T Level Technical Qualification in Digital Production, Design and Development

Mark Scheme (Results)

Autumn 2022

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	Award **one** mark for each identified way, up to a **maximum of two marks.** • Direct (1) • Harassment (1) • Victimisation (1)	**(2)**

Question Number	Answer	Mark
2(a)	Award **one** mark for each of the following linked points, up to a **maximum of three marks**. • Use a **two-dimensional** (2D) array (1) • where one dimension would store the students (1) • and the other dimension would store the test marks (1) **Accept any other appropriate responses.**	**(3)**

Question Number	Answer	Mark
2(b)	Award **one** mark for identification of the reason and **one** mark for a further expansion of the reason, up to a **maximum of four marks.** Program requirements are identified early at a high level (1) thus making it easier to explain the solution to others at an early stage (1) Program requirements can then be broken down further (stepwise refinement) and further (1) until they are small enough to be coded and tested (1) Modules can be developed (and tested) independently of each other (1) allowing for multiple programmers to work on the same project (1) The project can be easier to manage (1) as the problem is broken down and modules identified before coding (1) Aids debugging (1) due to the modularisation of the problem (1) **Accept any other appropriate response.**	**(4)**

Question Number	Answer	Mark
2(c)	Award **one** mark for each identified guideline/standard, up to a **maximum of two marks.** • ISO (International Standards Organisation) standards • Web Content Accessibility Guidelines (WCAG) 1.0 and 2.0 • World Wide Web Consortium (W3C®) • Internet Engineering Task Force (IETF)	**(2)**

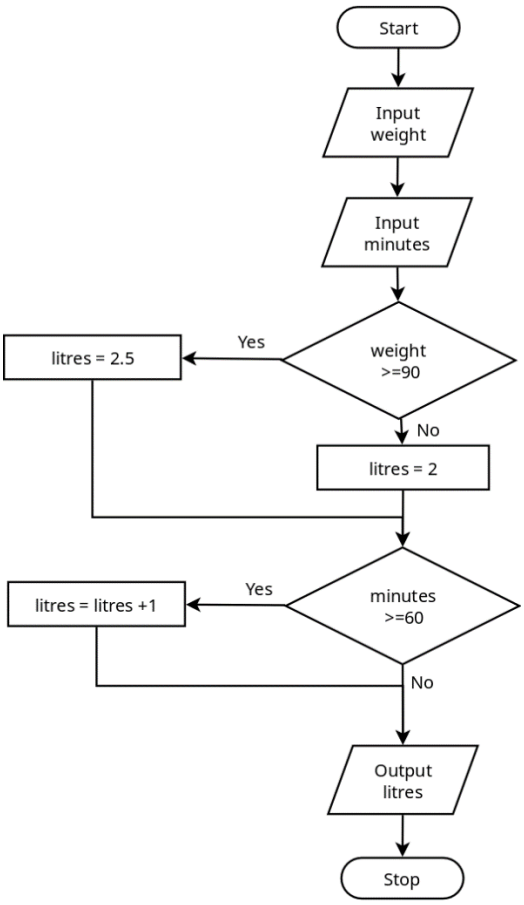
Question Number	Answer	Mark
3	Award **one** mark for each of the following linked points, up to a **maximum of three marks.** • function name defined (1) • then module logic is designed (1) • with required parameters identified (1) • and return (type/value) is identified (1) **Accept any other appropriate responses.**	**(3)**

Question Number	Answer	Mark
4(a)	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**. Found flag is set to false (1) if the value being examined is not the value being searched for (1) resulting in any TRUE being overwritten (1) There is no escape/break condition (within the loop) (1) so will continue to check even if found (1) resulting in any TRUE being overwritten (1) **Accept any other appropriate responses.**	**(3)**

Question Number	Answer	Mark
4(b)	Award **one** mark for identification of a reason and **one** mark for an appropriate linked explanation, up to a **maximum of two marks.** Linear search checks each element in turn (1) so the data does not need to be sorted (1) **Accept any other appropriate responses.**	**(2)**

Question Number	Answer	Mark
5(a)	Award **one** mark for identification of the purpose, **one** mark for an appropriate linked explanation and **one** mark for a further expansion, up to a **maximum of three marks**. To only **call** the start_motor function (1) if the door is closed (1) and the pin is 2102 (1) **Accept any other appropriate responses.**	**(3)**

Question Number	Answer	Mark
5(b)	Award **one** mark for identification of the benefit, **one** mark for an appropriate linked explanation of the benefit and **one** mark for a further expansion of the explanation, up to a **maximum of three marks**. No human interaction needed (1) which would free up developers (1) to fix issues rather than find them (1). Test scripts can be reused (1) on different versions (of the same software) (1) to compare performance (1) Automated tools can tend to execute tests faster than humans (1) so test time is decreased (1) therefore allowing for faster iteration of software (1) **Accept any other appropriate responses.**	**(3)**

Question Number	Indicative content:	Mark
6	**Award one mark for any of the following, up to a maximum of six marks.** Correct symbols used (1) Weight entered (1) Minutes exercised entered (1) Correct logic for weight used (1) Correct logic for exercise used (1) Litres needed output (1) **Example flowchart, note other solutions can be used.**  **Credit alternative solutions that use correct logic and would produce the expected outcome.**	**(6)**

Question Number	Indicative content:	Mark

7	**Learners might refer to some/all of the following in their responses, but learners should be rewarded for other pertinent contextualised answers.**
	
	General Points
	• Job losses
	• Quality of jobs lost
	• Amount of jobs lost
	• New jobs created
	• Quality of jobs created
	• Amount of new jobs created
	• Skills needed for new jobs
	• Retraining
	• Opportunities for existing workers
	
	Possible application of knowledge
	• Impact on company's public image:
	  ○ Large job loses would have a negative impact
	  ○ New opportunities and more accessible jobs positive impacts
	• Change in job types:
	  ○ Higher pay for more skilled staff positive impact
	  ○ Fewer low skill jobs available – potential negative impact
	• Number of jobs
	  ○ Large number of job losses - negative
	  ○ Fewer new jobs created – negative
	• Impact on local community
	  ○ More unemployment – negative
	  ○ More opportunities for skilled workers – positive
	• Retraining
	  ○ Opportunities for some workers to retrain to higher skill jobs – positive
	  ○ Not all new jobs will be accessible to existing workers – negative
	
	Example conclusion
	
	In conclusion many lower skill jobs could be lost, however these jobs are likely to be low wage jobs which are relatively unsatisfying. New jobs would be created, and these jobs would tend to be higher skill, higher wage jobs, however the amount of jobs created would be less than the amount of jobs lost
		(9)

Level	Mark	Descriptor
	0	No rewardable material
Level 1	1-3	• 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	• 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	• 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)	**Sample code, note other solutions can be used.**
	`dh=int(input("enter days hired"))`
	`em=int(input("enter final milage reading"))`
	`im=int(input("enter start mileage"))`
	`days_cost=dh*20`
	`miles_driven=em-im`
	`miles_cost=miles_driven*0.05`
	`total_cost=days_cost+miles_cost`
	`print(total_cost)`
	
	Award one mark for each related descriptive point, up to a maximum of six marks.
	
	All required data entered (1)
	Number of days validated (1)
	Daily cost calculated correctly (1)
	Mileage driven calculate correctly (1)
	Mileage cost calculated correctly (1)
	Total cost calculated correctly (1)
	Total cost is output (1)
	
	Accept any other relevant phrasing/wording.
	Credit alternative solutions that use correct logic and would produce the expected outcome.
		(6)

Question Number	Answer	Mark
8(b)	Award **one** mark for each of the following linked points, up to a maximum of **four** marks. Must respect privacy (1) by anonymising as far possible (1) informing customers how it will be used (1) and ensuring it is adequately protected / follow GDPR (1) **Accept any other appropriate responses.**	**(4)**

Question Number	Answer	Mark
8(c)	**Learners might refer to some/all of the following in their responses, but learners should be rewarded for other pertinent contextualised answers:** *Importance of style conventions* Using an accepted convention makes code more readable. Aspects that may be covered: Annotation Indentation Line Length Identifier Naming convention Application of knowledge: Writing code in a consistent manner makes code more readable Guidance on the degree of annotation comments to be included in code – this makes program flow easier to understand Indentation guidance is given to make program structure easier clearer Line length conventions are used to cut down on the use of overly long lines Variable naming/Identifier conventions are used to clearly convey the content of variables Ensures maintainability by making it easier for someone other than the original programmer to understand the purpose and structure of the code.	**(6)**

Level	Mark	Descriptor
	0	No rewardable material
Level 1	1-2	• 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	• 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	• 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)	Award **one** mark for correctly identified function and **one** mark for correct parameter. calc_change(3.60) calc_change (1) (must be lower case) 3.60 (1) **Additional guidance** MKPT1 – correct function name MKPT2 – value as a parameter	**(2)**

Question Number	Answer	Mark
9(a)(ii)	Award **one** mark for each correct row. 	pound_coins	Change	fiftyp	twentyp	tenp
---	---	---	---	---
3	0.60			
	0.10	1		
	0.10		0	
	0.00			1 | **Allow response with all values in table.** | pound_coins	Change	fiftyp	twentyp	tenp
---	---	---	---	---
3	0.60	0	0	0
3	0.10	1	0	0
3	0.10	1	0	0
3	0.00	1	0	1		**(4)**

Question Number	Answer	Mark
9(b)	Award **one** mark for each of the following linked points, up to a **maximum of three marks**. There is no common international copyright law (1), but many countries have signed up to various Intellectual Property (IP) treaties (1), so copyright does not need to be to be registered in every country (1) **Accept any other appropriate response.**	**(3)**

Question Number	Indicative content:	Mark
9(c)	**Learners might refer to some/all of the following in their responses, but learners should be rewarded for other pertinent contextualised answers:** **Software** All software used in the system should be fully tested, using techniques such as white box and black box testing. Test plans should be written, followed, and documented. Testing can be done automatically or manually. It is important that this software is tested properly so that the correctness of the code can be verified therefore allowing faults identified later in the testing cycle to isolated and identified correctly, **Hardware** The hardware used in the machine should be tested to ensure that it meets the required function, that it is reliable and that it works properly in conjunction with other hardware components. This can only be done one the software has been properly tested, as it is important to be sure that a fault is due to hardware and not faulty code. **Interfaces** The interface between software modules and the interface between software and hardware should be tested to ensure that data is communicated/transferred across boundaries properly. **Final Product**	

	The final assembled product should be rigorously tested in-house first and then a form of beta testing in specific locations should be undertaken to ensure that the machine is fir for purpose **Learner should make evaluative/value judgements. These could include (but not limited to):** • Important that all components are tested in isolation and in combination • Thorough testing improves reliability of a system • Trades offs between quality of product and speed of development. • Impact on user/customer experience **Conclusion** This is a complex item of machinery and any fault in hardware or software would cause the machine to fail. It is vital that both are fully tested and also that a form of integration testing takes place as well	**(9)**

Level	Mark	Descriptor
	0	No rewardable material
Level 1	1-3	• 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	• 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	• 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)(i)	Award **one** mark for identification of a suitable datatype and **one** mark for an appropriate lined explanation, up to a **maximum of two marks.** Boolean (1) as the function return type is true or false (1) **Accept any other appropriate responses.**	**(2)**

Question Number	Answer	Mark
10(a)(ii)	Award **one** mark for each of the following linked points, up to a **maximum of four marks**. Use a volume over 4 and a weight over 5 (e.g., 10 and 6) (1) to test that high tariff/True is correctly returned (on first condition) (1) Use a volume over 10 and a weight over 2 (e.g., 11 and 4) (1) to test that high tariff/True (is correctly returned (on second condition) (1) Use a volume of less than 4 or a weight of less than 2 (1) to test that low tariff/False is correctly returned (on else) (1) Pass erroneous data to a parameter (1) to check false is returned (1) **Accept any other appropriate responses.** **Additional Guidance** Accept examples of erroneous data/data outside of expected range for testing return False value	**(4)**

Question Number	Answer	Mark
10(b)	Award **one** mark for each of the following linked points, up to a **maximum of four marks.** (Use Machine learning) to analyse traffic patterns (1) to uncover trends and correlations (1) and avoid known bottlenecks / identify best route (1) minimising driving time / predicting delivery time (1) **Accept any other appropriate responses.**	**(4)**

Question Number	Answer	Mark
10(c)	Award **one** mark for each of the following linked points, up to a **maximum of four marks.** The programmer must act in a professional manner (1) by ensuring code meets requirements (1) Public safety should not be compromised (1) by assuming unsafe driving speeds when delivery schedule is being generated (1) Customer privacy must be respected (1) through the use of security measures / by not allowing driver to access to parcel content data (1) Have due regard for the legitimate rights of third parties (1) by respecting IP (1) Only undertake to do work or provide a service that is within your professional competence (1) by not claiming to have skills you have not mastered (1) **Accept any other appropriate response.**	**(4)**

Question Number	Answer	Mark
10(d)	**Learners might refer to some/all of the following in their responses, but learners should be rewarded for other pertinent contextualised answers:** **Discussion may include:** **Benefits of flowcharts** Flowcharts are language agnostic and offer more abstraction that pseudocode Flowcharts can clearly show the flow of a program Flowcharts require less specialist knowledge to understand Flowcharts ensure that no logical path is left incomplete **Drawbacks of flowcharts** Flowcharts can take a long time to draw and amend Moving from a flowchart to real code can take a long time Some control structures are difficult to represent using flowcharts Any non-linear code such as event driven software is difficult to express using flowcharts **Benefits of pseudocode** There is a clear link between pseudocode and high level languages, thus making it faster to move from design to implementation Pseudocode is generally faster to create than flowcharts and is easier to amend Pseudocode can represent common programming constructs **Drawbacks using pseudocode** Pseudocode can be difficult to understand There are little accepted standards for pseudocode **Conclusion points that could be made** Both approaches have their own strengths and weaknesses. The choice may depend on the technical competence the team, and also if the language that the application is being developed in has already been decided upon. Using **both** is a good idea. Using a flowchart allows the planning of data flow through the system, which will allow programmers to plan the sequence of processes more effectively. The flowchart can also be used to plan high-level user interaction and would be good for showing the 'process' to a non-technical audience such as clients or investors.	

	Being closer to programming languages, pseudocode allows the developers to plan logic in a way that will mimic the structure of the program, e.g., grouped as separate functions/modules etc. As it is language agnostic however so can be used to plan all parts of the system (front-end and back-end), and then handed to specialist developers who could implement it in an appropriate language.	**(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	• 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	• 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	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)