

T Level Technical Qualification (Level 3) in Digital: Digital Production, Design and Development

**Additional Specimen assessment material for first teaching
September 2020**

Component: Occupational Specialism

This booklet contains material for the completion of the set task under supervised conditions.

This booklet is specific to each series and this material must only be issued to Students who have been entered to undertake the task in the relevant series.

This booklet should be kept securely until the start of the 3-week assessment window.

Level

3

Total marks

58

Controlled
hours

20

Task 1: Analysing the problem and designing a solution

Paper Reference PXXXXXA

Instructions for students

You must complete ALL activities within the assessment.

This set task must be undertaken between [Day Month YYYY] and [Day Month YYYY].

Your centre will schedule **20 supervised hours during the three-week window** in which you will produce the outcomes for this task.

You are:

- only permitted to produce evidence of your proposal and design documentation during the scheduled supervised sessions
- not permitted to have access to your proposal and design documentation outside the supervised assessment sessions.

Outside the supervised assessment sessions you are permitted to:

- carry out research
- produce notes containing the facts and figures related to your research.

Any notes you wish to take into the supervised sessions must be submitted as part of the assessment so they can be checked by your tutor; your tutor will confirm that the notes contain **only** facts and figures related to the research carried out.

Notes that you are permitted to take into the scheduled supervised sessions must:

- **not contain** attempts to interpret, analyse or evaluate the research in the context of the scenario
- **not contain** any other content that has not been specified in these instructions
- be submitted as an appendix to the task and retained by your centre until after the end of the post-results service period.

You are allowed monitored access to the internet during the scheduled supervised sessions.

Your work will be kept securely during any breaks and between scheduled sessions.

You are not permitted to take anything into or out of the supervised assessment sessions without the approval of your tutor/invigator.

Templates provided for use during this task:

- *Task1_Test_Strategy_Template.doc*

Your work must:

- be completed independently
- identify any work that is not your own through the use of appropriate citations
- be authenticated by your tutor before being submitted to Pearson.

Your tutor is not permitted to provide guidance or feedback during this task.

Set Task Brief

The software development company you work for has secured a new contract to develop a digital solution for remote workers in the retail industry.

K1J LTD currently provides employees with:

- Access to a sales system
- Access to customer data
- Advises customers about different products

The client (owner of K1J LTD) would like to develop a digital solution that will:

- provide employees remote access from anywhere
- provide tracking of customer interactions
- provide management with information for decision making processes

The client has carried out some market research with existing customers, to identify features that could be included in the digital solution. The potential features suggested are:

- Dashboard-based analytics
- Email tracking and integration with Outlook and Gmail
- Instant messaging between employees and customers to up date orders and tracking
- Files and content sharing.

Activities

Activity A (i)

In preparation for developing a proposal for the digital solution, you have been asked to carry out research. Your research should consider how digital solutions are used to meet the needs of different users within the retail industry, including:

- how hardware and software are used within the context of the retail industry
- newly emerging technologies
- how digital solutions could be used to meet different user needs
- the industry-specific guidelines and regulations you will need to follow.

Any notes you produce should be kept and submitted as an appendix.

Activity A (ii)

Produce a detailed proposal for a digital solution for remote working you would develop to meet the needs of:

- the client (K1J LTD)
- existing and potential customers

Your proposal should provide a rationale for the solution you are proposing and include:

- the business context
- the functional and non-functional requirements of the solution
- decomposition of the problems that will need to be solved to implement the functional and non-functional requirements
- the key performance indicators (KPIs) and user acceptance criteria for the proposed solution
- a description of the proposed solution
- justification of:
 - how the recommended solution meets the needs of the client and users
 - how potential risks will be mitigated

- how relevant regulatory guidelines and legal requirements, in relation to software development and the industry, will be addressed.

[24 marks]

Activity B

Produce a set of design documents for the digital solution you are proposing. The design documentation must include:

- visual/interface designs
- data requirements
- a selection of algorithm designs
- a test strategy.

Your proposed solution must be of sufficient scope and complexity to demonstrate your ability to implement code in at least two appropriate languages to implement front-end and back-end processes.

Your design documents should provide sufficient detail to:

- effectively communicate the intended solution to both technical and non-technical stakeholders
- allow the client to make informed decisions
- allow a third-party developer to use the design documents to create the proposed solution.

Your test strategy does not need to detail specific tests for every part of the solution. However, it should provide a selection of tests, relevant to your proposed solution, that show:

- the order in which you intend to test all components of the solution
- the types of test to be carried out for each component.

Your algorithm designs do not need to show the whole solution but should show how you would solve a number of different key problems. You should limit your algorithm designs to a maximum of five complex problems.

[34 marks]

Outcomes for submission

You must submit:

1. A proposal for the designed solution, including appendices of relevant research notes to support your rationale.

Save your proposal as a PDF file in your folder for submission. Use this naming convention:

- Task1_Proposal_[Registration number #]_[Surname]_[First letter of first name]
2. A set of design documents.

Save your completed design documents as PDF files in your folder for submission. Use this naming convention:

- Task1_DesignDocs_[Document name]_[Registration number #]_[Surname]_[First letter of first name]

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Level

3

Total marks

48

Controlled
hours

30

Task 2: Developing the solution

Paper Reference PXXXXXA

Instructions for students

You must complete ALL activities within the assessment.

This task is to be completed under supervised conditions during a window of four weeks.

The window for this task is [Day Month YYYY] to [Day Month YYYY].

Your centre will schedule **30 supervised hours during the four-week window** in which you will produce the outcomes for this task.

During this task, you are allowed:

- monitored access to the internet
- access to a copy of your proposal and design produced in Task 1.

You are **not** allowed to make changes to the evidence produced in Task 1.

Your work will be kept securely during any breaks and between scheduled sessions.

Templates provided for use during this task:

- *Task2_Test_Log_Template.doc*

During this task, your tutor is permitted to provide general feedback about:

- the appropriateness of the solution you designed in Task 1
- whether the solution you are developing will function as intended.

Your tutor is **not** permitted to provide guidance about how to improve your solution.

Set Task Brief

Your manager has approved you to start developing your solution and has asked you to produce a prototype of the solution you have designed.

To help you develop a functional prototype, your manager has told you to refer to:

- information from your proposal and designs
- the information provided for Task 1 in the Set Task Brief (reproduced here).

Set Task Brief: Task 1

The software development company you work for has secured a new contract to develop a digital solution for remote workers in the retail industry

K1J Ltd currently provides employees with:

- Access to a sales system
- Access to customer data
- Advises customers about different products

The client (owner of K1J LTD) would like to develop a digital solution that will:

- provide employees secure access from any location
- provide tracking of customer interactions
- provide management with information for decision making processes

The client has carried out some market research with existing customers, to identify features that could be included in the digital solution. The potential features suggested are:

- Dashboard-based analytics
- Email tracking and integration with Outlook and Gmail
- Instant messaging between employees and customers to up date orders and tracking
- Files and content sharing.

The client has carried out some market research with existing customers, to identify features that could be included in the digital solution. The potential features suggested by the existing customers are:

- Dashboard-based analytics
- Email tracking and integration with Outlook and Gmail
- Instant messaging between employees
- Files and content sharing.

Activity

Developing the prototype

Develop a functional prototype of your proposed digital solution to meet the client's needs.

During development, make sure you:

- implement secure code in at least two appropriate languages to develop a solution for the client
- gather and prepare appropriate assets to be used in the development of your digital solution
- make use of, and document, iterative testing
- document the iterative development process, including changes made to the solution during development
- produce code that can be maintained by a third party
- ensure a high-quality user experience
- follow legal and regulatory guidelines and standards.

When gathering assets, you need to record the sources you use in an assets log. Your log must:

- record all the sources you have used
- describe the content and its intended purpose
- log the date on which you retrieved the information.

Your testing documentation does not need to include details of every test carried out. However, it should demonstrate:

- an iterative approach to testing
- understanding of how to test inputs, calculations, validation and processes using appropriate test data.

[48 marks]

Outcomes for submission

Prototype

Save copies of key versions of your functional prototype in your folder for submission.

Use any sensible folder structure and naming convention.

Development documentation

Save your development documents as PDF files in your folder for submission. Use this naming convention:

- Task2[Document name]_[Registration number #]_[Surname]_[First letter of first name]

Save your content and assets log as a PDF in your folder for submission. Use this naming convention:

- Task2ContentAssetsLog_[Registration number #]_[Surname]_[First letter of first name]

Test log

Save your test log as a PDF file in your folder for submission. Use this naming convention:

- Task2_Test_Log_[Registration number #]_[Surname]_[First letter of first name]

Code for prototype solution

Save your code as PDFs and as .txt files in your folder for submission. Use this naming convention:

- Task2Code[doc #]_[Registration number]_[Surname]_[First letter of first name]

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Level

3

Total marks

24

Controlled
hours

15

Task 3 Activity A: Gathering feedback to inform future development

Paper Reference PXXXXXA

Instructions for students

You must complete ALL activities within the assessment.

This task is to be completed under supervised conditions during a window of two weeks.

The window for Task 3a is [Day Month YYYY] to [Day Month YYYY].

During this task your centre will schedule **15 supervised hours during the two-week window** so you have sufficient access to others who can provide feedback to you on your solution.

In addition to the supervised time, you are permitted to produce evidence for this task during unsupervised time. You should use this time to gather feedback from sources outside those in your class or outside your centre.

You are allowed access to the internet during both the supervised and unsupervised elements of this task.

You are allowed access to copies of:

- your design
- the prototype digital solution you have produced.

You are **not** allowed to make changes to the evidence produced in previous tasks.

Your tutor is **not** permitted to provide guidance or feedback during this task.

Set Task Brief

Your manager has asked you to gather feedback on your prototype. You will use this feedback to evaluate the effectiveness of the prototype so you can identify and plan the next steps for future iteration.

Activities

Produce materials to support the gathering of feedback and use them to gain feedback from technical and non-technical audiences.

You need to:

- use appropriate tools, methods and techniques to prepare demonstrations of the prototype's functionality, suitable for:
 - a technical audience (e.g. programming professionals)
 - a non-technical audience (e.g. the client, the users)
- produce a plan for how you intend to gather feedback
- use the materials you produce to gather feedback
- record the feedback received in a format(s) suitable for analysis.

[24 marks]

Outcomes for submission

Save the materials you have created, and the feedback received, using any suitable file type in your folder for submission.

Use this naming convention:

- Task3_PartA_[Document name]_[Registration number #]_[Surname]_[First letter of first name]

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Level

3

Total marks

15

Controlled
hours

2

Task 3 Activity B: Evaluating feedback to inform future development

Paper Reference PXXXXXA

Instructions for students

You must complete ALL activities within the assessment.

This task is to be completed under supervised conditions during a window of two days.

The window for Task 3b is [Monday Month YYYY] to [Tuesday Month YYYY].

Your centre will schedule **a single two-hour supervised assessment** for you to produce the evidence for this task.

You are **not** allowed access to the internet during this task.

You are allowed access to:

- your design
- the prototype digital solution you have produced
- the feedback you gathered in Task 3 Part A.

You are **not** allowed to make changes to the evidence produced in previous tasks.

Your tutor is **not** permitted to provide guidance or feedback during this task.

Activity

Produce an evaluation of the effectiveness of the prototype digital solution you have developed.

Your evaluation should consider:

- the effectiveness of the assets and content used, including:
 - why the chosen assets and content were selected, and why other content was rejected
 - the validity and reliability of the sources of information used
 - any legal and ethical implications of the assets and content selected
- how well the digital solution you planned and produced meets:
 - functional and non-functional requirements of the solution
 - key performance indicators (KPIs)
 - user acceptance criteria for the proposed solution
- how the prototype could be developed further.

[15 marks]

Outcomes for submission

Save your feedback evaluation report as a PDF file in your folder for submission. Use this naming convention:

- Task3_PartB_Evaluation_[Registration number #]_[Surname]_[First letter of first name]

Task 1: Test strategy

Date of test	Component to be tested	Type of test to be carried out	Prerequisites and dependencies

Add more rows as required.

Task 2: Test log

Description of test	Test data to be used (if required)	Expected outcome	Actual outcome	Comments and intended actions

Add more rows and tables as required.

Task 1 Activity A (ii): The proposal

Indicative content and marker guidance

Students' proposals may refer to:

creation of a solution to support remote working portal including features (Simple central management, Support for standard and legacy applications
Predictable costs, Highly secure, Supports BYOD, Scales with demand

-
- how the solution will handle data and pass it between back end and front end
- Integration with APIs from external services e.g Post office and private couriers.
- how they will address issues such as:
 - providing customer details
 - storing and using data to provide and enable the client to track deliveries for customer
 - supporting and providing digital content on the chosen platform.

Students' rationales should make reference to wider issues which are likely to include:

- general computer-related risks such as:
 - security
 - privacy
 - user support
- potential context-specific risks such as:
 - handling of personal data
 - Threat of any activity that can lead to data/corruption to normal business operations.

Relevant regulations and guidelines, including legal requirements, relating to software development and the industrial context. Students' rationales should make reference to current practice and emerging technologies in the retail sector, such as:

- apps and mobile devices

- tracking technology
- video/remote instruction.

Assessment focus	Band 0	Band 1	Band 2	Band 3
	0	1–3	4–6	7–9
Decomposing the problem	No rewardable material	<p>The proposal:</p> <ul style="list-style-type: none"> identifies some of the problems to be solved effectively decomposes some of the problems identified. <p>The proposed solution would effectively:</p> <ul style="list-style-type: none"> meet some of the needs of the client and users mitigate some of the potential risks address some of the relevant regulatory guidelines and legal requirements, in relation to software development and the industry. 	<p>The proposal:</p> <ul style="list-style-type: none"> identifies most of the problems to be solved effectively decomposes most of the problems identified. <p>The proposed solution would effectively:</p> <ul style="list-style-type: none"> meet most of the needs of the client and users mitigate most of the potential risks address most of the relevant regulatory guidelines and legal requirements, in relation to software development and the industry. 	<p>The proposal:</p> <ul style="list-style-type: none"> fully identifies the problems to be solved effectively decomposes the problems identified. <p>The proposed solution would effectively:</p> <ul style="list-style-type: none"> meet the full needs of the client and users mitigate the potential risks address relevant regulatory guidelines and legal requirements, in relation to software development and the industry.

	0	1–3	4–6	7–9
Appreciation of wider issues in context	No rewardable material	<p>The proposal provides limited lines of reasoning that partially justify how:</p> <ul style="list-style-type: none"> the recommended solution meets the needs of the client and users potential risks will be mitigated the proposed solution will address relevant regulatory guidelines and legal requirements, in relation to software development and the industry. 	<p>The proposal provides good lines of reasoning that mostly justify how:</p> <ul style="list-style-type: none"> the recommended solution meets the needs of the client and users potential risks will be mitigated the proposed solution will address relevant regulatory guidelines and legal requirements, in relation to software development and the industry. 	<p>The proposal provides comprehensive lines of reasoning that fully justify how:</p> <ul style="list-style-type: none"> the recommended solution meets the needs of the client and users potential risks will be mitigated the proposed solution will address relevant regulatory guidelines and legal requirements, in relation to software development and the industry.
	0	1–2	3–4	5–6
Appreciation of the business context	No rewardable material	<p>The proposal provides basic definitions of:</p> <ul style="list-style-type: none"> functional and non-functional requirements key performance indicators user acceptance criteria. 	<p>The proposal provides good definitions of:</p> <ul style="list-style-type: none"> functional and non-functional requirements key performance indicators user acceptance criteria. 	<p>The proposal provides comprehensive and perceptive definitions of:</p> <ul style="list-style-type: none"> functional and non-functional requirements key performance indicators user acceptance criteria.

Task 1 Activity B: The design – visual/interface design

Indicative content and marker guidance

The design should aim to incorporate the following characteristics:

- It should minimise the user's memory load by making objects, actions and options visible. The user should not have to remember information from one part to another. This should be clearly shown in the design.
- It should always show clients what the users are informed about / what is going on, through appropriate feedback messages or snippets.
- It should not contain information which is irrelevant or rarely needed. Every piece of extra information competes with the relevant information and diminishes its relative visibility. For example, the use of images with little or no relevance to the product or brand should be avoided.

The design should also consider the following factors:

- consistency and standards
- aesthetic and minimalist design
- help and documentation
- use of consistent fonts, colours and imagery, which will help users to know that all pieces of the solution are working together and are pieces of a consistent whole
- use of space, e.g.
 - space between lines, called leading, is important for readability; if the line spacing is too small, it is more difficult for readers to follow the line properly, but too much space may cause readers to wander away from the text altogether
 - check for lots of white space but remember, depending on the design, white space is not necessarily wasted space
- imagery used in a website or app will help users to skim the content and digest material quickly and easily.
- Consider UX and UI principles

Assessment focus	Band 0	Band 1	Band 2	Band 3
	0	1–2	3–4	5–6
Effectiveness of the design interface	No rewardable material	<p>The proposed design interface is adequate as a result of reasonably effective use of:</p> <ul style="list-style-type: none"> • layout and white space • visual hierarchies • common conventions. 	<p>The proposed design interface is good as a result of effective use of:</p> <ul style="list-style-type: none"> • layout and white space • visual hierarchies • common conventions. 	<p>The proposed design interface is excellent as a result of sophisticated and highly effective use of:</p> <ul style="list-style-type: none"> • layout and white space • visual hierarchies • common conventions.

Task 1 Activity B: The design – algorithm design

Indicative content and marker guidance

Decomposition

Students should select some key processes such as:

- collection and processing of data
- communication/data exchange between different platforms, front-end and back-end
- key calculations such cost of products, estimated delivery times etc
- data filtering and visualisation.

Algorithms

May be presented in the form of flowcharts, pseudocode, data flow diagrams, static and dynamic model diagrams or a combination of these methods.

The characteristics of a good algorithm are as follows:

- The steps are clearly defined.
- Each step is uniquely defined and depends on the input and the result of the preceding steps.
- The algorithm stops after a finite number of instructions is executed; there are two key constructs, iterate and decide.
- The algorithm receives an input – how much and what data is required.
- The algorithm produces an output – type of output (e.g. print out, return value or return list), what results are required, what happens if no results can be computed (e.g. an error message).
- The algorithm links to API, CSV or database files.
- The algorithm uses:
 - sensible names
 - key words
 - indentation
 - no programming syntax.

Flow charts are allowed, as long as symbols are used correctly.

Assessment focus	Band 0	Band 1	Band 2	Band 3
	0	1	2–3	4
Decomposition of problem	No rewardable material	Basic decomposition of the identified problems that superficially covers the required: <ul style="list-style-type: none"> inputs processes outputs. 	Good decomposition of the identified problems that sufficiently covers the required: <ul style="list-style-type: none"> inputs processes outputs. 	Highly effective decomposition of the identified problems that comprehensively covers the required: <ul style="list-style-type: none"> inputs processes outputs.
	0	1–2	3–4	5–6
Application of logical thinking and conventions	No rewardable material	Algorithms would produce some correct outcomes as a result of: <ul style="list-style-type: none"> some precise logic some appropriate structure and sequence which is likely to be inefficient. Some effective use of accepted conventions, although inconsistencies still exist.	Algorithms would produce mostly correct outcomes as a result of: <ul style="list-style-type: none"> mostly precise logic appropriate structure and sequence but which may lack efficiency. Mostly effective use of accepted conventions, though some minor inconsistencies may still exist.	Algorithms would produce consistently correct outcomes as a result of: <ul style="list-style-type: none"> precise logic efficient structure and sequence. Effective and consistent use of accepted conventions.

Task 1 Activity B: The design – data requirements

Indicative content and marker guidance

Data design maybe in the form of:

- data dictionaries
- entity-relationship diagrams
- data flow diagrams
- static and dynamic model diagrams or a combination as appropriate to describe the planned solution.

Note: Data normalisation may not be required depending on the identified/proposed solution.

Assessment Focus	Band 0	Band 1	Band 2	Band 3
	0	1–2	3–4	5–6
The design of the data requirements	No rewardable material	<p>Data requirements for the proposed solution are somewhat appropriate, including (as required):</p> <ul style="list-style-type: none"> • variables • data structures • data types. <p>Naming conventions used are mostly appropriate but are inconsistent.</p> <p>Effective error handling procedures are identified for some inputs/processes that require them.</p>	<p>Data requirements for the proposed solution are mostly appropriate, including (as required):</p> <ul style="list-style-type: none"> • variables • data structures • data types. <p>Naming conventions used are appropriate and mostly consistent.</p> <p>Effective error handling procedures are identified for most inputs/processes that require them.</p>	<p>Data requirements for the proposed solution are fully appropriate, including (as required):</p> <ul style="list-style-type: none"> • variables • data structures • data types. <p>Thoroughly appropriate and consistent naming conventions are used throughout.</p> <p>Thoroughly effective error handling procedures are identified for the inputs/processes that require them.</p>

Task 1 Activity B: The design – test strategy

Indicative content and marker guidance

Look for the most appropriate test strategies used:

- black-box
- white-box.

Testing should:

- provides mechanisms to trace tests to product objectives and their associated priorities
- engage all stakeholders where possible
- make it easy to create, view and report links between requirements, test cases, test data, test scripts, test results and defects
- be evident in some form at every stage of the development life cycle
- improve decomposition
- ensures that components and subcomponents come together to make a useful, functional system, by relating the lower-level requirements to the higher-level requirements
- check to see that some pieces have been put together and implement late-stage changes.

Assessment focus	Band 0	Band 1	Band 2	Band 3
	0	1–2	3–4	5–6
Test strategy	No rewardable material	<p>The test strategy demonstrates a basic understanding of:</p> <ul style="list-style-type: none"> • how components interrelate • the order in which components should be tested • the types of test required. 	<p>The test strategy demonstrates a good understanding of:</p> <ul style="list-style-type: none"> • how components interrelate • the order in which components should be tested • the types of test required. 	<p>The test strategy demonstrates a thorough and detailed understanding of:</p> <ul style="list-style-type: none"> • how components interrelate • the order in which components should be tested • the types of test required.

Task 1 Activity B: The design – design documentation

Indicative content and marker guidance

Written communication must be effective and appropriate, in terms of:

- suitability for the intended audience
- clarity
- use of technical language
- choice of tools / how information is presented.

Assessment focus	Band 0	Band 1	Band 2	Band 3
	0	1–2	3–4	5–6
Quality of communication	No rewardable material	<p>Some effective communication of the design as a result of:</p> <ul style="list-style-type: none"> • some use of appropriate techniques, methods and formats • some use of technical language that is appropriate for the intended audience. 	<p>Mostly effective communication of the design as a result of:</p> <ul style="list-style-type: none"> • use of mostly appropriate techniques, methods and formats • use of technical language that is mostly appropriate for the intended audience. 	<p>Consistently effective communication of the design as a result of:</p> <ul style="list-style-type: none"> • use of consistently appropriate techniques, methods and formats • use of technical language that is consistently appropriate for the intended audience.

Task 2: Developing the solution – The solution

Indicative content and marker guidance

Functionality

- Must demonstrate the use of two different languages, Python, JS, Java and PHP or SQL.
- Techniques used must be appropriate and must demonstrate a level of technical skill.
- There may be a complex data model in the database, interlinking more than one table.
- If recursive algorithms are used in PHP, there must be a mechanism (e.g. an IF statement) that stops the recursion after the desired result has been found.
- Should include:
 - server-side scripting using request and response objects and server-side extensions for a complex client-server model
 - web service APIs and parsing JSON/XML to service a complex client-server model
 - use of MySQL, DML and DDL
 - use of functions, procedures and classes.
- Various outcomes, ranging from a very linear structure to a more logical and efficient approach.
- Solution should be well-structured and modular in nature, with clearly visible subsections (e.g. separate modules).

Code organisation

- For top marks, students should avoid multiple pages of nested IF clauses and FOR loops with a lot of copied and pasted procedural code.
- Code should consist of pieces of logic, classes or objects, with proper structure.
- Comments should be used wherever possible to help explain the logic.

- Code should demonstrate:
 - clear and meaningful indentation
 - good use of local variables and minimal use of global variables
 - use of constants
 - a well-designed interface
 - a consistent style throughout
 - defensive programming
 - good exception handling.

User experience considerations

- Useful – Does it meet the needs of the user? Are outputs etc. accurate?
- Usable – Is it easy to use / intuitive?
- Desirable – Is it aesthetically pleasing? Does it represent a brand? Is the design/appearance consistent?
- Findable – Is it easy to navigate around and find the required information/features?
- Accessible – What accessibility features have been included? Have they been implemented well? Are they sufficient?
- Credible – Is the information credible?
- UI and UX principles

Assessment focus	Band 0	Band 1	Band 2	Band 3	Band 4
	0	1–2	3–4	3–5	6–8
Functionality	No rewardable material	<p>The prototype implements code with some functionality in a single language but the code lacks efficiency and some major errors persist.</p> <p>Uses some precise logic and programming structures which would result in some correct outcomes.</p>	<p>The prototype implements code with some functionality in at least two different languages but the code lacks efficiency and some major errors persist.</p> <p>Uses sufficient precise logic and programming structures which would result in adequate correct outcomes.</p>	<p>The prototype implements mostly efficient functional code in at least two different languages but some minor errors still persist.</p> <p>Uses mostly precise logic and programming structures which would result in mostly correct outcomes.</p>	<p>The prototype implements consistently efficient functional code in at least two different languages.</p> <p>Uses precise logic and programming structures throughout which would result in consistently correct outcomes.</p>

	0	1–2	3–4	3–5	6–8
Code organisation	No rewardable material	<p>Code is maintainable by a third party, but would present significant difficulties through the use of:</p> <ul style="list-style-type: none"> inconsistent naming conventions limited logical organisation limited informative commenting. 	<p>Code is maintainable by a third party, but would present some difficulties through the use of:</p> <ul style="list-style-type: none"> somewhat appropriate naming conventions some logical organisation some informative commenting. 	<p>Code is maintainable by a third party and would present only a few minor difficulties through the use of:</p> <ul style="list-style-type: none"> mostly appropriate naming conventions mostly logical organisation mostly informative commenting. 	<p>Code is easily maintainable by a third party through the use of consistently appropriate:</p> <ul style="list-style-type: none"> naming conventions. logical organisation informative commenting.

	0	1–2	3–4	3–5	6–8
User experience	No rewardable material	<p>Basic user experience is provided through limited effective use of:</p> <ul style="list-style-type: none"> • input handling • user guidance and error messages • outputs. <p>The solution is partially robust and effectively handles some common errors.</p>	<p>Adequate user experience is provided through somewhat effective use of:</p> <ul style="list-style-type: none"> • input handling • user guidance and error messages • outputs. <p>The solution is adequately robust and effectively handles sufficient common and unexpected errors.</p>	<p>Good user experience is provided through mostly effective use of:</p> <ul style="list-style-type: none"> • input handling • user guidance and error messages • outputs. <p>The solution is largely robust and effectively handles most common and unexpected errors.</p>	<p>Excellent user experience is provided through consistently effective use of:</p> <ul style="list-style-type: none"> • input handling • user guidance and error messages • outputs. <p>The solution is fully robust and effectively handles common and unexpected errors.</p>

	0	1–2	3–4	5–6	
Legal and regulatory guidelines and standards	No rewardable material	<p>Some effective application of standards and guidelines in relation to:</p> <ul style="list-style-type: none"> • accessibility • compatibility • legal and ethical considerations. <p>Some effective application of procedures and security controls to ensure confidentiality, integrity and availability.</p>	<p>Mostly effective application of standards and guidelines in relation to:</p> <ul style="list-style-type: none"> • accessibility • compatibility • legal and ethical considerations. <p>Mostly effective application of procedures and security controls to ensure confidentiality, integrity and availability.</p>	<p>Consistent and effective application of standards and guidelines in relation to:</p> <ul style="list-style-type: none"> • accessibility • compatibility • legal and ethical considerations. <p>Thoroughly effective application of procedures and security controls to ensure confidentiality, integrity and availability.</p>	

Task 2: Developing the solution – Testing

Indicative content and marker guidance

Test execution should contain numerous stages and may include different types of software testing with different data to thoroughly test the solution.

Data is needed for performance, stress and load testing and can also be achieved through the use of testing software.

There should be evidence that, when errors were identified, procedures to correct these errors were implemented and regression testing applied to ensure no additional errors were introduced as a result of the changes made.

Test data can be grouped according to different parameters, such as:

- **test-specific data:** influences the system behaviour and reveals the case specifics under the test
- **test-reference data:** has little influence on the test performance
- **application reference data:** irrelevant to the behaviour under test; needed to start the application
- **valid test data:** used to check whether system functions comply with the requirements, and whether the system processes and stores the data as intended
- **invalid test data:** used to see if the software correctly processes invalid values, shows the relevant messages, and notifies the user that the data is improper
- **boundary test data:** helps to reveal defects connected with processing of boundary values
- **wrong data:** used to check whether the system shows the correct error messages if data is entered in an inappropriate format, thus testing the use of validation
- **absent data:** to check that the solution can cope with blank fields.

Assessment focus	Band 0	Band 1	Band 2	Band 3
	0	1–2	3–4	5–6
Suitability of test data	No rewardable material	<p>Tests selected show a basic understanding of how to effectively test inputs, calculations, validation and processes using test data which makes limited use of:</p> <ul style="list-style-type: none"> • normal data • erroneous data • extreme data. 	<p>Tests selected show a good understanding of how to effectively test inputs, calculations, validation and processes using test data which includes:</p> <ul style="list-style-type: none"> • normal data • erroneous data • extreme data. 	<p>Tests selected show a thorough and detailed understanding of how to effectively test inputs, calculations, validation and processes using test data which includes:</p> <ul style="list-style-type: none"> • normal data • erroneous data • extreme data.
		1–2	3–4	5–6
Use of testing to inform the iterative development process	No rewardable material	<p>Comments show a basic understanding of how errors/problems were identified and how they were rectified (as appropriate) for:</p> <ul style="list-style-type: none"> • inputs • calculations • validation and processes. <p>Testing shows evidence of a basic iterative development process.</p>	<p>Comments show a good understanding of how errors/problems were identified and how they were rectified (as appropriate) for:</p> <ul style="list-style-type: none"> • inputs • calculations • validation and processes. <p>Testing shows evidence of a good iterative development process.</p>	<p>Comments show a comprehensive understanding of how errors/problems were identified and how they were rectified (as appropriate) for:</p> <ul style="list-style-type: none"> • inputs • calculations • validation and processes. <p>Testing shows evidence of an effective iterative development process.</p>

Task 2: Developing the solution – Documentation

Indicative content and marker guidance

The student should demonstrate an iterative approach which consists of repeating the following four phases in sequence:

- **Requirements phase:** The requirements for the software are gathered and analysed, eventually resulting in a completed and final specification of requirements.
- **Design phase:** A software solution that meets the requirements is designed. This may be a new design or an extension of an earlier design.
- **Implementation and test phase:** The software is coded, integrated and tested, using a correct and appropriate test strategy.
- **Review phase:** The software is evaluated, the current requirements are reviewed, and changes and additions to the requirements are proposed.

For each iteration, documentation should show that a decision has been made as to whether the software produced in this phase will be discarded or kept as a starting point for the next iteration.

At each iteration, there should be rigorous validation of requirements and verification (including testing) of each version of the software against those requirements.

Assessment focus	Band 0	Band 1	Band 2	Band 3
	0	1–2	3–4	5–6
Quality of iterative development process	No rewardable material	<p>A basic iterative development process is demonstrated, including:</p> <ul style="list-style-type: none"> • limited and/or superficial records of changes made throughout the development stage • a superficial or vague rationale for changes made • some effective use of versioning. 	<p>An adequate iterative development process is demonstrated, including:</p> <ul style="list-style-type: none"> • adequate records of notable changes made throughout the development stage • a supported rationale for some notable changes made • mostly effective use of versioning. 	<p>An effective iterative development process is demonstrated, including:</p> <ul style="list-style-type: none"> • thorough and detailed records of notable changes made throughout the development stage • convincing and perceptive rationales for notable changes made • fully effective use of versioning.

Task 3 Activity A: Gathering feedback to inform future development

Indicative content and marker guidance

Types of feedback and materials used to support the gathering of feedback might include:

- screencasts to demonstrate the prototype to both technical and non-technical audiences
- user questionnaires
- records of observation of users
- paired coding review records.

Testers/feedback users might include:

- potential and existing users of the system
- programming professionals.

Assessment focus	Band 0	Band 1	Band 2	Band 3	Band 4
	0	1–3	4–6	7–8	9–12
Effectiveness of materials to support the feedback process	No rewardable material	The materials would allow for the gathering of limited quality feedback for different aspects of the developed prototype.	The materials would allow for the gathering of adequate quality feedback for different aspects of the developed prototype.	The materials would allow for the gathering of good quality feedback for different aspects of the developed prototype.	The materials would allow for the gathering of high quality feedback for different aspects of the developed prototype.

	0	1–2	3–4	5–6	
Use of appropriate feedback tools to support the gathering of effective feedback	No rewardable material	The use of the tools has resulted in feedback that provides some opportunity for evidence-informed further iteration.	The use of the tools has resulted in feedback that mostly provides the opportunity for evidence-informed further iteration.	The use of the tools has resulted in feedback that consistently provides the opportunity for evidence-informed further iteration.	
		1–2	3–4	5–6	
Effectiveness of communication	No rewardable material	<p>The quality of communication is only sometimes effective for both technical and non-technical audiences as a result of limited use of appropriate techniques, methods and formats.</p> <p>There is limited use of technical language that is appropriate for the intended audience.</p>	<p>The quality of communication is mostly effective for both technical and non-technical audiences as a result of the use of mostly appropriate techniques, methods and formats.</p> <p>There is use of technical language that is mostly appropriate for the intended audience.</p>	<p>The quality of communication is effective for both technical and non-technical audiences as a result of the consistent use of appropriate techniques, methods and formats.</p> <p>There is use of technical language that is consistently appropriate for the intended audience.</p>	

Task 3 Activity B: Evaluating feedback to inform future development

Indicative content and marker guidance

Legal considerations: licencing, copyright etc.

Possible content collected:

- third party data (e.g. to simulate customer data)
- multimedia content
- snippets of pre-written code.

Any other appropriate information (e.g. Remote access portal).

Assessment Focus	Band 0	Band 1	Band 2	Band 3
	0	1–2	3–4	5–6
Effectiveness of assets and content	No rewardable material	<p>A limited review of the content selected, including superficial consideration of the:</p> <ul style="list-style-type: none"> • appropriateness of the assets selected • validity and reliability of the sources used • legal and ethical implications of using the identified assets. <p>The review is only sometimes supported by superficial consideration, comparison and corroboration across multiple sources.</p>	<p>A good review of the effectiveness of the content selected, including good consideration of the:</p> <ul style="list-style-type: none"> • appropriateness of the assets selected • validity and reliability of the sources used • legal and ethical implications of using the identified assets. <p>The review is mostly supported by good consideration, comparison and corroboration across multiple sources.</p>	<p>A comprehensive review of the effectiveness of the content selected, including thorough consideration of the:</p> <ul style="list-style-type: none"> • appropriateness of the assets selected • validity and reliability of the sources used • legal and ethical implications of using the identified assets. <p>The review is well supported by effective consideration, comparison and corroboration across multiple sources.</p>

		1–3	4–6	7–9
Evaluation of project outcomes	No rewardable material	<p>A basic or superficial evaluation of how well the prototype meets:</p> <ul style="list-style-type: none"> functional and non-functional requirements of the system key performance indicators (KPIs) user acceptance criteria for the proposed system. <p>Basic and/or simplistic rationale for future iteration is provided.</p> <p>Points made are supported by limited relevant:</p> <ul style="list-style-type: none"> selection of examples consideration of feedback. 	<p>A good evaluation of how well the prototype meets:</p> <ul style="list-style-type: none"> functional and non-functional requirements of the system key performance indicators (KPIs) user acceptance criteria for the proposed system. <p>Good rationale for future iteration is provided.</p> <p>Points made are supported by mostly relevant:</p> <ul style="list-style-type: none"> selection of examples consideration of feedback. 	<p>A thorough and detailed evaluation of how well the prototype meets:</p> <ul style="list-style-type: none"> functional and non-functional requirements of the system key performance indicators (KPIs) user acceptance criteria for the proposed system. <p>Convincing and perceptive rationale for future iteration is provided.</p> <p>Points made are supported by entirely relevant and perceptive:</p> <ul style="list-style-type: none"> selection of examples consideration of feedback.