



# Mark Scheme (Results)

January 2022

Pearson BTEC Nationals  
In Computing (31768H)  
Unit 1: Principles of Computer Science

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# **Unit 1: Principles of Computer Science**

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## **General Marking Guidance**

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- All marks on the mark scheme should be used appropriately.
- All marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if a candidate's response is not worthy of credit according to the mark scheme.
- Where some judgment is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt about applying the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed-out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Phonetic spelling should be accepted.

## **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.

## BTEC Nationals Unit 1 Mark Scheme

Question Number	Answer	Mark
1a	<p>Award one mark for each point below up to a maximum of 3 marks.</p> <p>1: lines 3,5,9,11,15,17</p> <p>2: lines 2,4,8,10,14,16</p> <p>3: lines 6,12,18</p>	3

Question Number	Answer	Mark
1b	<p>Any <b>three</b> improvements from</p> <p>Indentation (1)</p> <p>Loops (1)</p> <p>Comments (1)</p> <p>Meaningful variable names (1)</p>	3

Question Number	Answer	Mark
1c	<p>Any <b>two</b> inputs from</p> <p>Score for each dart (1)</p> <p>Double/triple/update score (button pressed) (1)</p> <p>Starting score (501 or 301) (1)</p> <p>Player ID / Player name / Player 1 or 2 (1)</p>	2

Question Number	Answer	Mark
1d	<p>A description to contain any two from.</p> <ul style="list-style-type: none"> <li>• Last In First Out (LIFO) / First In Last Out (FILO) (1)</li> <li>• data added to the top of the stack (1)</li> <li>• most recent score will be at the top of the stack (1)</li> <li>• can output/pop/peek the value on top of the stack (1)</li> </ul>	2

Question Number	Answer	Mark
1e	<p>EXAMPLE SOLUTION:</p> <pre>total = 0 FOR dart = 1 to 3   POP value from stack   total = total + value NEXT dart</pre> <p><b>One</b> mark for each of:</p> <p>Zero score at start (1)  Uses a Loop to retrieve data (from stack) (1)  Remove value from stack (and assign to a variable) (1)  Add value to total (1)</p>	4

Question Number	Answer	Mark
1f	<p>An explanation such as:</p> <p>Trigger functions decide on which code/event handler to run (1) whenever there is a specific event/input/condition (1) such as a user action or system timer (1)</p>	3

Question Number	Answer	Mark
1g	<p>Award <b>one</b> mark for identification and one additional mark for appropriate expansion up to 3 marks.</p> <p>Explanations such as:</p> <p>Time Driven (1) to run a specific code at a pre-set time (1) such as ending the game after a certain amount of time (1)</p> <p>Event Handlers (1) to run a specific action when a specific event is triggered (1) such as pressing the double or triple button (1)</p> <p>Mouse events (1) such as highlight a button (1) when the mouse pointer hovers over it (1)</p> <p>Event listener (1) waits for an event to occur (1) such as a mouse click or button click (1)</p> <p><b>Additional guidance</b> accept alternative examples of how features could be used in the app for second expansion mark.</p>	3

Question Number	Answer	Mark																
2a	<p>One mark for each correct response</p> <p>Array 3</p> <table border="1"> <tr> <td>on</td> <td>off</td> <td>on</td> <td>on</td> <td>off</td> <td>on</td> <td>on</td> <td>on</td> </tr> </table> <p>Array 4</p> <table border="1"> <tr> <td>on</td> <td>on</td> <td>on</td> <td>on</td> <td>on</td> <td>on</td> <td>on</td> <td>off</td> </tr> </table>	on	off	on	on	off	on	on	on	on	on	on	on	on	on	on	off	2
on	off	on	on	off	on	on	on											
on	on	on	on	on	on	on	off											

Question Number	Answer	Mark
2b	<p>A description to contain any two from</p> <p>Length check (1) Array must be 8 values (1)</p> <p>Type check (1) All values must be string/Boolean (1)</p> <p>Presence check (1) Ensure that data has been entered(1)</p> <p>Lookup / constraints check (1) Ensure only 'on' or 'off' is entered (1)</p>	2

Question Number	Answer	Mark
2c	<p>Any four from</p> <ul style="list-style-type: none"> <li>• Inputs (1)</li> <li>• Outputs (1)</li> <li>• Key processes (1)</li> <li>• Repeated processes (1)</li> <li>• Constants (1)</li> <li>• Order of processes (1)</li> </ul>	4

Question Number	Answer	Mark
2d	One mark per correct answer  28.3 (1) 25 (1)	2

Question Number	Answer	Mark
2e(i)	23.6 (1)	1

Question Number	Answer	Mark
2e(ii)	23.5 (1)	1

Question Number	Answer	Mark
2e(iii)	Award <b>one</b> mark for identification and one additional mark for appropriate expansion up to <b>two</b> marks.  The garage will make less money (1) because customers will always pay less for the fuel (1)  The garage may run out of fuel (1) because more fuel is being used than has been recorded (1)	2

Question Number	Indicative content	Mark
2f	<p>Example</p> <pre> BEGIN total_volume = 0 rounded_volume =0 FOR row = 0 to 3     FOR col = 0 to 9         total_volume = total_volume + litres(row,col)     ENDFOR ENDFOR rounded_volume = ROUND(total_volume) OUTPUT rounded_volume END </pre> <p>The solution may use:</p> <ul style="list-style-type: none"> <li>• Nested loops</li> <li>• Loop for pumps is 0 to 3</li> <li>• Loop for customers is 0 to 9</li> <li>• Method of adding numbers to a single total</li> <li>• Final value is rounded to nearest litre</li> </ul>	6

Level	Mark	Descriptor
Level 0	0	No rewardable material.
1	1-2	<p>Structure of the algorithm uses some appropriate hierarchies/subdivision but clarity and/or readability is limited.</p> <p>Variable/object/process names are inappropriate and/or inconsistent</p> <p>Use of logical operations and sequence/structure of processes demonstrate limited accuracy.</p> <p>There is limited use of accepted conventions</p> <p>A partial and/or highly inefficient solution has been achieved.</p>

2	3-4	<p>Structure of the algorithm uses mostly appropriate hierarchies/subdivision to provide some clarity and readability.</p> <p>Variable/object/process names are mostly appropriate but there is some inconsistency</p> <p>Use of logical operations and sequences/structure are mostly accurate with only minor errors.</p> <p>Accepted conventions have been applied but there are some inconsistencies.</p> <p>An almost complete/inefficient solution has been achieved.</p>
3	5-6	<p>Structure of the algorithm uses appropriate and consistent hierarchies/subdivision providing clarity and readability.</p> <p>Variable/object/process names are appropriate and used consistently</p> <p>Use of logical operations and sequences/structures are accurate throughout.</p> <p>Accepted conventions have been used consistently</p> <p>A full and efficient solution been achieved.</p>

Question Number	Answer	Mark
3a	<pre> IF length(userid) &gt;= 5 AND &lt;= 30     Output <b>ID Valid</b> ELSE     Output <b>ID not valid</b> ENDIF </pre> <p><b>Additional Guidance</b> Accept appropriate alternative wording for output messages.</p>	3

Question number		
3 (b)	<p>An explanation such as:</p> <p>Don't know which device/browser/Operating System the parents will access with (1) so you need to ensure it is widely accessible (1) so everyone gets the same user experience (1)</p> <p>Will look and behave the same on different devices (1) so all users can access all features (1) without the need to install additional software (1)</p> <p><b>Accept any other appropriate response</b></p>	3

Question number	Indicative content
3(c)	<pre> graph TD     Start([Start]) --&gt; Input[/Input pword/]     Input --&gt; D1{Pword = userID}     D1 -- Yes --&gt; O1[/Output invalid password/]     O1 --&gt; Input     D1 -- No --&gt; D2{Pword length &gt;=8 and &lt;=15}     D2 -- No --&gt; O1     D2 -- Yes --&gt; P1[Count = 0]     P1 --&gt; P2[Count capital letters in pword]     P2 --&gt; D3{Count &gt;=1}     D3 -- No --&gt; O1     D3 -- Yes --&gt; P3[Count = 0]     P3 --&gt; P4[Count numerical characters in pword]     P4 --&gt; D4{Count &gt;=1}     D4 -- Yes --&gt; O2[/Output password valid/]     O2 --&gt; End([End])     D4 -- No --&gt; O1   </pre>

Level	Mark	Descriptor
Level 0	0	No rewardable material.
1	1-3	<p>Structure of the flowchart uses some appropriate hierarchies/subdivision but clarity and/or readability is limited.</p> <p>Variable/object/process names are inappropriate and/or inconsistent</p> <p>Logical operations and sequence/structure of processes used with limited accuracy.</p> <p>There is limited use of accepted conventions</p> <p>A limited or highly inefficient solution.</p>
2	4-6	<p>Structure of the flowchart uses mostly appropriate hierarchies/subdivision to provide some clarity and readability.</p> <p>Variable/object/process names are mostly appropriate but there is some inconsistency</p> <p>Logical operations and sequences/structure of processes used with some accuracy.</p>

		<p>Accepted conventions have been applied but there are some inconsistencies.</p> <p>A solution that meets most of the requirements with some inefficiencies.</p>
3	7-8	<p>Structure of the flowchart uses appropriate and consistent hierarchies/subdivision providing clarity and readability.</p> <p>Variable/object/process names are appropriate and used consistently</p> <p>Logical operations and sequences/structures of processes are mostly accurate.</p> <p>Accepted conventions have been used consistently.</p> <p>A solution that meets the requirements with minor inaccuracies/inefficiencies.</p>

Question number	Indicative content
3(d)	<p><b>Security issues that may be considered:</b></p> <p><b><u>Injection</u></b>  Attackers insert their own code into a program, to gain access to data or control of systems.  Examples of injection include SQL injections, command injections, CRLF injections, and LDAP injections.</p> <p><b>Prevention</b>  Application security testing can reveal injection flaws.  Data input should be sanitised e.g. stripping special characters, specific commands etc from user input or writing parameterized SQL queries.</p> <p><b><u>Broken authentication</u></b>  If a coder incorrectly implements authentication and session management calls these can be a huge security risk. This would allow attackers to easily assume legitimate users' identities.</p> <p><b>Prevention</b>  Multifactor authentication is one way to mitigate broken authentication. DAST and SCA scans can be used to detect and remove issues with implementation errors before code is deployed.</p> <p><b><u>Sensitive Data Exposure</u></b>  Some APIs rely on insecure data transmission methods, which attackers can exploit to gain access to usernames, passwords, and other sensitive information.</p> <p><b>Prevention</b>  Data encryption, tokenization, proper key management, and disabling response caching can all help reduce the risk of sensitive data being exposed.</p> <p><b><u>Cross-Site Scripting</u></b>  Cross-site scripting widens the attack surface for attackers, enabling them to hijack user accounts, access browser histories, spread Trojans and worms, control browsers remotely, and more.</p> <p><b>Prevention</b>  Developers could be trained in best practices such as data encoding and input validation to reduce the likelihood of this risk. Sanitize the data by validating that it's the content you expect for that particular field, and by encoding it for the "endpoint" as an extra layer of protection.</p>

	<p><b>General internet security issues can include:</b></p> <p>Database is visible across the internet  Risk of unauthorised access increases  Risk of data loss  Data might be deleted or changed  Data might be copied</p> <p><b>Links to the given scenario:</b>  Responses should provide analysis of the issues in relation to the scenario of the question. This could include:</p> <ul style="list-style-type: none"> <li>• Personal/private information (e.g. parents' payment info, addresses, medical info of pupils)</li> <li>• Hackers may get to the web server/other school systems directory via the database</li> <li>• Information/data deleted after trips have taken place – code be configured to automatically remove data after a specified time period.</li> <li>• Which staff need access to the data -how are their access and credentials managed</li> </ul>
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Level		
Level 0	0	No rewardable material.
1	1-4	<p>Demonstrates isolated knowledge and understanding, there will be major gaps or omissions</p> <p>Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question</p> <p>Limited analysis which contains generic assertions rather than interrelationships or linkages</p>
2	5-7	<p>Demonstrates some accurate knowledge and understanding, with few minor omissions/any gaps or omissions are minor</p> <p>Breaks the situation down into component parts and some of the points made will be relevant to the context in the question</p> <p>Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.</p>
3	8-10	<p>Demonstrates mostly accurate and thorough/detailed knowledge and understanding</p> <p>Breaks the situation down into component parts and most of the points made will be relevant to the context in the question</p> <p>Displays a well-developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner</p>

Question number	Indicative content
4 (a)	<p>Indicative Content</p> <p><b>Implications</b>  Expert staff may need to be hired  More efficient systems  Changes to system requirements  Change in screen layout and functionality  New code may have different functions  Integration of existing data  Staff training needed  System change over may need down time  New errors may be introduced</p> <p><b>Impact</b>  Potential to lose data  Potential loss of custom  System downtime  Development/staff costs  Training costs  Time out for training</p>

<b>Mark scheme (award up to 6 marks)</b> 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>Demonstrates isolated elements of knowledge and understanding, there will be major gaps or omissions</p> <p>Few of the points made will be relevant to the context in the question</p> <p>Limited discussion which contains generic assertions rather than considering different aspects and the relationship between them</p>
Level 2	3-4	<p>Demonstrates some accurate knowledge and understanding, with only minor gaps or omissions</p> <p>Some of the points made will be relevant to the context in the question, but the link will not always be clear</p> <p>Displays a partially developed discussion which considers some different aspects and some consideration of how they interrelate, but not always in a sustained way</p>
Level 3	5-6	<p>Demonstrates mostly accurate and detailed knowledge and understanding</p> <p>Most of the points made will be relevant to the context in the question, and there will be clear links</p> <p>Displays a well-developed and logical discussion which clearly considers a range of different aspects and considers how they interrelate, in a sustained way</p>

Question number	Indicative content
4(b)	<p><b>What works</b>  Code breaks down the date into year, month and day  checks the month is between 1 and 12  checks the number of days in specific months  check 30, and 31 day months  check for February  allows for leap years and the 29th day  gives message if anything is not valid</p> <p><b>What's missing</b>  Does not check if date is in past or future  Does not check that return data is later than hire date  Does not give helpful messages only that date not valid  Does not give any message if date valid.  Does not have a loop  Does not give chance to re-enter date</p>

Level	Mark	
	0	No rewardable material
1	1-3	<p>Demonstrates isolated elements of knowledge and understanding, there will be major gaps or omissions</p> <p>Few of the points made will be relevant to the context in the question</p> <p>Limited discussion which contains generic assertions rather than considering different aspects and the relationship between them</p>
2	4-6	<p>Demonstrates some accurate knowledge and understanding, with only minor gaps or omissions</p> <p>Some of the points made will be relevant to the context in the question, but the link will not always be clear</p> <p>Displays a partially developed discussion which considers some different aspects and some consideration of how they interrelate, but not always in a sustained way</p>
3	7-8	<p>Demonstrates mostly accurate and detailed knowledge and understanding</p> <p>Most of the points made will be relevant to the context in the question, and there will be clear links</p> <p>Displays a well-developed and logical discussion which clearly considers a range of different aspects and considers how they interrelate, in a sustained way</p>

Question number	Indicative content
4(c)	<p><b>Indicative Content</b></p> <p><b>General</b>  Need to make the website interact with the customer, need to store data that customer enters on a web form.</p> <p>Might want to validate the data before it is submitted or stored. This will need scripting of some kind.</p> <p>Website scripts run in one of two places – the client side, the front-end, or the server side, the back-end.</p> <p><b>Server side</b>  The processing takes place on the web server.</p> <p>A script runs on the web server to generate dynamic HTML pages.</p> <p>This HTML is then sent to the client browser.</p> <p>It provides interactive web sites that can interface to databases on the server.</p> <p>An advantage for the shop of using server-side scripting is the ability to customise the response based on the user's input, and store the data on the server.</p> <p><b>Client side</b>  The processing takes place on the user's computer  The client-side normally run scripts in the browser.  The script is usually in JavaScript  The source code is transferred from the web server to the user's computer over the internet and run directly in the browser.</p> <p>The scripting language needs to be enabled on the client computer.</p> <p>Users might switch the scripting facility off because of security risks. This might prevent the page from working.</p>

Level	Mark	
	0	No rewardable material
1	1-4	<p>Demonstrates isolated knowledge and understanding, there will be major gaps or omissions</p> <p>Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question</p> <p>Limited analysis which contains generic assertions rather than interrelationships or linkages</p>
2	5-8	<p>Demonstrates some accurate knowledge and understanding, with few minor omissions/any gaps or omissions are minor</p> <p>Breaks the situation down into component parts and some of the points made will be relevant to the context in the question</p> <p>Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.</p>
3	9-12	<p>Demonstrates mostly accurate and thorough/detailed knowledge and understanding</p> <p>Breaks the situation down into component parts and most of the points made will be relevant to the context in the question</p> <p>Displays a well-developed and logical analysis which clearly considers interrelationships or linkages in a sustained manner</p>

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