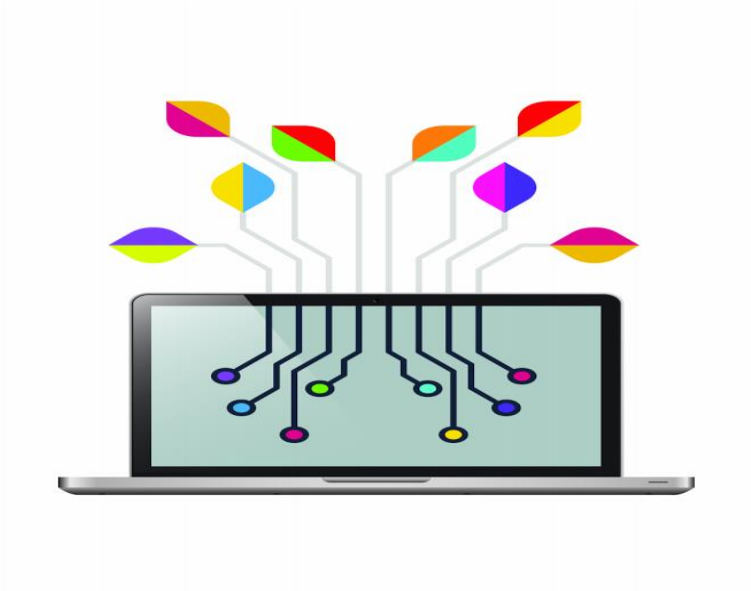
Mark Scheme (Results)

Jan 2018

Pearson BTEC Level 3 - Computing

Unit 2: Fundamentals of Computer Systems (31769H)



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Unit 2: Fundamentals of Computer Systems –marking grid

General marking guidance

- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Marking grids should be applied positively. Learners must be rewarded for what they have shown they can do, rather than be penalised for omissions.
- Examiners should mark according to the marking grid, not according to their perception of where the grade boundaries may lie.
- All marks on the marking grid should be used appropriately.
- All the marks on the marking grid are designed to be awarded. Examiners should always award full marks if deserved. Examiners should also be prepared to award zero marks, if the learner's response is not rewardable according to the marking grid.
- Where judgement is required, a marking grid will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the marking grid to a learner's response, a senior examiner should be consulted.

Specific marking guidance

The marking grids have been designed to assess learner work holistically. Rows in the grids identify the assessment focus/outcome being targeted. When using a marking grid, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches the learner's response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer, in response to the assessment focus/outcome and will be modified according to how securely all bullet points are displayed at that band.
- Marks will be awarded towards the top or bottom of that band, depending on how they have evidenced each of the descriptor bullet points.

Question Number	Answer	Mark
1 (a)	A description such as: Tether to a smartphone/mobile hotspot (1) using Bluetooth/Wi-Fi/USB (1) to share the smartphone's data connection (1) Use a 3G/4G connection (to access the internet) (1) to connect to a mobile phone network (1) this may require a subscription/SIM from the data provider (1). **Additional Guidance** Do not accept 'Wi-Fi' on its own Do not accept 'hotspot' on its own	3

Question Number	Answer	Mark
1 (b)	Any two from: • Unreliable signal (due to movement) / short range signal • Dependent on Wi-Fi hotspot being available • Constant searching for a signal will increase battery consumption • Wi-Fi signal is prone to interference (which may cause signal to drop out/corrupt data) • A shared connection so available bandwidth will be limited • There may be lots of users so download times will be slow • May need to keep stopping in order to log in (to public hotspots) **Additional guidance** Do not accept answers relating to speed without justification (e.g. the connection is shared). Allow 'download speed for bandwidth'.	2

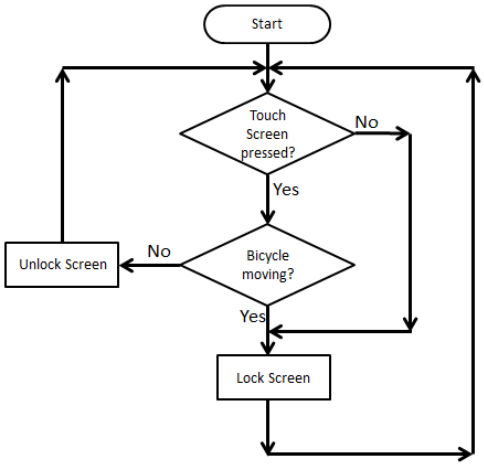
Question Number	Answer	Mark
1(c)	A description such as: A GPS receiver (1) will use the signal from (at least three) satellites (1) calculates longitude and latitude co-ordinates / triangulates (1) based on the strength of the signals (from the satellites)(1) Use a Wi-Fi receiver (1) to identify publicly recorded Wi-Fi hotspots (1) and measure signal strength (1) to determine proximity to hotspots (1) Use 3g/4g/phone network antenna (1) to identify cell towers / the unique ID from cell towers (1) and measure signal strength (1) to determine proximity to towers (1) **Additional Guidance** Allow 'triangulate' for 'determine proximity' in responses for Wi-Fi and cellular Linked description required for maximum marks	4

Question Number	Answer	Mark
1(d)	Award **one** mark for the identification and **one** additional mark for the appropriate expansion to a maximum of **four** marks. They are (typically) smaller than microcomputer/server processors / small form factor(1) which will reduce the size and weight of the device (1) They have low power drain (1) which makes them suitable for battery- powered devices / will need charging less often (1) They produce less heat than microcomputer/server processors (1) so do not require heatsinks/additional cooling (1) **Additional guidance**	4

	Allow examples of impact of size/weight, e.g. 'suitable for wearable/mounted devices'. Do not accept 'they are small' on its own.	

Question Number	Answer	Mark
1 (e)	Award **one** mark for each correct row of the truth table to a maximum of **three** marks. **Additional guidance** Accept true/false etc.	3

Night	Foggy	Output:Lights
0	**0**	**0**
0	1	1
1	0	1
1	1	1

Question Number	Answer	Mark
Example response  		
1 (f)	Award **one** mark for inclusion of each of the following in a 'flow chart' diagram. • Correct logical statements for checking 'If bike is moving' AND 'User input' • 'Yes' and 'No' routes from user input check clearly labelled and lead to logically correct outcome(s) • 'Yes' and 'No' routes from 'If bike is moving' check clearly labelled and lead to logically correct outcome(s) • Process loops continuously (to beginning of the program) **Additional guidance** Learners' flow charts may vary from the example. Award marks based on correct application of the logic to solve the given problem.	4

Question Number	Answer	Mark
2(a)	A description to contain 4 from: • GPU has a parallel structure / can process large amounts of data in parallel (1) • GPU (more suited to) processes commands/instructions related to shapes/colours/rendering (1) • CPU performs (other) instructions/calculations (1) • GPU reduces the load on the CPU (1) • which will reduce delay/buffering/lag (when playing games)(1) **Additional Guidance** Do not accept 'GPU processes graphics' on its own. 'reduce lag' can only be awarded as part of a complete response. Accept examples of data/tasks carried out by CPU.	4

Question Number	Answer	Mark
2 (b)	A description to contain two from: • Uses an algorithm (1) • alters sampling rate / bit rate / colour depth (1) • removes repeated/unnecessary data (1) **Additional guidance** Accept algorithm names Accept examples of removed/unnecessary data Award two marks for responses that give bit rate **and** colour depth as part of an answer that describes video **and** audio files	2

Question Number	Answer	Mark
2 (c)	A description such as: Metadata may have been removed (1) which will limit additional features available (1) such as track ID/Album art (1) May alter the file format (1) which may require specialist software/CODEC (1) limiting the devices it can be used on (1) Data will be (permanently) lost (1) during conversion (1) so future editing cannot be completed as accurately (1) (Sound) quality/accuracy will be reduced (1) by removing higher and lower frequencies / altering sample rate (1) which may affect the types of output device it is suitable for (1)	3

Question Number	Answer	Mark
2 (d)	An explanation such as: Compatible with / can be used alongside other protocols (1) such as SSH (1) to provide a secure connection / to improve security (1) Keeps an open connection (1) between the client and server (1) which makes it suitable for extended sessions (1) Allows direct connection with the NAS (1) using NAS' IP address (1) improving data transfer times (1) Allows connection from any location (1) using an IP address (1) so NAS can be accessed using ad hoc networks / internet (1) **Additional guidance** Do not accept 'to improve security' on its own To award multiple marks, points must form part of a linked explanation.	3

Question number	Indicative content
2e	A analysis of the factors Angga would need to consider when implementing back up procedures for his home network. **Scheduling** when will the backup will be completed? home network – more use in evening instead of daytime , Avoiding heavy use times would maximise bandwidth for back up. There are multiple portable devices (laptops, Tablet, Smartphones):- • may not be available during the day. • overnight back up may solve this • may require them to leave their devices switched on overnight. Share/sync data on devices to a folder on network Synchronise to the folder whenever on the network. Folder on server can be backed up without the need to have devices switched on. **What to back up** Angga could set the backup to back up all devices completely every time there is a backup. This would be the simplest solution. However, as individuals may have downloaded some of the media files that are stored on the NAS box, complete backups would duplicate data and the size of the backup would soon grow very large. Angga may consider different types of backup such as differential or incremental to reduce the amount of data backed up at any one time. **Connection types** Some devices use Wi-Fi, which may not provide sufficient bandwidth to back up the device's content efficiently. I Syncing the portable devices using Wi-Fi and in background which would affect the device's performance and the user's experience when attempting to other things **Security issues** Any sensitive materials that need higher levels of security than other data?

	How to secure the back up

Mark scheme (award up to 6 marks) refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

Level	Mark	Descriptor
Level 0	0	No rewardable content
Level 1	1–2	Technical vocabulary is used but it is not used appropriately to support arguments in relation to the issues of the question. Issues are identified but chains of reasoning are not made leading to a superficial understanding of the relative importance of issues to the scenario
Level 2	3–4	Accurate technical vocabulary is used to support arguments but not all are relevant to the issues of the question A consideration of relevant issues using logical chains of reasoning but does not reflect upon their relative importance to the given scenario
Level 3	5–6	Fluent and accurate technical vocabulary is used to support arguments that are relevant to the issues of the question A balanced and wide ranging consideration of relevant issues using coherent and logical chains of reasoning that shows a full awareness of their relative importance to the given scenario

Question Number	Answer	Mark
3 (a)	An explanation to contain **four** from: • Queue is A first in first out structure (FIFO) (1) • Stack is First in last out (FILO) (1) • Using a queue orders are processed as they are received (1) • whereas the stack will process them in reverse order (1) • (queue) processes the orders more fairly (1) • (queue) avoids customers who order first waiting a long time (1)	4

<table>
<tr><th>Question number</th><th colspan="2">Indicative content</th></tr>
<tr><td>3(b)</td><td colspan="2">A discussion of how the given hardware and setup may affect the security of the system.

Discussion may include:

Positioning of the terminals - All terminals are very close to each other which may mean that other customers may see card details/PIN etc. when they are paying for items.

Access to the PCs/hardware:
• The PCs are exposed, which means that people could restart/insert removable media that could bypass any security system or introduce viruses to the system
• The card readers are easily accessibly meaning malicious users may interfere with these in an attempt to steal other customers' details
• Ethernet/network sockets are visible/accessible meaning unauthorised users may connect other devices and try to gain access to the network

Impacts may include:
• Loss of revenue
• Loss of customer confidence
• System down time
• Issues processing orders/accuracy of orders
• Loss/theft of data
• Legal action resulting from not adequately protecting customer data</td></tr>
<tr><td colspan="3">Mark scheme (award up to 8 marks) refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.</td></tr>
<tr><th>Level</th><th>Mark</th><th>Descriptor</th></tr>
<tr><td>Level 0</td><td>0</td><td>No rewardable content</td></tr>
<tr><td>Level 1</td><td>1–2</td><td>Technical vocabulary is used but is not used appropriately to support arguments in relation to the issues of the question.

Issues are identified but chains of reasoning are not made leading to a superficial understanding of the relative importance of issues to the scenario

Does not link arguments to the given scenario</td></tr>
<tr><td>Level 2</td><td>3–5</td><td>Accurate technical vocabulary is used to support arguments but not all are relevant to the issues of the question

A consideration of relevant issues using logical chains of reasoning but does not reflect upon their relative importance to the given scenario

Considers the various elements of the question and but does not always link arguments to the given scenario</td></tr>
</table>

Level 3	6-8	Fluent and accurate technical vocabulary is used to support arguments that are relevant to the issues of the question A balanced consideration of relevant issues using coherent and logical chains of reasoning that shows a full awareness of their relative importance to the given scenario Carefully considers the various elements of the question and Links arguments to the given scenario

Question number	**Indicative content**
3(c)	An analysis of how the features of the two possible interfaces will affect Carter's choice of interface. The analysis should explore how the two interfaces suit a touch screen ordering system. Graphical Interface • Improves accessibility as images aid understanding for users with lower literacy skills/EAL • Image data takes up more space than textual data • High numbers of/high resolution images may cause the system/screens to load more slowly than other types of interface • If high resolution images used the system may need to be more powerful (larger storage space, faster processor etc.), which will increase the cost of installing the system • If the images used don't accurately reflect what the food actually looks like (i.e. the system uses stock images) customers may complain • Better use can be made of screen space as using icons/images for the links means each individual button can be smaller • Users may find it more engaging Menu- based interface • Relatively easy to use, only a limited number of options are provided at a time • If a there is logical structure to the menu system it is intuitive to use • Can be frustrating to use if the item you want is several menu layers down • Can integrate with accessibility systems easily (such as voice control) as limited options/commands can be programmed for each screen • Reduces development time as they can often be generated by the programmer and do not require specialist graphic designers

Mark scheme (award up to 8 marks) refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

Level	Mark	Descriptor
Level 0	0	No rewardable content
Level 1	1–2	Technical vocabulary is used but it is not used appropriately to support arguments in relation to the issues of the question. Issues are identified but chains of reasoning are not made leading to a superficial understanding of the relative importance of issues to the scenario
Level 2	3–5	Accurate technical vocabulary is used to support arguments but not all are relevant to the issues of the question A consideration of relevant issues using logical chains of reasoning but does not reflect upon their relative importance to the given scenario
Level 3	6-8	Fluent and accurate technical vocabulary is used to support arguments that are relevant to the issues of the question A balanced and wide ranging consideration of relevant issues using coherent and logical chains of reasoning that shows a full awareness of their relative importance to the given scenario

Question number	Indicative content
4(a)	A discussion of the applications and implications for Shania of error correction systems that she could use to ensure that data is accurate. **Applications** Automatic repeat request (ARQ) – data sent contains error detection codes to determine if received data is different to that of the data sent. If the check determines that the data is incorrect it send resend the request to the source computer, which sends the data again. There are different ARQ protocols, which include: • Stop-and-wait ARQ • Go-Back-N ARQ, • Selective Repeat ARQ. Forward error correction (FEC) / Error correcting code (ECC) – uses data redundancy to help reduce errors by not requiring data to be resent. The sent data includes extra data that can be used to repair/reinstate the data that was sent when an error is detected. FEC is usually used for data that is not stored and is non-repeatable (such as the data sent for sensors). **Implications** ARQ requires a connection that allows two-way communication, therefore would not be appropriate for use with the data from the sensors as these would most likely be a simplex communication channel that streams data received to the laptop. The sensors are also unlikely to store the data after it has been transmitted. ARQ may be suitable for sending the data to be backed up because, as there will probably be a large amount of data being sent, ARQ will allow more of the data packet being dedicated to the data to be sent (reduced redundancy). The transmission method will be two-way and a copy of the data will be saved on the laptop so a resend request completed. FEC requires extra data to be sent in each packet, which increases the size of data packets and/or can result in more data packets being required, which can create extra overheads in terms of bandwidth required is a lit of data is being processed. However, as corrupt data does not have to be resent it is useful in this context for transmitting the sensor data to the laptop. **Additional guidance**

	Credit appropriate discussion of error correction techniques not explicitly listed in the specification (e.g. hybrid error correction). Learners may include some information about the role of error detection methods but this should be credited only in relation to how they are used along with the error correction methods.

Mark scheme (award up to 10 marks) refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

Level	Mark	Descriptor
Level 0	0	No rewardable content
Level 1	1–3	Technical vocabulary is used but is not used appropriately to support arguments in relation to the issues of the question. Issues are identified but chains of reasoning are not made leading to a superficial understanding of the relative importance of issues to the scenario Does not link arguments to the given scenario
Level 2	4-7	Accurate technical vocabulary is used to support arguments but not all are relevant to the issues of the question A consideration of relevant issues using logical chains of reasoning but does not reflect upon their relative importance to the given scenario Considers the various elements of the question and but does not always link arguments to the given scenario
Level 3	8-10	Fluent and accurate technical vocabulary is used to support arguments that are relevant to the issues of the question A balanced consideration of relevant issues using coherent and logical chains of reasoning that shows a full awareness of their relative importance to the given scenario Carefully considers the various elements of the question and Links arguments to the given scenario

Question number	Indicative content
4(b)	Discussion of the role of the kernel in controlling and managing system components and tasks in Shania's computer system. **Program execution** The OS aids the fetch-decode-execute cycle of the CPU by working as a 'go-between' between the active program and the CPU/computer hardware. When a program wishes to perform an operation/instruction, this is sent to the kernel which translates the program code in appropriate system calls, which provide the CPU and related hardware with the appropriate commands at the appropriate time to ensure instructions are carried out as intended by the program. The kernel also ensures the correct commands and data are sent between running programs. **Interrupts** An interrupt is any signal (from software or hardware) that is deemed to require immediate attention by the system. The OS controls the translation of inputs from peripherals and calls from software to decide if the input is an interrupt or not. The OS then ensures that the interrupt is processed by the CPU immediately rather than being queued as would happen with other instructions. The kernel will ensure that data that is being queued and processed at the time of the interrupt is saved (usually in the CPU registers) and that the correct interrupt handler is executed. When the interrupt has been dealt with the OS will ensure that the CPU and hardware revert back to the saved state and resume processing as before. **Memory management** The OS monitors active processes that are being carried out by the computer to ensure each task has sufficient memory to be carried out. The OS will actively manage the amount of RAM for each process that is being run. For example, if there are multiple programs running with one actively being used by the user and others running in the background, more RAM is dedicated to the active program because more memory is needed to update the visual changes on screen, deal with the user inputs etc. whereas programs running in the background only need RAM dedicating to vital processing. The kernel also provides the instructions for the hardware (CPU/RAM) to keep track of what data is in which memory location at any one time. **Multi-tasking** The kernel is responsible for controlling the process of 'time slicing', which is one way that a computer creates the illusion of

	multiple things happening at once. A single processor cannot execute more than one instruction at a time so the kernel 'slices' instructions in to smaller pieces and dedicates processor cycles to executing these instructions. The OS will calculate which instructions require greater percentage of processor time while still maintaining the appearance of multiple processes being run at simultaneously. In modern multi-core and multi-processor systems the OS kernel uses a similar process to divide the instructions between threads, cores and processors. This is combined with time slicing when there is a large amount of data and all cores etc. are in use **Disk access** Computer storage drives can typically only read/write one piece of data at a time. The kernel will ensure that program instructions that require data to be written or retrieved form the storage disk are queued and/or given priority and then passed to the required disk location, hardware or program. Disk access works in conjunction with memory management to ensure data that is yet to be saved to the secondary storage is kept in RAM for as long as required. The kernel will also control which programs, users etc. can read/write to the disk and which data they have access to. This helps ensure security of the data and ensure data does not become corrupt due to being over written or attempted access by an unauthorised program or user. **File systems** The kernel ensures that data that is stored on the system is in the appropriate format and in a way that allows the system to identify and retrieve data. The file system will most likely allow journaling, which improves data reliability by keeping logs of what changes are made when data is saved and in some cases saving data in multiple locations in case corruption occurs. As Shania's system is a specialist OS it is likely to be GNU/Linux or Unix based, which means the file systems used to save data on the cameras (if they have local storage) are likely to be different (cameras are likely to be FAT32/NTFS file systems). These two systems are not directly compatible but some OS provide tools that will translate the system for the kernel to process. As this is likely to be a GNU/Linux or Unix- based system, the files system is likely to be less fragmented as the nature of the kernel ensures data is grouped wherever possible, which reduces fragmentation and the need to run 'defrag' software. **Device drivers** The OS kernel will contain device drivers that will be responsible for communicating with the system's hardware. The device drivers work as a translator for the Operating system and Program

	software. The drivers take the standard programming code/instructions provided by the system's software and turn it in to the exact instructions that a device understands. This allows for programs to be used with a range of devices and does not require programmers to write programs for every possible combination of hardware and software.

Mark scheme (award up to 12 marks) refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

Level	Mark	Descriptor
Level 0	0	No rewardable content
Level 1	1–4	Technical vocabulary is used but is not used appropriately to support arguments in relation to the issues of the question. Issues are identified but chains of reasoning are not made leading to a superficial understanding of the relative importance of issues to the scenario Does not link arguments to the given scenario
Level 2	5-8	Accurate technical vocabulary is used to support arguments but not all are relevant to the issues of the question A consideration of relevant issues using logical chains of reasoning but does not reflect upon their relative importance to the given scenario Considers the various elements of the question and but does not always link arguments to the given scenario
Level 3	9-12	Fluent and accurate technical vocabulary is used to support arguments that are relevant to the issues of the question A balanced consideration of relevant issues using coherent and logical chains of reasoning that shows a full awareness of their relative importance to the given scenario Carefully considers the various elements of the question and Links arguments to the given scenario

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