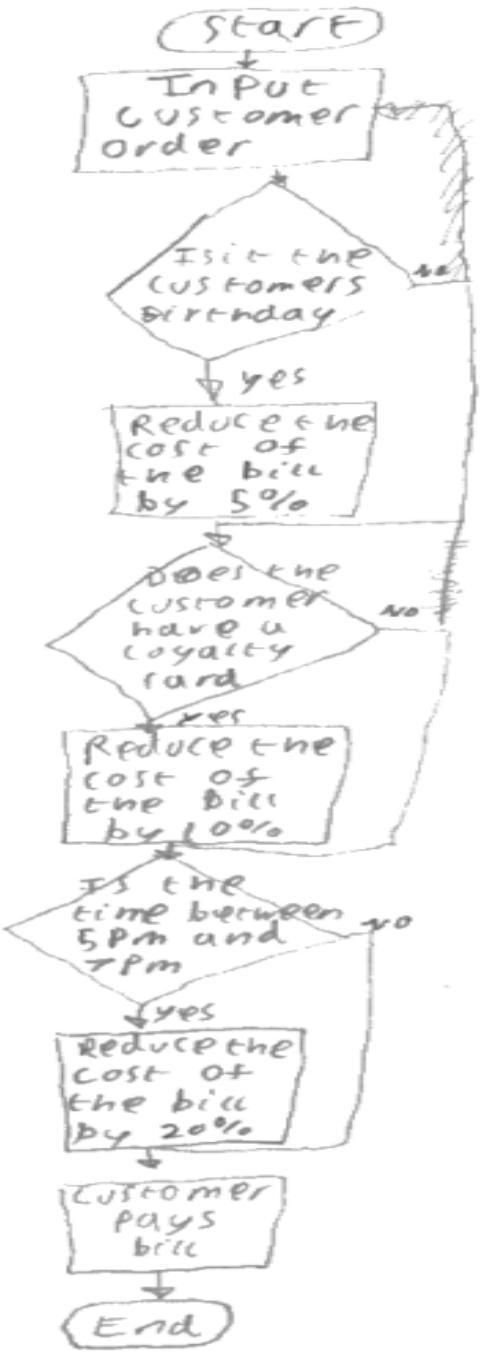
Question 2b

Overall, the majority of learners were able to provide two suitable output devices with most of those being able to link them to appropriate business needs for the given scenario.

Question 2c

Most learners were able to access some marks on this question, although responses were typically only demonstrated sufficient quality to access mark levels 1 and 2. Often, the flowcharts provided did not demonstrate correct logic or calculations for applying the discounts to the bill.

Q2c Example response 1:



Lead examiner commentary (2c Example 1):

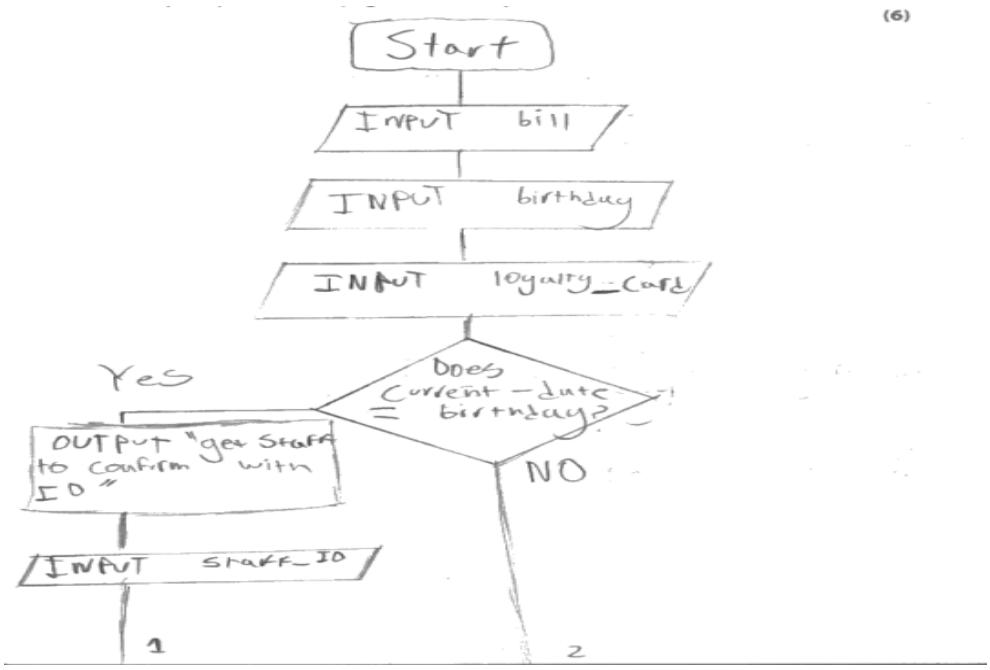
The flowchart is mostly appropriately structured but is not always fully clear (crossed out lines and data flow).
There is some use of accepted conventions.
Content of calculations is correct but no use of variables names or the actual calculation shown.
Does not check for proof of birthday and initial bill total is only implied (get customer order).

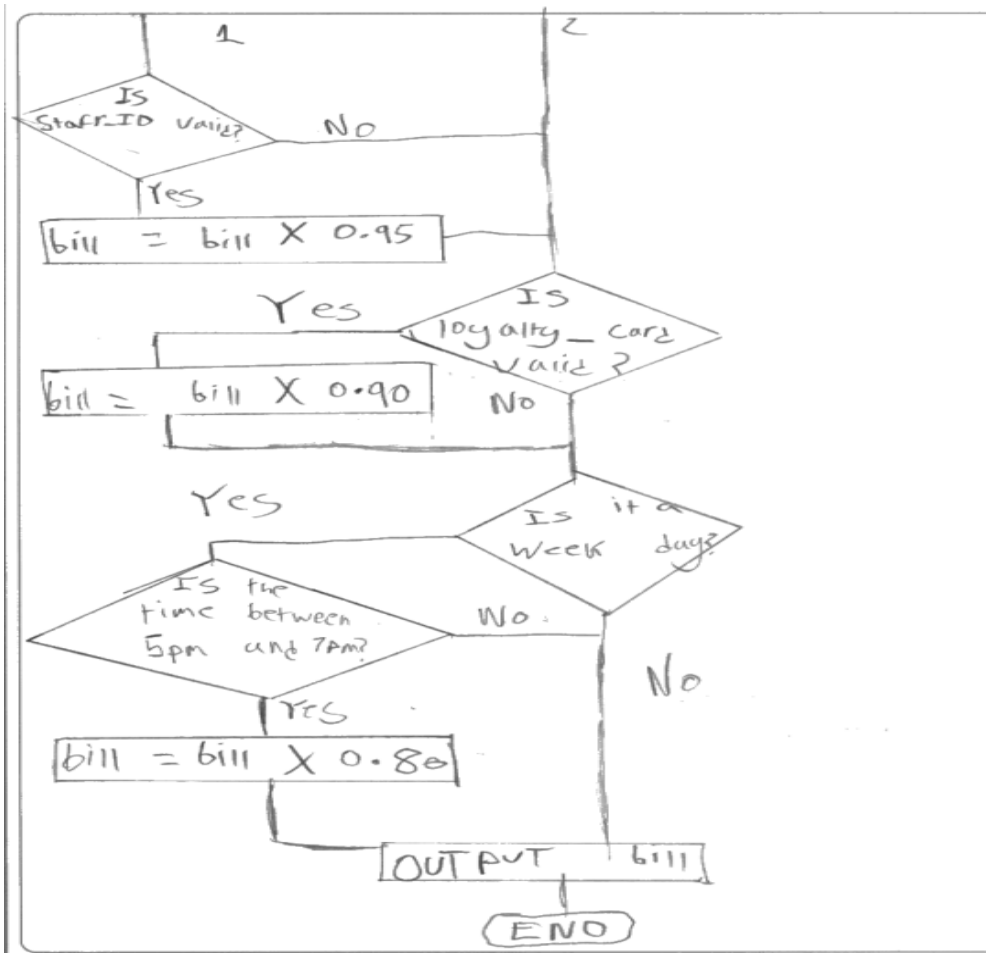
The response mostly meets the level 2 descriptors.

3 marks awarded

Q2c Example response 2:

(6)





Lead examiner commentary (2c Example 2):

The response meets all requirements of the scenario.
The flowchart makes appropriate use of conventions.
The solution demonstrates appropriate use of logical operations which would result in correct outcomes.

The response fully meets the descriptors of mark level 3.

6 marks awarded.

Question 2d

This question item was designed to differentiate the between the Merit and Distinction boundary and in that regard learner performance was broadly in line with expectations. However, there are many things that all learners can take from this question. Typically, learners that performed better on this question had a much stronger grasp of technical concepts and were able to use technical language more effectively, to communicate their responses.

More successful learners were also able to provide contextualisation of their answers and did not rely on basic recall of definitions.

Q2d Example response:

(d) The system records items ordered by a customer. The data is stored in an array.

The system uses the items in the array when calculating the final total for the bill.

Explain **two** reasons why arrays are suitable data structures for this task.

(4)

Reason 1

Iterable. Easy to calculate grand cost because, the array can be iterated over, using the index, to find the sum of the elements.

Reason 2

Non-constant values. If a ~~user~~ customer was to change their order, the index containing the original ~~order~~ thing could be modified to store the new price, rather than needing to make a new ~~data~~ instance.

Lead examiner commentary:

Reason 1

Can be iterated over (1 mark) to find the sum of the elements (1 mark). The expansion is enough to award for 'including all elements in the final calculation.

Reason 2

Non-constant values (1 mark) – alternative wording for mutable.
"if a customer was to change their order…original could be modified" (1 mark). This is a suitable expansion.

4 marks total.

Question 2e

Overall, this question was quite well answered with most learners able to provide a response that gained at least 1 out of the 3 marks available. Responses were typically awarded marks for identifying that a GUI is easier to use than alternatives. Many learners were also able to gain a second mark for providing an expansion that considered meeting the needs of different users.

Question 3a

Learner performance on this question was generally quite good. Majority of learners were able to identify at least one way in which data on the identified systems could be protected. In many instances, learners were able to identify at least 2 ways with linked explanations.

Question 3b

Many learners struggled with the more technical nature of this question. Many learners were not able to provide mark worthy responses. In several instances, learners had shortfalls in their understanding of technical details of some areas of the specification.

It was evident that many learners did not understand the concept of validation and often provided examples of verification instead.
In addition, there were many blank responses seen, or often answers which did not demonstrate the depth and application of knowledge to move beyond the descriptors for Mark band, regularly providing only one or two sentences.

Centres are advised that these extended questions are designed to differentiate across Pass, Merit and Distinction. Therefore, when preparing learners, centres should be aware that to access the middle and top mark bands, responses should demonstrate good subject knowledge that is applied in context to the scenario.

Q3b Example response:

(b) The library processes a large amount of data about customers, books and loans.

Analyse how the computer system will make use of validation when processing data.

You should provide examples to support your analysis.

(6)

The computer system will make great use of validation ~~data~~ when processing data, as each bit of input data will have to be validated before it should be stored. For instance, a length check could be implemented in order to make sure the input 'customer name' is of a suitable length, such as over 4 characters long. Another validation check that could be used is a 'data type' check, to ensure that a number has been entered when adding the 'loans' the customer has taken out. Overall, the computer system will make sufficient use from validation, in order to keep the data valid and integrid.

Lead examiner commentary:

The response shows some accurate knowledge, which identifies two possible uses of data validation (length and type checks). There is some attempt to break the situation down and there is some attempt to provide relevant contextualised examples. However, the analysis is limited.

The response meets the descriptors for mark band level 2.

The response does not show sufficient depth of understanding or enough analysis to access mark band level 3.

Question 3c

Majority of learners were able to provide a mark band 1 answer and gain between one and three marks, out of the possible eight. A significantly smaller number were able to provide a mark band 2 or mark band 3 answer.

Responses often focused solely on a particular type of back up (incremental) or focused too narrowly on particular technologies. For example, many learners provided definitions of how RAID might work, but with very little consideration of how it applied to the context of the question.

Performance on this question highlighted response characteristics which were present I may of the extended responses, and highlights some of the key areas for development for learners and centres. In particular:

1. The extended questions are an opportunity to demonstrate deeper knowledge. Centres should work with learners to develop ideas and expand on points made. Using examples and reasons where appropriate

2. More successful learners make use of the context provided. To access the higher mark bands knowledge from the specifications core concepts should be considered and applied to the give scenario.

Q3c Example response – Typical mark band level 1 response:

(c) The library will need to backup the data that it holds.

Discuss backup and recovery procedures that the library could use.

You should provide justification and examples to support your discussion.

(8)

The liabray would need to backup there data in— case of these scenaio for example fire, hurricane flood earthquake etc, However if they are from the uk you would know that not much of these occur- so not much to worry about. The liabray should use a backup server or database this is for the ~~comp~~ liably safety that the labry should have a backup of there data on the cloud or on cloud based system this is because it is relatively cheap and can be free to ~~install or~~ use. However the liabry should not overdue the amount of backups they have due to the fact may lose count and don't need much backups. A Recovery Procedure could be used to auto recover all data that had been backup to be stored.

Lead examiner commentary (Q3c):

The response shows some isolated knowledge of a range of aspects relating to back-up and recovery. There is mention of location/media (cloud) and the potential use of auto recovery, although this is very vague.

The points made are relevant, but they are quite generic and there is little or no consideration of the points in relation to the scenario.

The response partially meets the descriptors for mark band level 1.

Q3c Example response – Typical mark band level 3 response:

Discuss backup and recovery procedures that the library could use.

You should provide justification and examples to support your discussion.

(8)

A backup procedure the library could use is backing up on the cloud. There is an option to physically backup the data in another site however this is not necessary as it this can be due to maitenance costs expensive and therefore not be a suitable for a small village library. Backing up on the cloud is a good option as there is not much data to be backed up and so will not cost much as they will not be maintaining it.

Making full backups once or twice a week could be suitable in this case as it is a small village library. Normally, frequent full backups are not suitable as it can take a lot of time if there is a lot of data to be backed up however due to the amount of customers being a lot less compared to a larger library located in busier places, there would most likely not be a lot of data to be backed up. When it comes to recovering data that has been backed up fully, it is more likely that no little to no data will be lost (if fully backed up frequently).

As a recovery procedure the library can have an extra laptop or PC with the backed up data in which this can be used to transfer the data to other devices if a disaster happens.

Lead examiner commentary (Q3c):

The points made are accurate, demonstrating a range of knowledge relating to back up and recovery. The response considers types of back-up, frequency and the location and media to use.

The points made are related to the scenario and there is a logical discussion of how these may be relevant to the library including costs, likely amounts of data etc

The response meets the descriptors for mark level 3.

Question 4a

Although, learner performance on this question was slightly better than responses in Q3, this question did not perform very well overall.

Typically, most learner responses relied on more general understanding of compression. Whilst many learners were able to show an understanding that compression is used to reduce file size, and that this may impact on quality, many learners did not demonstrate any deeper technical understanding expected for a BTEC level 3 computing qualification. The lack of technical detail, and lack of scope with the responses, often meant the learner answers had only accessed between mark band level 1 and mark band level 2, with 4 or 5 marks.

As previously mentioned, centres should work on examination technique and developing learners' depth of knowledge, so that it can be applied appropriately in a range of scenarios.

Q4a Example response 1:

(a) The streaming service will use data compression.

Discuss the implications of using data compression on the streaming service.

In your discussion you should consider:

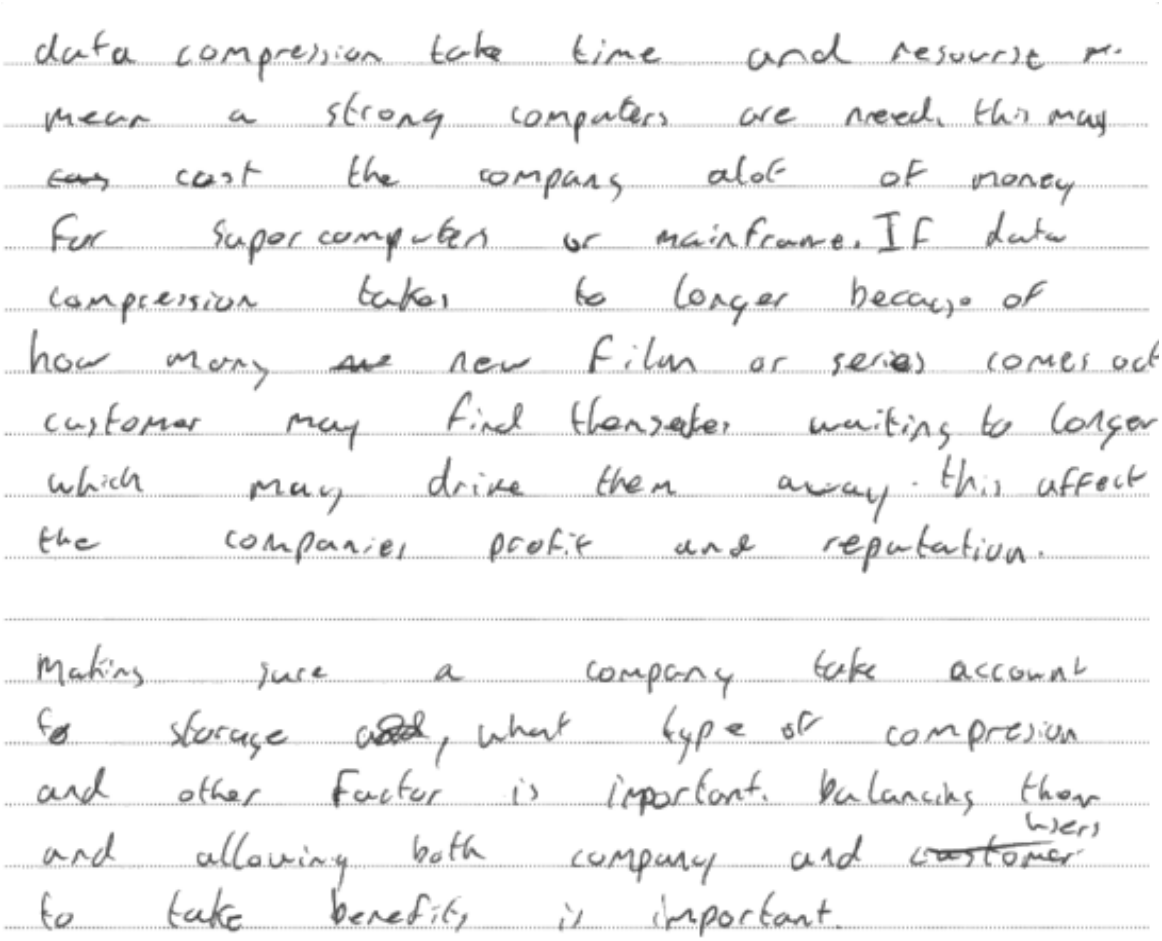
- ways data compression might be used by the streaming service
- possible implications for the customer
- potential impacts on the company.

You should provide justification and examples to support your discussion.

(10)

depend what data compression you use does affect many thing. for example quality loss on videos may drive customers away from the platform as if the compresion is ~~heavy~~ heavy but this saves storage. ~~if the~~ having bad video quality affect the ~~p~~ reputation for the company a make them lose members.

On the other hand having data compression such as lossless allows better quality media but require a higher amount of storage needed. this ~~may~~ cause the company to spend more money on ~~storage~~ storage which may out them over budget.


data compression take time and resource m. mean a strong computers are need. this may ~~can~~ cost the company alot of money for super computers or mainframe. If data compression takes to longer because of how many ~~are~~ new film or series comes out customer may find themselves waiting to longer which may drive them away. this affect the companies profit and reputation.

Making sure a company take account for storage ~~cost~~, what type of compression and other factor is important. balancing them and allowing both company and ~~customer~~ users to take benefits is important.

Lead examiner commentary (Q4a – example 1):

The response shows some accurate knowledge of data compression (e.g. quality loss, file size, processing time), but this is not always covered in a way that is fully relevant to the given context (i.e. streaming).

There is some attempt to relate the points made to customers and the company, but the discussion is often quite generic.

The response partially meets the descriptors for mark level 2.

Q4a Example response 2:

You should provide justification and examples to support your discussion.

(10)

Data compression might be used by the streaming service to compress files and reduce file size, so that the app will run more smoothly and load times will be faster. However, for customers the quality of the films will be reduced and they might not like this, but their bandwidth will not need to be that strong to play the films and videos. Impacts on the company will be more storage space, money saved as there is no need to buy more storage. Also a loss in revenue because of the reduced quality in ~~fi~~ films and videos, customers might leave, but the reduced quality will be beneficial to customers with slow Wi-fi, because the lower the quality the lower the wifi speed needed.

Lead examiner commentary (Q4a):

There is some good accurate knowledge demonstrated. The response considers the impact of reduced file sizes on the customers, with improved load times, smooth playback, loss of quality. The response also considers technical impacts such as the reduced bandwidth requirements.

The response then explores impacts on the company such as reduced storage need, and potential loss of customers if video quality is poor.

The response is mostly accurate. The points made are relevant to the context and the development of the discussion is logical.

The response meets the descriptor for mark level 3

Question 4b

Learner performance on this question was generally better than on the other extended open response questions. With a greater percentage of learners providing a response that meets the descriptors for mark band level 2.

However, as with the other extended questions, many responses lacked clarity and did not demonstrate sufficient technical understanding to move access the higher marks.

Improvement was seen in the application of the command verb (evaluation), with most learners attempting to make value judgments as to the relative merits of the two different types of CPU provided in the question. Where learners did less well, responses tended to be quite superficial and did not apply knowledge to the given scenario (i.e. a video streaming device).

As a general point, when answering an evaluation question, learners should not just try to consider the positive and/or negative aspects of a given technology or situation but consider the impact/implications in particular reference to the given scenario. In this scenario for example, while many learners considered the relative size of the CPUs relatively few applied that to the design and build of a device that would be used with a TV, and how that might impact on connection, position etc.

Q4b Example response:

(b) Ori is developing a device that can be used with the streaming service. The device will plug in to a TV and will use a Wi-Fi connection to access content.

Ori must choose which type of a central processing unit (CPU) to use in the device.

He must choose either a CPU designed for a desktop PC (microcomputer) or a mobile CPU.

Evaluate the suitability of the two types of processor for use in the streaming device.

Your evaluation should include:

- the features and implications of the two types of CPU
- a supported conclusion as to which type of CPU would be most suitable for use in the streaming device.

(12)

Mobile CPUs and embedded CPUs use a system-on-chip CPU. These CPUs are smaller than the CPUs used in desktop PCs as they contain all the components of a computer on a single chip. Due to this tight integration of components, these CPUs have lower clock and core speeds ~~These CPUs~~ They also use less power and produce less heat because of this. These CPUs also use a Reduced Instruction ~~sett~~ Set called ARM, this instruction set is simple and more easy to use and implement than the instruction set in desktop PCs (called CISC). They use more instructions & require more RAM, but can take advantage of pipelining to increase the speed of instruction execution

Microcomputer CPUs use a single silicon chip. They also use CISC, which is a more complex instruction set. These CPUs have higher clock speeds / more cores and are used for more complex tasks. They also use the x86 and x86-64 instruction sets. These systems require more power than mobile CPUs but require RAM to be fetched less.

conclusion: For a streaming device, I believe that Ori should use a Mobile CPU. As the device is going to be plugged into a tv, it's ~~cor~~ ~~cannot~~ the device cannot be overly large or this would not be user-friendly. Therefore a mobile CPU, which is smaller, would be advised. A mobile CPU would also be easier for Ori to implement into his device, instead of a microcomputer CPU. ~~This~~ using a mobile CPU will mean that his device will consume less power & produce less heat when connected to a TV system. This would help the TV and graphics card in it to perform better when streaming as not much strain will ~~p~~ be put on it's resources. However, using a mobile CPU could limit the processing power and ~~graphics~~ performance capabilities of the streaming device. This may cause the device to be slow when streaming movies due to the lower clock speed & fewer cores. But overall, a Mobile CPU would still be best suited for a streaming device.

Lead examiner commentary (Q4b):

The response demonstrates good technical knowledge and applies understanding to the scenario given.

The response makes value judgements (evaluates) the options at hand in relation to the requirements of the scenario.

All the points made are relevant to the scenario.

The response meets the descriptors for mark band level 3.

Summary

Overall learners' performance was in line with the previous, pre-pandemic series (June 2019) with a mean average mark that was broadly similar. Typically, learners performed as expected in many question items but there were also some significant gaps.

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

- Continue to develop understanding of key terminology used in the unit so that you are able to access the context of the question.
- Explore the some of the more technical aspects of the specification in greater depth.
- Ensure that when providing answers/information your response is applied to the given context.
- Improve understating of 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 understating of a single point.
- Develop the quality of responses to 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. General/generic answers often struggle to meet descriptors beyond that of mark band 1.
- Centres are encouraged to consult the 'Technology Update' which will be 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. and should be used in conjunction with the specification when planning and delivering content.