



National 5 Computing Science Assignment Assessment task

This document provides information for teachers and lecturers about the coursework component of this course in terms of the skills, knowledge and understanding that are assessed. It **must** be read in conjunction with the course specification.

Valid for session 2022-23 only.

This assessment is given to centres in strictest confidence. You must keep it in a secure place until it is used.

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Introduction

This document contains instructions for teachers and lecturers, and instructions for candidates for the National 5 Computing Science assignment. You must read it in conjunction with the course specification.

This assignment has 40 marks out of a total of 120 marks available for the course assessment.

This is one of two course assessment components. The other component is a question paper.

Instructions for teachers and lecturers

This assessment applies to the assignment for National 5 Computing Science for the academic session 2022-23.

The task is valid for 2022-23 only. Once complete, you must send the assignment responses to SQA to be marked.

You must conduct the assignment under a high degree of supervision and control. This means:

- ◆ candidates must be supervised throughout the session(s)
- ◆ candidates must not have access to email or mobile phones
- ◆ candidates must complete their work independently – no group work is permitted
- ◆ candidates must not interact with each other
- ◆ with no interruption for targeted learning and teaching
- ◆ in a classroom environment

Time

Candidates have 6 hours to carry out the assignment, starting at an appropriate point in the course, after all content has been delivered. It is not anticipated that this is a continuous 6-hour session, although it can be, but conducted over several shorter sessions. This is at your discretion.

You have a responsibility to manage candidates' work, distributing it at the beginning and collecting it in at the end of each session, and storing it securely in between. This activity does not count towards the total time permitted for candidates to complete the assignment.

Candidates are prompted to print their work at appropriate stages of the tasks. They can print on an ongoing basis or save their work and print it later. Whatever approach they take, time for printing is not part of the 6 hours permitted for the assignment.

Resources

Each candidate must have access to a computer system with a high-level (textual) programming language and **either**:

- ◆ a database application or software that can create, edit and run SQL
- ◆ software that can create, edit and run HTML and CSS

This is an open-book assessment. Candidates can access resources such as programming manuals, class notes, textbooks and programs they have written throughout the course. These may be online resources.

You must not create learning and teaching tasks that make use of constructs required in the assessment task, **with the specific purpose of developing a solution that candidates can access during the assignment.**

There may be instances where restriction of network use is prohibited (for example, a local authority-managed network with specific limitations). However, it remains your professional responsibility to make every effort to meet the assessment conditions.

Reasonable assistance

The assignment consists of three independent tasks. They are designed in a way that does not require you to provide support to candidates, other than to ensure that they have access to the necessary resources. Candidates can complete the tasks in any order.

Once the assignment is complete, you must not return it to the candidate for further work to improve their mark. You must not provide feedback to candidates or offer an opinion on the perceived quality or completeness of the assignment response, at any stage.

You can provide reasonable assistance to support candidates with the following aspects of their assignments:

- ◆ printing, collating and labelling their evidence to ensure it is in the format specified by SQA
- ◆ ensuring candidates have all the materials and equipment required to complete the assignment – this includes any files provided by SQA
- ◆ ensuring candidates understand the conditions of assessment and any administrative arrangements around the submission and storage of evidence, and the provision of files
- ◆ technical support

Evidence

All candidate evidence (whether created manually or electronically) must be submitted to SQA in a paper-based format. The evidence checklist details all evidence to be gathered. You can use it to ensure you submit all evidence to SQA.

You should advise candidates that evidence, especially code, must be clear and legible. This is particularly important when pasting screenshots into a document.

There is no need for evidence to be printed single sided or in colour.

Alteration or adaptation

The tasks are in PDF and Word formats. Each task is available as a separate file from the secure site. Word files allow candidates to word process their responses to parts of the task.

You must not adapt the assignment in any way that changes the instructions to the candidate and/or the nature and content of the tasks. However, you can make changes to font size, type and colour and to the size of diagrams for candidates with different assessment needs, for example, visual impairment.

If you are concerned that any particular adaptation changes the nature and/or the content of the task, please contact our Assessment Arrangements Team for advice as soon possible at aarequests@sqa.org.uk.

Submission

Each page for submission has the number of the assignment task that it refers to, for example 1a, and contains space for candidates to complete their name and candidate number. Any other pages submitted, for example, prints of program listings or screenshots, must have this information added to them.

Specific instructions for teachers and lecturers: 2022-23

All candidates must complete task 1 (software design and development) and **either** task 2 (database design and development) or task 3 (web design and development).

It is at your discretion how you approach this optionality in assessment. The task your candidates complete might be pre-determined by your progress through the course, or you may be able to let candidates choose which task to complete.

You must follow these specific instructions and ensure that candidates are aware of what you will give them at each stage in the assessment.

Print each task on single-sided paper, where applicable as this:

- ◆ allows candidates to refer to information on other pages
- ◆ helps you manage tasks that are split into more than one part

Task 1 – part A requires candidates to design input validation. They must submit their evidence to you before you issue part B.

Task 1 – part B is a separate section. This ensures that candidates do not access part A and change their responses. Candidates must still have access to the program analysis pages during part B.

Task 2 – part A requires candidates to analyse a database. They must submit their evidence to you before you issue part B.

Task 2 – part B requires candidates to complete a data dictionary. They must submit their evidence to you before you issue part C.

Task 2 – part C is a separate section. This ensures that candidates do not access part B and change their responses.

A Microsoft Access file (maintenance.accdb) is provided for candidates to use in part C. If your centre uses a different database management system, you can create the relational database for part C using the CSV files or the text files provided.

If using the CSV files, you should set up all tables, fields and validation shown in the data dictionaries below. Referential integrity should also be enforced.

The text files contain SQL create and insert statements for each table. If you use the text files, you must add validation (shown in the data dictionaries below), appropriate for your version of SQL. Referential integrity should also be enforced.

Entity: Staff					
Attribute name	Key	Type	Size	Required	Validation
forename		text	30	N	
surname		text	60	N	
department		text	10	N	
email	PK	text	100	Y	

Entity: Problem					
Attribute name	Key	Type	Size	Required	Validation
problemID	PK	number		Y	
email	FK	text	100	Y	
dateRaised		date		Y	
description		text	255	Y	
rating		number		Y	range: >=1 and <=4
completed		boolean		Y	

Task 3 – part A requires candidates to identify functional requirements. They must submit their evidence to you before you issue part B.

Task 3 – part B is a separate section. This ensures that candidates do not access part A and change their responses.

A folder named ‘Web files’ is provided. This contains the CSS, HTML and media files candidates need to complete this task. These files must not be renamed and they must remain in the folders provided.

Candidates **do not** need to print completed web pages in colour.

Instructions for candidates

This assessment applies to the assignment for National 5 Computing Science.

This assignment has 40 marks out of a total of 120 marks available for the course assessment.

It assesses the following skills, knowledge and understanding:

- ◆ applying aspects of computational thinking across a range of contexts
- ◆ analysing problems within computing science across a range of contemporary contexts
- ◆ designing, implementing, testing and evaluating digital solutions (including computer programs) to problems across a range of contemporary contexts
- ◆ demonstrating skills in computer programming
- ◆ applying computing science concepts and techniques to create solutions across a range of contexts

Your teacher or lecturer will let you know if there are any specific conditions for doing this assessment.

In this assessment, you have to complete **two** short practical tasks.

You must complete task 1 (software design and development) and **either** task 2 (database design and development) **or** task 3 (web design and development).

You may complete the tasks in any order.

Advice on how to plan your time

You have 6 hours to complete the assignment. Marks are allocated as follows:

- ◆ Task 1 – software design and development 25 marks (63% of total)

AND EITHER

- ◆ Task 2 – database design and development 15 marks (37% of total)

OR

Task 3 – web design and development 15 marks (37% of total)

You can use this split as a guide when planning your time for each of the two tasks.

Advice on gathering evidence

As you complete each task, you must gather evidence as instructed in each task.

Your evidence, especially code, must be clear and legible. This is particularly important when you paste screenshots into a document.

Use the evidence checklist provided to make sure you submit everything necessary at the end of the assignment. Ensure your name and candidate number is included on all your evidence.

Evidence may take the form of printouts of code/screenshots/typed answers, hand-written answers or drawings of diagrams/designs.

Advice on assistance

This is an open-book assessment. This means that you can use:

- ◆ any classroom resource as a form of reference (for example programming manuals, class notes, and textbooks) – these may be online resources
- ◆ any files you have previously created throughout the course

The tasks are designed so you can complete them independently, without any support from your teacher or lecturer. This means that you:

- ◆ cannot ask how to complete any of the tasks
- ◆ cannot access any assignment files outside the classroom

Computing Science assessment task: evidence checklist

You should complete the checklist for task 1 and **either** task 2 or task 3.

Task 1	Evidence	
Part A		
1a	Completed task sheet showing the design	☐
Part B		
1b	Printout of your program code	☐
1c(i)	Printout evidence of the test showing inputs and outputs	☐
1c(ii)	Completed task sheet showing the completed test table	☐
1c(iii)	Completed task sheet with description of how to make program fit for purpose	☐
1d	Completed task sheet with evaluation of your program	☐

Task 2	Evidence	
Part A		
2a	Completed task sheet showing the completed analysis of inputs table	☐
Part B		
2b	Completed task sheet showing the completed data dictionary	☐
Part C		
2c	Printout evidence of the implemented department field validation	☐
2d(i)	Printout of SQL statement	☐
	Printout of the updated Staff table	☐
2d(ii)	Printout of SQL statement	☐
	Printout of the output of the query	☐
2e(i)	Completed task sheet with explanation why query is not fit for purpose	☐
2e(ii)	Completed task sheet with description of how query could be improved	☐

Task 3	Evidence	
Part A		
3a	Completed task sheet stating two functional requirements for the web page	☐
Part B		
3b and 3c	Printouts of: <ul style="list-style-type: none"> ◆ HTML and CSS code ◆ Web page as viewed in a browser 	☐
3d	Completed task sheet with your evaluation of fitness for purpose	☐
3e	Completed task sheet with description of how web page was made interactive	☐
3f	Completed task sheet with navigational structure diagram	☐

Please follow the steps below before handing your evidence to your teacher or lecturer:

- ◆ Check you have completed all parts of task 1 and one of **either** task 2 or 3
- ◆ Label any printouts/screenshots with the task number (for example 1a, 2a)
- ◆ Clearly display your name and candidate number on each printout

Task 1: software design and development

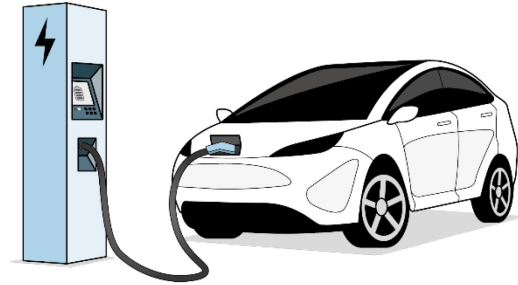
EVcharge is a company that runs an electric vehicle charging network. It requires a program to provide users with a summary of their journey, and to calculate the cost for using the charging network.

Program analysis

At the end of the journey, details are submitted to EVcharge to calculate the final cost.

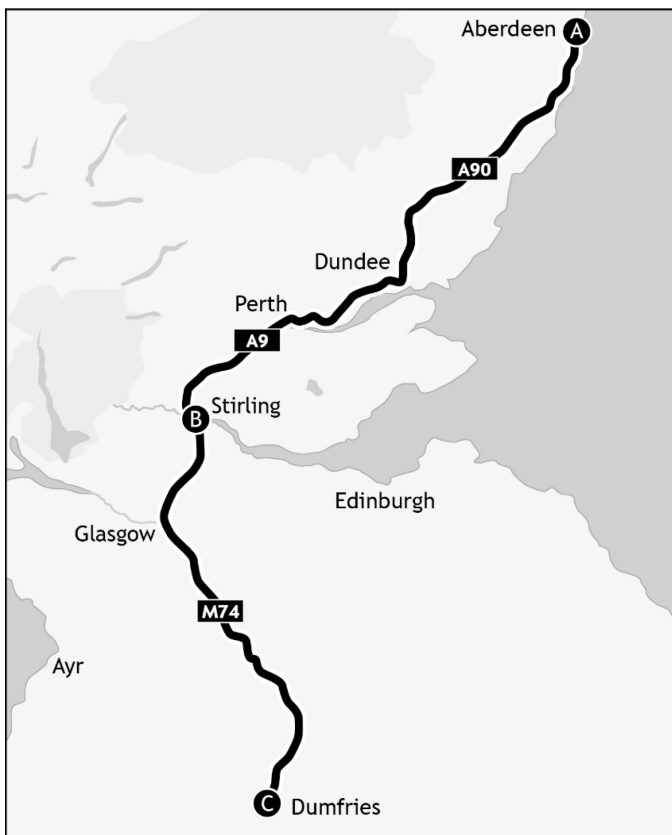
Inputs

- ◆ The vehicle mileage at the start of the journey.
- ◆ The number of charging stations visited.
- ◆ A valid kilowatt (kW) rating for each charging station (7kW, 22kW or 50kW).
- ◆ The vehicle mileage at each charging station.



For example, if making the journey from Aberdeen to Dumfries via Stirling (shown in the diagram below), the user would enter:

- ◆ the vehicle mileage at the start of the journey (A)
- ◆ that two charging stations were visited (B and C)
- ◆ the kW rating of each of the two charging stations
- ◆ the vehicle mileage at each of the two charging stations (B and C)



Process

- ◆ Calculate the number of miles travelled in each stage of the journey.
- ◆ Calculate the cost of each stage of the journey using the number of miles travelled and the cost per mile, based on the kW rating of the charging station as shown below:
 - 7kW = £0 per mile
 - 22kW = £0.005 per mile
 - 50kW = £0.01 per mile
- ◆ Calculate the total number of miles travelled from the start to the end of the journey.
- ◆ Calculate the total cost for the journey.

Outputs

- ◆ The total number of miles travelled.
- ◆ The cost (£) of each stage of the journey.
- ◆ The total cost (£) rounded to two decimal places.

Assumption(s)

- ◆ The user will complete the journey using no more than 10 charging stations.

Task 1: software design and development (part A)

- 1a Input validation is used to check that a valid kW rating has been entered for a charging station.

Using the information provided in the program analysis, design how this process could be carried out. You can use a flowchart, structure diagram or pseudocode design.

(3 marks)

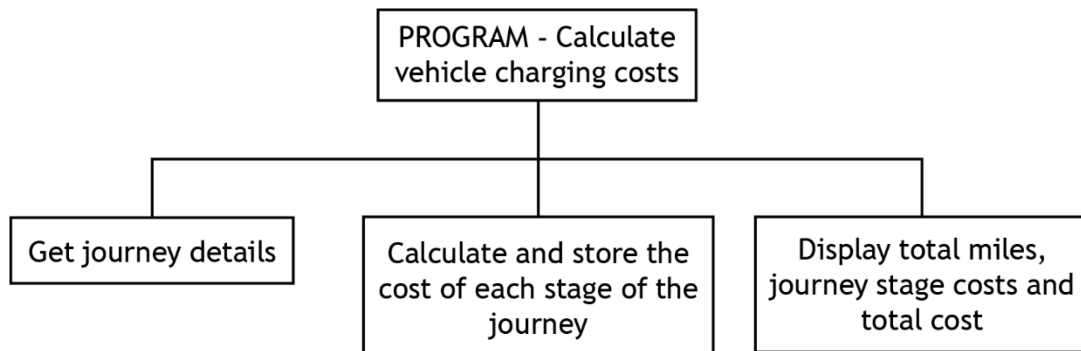
- ◆ Check your answers carefully, as you cannot return to part A after you hand it in.
- ◆ When you are ready, hand part A to your teacher or lecturer and collect part B.

Candidate name_____ Candidate number_____

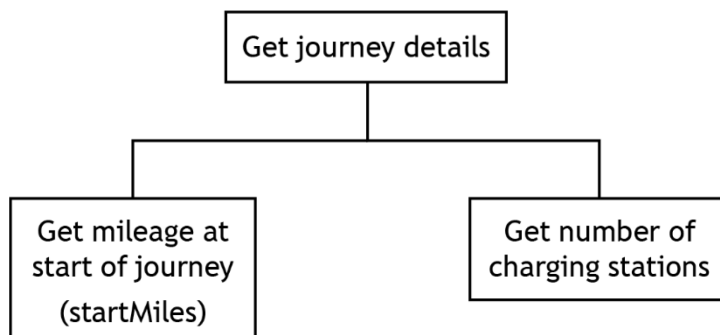
Task 1: software design and development (part B)

Program design (structure diagram)

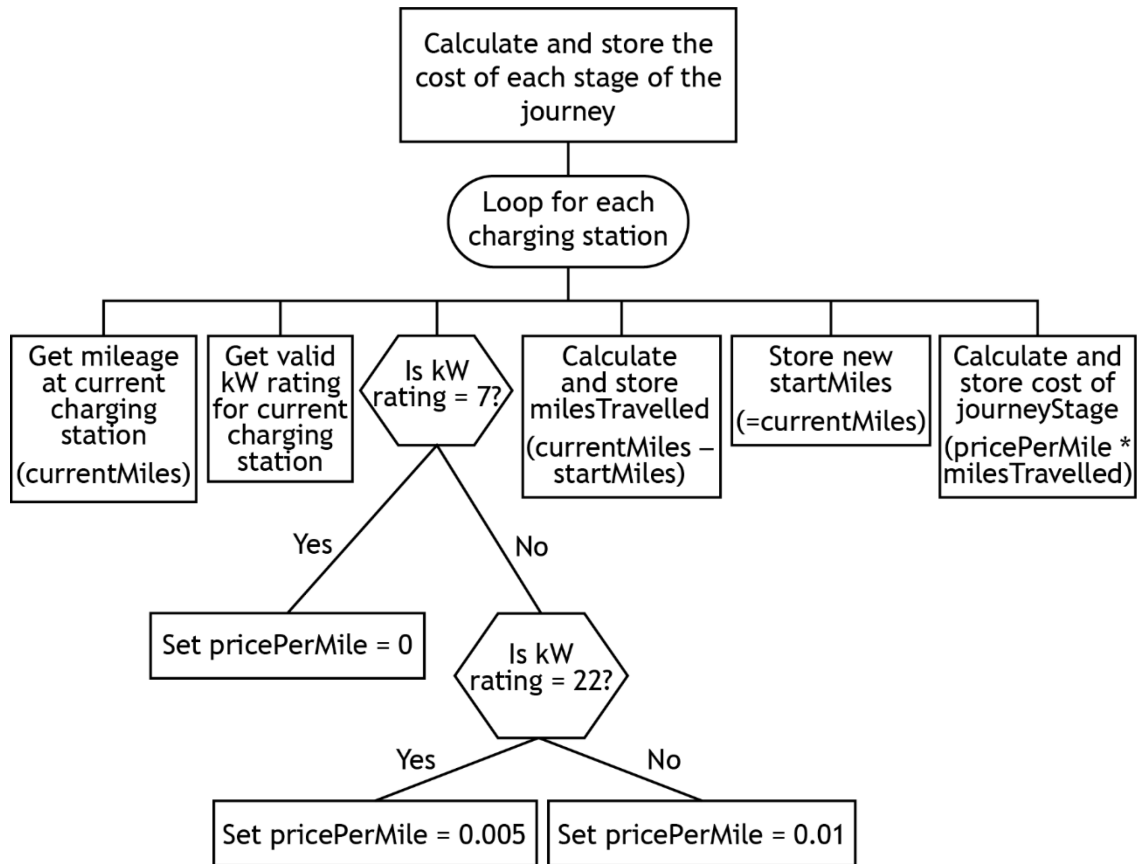
Main steps



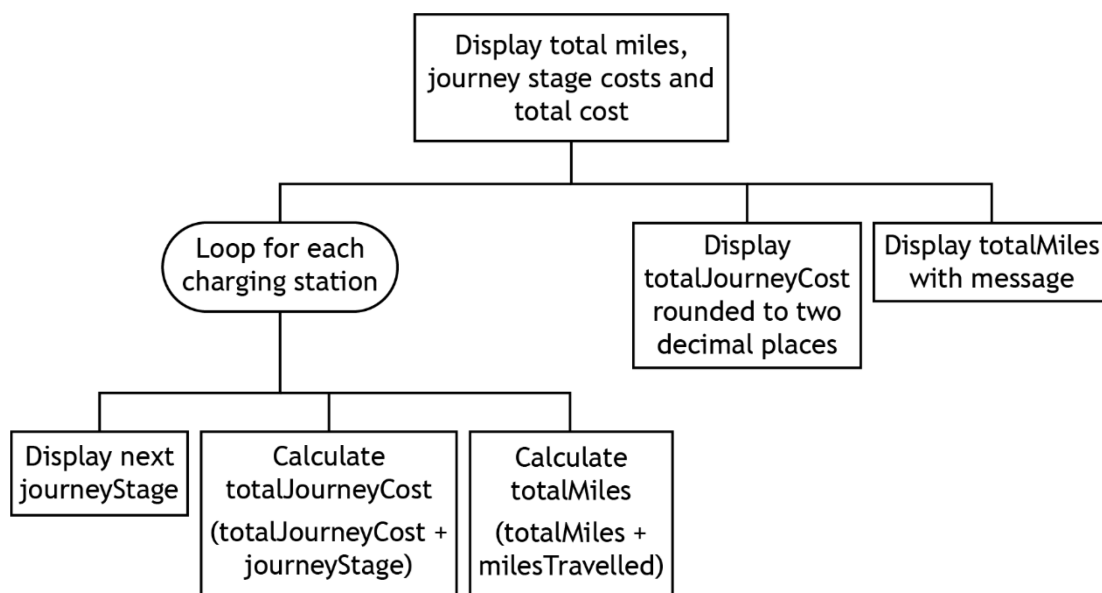
Refinement of 'Get journey details'



Refinement of 'Calculate and store the cost of each stage of the journey'



Refinement of 'Display total miles, journey stage costs and total cost'



- 1b Using the program analysis and the design, implement the program in a language of your choice.

Ensure the program matches the structure diagram given.

(15 marks)

Print evidence of your program code.

- 1c(i) Your program should be tested to ensure it produces the correct output.

Use the test data provided below to check that your program produces the correct output.

Type of test	User input	Expected output	Actual output
Normal	Miles at start 1200 2 charge stations visited Charge station 1 ♦ 1320 miles ♦ 22kW Charge station 2 ♦ 1411 miles ♦ 50kW	Journey stage 1 cost = 0.60 Journey stage 2 cost = 0.91 Total cost = 1.51 Total miles = 211	Attach printouts of inputs and outputs as evidence

Print evidence of the test showing inputs and outputs.

(1 mark)

- (ii) In the test data below, the mileage entered at Charge station 2 is not correct.

Complete the test table below – this will show that the program is not fit for purpose.

(2 marks)

Test data	Expected results
Miles at start 18000 2 charge stations visited Charge station 1 ♦ 18350 miles ♦ 7kW Charge station 2 ♦ 17800 miles ♦ 50kW	Journey stage 1 cost = _____ Journey stage 2 cost = _____ Total cost = _____ Total miles = _____

- (iii) With reference to the test data above, describe how to make the program fit for purpose.

(1 mark)

--

Candidate name_____ Candidate number_____

1d With reference to your code, evaluate your program by commenting on the following:

Efficiency of your program code	(1 mark)
Robustness of your completed program	(1 mark)
Readability of your code	(1 mark)

Candidate name_____ Candidate number_____

Task 2: database design and development

An IT support team requires a database to store network problems raised by staff. A wide range of problems (from forgotten passwords to potential security breaches) are reported by staff from the admin, sales, and management departments. Each problem will be given a problem ID.

Details for all staff are added to the database. Their full name, unique email address and department is stored. When a member of staff wants to report a problem, they send an email to the support team with a description of the problem.

When the support team receive an email, they note the date that the problem was raised along with its importance (on a scale of 1 to 4). A rating of 1 is urgent and should be addressed as soon as possible. Any resolved problems are also marked as completed.

Task 2: database design and development (part A)

- 2a The IT support team needs to create a database to store details of problems that staff report.

Complete the staff details and problem details in the analysis of inputs table below:

(2 marks)

Staff details:	Problem details:
forename surname	date description rating

- ♦ Check your answers carefully, as you cannot return to part A after you hand it in.
- ♦ When you are ready, hand part A to your teacher or lecturer and collect part B.

Candidate name_____ Candidate number_____

Task 2: database design and development (part B)

2b Complete the data dictionary below for the Staff and Problem entities by:

- ♦ identifying the required key fields
- ♦ adding the missing range validation

(3 marks)

Entity: Staff					
Attribute name	Key	Type	Size	Required	Validation
forename		text	30	N	
surname		text	60	N	
department		text	10	N	restricted choice: admin, sales and management
email		text	100	Y	

Entity: Problem					
Attribute name	Key	Type	Size	Required	Validation
problemID		number		Y	
email		text	100	Y	
dateRaised		date		Y	
description		text	255	Y	
rating		number		Y	
completed		boolean		Y	

- ♦ Check your answers carefully, as you cannot return to part B after you hand it in.
- ♦ When you are ready, hand part B to your teacher or lecturer and collect part C.

Candidate name_____ Candidate number_____

Task 2: database design and development (part C)

2c Your teacher or lecturer will provide you with a database file containing two linked tables.

Entity: Staff					
Attribute name	Key	Type	Size	Required	Validation
forename		text	30	N	
surname		text	60	N	
department		text	10	N	restricted choice: admin, sales and management
email	PK	text	100	Y	

Entity: Problem					
Attribute name	Key	Type	Size	Required	Validation
problemID	PK	number		Y	
email	FK	text	100	Y	
dateRaised		date		Y	
description		text	255	Y	
rating		number		Y	range: >=1 and <=4
completed		boolean		Y	

Using the data dictionary above, complete the relational database by adding the required validation to the department field.

Print evidence of the implemented department field validation.

(1 mark)

2d Eva Livingstone has moved from sales to management.

(i) Implement the SQL statement that will make the following change:

forename: Eva
surname: Livingstone
department: management
email: eliv123@email.net

(2 marks)

Print evidence of the SQL statement and the Staff table, clearly showing that the change has been implemented.

(ii) The support team notice that a lot of issues were raised on 7th July 2022.

Implement an SQL statement to output the forename, surname and problem description for all problems raised on 7th July 2022 which remain incomplete. Sort the list based on the urgency of the problems (most urgent first).

(5 marks)

Print evidence of the SQL statement and the output.

- 2e Fiona Bradley no longer wants problem ID106 recorded on the database, as a colleague has already reported the issue.

The following SQL statement was written to remove the entry but is not fit for purpose.

```
DELETE *  
FROM Problem  
WHERE rating = 1  
AND email = "fbr530@email.net";
```

- (i) Explain why this query is not fit for purpose.

(1 mark)

- (ii) Describe how this query could be improved to ensure it is fit for purpose.

(1 mark)

Candidate name_____ Candidate number_____

Task 3: web design and development (part A)

A baby shop requires a web page to promote its products. The web page should contain the following elements:

- ◆ A page title containing the shop's name 'Babylicious'
- ◆ Four different sections:
 - the company logo, name, address and telephone number
 - information about feeding products and an external link to baby food recipes
 - information about baby furniture with an interactive photo
 - information about toys and gifts, and a video of one of the toys being played with

3a State two functional requirements for the web page.

Functional requirement 1	(1 mark)
Functional requirement 2	(1 mark)

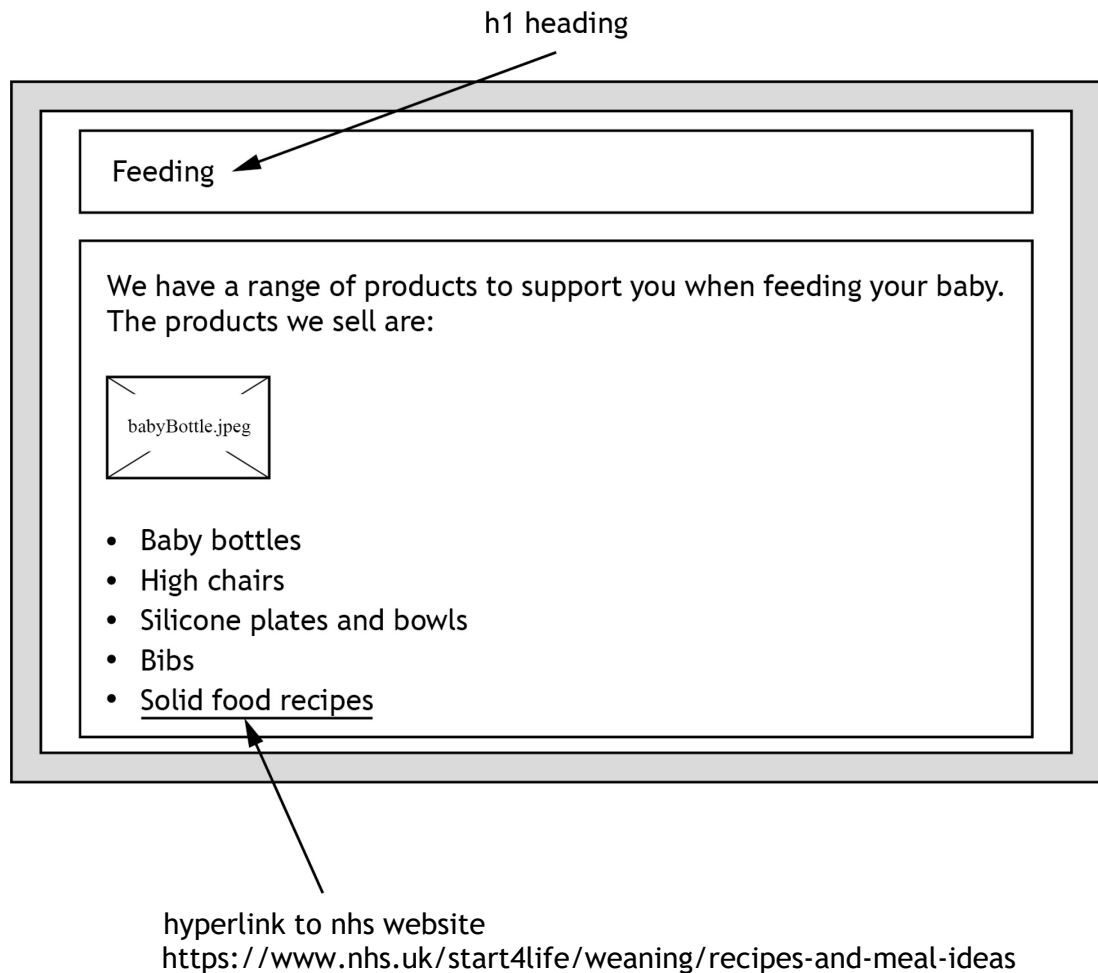
- ◆ Check your answers carefully, as you cannot return to part A after you hand it in.
- ◆ When you are ready, hand part A to your teacher or lecturer and collect part B.

Candidate name_____ Candidate number_____

Task 3: web design and development (part B)

3b Open the babyshop.html file in both a web browser and HTML editor.

A wireframe design for the feeding section is shown below.



Implement the wireframe design for the feeding section using HTML and style the page using CSS as follows:

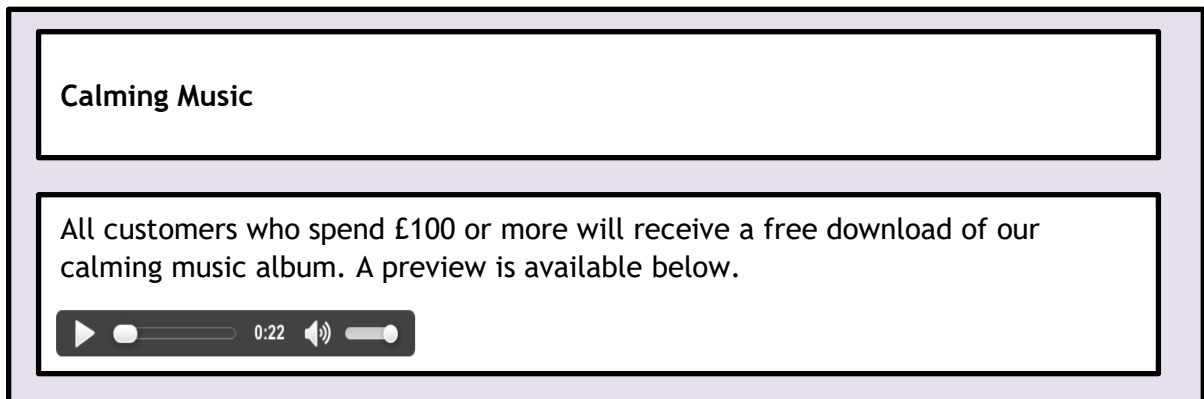
- ◆ The page background should be the colour palegreen (#98FB98):
 - the top section should have the background colour lightyellow (#FFFFE0)
 - all other sections should have a background colour lightblue (#ADD8E6)
- ◆ The size of company logo is 648px by 136px:
 - all other images are sized 320px by 240px
- ◆ The font for all text should be Calibri and the colour darkblue (#00008B).
- ◆ The text size of the paragraphs should be size 14px.

Your teacher or lecturer will provide you with a folder containing the required files.

(7 marks)

3c The shop wants to promote a free music download to eligible customers.

The design for the promotion is shown below.



Edit your HTML file to implement this change.

(1 mark)

Print evidence of the following:

- ◆ HTML and CSS code.
- ◆ Web page as viewed in a browser.

3d Functional requirements for the web page are shown below.

The web page should include:

- ◆ the company logo, name address and telephone number.
- ◆ a list of furniture products for sale, including one photo of a furniture product. The photo of the baby furniture should be interactive.
- ◆ images of toys for sale, with a description of each toy. A video of a toy in use should be included.
- ◆ a list of feeding products and a picture of one feeding product.
- ◆ details of a free gift available for orders over £100. A sample of the free gift should be included.
- ◆ a feeding section containing a link to recipes on the NHS website.

Evaluate your web page in terms of fitness for purpose against these criteria.

(2 marks)

3e Describe how JavaScript has been used to make the web page interactive.

(1 mark)

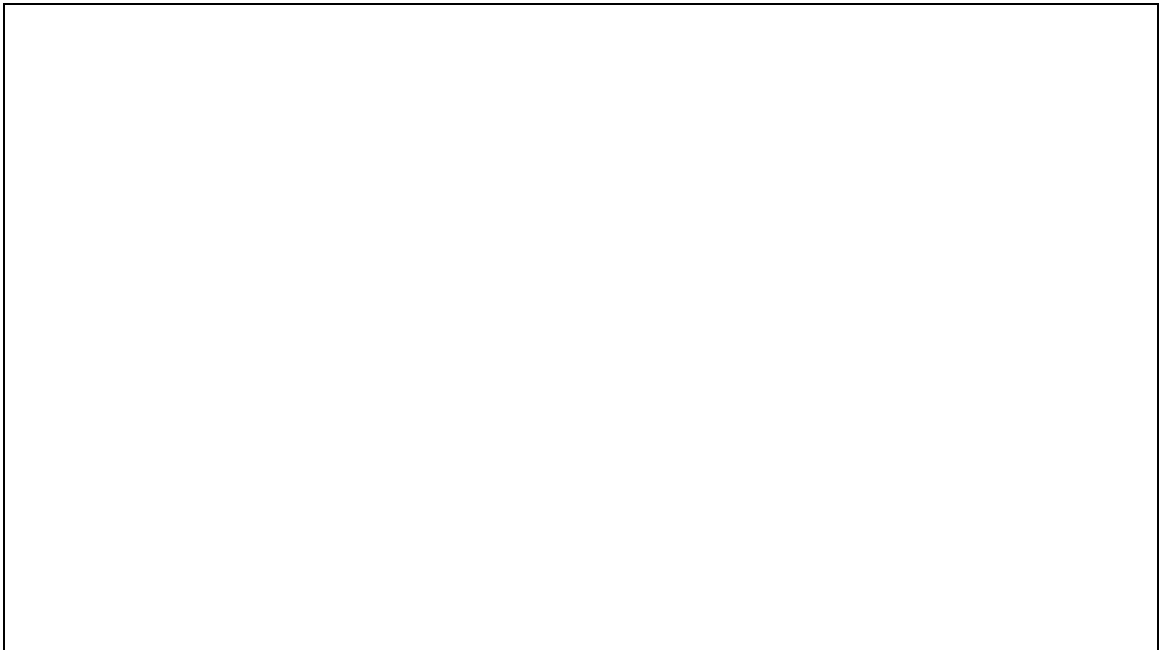
Candidate name_____ Candidate number_____

- 3f The finished web page was shown to customers. A comment from the feedback is shown below.

“There is a lot of information on a single page. It is hard to spot what you are looking for quickly.”

Create a navigational structure diagram to show how the web page could be split into different pages, showing all links.

(2 marks)



Candidate name_____ Candidate number_____

Copyright acknowledgements

Task 1 - petovarga/Shutterstock.com

Electronic files:

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Administrative information

Published: January 2023 (version 1.0)

History of changes

Version	Description of change	Date

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