



# Mark Scheme (Results)

June 2017

Pearson BTEC Level 3 - Computing

Unit 2: Fundamentals of Computer  
Systems (31769H)



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# Unit 2: Fundamentals of Computer Systems –Marking Grid

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## 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

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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)	<p>A description to include <b>four</b> from:</p> <ol style="list-style-type: none"> <li>1. Productivity (suite/applications) (1)</li> <li>2. Spreadsheet/database (1)</li> <li>3. to perform calculations (1)</li> <li>4. show trends / monitor/predict performance (1)</li> <li>5. display as graphs (1)</li> </ol> <p><b>Additional guidance</b>  Linked response required for maximum marks</p> <p>Allow brand names (e.g. Excel/Access) for MKPT2</p>	4

Question Number	Answer	Mark
1 (b)	<p>Award <b>one</b> mark for identification and <b>one</b> additional mark for appropriate expansion up to a maximum of <b>four</b> marks.</p> <p>(Must be suitable for a) touch screen interface (1) (GUI) suitable for hand held devices (1)</p> <p>Using icons is more intuitive (1) so suits the alternative input (e.g. swipes etc) of a tablet (1)</p> <p>Tablet screens are (usually) smaller than traditional/desktop/laptop computers (1) using icons makes more efficient use of screen space. (1)</p> <p>Typing on touch screens can be difficult /more prone to typing errors (1) making command line interfaces inefficient. (1)</p>	4

Question Number	Answer	Mark
1 (c)	<p>An explanation such as:</p> <p>Smaller image sensor (1) meaning there are fewer pixels per image (1) which reduces the maximum size/resolution (of the captured image) (1)</p> <p>Unlikely to have optical zoom / only has digital zoom (1) so images are cropped and enlarged (1) which reduces dpi/resolution. (1)</p> <p>Lower quality lens (1) focus is less sharp (1) producing more blurry photos / less depth in photos (1)</p> <p>The tablet is multifunctional (1) meaning less powerful/lower quality components are used (1) which offer lower maximum resolutions (1)</p> <p><b>Allow</b> 'Has less megapixels' for smaller image sensor</p> <p><b>Additional guidance</b> Accept reverse arguments that give valid reasons why a dedicated camera would give <b>better</b> quality images/video.</p>	3

Question Number	Answer	Mark
1(d)	<p>Award <b>one</b> mark for identification of a suitable device from:</p> <ul style="list-style-type: none"> <li>• SD/flash memory card</li> <li>• (External) hard drive</li> <li>• (External) optical drive</li> <li>• Flash memory stick</li> </ul> <p>Award an additional <b>two</b> marks for an appropriate linked description of the transfer process:</p> <p>Description stages:</p> <ul style="list-style-type: none"> <li>• Connection method (e.g. USB port/cable, card reader, SD card caddy)</li> <li>• Process – (e.g. Copy the file to/from each device)</li> </ul> <p><b>Do not allow</b> Remote server/cloud</p> <p><b>Additional guidance</b> Connection and process marks can be awarded if remote server/cloud identified as follow through</p> <p>'Device' mark can be awarded from the learners description</p>	3

Question Number	Answer	Mark
1(e)	<p>A linked explanation to contain three from:</p> <ul style="list-style-type: none"> <li>• Loss of data (1)</li> <li>• Number of colours/bit depth is reduced (1)</li> <li>• Converting similar colours/shades to the same colour/shade (1)</li> <li>• Reduced resolution (1)</li> <li>• Fewer pixels to represent the image (1)</li> <li>• Reduces the clarity/accuracy of the image. (1)</li> </ul> <p><b>Additional guidance</b> Allow 'reduced resolution' for reduce colour/bit depth</p>	3

Question Number	Answer	Mark
1(f)	<p>A description such as to contain <b>three</b> from:</p> <ul style="list-style-type: none"> <li>• Compare to virus definitions/database</li> <li>• Identify if code/file is malicious</li> <li>• Alert the user</li> <li>• Quarantine/remove/confirm as safe</li> </ul> <p><b>Additional Guidance</b> Only allow 'remove' as part of a complete description of a process</p>	3

Question Number	Answer	Mark
2 (a)	<p>Award <b>one</b> mark for identification and <b>one</b> additional mark for appropriate expansion.</p> <p>They have a large bandwidth (1) which will support the large amount of data being transmitted / reduce response time/lag (of the solar panels) (1)</p> <p>The cables will be able to be placed in the ground / in piping (1) to protect them from physical damage in the outside environment. (1)</p> <p>Wired connections are less prone to interference /signal loss (1) so it is more suitable for this application (outdoors) than wireless connections. (1)</p> <p>The data has to be sent quite a long distance (1) which is likely to be outside the effective range of most common wireless transmission methods. (1)</p> <p>More secure than wireless (1) which would prevent eavesdropping / make it harder for others to intercept the data/signals (1)</p> <p><b>Additional guidance</b> Do not accept 'They are full duplex' or similar.</p> <p>To gain full marks a linked response is required</p> <p>Award <b>one</b> mark for 'they provide faster data transfer speeds than wireless' (or similar</p>	2

Question Number	Answer	Mark
2(b)	<p>An explanation such as:</p> <p>data be sent in both directions <b>simultaneously</b> (1)</p> <p>the system needs real time communication / is constantly communicating with each other (1)</p> <p>for example, monitoring/diagnostic information (1)</p> <p>this channel will reduce interrupts of data/is more efficient (than other channels) (1)</p> <p><b>Additional guidance</b> Allow 'more efficient' only as part of a linked response</p>	4

Question Number	Answer	Mark
2(c)	<p>2849</p> <p><b>Additional Guidance</b></p> <p>Answer may be on BCD string and not on answer line</p>	1

Question Number	Answer	Mark															
2(d)	<p>Example</p> <p>Conversion:</p> <table border="1"> <thead> <tr> <th>Module</th> <th>Energy Product (watts)</th> <th>Denary value</th> </tr> </thead> <tbody> <tr> <td>Module 1</td> <td>00111100</td> <td>60</td> </tr> <tr> <td>Module2</td> <td>00100110</td> <td>38</td> </tr> <tr> <td>Module 3</td> <td>01100110</td> <td>102</td> </tr> <tr> <td>Module 4</td> <td>00110000</td> <td>48</td> </tr> </tbody> </table> <p>Calculate average:  <math>(60 + 38 + 102 + 48) / 4 = 248 / 4 = 62</math></p>	Module	Energy Product (watts)	Denary value	Module 1	00111100	60	Module2	00100110	38	Module 3	01100110	102	Module 4	00110000	48	
Module	Energy Product (watts)	Denary value															
Module 1	00111100	60															
Module2	00100110	38															
Module 3	01100110	102															
Module 4	00110000	48															
	<p>Award <b>two</b> marks for the correct conversion of all four binary numbers to denary.</p> <p><b>and</b></p> <p>Award <b>one</b> mark for the correct average based on converted denary value.</p> <p><b>Additional guidance</b>            Correct answer on its own gains all three marks.            Correct conversion of three out of four binary numbers to denary gains one mark.</p>	3															

Question Number	Answer	Mark
2(e)	<p>A description of a parity scheme to contain <b>four</b> from:</p> <ul style="list-style-type: none"> <li>• A parity bit/check bit (1)</li> <li>• is added to the end of a binary string (1)</li> <li>• to identify if the number of '1 bits' is even/odd (1)</li> <li>• the number of 1 bits (in the received string) is then compared to the check bit (1)</li> <li>• and if they do not match then there is assumed to be an error in the data. (1)</li> </ul>	4

Question number	Indicative content
2 (f)	<ul style="list-style-type: none"> <li>• All the data will be of the same type (numeric) so array can hold this information.</li> <li>• The array could be initialised as a multi-dimensional array to store the data for each module in each panel.</li> <li>• Individual identifiers for each location in the array are unlikely to be needed as data from individual modules is likely to be stored in the same location of the array each time the data is processed.</li> <li>• The number of modules in each unit is constant so arrays being of fixed length, which is set when initialised, is ideal for this task.</li> <li>• They are performance efficient as each element in the array will be stored in memory locations that are contiguous (in sequence next to each other).</li> </ul>

**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 material.
Level 1	1-2	<p>Technical vocabulary is used but it is not used appropriately to support arguments in relation to the issues of the question.</p> <p>Issues are identified but chains of reasoning are not made leading to a superficial understanding of the relative importance of issues to the scenario.</p>
Level 2	3-4	<p>Accurate technical vocabulary is used to support arguments but not all arguments are relevant to the issues of the question</p> <p>A consideration of relevant issues using logical chains of reasoning but does not reflect upon their relative importance to the given scenario.</p>
Level 3	5-6	<p>Fluent and accurate technical vocabulary is used to support arguments that are relevant to the issues of the question.</p> <p>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.</p>

Question Number	Answer	Mark
3(a)	An explanation to contain <b>four</b> from: <ul style="list-style-type: none"><li>• high speed memory location (within the CPU) (1)</li><li>• There are two types of register, general and special (1)</li><li>• Registers hold temporary data/instructions (1)</li><li>• or location of larger amounts of data (1)</li></ul>	4

Question number	Indicative content
3(b)	<p>Learners' responses should consider how the concepts of microarchitecture will impact on the execution speeds of a CPU and how this will affect Gurvinder's work.</p> <p>They may consider:</p> <p><b>Analysis of how factors will affect execution speed:</b></p> <ul style="list-style-type: none"> <li>• Clock speed</li> <li>• Number of threads/cores</li> <li>• Power consumption/power saving etc.</li> <li>• Overheating/throttling</li> <li>• Cache</li> <li>• Processor type/instruction set</li> <li>• Number of processors (multi-processing).</li> <li>• Amount of RAM</li> <li>• Storage medium used (SSD/HDD, Raid array)</li> </ul> <p><b>Consideration of the implications of execution speeds</b></p> <ul style="list-style-type: none"> <li>• More complex calculations generally take longer as they will require more steps to complete.</li> <li>• Some processes may require the output generated by others so slow output from one process will affect subsequent actions resulting in further delays.</li> <li>• His calculations/outcomes may be time critical as he provides information on the weather, which may affect if sailors go out or not. Delayed or inaccurate information may be dangerous.</li> </ul>

**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 material.
Level 1	1-2	<p>Technical vocabulary is used but it is not used appropriately to support arguments in relation to the issues of the question.</p> <p>Issues are identified but chains of reasoning are not made leading to a superficial understanding of the relative importance of issues to the scenario.</p>
Level 2	3-4	<p>Accurate technical vocabulary is used to support arguments but not all arguments are relevant to the issues of the question.</p> <p>A consideration of relevant issues using logical chains of reasoning but does not reflect upon their relative importance to the given scenario.</p>
Level 3	5-6	<p>Fluent and accurate technical vocabulary is used to support arguments that are relevant to the issues of the question.</p> <p>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.</p>

Question number	Indicative content
3(c)	<p>A discussion of the factors to consider when setting up a computer cluster</p> <p><b>Hardware</b>  Will need to decide how many computers will form the cluster</p> <ul style="list-style-type: none"> <li>• To avoid problems/conflicts all computers in the cluster should be the same computer type/specification etc.</li> <li>• A high speed infrastructure will be needed including: <ul style="list-style-type: none"> <li>○ Network interface cards in all computers forming the cluster</li> <li>○ High-speed connection (e.g. cabled network)</li> <li>○ High speed network switch.</li> </ul> </li> <li>• Shared storage</li> </ul> <p><b>Software</b></p> <ul style="list-style-type: none"> <li>• Operating system: <ul style="list-style-type: none"> <li>○ A 'Single system Image'(SSI) will be deployed to ensure that each node can communicate</li> <li>○ The SSI acts as 'middleware' so that outside of the cluster the system is viewed as a single computing instance.</li> </ul> </li> <li>• Applications – an application level for the SSI will need to be considered as this is the part that is seen by the user.</li> </ul> <p><b>Protocols</b></p> <ul style="list-style-type: none"> <li>• Typically cluster will use the TCP/IP protocols to connect and communicate over the connective infrastructure.</li> <li>• Other protocols should be implemented for tasks such as use of shared memory, virtual memory and multiplexing.</li> </ul> <p><b>Additional factors</b></p> <ul style="list-style-type: none"> <li>• Scalability – a well set up cluster will allow Gurvinder to add/remove nodes as needed to scale the power and scope of the cluster.</li> <li>• Knowledge – Gurvinder may not have the knowledge to effectively build or maintain the cluster himself.</li> <li>• Stability/robustness – Clusters are generally very good at responding to problems in the cluster and can often withstand multiple node failures and still continue to perform the required operations, although at reduced performance.</li> <li>• Performance – Clusters are best used for complex problems that require multiple complex and parallel calculations, they would provide Gurvinder with a more cost effective way to achieve results similar to that of large, expensive servers.</li> <li>• Cost – Typically more cost effective than using a 'supercomputer' but can still be very expensive to purchase all components and set up. Cheaper single board computers (e.g. Raspberry Pi) may provide a cost effective way of building a cluster but their relative individual processing power may mean more nodes are required to process all data efficiently</li> </ul>

**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\*.

<b>Level</b>	<b>Mark</b>	<b>Descriptor</b>
Level 0	0	No rewardable material.
Level 1	1-2	<p>Technical vocabulary is used but is not used appropriately to support arguments in relation to the issues of the question.</p> <p>Issues are identified but chains of reasoning are not made leading to a superficial understanding of the relative importance of issues to the scenario.</p> <p>Does not link arguments to the given scenario.</p>
Level 2	3-5	<p>Accurate technical vocabulary is used to support arguments but not all arguments are relevant to the issues of the question.</p> <p>A consideration of relevant issues using logical chains of reasoning but does not reflect upon their relative importance to the given scenario.</p> <p>Considers the various elements of the question and but does not always link arguments to the given scenario.</p>
Level 3	6-8	<p>Fluent and accurate technical vocabulary is used to support arguments that are relevant to the issues of the question.</p> <p>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.</p> <p>Carefully considers the various elements of the question and Links arguments to the given scenario.</p>

Question number	Indicative content
4(a)	<p>A discussion of the factors that would affect Stephanie's choice of hardware.</p> <p><b>User experience</b></p> <ul style="list-style-type: none"> <li>• Performance – it is likely that as a computer software designer she will often have lots of programs running at once for development, testing, compiling code etc. she will therefore need a computer that can support multitasking and varied workflow.</li> <li>• Accessibility – as this is for work it will be used for long periods of time so the computer will need to be comfortable to use and consideration of peripherals that are more ergonomic (such as keyboards)</li> </ul> <p><b>User needs</b></p> <ul style="list-style-type: none"> <li>• A large storage capacity may be needed to store all the different programs she creates (including different versions of the same software for a range of platforms) and related assets. Although cloud storage can make up for shortfalls in local storage using web-based storage for large files that are regularly accessed is inefficient .</li> <li>• A large, high resolution screen would be beneficial to allow multiple programs, documents etc. to be seen at once and to reduce eyestrain when using the computer.</li> <li>• A large number of expansion ports is advisable to allow connection of different peripherals and devices for testing software.</li> <li>• Dedicated high performance GPU</li> </ul> <p><b>Compatibility</b></p> <ul style="list-style-type: none"> <li>• Stephanie would most likely choose a platform that is compatible with her preferred development and testing environments.</li> </ul> <p><b>Cost</b></p> <ul style="list-style-type: none"> <li>• As this is a new company, Stephanie will look to get the best possible performance for the lowest price, it may be that she will have to prioritise what she most needs in the computer (e.g. she may choose to trade higher RAM for slightly smaller storage capacity).</li> </ul> <p><b>Implementation</b></p> <ul style="list-style-type: none"> <li>• Stephanie may want a PC that is ready to use immediately as work she has to create may be time critical – she may choose a computer with the OS already installed and then just install the development tools she needs.</li> <li>• As she is a computing professional, she may have the skills and the desire to build the PC herself, although this may be more time consuming, by buying all components individually she can get the parts from different suppliers seeking out the best deal.</li> <li>• Building the PC herself will mean she can get exactly the specification she wants and only install the software she wants. Many pre-built PCs come with additional 'bloatware', which may use up computer resources and impact on performance.</li> </ul>

**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\*.

<b>Level</b>	<b>Mark</b>	<b>Descriptor</b>
Level 0	0	No rewardable material.
Level 1	1-3	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	4-7	Accurate technical vocabulary is used to support arguments but not all arguments 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	8-10	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(b)	<p>An evaluation of the extent to which emulation is suitable for the needs of the software designer:</p> <p>Emulation – using software to allow one computer to behave like another computer to allow the host computer to perform certain operations in a required way or use particular software (such as operating systems).</p> <p>Reasons for Stephanie to use emulation</p> <ul style="list-style-type: none"> <li>• Allows her to access software/operating systems of other computer systems/platforms without the need to have access to different devices.</li> <li>• Emulation software can be configured to match a range of different specifications of platforms to allow her to test performance and compatibility of her software in different scenarios.</li> <li>• Allows Stephanie to develop in an environment that makes it easier/more comfortable to code/develop – for example if developing an app for a smartphone (such as an Android device) it would be more comfortable to work on a PC with a keyboard than directly on the smartphone.</li> <li>• Cost benefits – Stephanie does not have to buy many different hardware devices to test software on, reducing the amount she needs to spend on hardware.</li> <li>• Allows Stephanie to test software for different platforms herself rather than having to employ other test users.</li> </ul> <p>Reasons against Stephanie using emulation software</p> <ul style="list-style-type: none"> <li>• Performance of software running on emulation software can be negatively affected as the software being used is further removed from the computer hardware – i.e. the software being tested is running by an operating system, which is running inside the emulation program, which itself is running on another operating system.</li> <li>• Software licensing may be problematic, even if Stephanie owns legal versions of operating systems some of their licences do not permit use in virtualised/emulated environments.</li> <li>• Using emulation for testing may not give accurate test results on ease of use etc. – for example Stephanie may be using keyboard and mouse to test a program that is designed to be used on a tablet with a touch screen interface.</li> <li>• Emulators may not be able to test some functions provided by some devices such as use of NFC, screen orientation, location etc.</li> </ul>

**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\*.

<b>Level</b>	<b>Mark</b>	<b>Descriptor</b>
Level 0	0	No rewardable material.
Level 1	1-4	<p>Technical vocabulary is used but are not used appropriately to support arguments in relation to the issues of the question.</p> <p>Issues are identified but chains of reasoning are not made leading to a superficial understanding of the relative importance of issues to the scenario.</p> <p>No conclusion is presented or is generic.</p>
Level 2	5-8	<p>Accurate technical vocabulary is used to support arguments but not all arguments are relevant to the issues of the question.</p> <p>A consideration of relevant issues using logical chains of reasoning but does not reflect upon their relative importance to the given scenario.</p> <p>An attempt at a conclusion is presented that links arguments to the given scenario but is not justified in that it does not reflect the careful consideration of both sides of the argument.</p>
Level 3	9-12	<p>Fluent and accurate technical vocabulary is used to support arguments that are relevant to the issues of the question.</p> <p>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.</p> <p>A fully justified conclusion is presented that links arguments to the given scenario and that reflects the careful consideration of both sides of the argument leading to a reasoned decision.</p>

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