

T Level Technical Qualification in Digital Production, Design and Development

Mark Scheme (Results)

Summer 2023

Paper 1: Digital Analysis, Legislation and Emerging Issues

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.
- Mark schemes should be applied positively. Learners 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 the marks on the mark scheme 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 mark scheme.
- Where judgement is required, a mark scheme will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the mark scheme to a learner's response, a senior examiner should be consulted.
- Crossed out work should be marked unless the learner has replaced it with an alternative response.
- Accept incorrect/phonetic spelling (as long as the term is recognisable) unless instructed otherwise.

Points-Based Mark Scheme Guidance

Points-based mark schemes are made up of:

1. Mark scheme rubric
A mark scheme rubric instructs an examiner as to how each mark is awarded.
2. Example Responses
These demonstrate the type of acceptable responses that a student might provide and where each mark is awarded.
3. Additional marking Guidance
This informs examiners about any parameters which should be applied e.g., 'accept any other appropriate/alternative responses'.

Applying the points-based mark scheme guidance

Examiners should follow the mark scheme rubric and use the example responses as a guide for the relevance and expectation of the responses. Students must be credited for any appropriate response. Should candidates provide answers that meet the rubric but in an alternative order, credit should be given.

Levels-Based Mark Scheme Guidance

Levels-based mark schemes (LBMS) have been designed to assess students' work holistically. They consist of two parts:

1. Indicative content

Indicative content reflects content-related points that a student might make but is not an exhaustive list. Nor is it a model answer. Students may make some or none of the points included in the indicative content as its purpose is as a guide for the relevance and expectation of the responses. Students must be credited for any appropriate response.

2. Levels-based descriptors

Each level is made up of a number of traits which when combined together articulate the quality of response that a student needs to demonstrate. The traits progress across the levels to demonstrate the different expectations of each level. When using a levels-based mark scheme, the 'best fit' approach should be used.

Applying the levels-based descriptors

Examiners should take a 'best fit' approach to determining the mark.

- Examiners should first make a holistic judgement on which level most closely matches the student's response. Students will be placed in the level that best describes their answer. Answers can display characteristics from more than one level, and where this happens markers must use any additional guidance (e.g., weighting of traits) and their professional judgement to decide which level is most appropriate.
- The mark awarded within the level will be decided based on the quality of the answer and will be modified according to how securely all traits are displayed at that level:
 - Marks will be awarded at the top of that level if the student has evidenced each of the descriptor traits securely.
 - Where the response does not securely meet all traits, the marks should be awarded based on how closely the descriptor has been met.

Section A

Question Number	Answer	Mark															
1	<p>Award one mark for each correctly completed row, up to a maximum of four marks.</p> <table border="1"> <thead> <tr> <th>CustomerType</th><th>UnitsUsed</th><th>DailyCharge</th></tr> </thead> <tbody> <tr> <td>SingleUse</td><td>1400</td><td>2</td></tr> <tr> <td>DualUse</td><td>3000</td><td>1</td></tr> <tr> <td>DualUse</td><td>1800</td><td>1.5</td></tr> <tr> <td>SingleUse</td><td>2400</td><td>2</td></tr> </tbody> </table>	CustomerType	UnitsUsed	DailyCharge	SingleUse	1400	2	DualUse	3000	1	DualUse	1800	1.5	SingleUse	2400	2	(4)
CustomerType	UnitsUsed	DailyCharge															
SingleUse	1400	2															
DualUse	3000	1															
DualUse	1800	1.5															
SingleUse	2400	2															

Question Number	Answer	Mark
2(a)	<p>Award one mark for each identification and one mark for an appropriate linked explanation, up to a maximum of four marks.</p> <p>Mobile_Phone_Number String (1) as the number would contain a leading zero / as an integer would cause overflow / as strings can hold symbols such as () and + (1)</p> <p>Number_Of_Lessons_Taken Integer (1) as the data would always be a whole number (1)</p> <p>Accept any other appropriate responses.</p>	(4)

Question Number	Answer	Mark
2(b)	<p>Award one mark for each of the following linked points, up to a maximum of three marks.</p> <ul style="list-style-type: none">• use a presence check (1) to ensure that the field is filled in (1) and reject blank data (1)• use a length check (1) to ensure that data has the correct number of characters / ensure it is 11 characters long (1) and reject anything that is not (1)• use a format check (1) to ensure data only contains digits (1) and rejects any other characters (1)	(3)

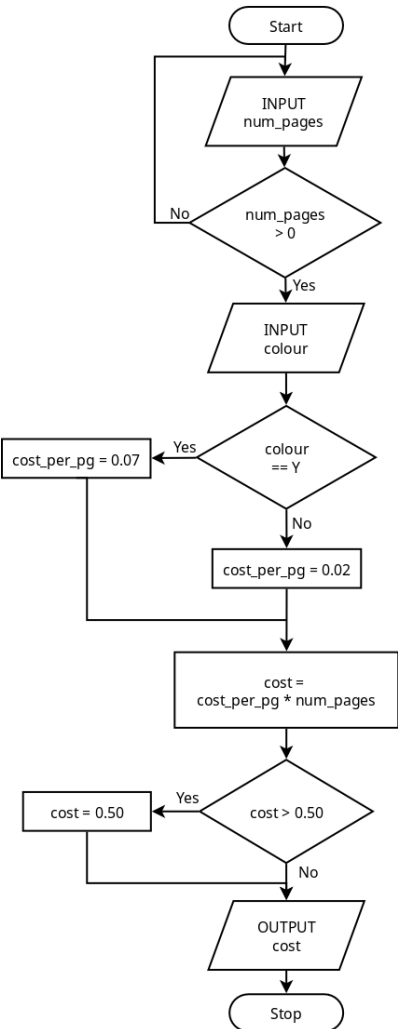
Question Number	Answer	Mark
3	<p>Award one mark for each identified method, up to a maximum of two marks.</p> <ul style="list-style-type: none">• Recognise/observe normal behaviour• be aware of co-workers• Recognise/observe changing behaviour• Recognise/observe abnormal behaviour	(2)

Question Number	Answer	Mark
4	<p>Award one mark for identification of a reason and one mark for an appropriate linked explanation, up to a maximum of four marks.</p> <ul style="list-style-type: none">• Open-source software is often free (1) therefore costs are minimised (1)• Open-source software has a community of users (1) who often contribute to improvements in the software (1)• Open-source software is transparent/ has visible/examinable source code (1) for security risks / implementation method(1)• Open-source software tends to be reliable (1) as many users contribute towards the code base (1)• (The company) can modify the software (1) to meet specific needs (1) <p>Accept any other appropriate responses.</p>	(4)

Question Number	Answer	Mark
5(a)	<p>Award one mark for identification of an algorithm and one mark for an appropriate linked explanation, up to a maximum of two marks.</p> <p>An algorithm is a series of (finite) steps (1) to solve a given problem/arrive at an outcome/get desired output/complete a task (1)</p> <p>Accept any other appropriate responses.</p>	(2)

Question Number	Answer	Mark
5(b)	<p>Award one mark for identification of the reason, one mark for an appropriate linked explanation of the reason and one mark for a further expansion of the explanation, up to a maximum of three marks.</p> <p>Development time is shortened (1) as pseudocode matches closely to programming languages (1) so implementing the algorithm (in code) would be a smaller step (1)</p> <p>Pseudocode is easy to understand (1) as it focuses on logic only (1) without needing to worry about syntax (1)</p> <p>Accept any other appropriate responses.</p> <p>Additional guidance Accept 'simplified version of code' (or similar) for mark point 2</p>	(3)

Question Number	Answer	Mark
5(c)	<p>Award one mark for each of the following linked descriptive points, up to a maximum of three marks.</p> <p>Use the mod operator (1) to determine the remainder is not zero (1) when divided by 2 (1)</p> <p>Divide the number by 2 (1) use the MOD operator to compute the remainder (1) if the remainder is not zero, the number is odd (1)</p> <p>Accept any other appropriate responses.</p>	(3)

Question Number	Answer	Mark
6	<p>Award one mark for any of the following, up to a maximum of six marks:</p> <ul style="list-style-type: none"> Correct symbols used (1) Number of pages entered (1) Invalid number rejected (1) Page type entered (1) Initial cost calculated correctly (1) Total cost calculated correctly (1) Total Cost output (1) <p>Example flowchart, note other solutions can be used.</p>  <pre> graph TD Start([Start]) --> InputPages[/INPUT
num_pages/] InputPages --> Decision1{num_pages
> 0} Decision1 -- No --> InputPages Decision1 -- Yes --> InputColour[/INPUT
colour/] InputColour --> Decision2{colour
== Y} Decision2 -- Yes --> Process1[cost_per_pg = 0.07] Decision2 -- No --> Process2[cost_per_pg = 0.02] Process1 --> Process3[cost =
cost_per_pg * num_pages] Process2 --> Process3 Process3 --> Decision3{cost
> 0.50} Decision3 -- Yes --> Process4[cost = 0.50] Decision3 -- No --> OutputCost[/OUTPUT
cost/] Process4 --> OutputCost OutputCost --> Stop([Stop]) </pre>	

	<p>Accept any other relevant phrasing/wording.</p> <p>Credit alternative solutions that use correct logic and would produce the expected outcome.</p>	(6)
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Question Number	Indicative content:	Mark
7	<p>Learners might refer to some/all of the following in their responses, but learners should be rewarded for other pertinent contextualised answers.</p> <p>Advantages of decomposition A larger complex problem is broken up into smaller, simpler problems that should be easier for programmers to comprehend and design solutions for.</p> <p>Decomposition also naturally allows for teams to work on the same problem with each subproblem being solved by different teams at the same time.</p> <p>Decomposition could also aid in the identification of opportunities to reuse existing code, so speeding up development time.</p> <p>Disadvantages of decomposition It is important that the problem is fully understood, before it is broken up into smaller constituent parts. Also making sure that the subproblems interface properly can be problematic. Testing of a submodule might not be possible until other, dependent submodules have been completed and this can delay system development.</p> <p>Breaking a problem down too far can become difficult to manage and team members may not see the bigger picture.</p> <p>Conclusion There are many advantages to problem decomposition and these far outweigh the disadvantages. Problem decomposition naturally leads to modular programming and should therefore be used when developing new systems.</p>	(9)

Level	Mark	Descriptor
	0	No rewardable material
Level 1	1-3	<ul style="list-style-type: none">• Demonstrates a basic analysis of the situation by superficially breaking down the different aspects into component parts (AO3)• Demonstrates basic application of knowledge and understanding that is partially relevant to the context of the question (AO2)• Demonstrates a basic evaluation which partially considers different factors/events and their relative importance, leading to a conclusion which is superficial or unsupported (AO3)
Level 2	4-6	<ul style="list-style-type: none">• Demonstrates a good analysis of the situation by breaking down the different aspects into component parts (AO3)• Demonstrates good application of knowledge and understanding that is relevant to the context of the question (AO2)• Demonstrates a good evaluation which considers different factors/events and their relative importance, leading to a conclusion which is partially supported (AO3)
Level 3	7-9	<ul style="list-style-type: none">• Demonstrates a thorough analysis of the situation by comprehensively breaking down the different aspects into their component parts (AO3)• Demonstrates comprehensive application of knowledge and understanding that is consistently relevant to the context of the question (AO2).• Demonstrates a thorough evaluation which comprehensively considers different factors/events and their relative importance, leading to a conclusion which is well supported (AO3)

Section B

Question Number	Answer	Mark
8(a)	<p>Sample code, note other solutions can be used.</p> <pre> SET Total TO 0 SET Mean TO 0 SET RainyDays TO 0 FOR Index FROM 0 TO 99 DO SET Total TO Total+Rain(Index) END FOR SET Mean TO Total/100 FOR Index FROM 0 TO 99 DO IF Rain(Index)>Mean SET RainyDays TO RainyDays+1 END IF END FOR SEND RainyDays TO DISPLAY </pre> <p>Award one mark for each related descriptive point, up to a maximum of six marks.</p> <p>Variables initialised correctly (1) Iteration used correctly to calculate total (1) Total rainfall calculated correctly (1) Average rainfall calculated correctly (1) Iteration used to loop through array again (1) Correct logic used to decide if daily rainfall is above average (1) Number of above average rainfall days calculated correctly (1) Number of above average rainfall days output (1)</p> <p>Accept any other relevant phrasing/wording. Credit alternative solutions that use correct logic and would produce the expected outcome.</p>	(6)

Question Number	Answer	Mark
8(b)	<p>Award one mark for each identification and one mark for an appropriate linked explanation, up to a maximum of four marks.</p> <p><u>Robust</u> To ensure the code can handle errors (1) and prevent unexpected stopping of the program (1)</p> <p><u>Reliable</u> To ensure the code produces accurate output (1) that allows user to make meaningful use of data / does not damage company reputation (1)</p> <p>Accept any other appropriate responses.</p>	(4)

Question Number	Answer	Mark
8(c)	<p>Learners might refer to some/all of the following in their responses, but learners should be rewarded for other pertinent contextualised answers.</p> <p>Growing conditions can be controlled to minimise environmental damage.</p> <p>Old systems might be upgraded causing large amounts of electronic waste/landfill.</p> <p>Systems such as this require a continuous supply of electrical power, potentially contributing to CO2 emissions.</p> <p>Data might be fed back to a data centre, and these data centre require large amounts of power.</p> <p>Systems such as this can be controlled from a remote location, thus saving emissions due to driving.</p>	(6)

Level	Mark	Descriptor
	0	No rewardable material
Level 1	1-2	<ul style="list-style-type: none">• Demonstrates a basic analysis of the situation by superficially breaking down the different aspects into component parts (AO3)• Demonstrates basic application of knowledge and understanding that is partially relevant to the context of the question (AO2)
Level 2	3-4	<ul style="list-style-type: none">• Demonstrates a good analysis of the situation by breaking down the different aspects into component parts (AO3)• Demonstrates good application of knowledge and understanding that is relevant to the context of the question (AO2)
Level 3	5-6	<ul style="list-style-type: none">• Demonstrates a thorough analysis of the situation by comprehensively breaking down the different aspects into their component parts (AO3)• Demonstrates comprehensive application of knowledge and understanding that is consistently relevant to the context of the question (AO2)

Question Number	Answer	Mark
9(a)(i)	<p>Award one mark for correctly identified function and one mark for correct parameter.</p> <p>food_types.insert(4,'Drinks')</p> <p>food_types.insert (1)</p> <p>(4, 'Drinks') (1)</p> <p>OR</p> <p>food_types.append('Drinks')</p> <p>food_types.append (1)</p> <p>('Drinks') (1)</p> <p>Correct use of quotation marks important (accept double or single quotation marks). Ignore upper/lower case.</p>	(2)

Question Number	Answer	Mark
9(a)(ii)	<p>Award one mark for correctly identified function and one mark for correct parameter.</p> <p>len(food_types)</p> <p>len (1)</p> <p>(food_types) (1)</p>	(2)

Question Number	Answer	Mark
9(b)	<p>Award one mark for each identification and one mark for an appropriate linked explanation, up to a maximum of four marks.</p> <p>data structures allow for the grouping/organising (1) of many related data items (1) as data structures allow for more efficient coding (1) as iteration can be used to process individual items (1)</p> <p>data structures allow for more readable/maintainable code (1) as the length of a program can be shortened (1) as data structures allow for the grouping (1) of many related data items (1)</p> <p>Accept any other appropriate response.</p>	(4)

Question Number	Answer	Mark
9(c)	<p>Award one mark for each of the following linked points, up to a maximum of two marks.</p> <ul style="list-style-type: none">• GPS sensors in delivery vehicles (1) allow for locating deliveries (1)• Sensors on food containers (1) can be read by smart fridges (1)• Smart devices (1) can be used to order food from any location (1)• Smartspeaker(1) can be used to order food using voice recognition (1) <p>Accept any other appropriate response.</p>	(2)

Question Number	Indicative content:	Mark
9(d)	<p>Learners might refer to some/all of the following in their responses, but learners should be rewarded for other pertinent contextualised answers.</p> <p>Data must be processed fairly, lawfully and transparently This means that the company cannot be deceitful in how it gathers data. This allows customers to have control over their data.</p> <p>Data must only be processed for specific purposes This means that customer data can only be used to process customer food orders and cannot be used for any other purpose. Also, the company cannot disclose customer data to any other companies.</p> <p>Data held must be relevant and not excessive This means that the company can only gather the customer data that it needs to fulfil its business function. For example, customer address would be needed but the income of the customer is not needed.</p> <p>Data held must be accurate The company must correct any errors in customer data. This means that customers must be allowed to view the data held about them.</p> <p>Data must not be kept for longer than needed This means that ex-customers could ask to have their data removed from the system.</p> <p>Data must be held securely This means that the company must take adequate precautions to protect data. This could include access control, encryption and other measures. This protects sensitive data from cyber criminals.</p> <p>Possible evaluative points</p> <ul style="list-style-type: none"> • Staff training/time/cost • Helps to build trust with customers and protect the business's reputation • Can prevent costly data breaches and legal issues for the business • May require more resources - human and financial • May be timely and complex to implement data compliance processes <p>Conclusion</p> <p>There are important principles incorporated into the act that protect customer data. This ensures that the data held about customers is accurate, not excessive and secured. This means that current legislation is effective in maintaining privacy and protecting data.</p>	(9)

Level	Mark	Descriptor
	0	No rewardable material
Level 1	1-3	<ul style="list-style-type: none">• Demonstrates a basic analysis of the situation by superficially breaking down the different aspects into component parts (AO3)• Demonstrates basic application of knowledge and understanding that is partially relevant to the context of the question (AO2)• Demonstrates a basic evaluation which partially considers different factors/events and their relative importance, leading to a conclusion which is superficial or unsupported (AO3)
Level 2	4-6	<ul style="list-style-type: none">• Demonstrates a good analysis of the situation by breaking down the different aspects into component parts (AO3)• Demonstrates good application of knowledge and understanding that is relevant to the context of the question (AO2)• Demonstrates a good evaluation which considers different factors/events and their relative importance, leading to a conclusion which is partially supported (AO3)
Level 3	7-9	<ul style="list-style-type: none">• Demonstrates a thorough analysis of the situation by comprehensively breaking down the different aspects into their component parts (AO3)• Demonstrates comprehensive application of knowledge and understanding that is consistently relevant to the context of the question (AO2).• Demonstrates a thorough evaluation which comprehensively considers different factors/events and their relative importance, leading to a conclusion which is well supported (AO3)

Question Number	Answer	Mark
10(a)	<p>Award one mark for identification of the input data and one mark for an appropriate linked explanation, up to a maximum of four marks.</p> <p>Instrument (1) so that a suitable tutor can be chosen (1) Date/time of lesson (1) to ensure availability of tutor (1) Is the lesson remote (1) to ensure tutor has suitable hardware (1) Learner details (1) to identify learner (1)</p> <p>Accept any other appropriate responses.</p>	(4)

Question Number	Answer	Mark
10(b)	<p>Award one mark for each of the following <u>linked</u> points, up to a max of four marks.</p> <ul style="list-style-type: none">• Perform concept testing (1) by talking to client (1)• Perform unit testing (1) by ensuring modules work correctly (1)• Perform boundary testing (1) by using extreme values (1)• Perform validation testing (1) by using invalid/valid data (1)• Perform integration testing (1) by ensuring units work together (1)• Perform performance testing (1) by measuring against set metrics (1)• Perform system testing (1) by ensuring hardware and software integrate correctly (1)• Perform acceptance testing (1) by validating finished system against user requirements (1)• Perform regression testing (1) by checking recent changes do not cause adverse effects (1)• Perform load/stress testing (1) by placing a simulated typical user processing load onto to system (1) <p>Accept any other appropriate responses.</p>	(4)

Question Number	Answer	Mark
10(c)	<p>One mark each identified principle</p> <ul style="list-style-type: none">• Perceivable• Operable• Understandable• Robust <p>Accept any other appropriate response.</p>	(2)

Question Number	Answer	Mark
10(d)	<p>Award one mark for identification of the reason, one mark for an appropriate linked explanation of the reason and one mark for a further expansion of the explanation, up to a maximum of three marks.</p> <p>Makes code easier to read (1) by limiting line length (1) to avoid text wrapping. (1)</p> <p>Minimising need to consult other documentation (1) by using consistent naming conventions (1) to clearly indicate purpose of variables. (1)</p> <p>Make code easy to follow (1) by using spacing/indentation (1) to clearly identify code structures (1)</p> <p>Accept any other appropriate answer.</p>	(3)

Question Number	Indicative content:	Mark
10(e)	<p>Learners might refer to some/all of the following in their responses, but learners should be rewarded for other pertinent contextualised answers.</p> <p>Discussion may include:</p> <p>Benefits of using local variables</p> <p>Using local variables would allow programmers to use the same variable name in many different submodules. This would mean that sensible variable names could be used wherever they are appropriate.</p> <p>Using local variables also ensures that side effects of changing a variable value inside a subprogram do not affect other subprograms.</p> <p>Using local variables can also save RAM as local variables mostly no longer exist when a submodule is exited.</p> <p>Drawbacks of using local variables</p> <p>Passing a value between subprograms requires the use of parameters and these can increase execution/compilation/translation time.</p> <p>Using local variables can also increase memory overheads.</p> <p>Unless a static declaration is used then the value held in a local variable is forgotten and this may be problematic.</p> <p>Benefits of global variables</p> <p>The variable is only declared once, no other copies of that variable exist, thus saving memory and other programming overheads.</p> <p>All submodules can see/use the variable, without resorting to parameter passing.</p> <p>Drawbacks of using global variables</p> <p>Unwanted side effects can occur if a submodule inadvertently changes the value of the global variable.</p> <p>The lead programmer would need to maintain a data dictionary of all variable names, to ensure that the same identifier is not reused.</p> <p>Conclusion</p> <p>Both local and global variables have their advantages, however as the system is being developed by a team of programmers and system response is not critical, then it would be most appropriate to use predominantly local variables when developing this system.</p>	(12)

The 2nd trait (AO2) carries twice as much weighting as traits 1 & 3.

Level	Mark	Descriptor
	0	No rewardable material
Level 1	1-4	<ul style="list-style-type: none"> • Demonstrates a basic analysis of the situation by superficially breaking down the different aspects into component parts (AO3) • Demonstrates basic application of knowledge and understanding that is partially relevant to the context of the question (AO2) • Demonstrates a basic evaluation which partially considers different factors/events and competing points, leading to a conclusion which is superficial or unsupported (AO3)
Level 2	5-8	<ul style="list-style-type: none"> • Demonstrates a good analysis of the situation by breaking down the different aspects into component parts (AO3) • Demonstrates good application of knowledge and understanding that is relevant to the context of the question (AO2) • Demonstrates a good evaluation which considers different factors/events and competing points, leading to a conclusion which is partially supported (AO3)
Level 3	9-12	<ul style="list-style-type: none"> • Demonstrates a thorough analysis of the situation by comprehensively breaking down the different aspects into their component parts (AO3) • Demonstrates comprehensive application of knowledge and understanding that is consistently relevant to the context of the question (AO2) • Demonstrates a thorough evaluation which comprehensively considers different factors/events and competing points, leading to a conclusion which is well supported (AO3)

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