

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	<input type="checkbox"/>
Part B		
1b	Printout of your program code	<input type="checkbox"/>
1c(i)	Printout evidence of the test showing inputs and outputs	<input type="checkbox"/>
1c(ii)	Completed task sheet showing the completed test table	<input type="checkbox"/>
1c(iii)	Completed task sheet with description of how to make program fit for purpose	<input type="checkbox"/>
1d	Completed task sheet with evaluation of your program	<input type="checkbox"/>

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

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

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

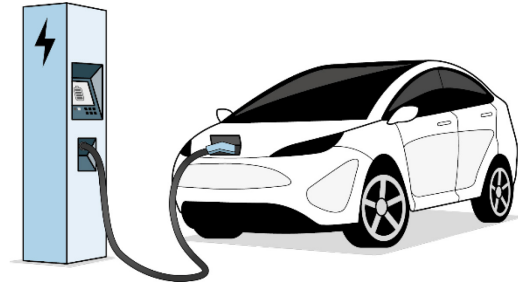
EVcharge is a company that runs an electric vehicle charging network. It requires a program to provide users with a summary of their journey, and to calculate the cost for using the charging network.

Program analysis

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

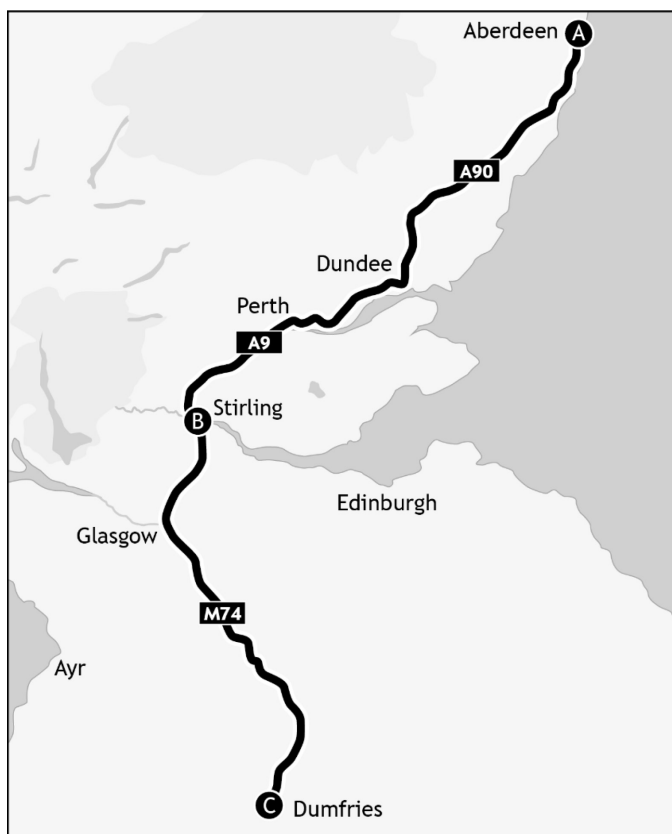
Inputs

- ◆ 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)

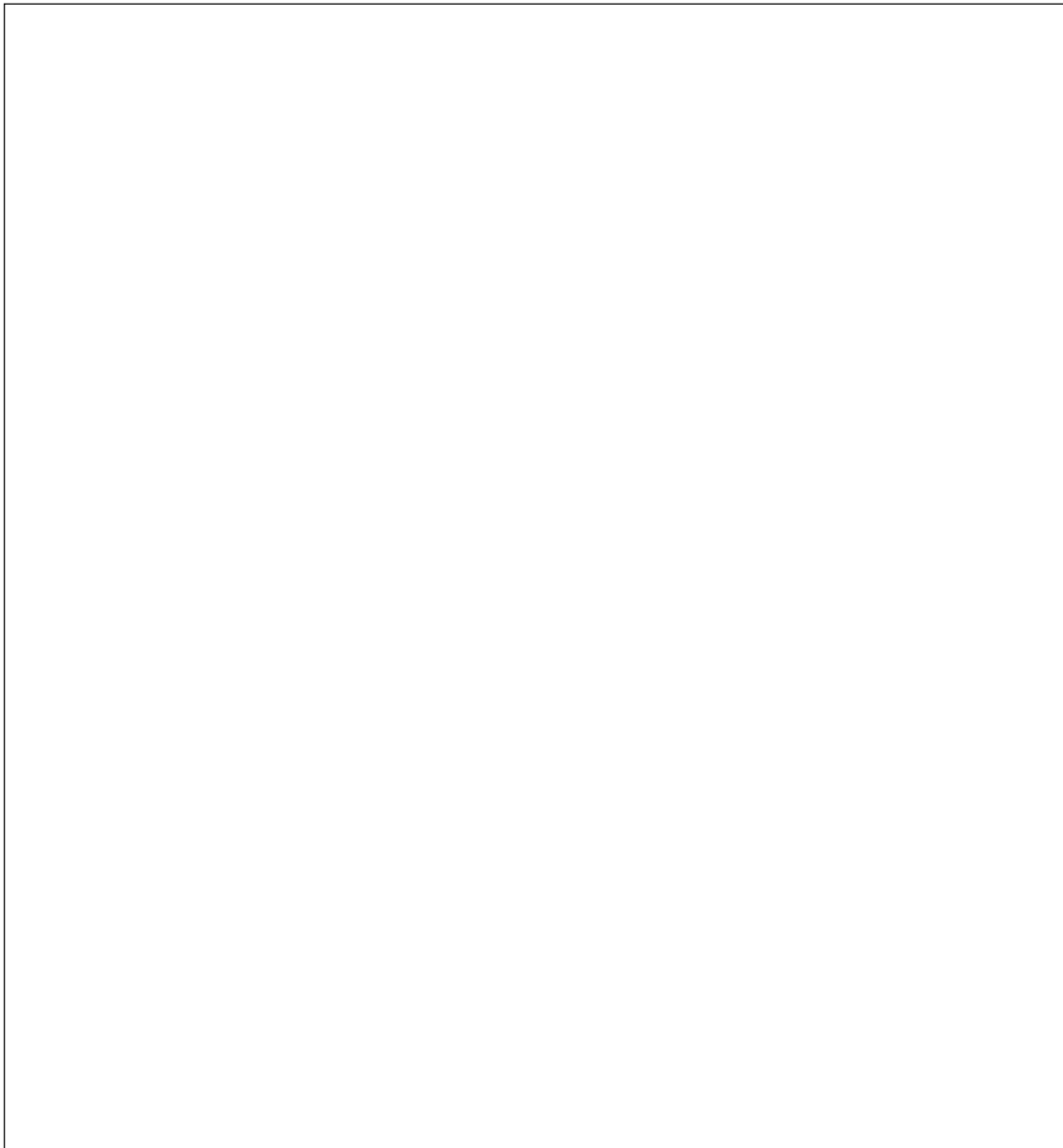
- ◆ The user will complete the journey using no more than 10 charging stations.

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)



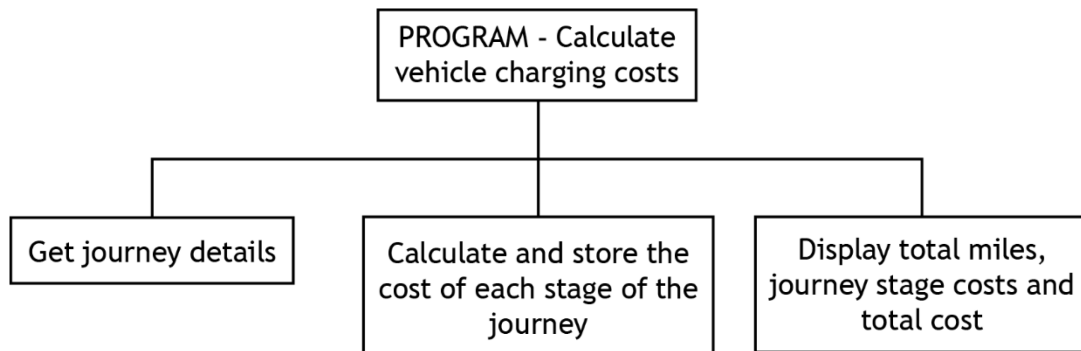
- ◆ Check your answers carefully, as you cannot return to part A after you hand it in.
- ◆ When you are ready, hand part A to your teacher or lecturer and collect part B.

Candidate name_____ Candidate number_____

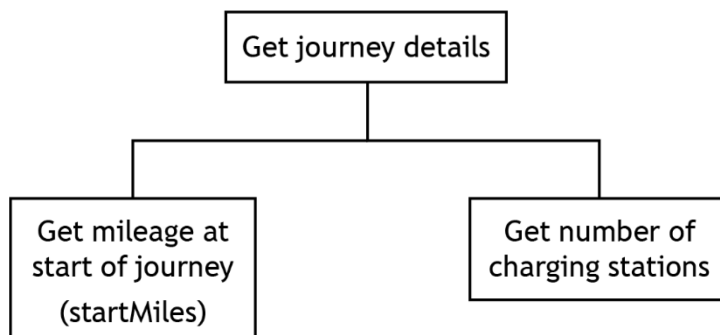
Task 1: software design and development (part B)

Program design (structure diagram)

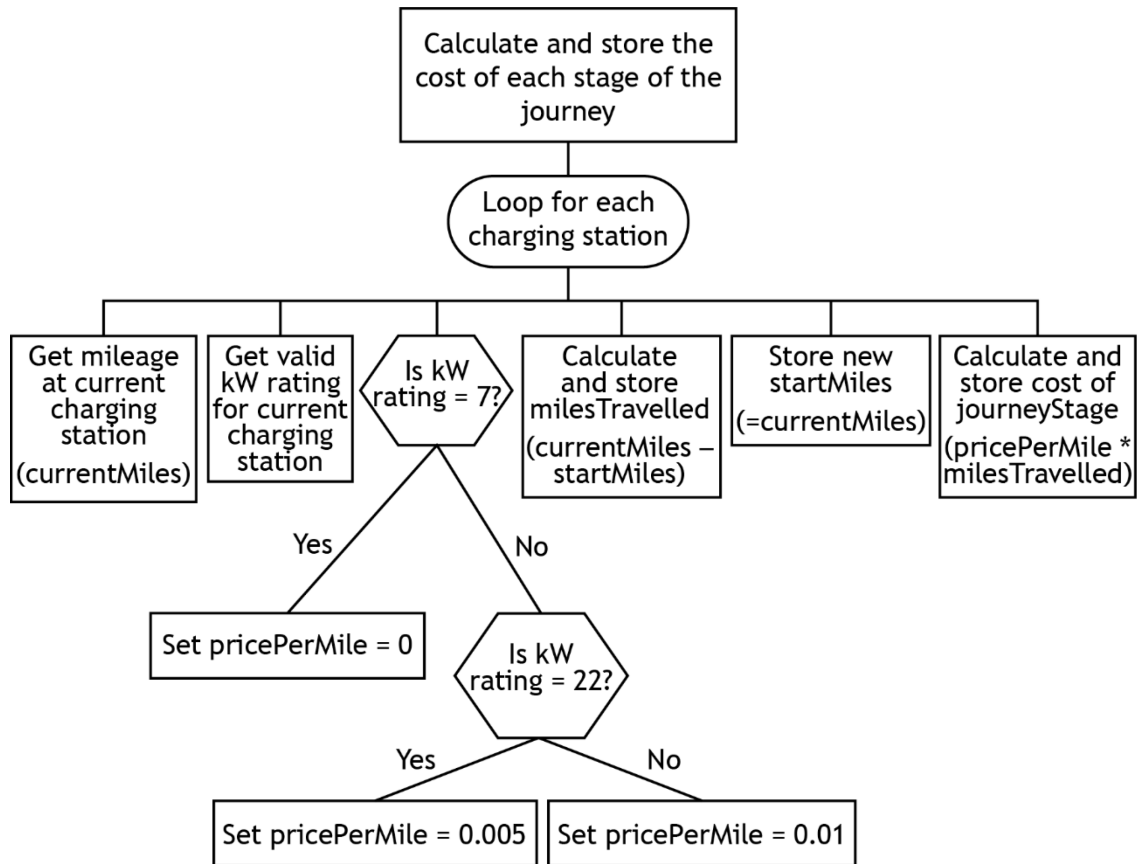
Main steps



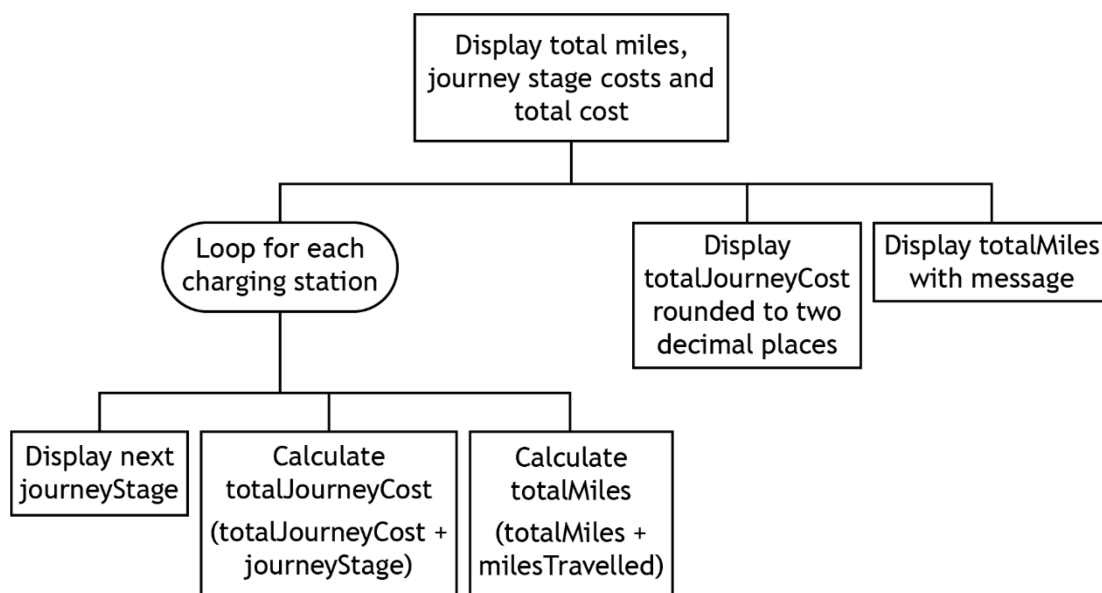
Refinement of 'Get journey details'



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)

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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)

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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.

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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)

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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)

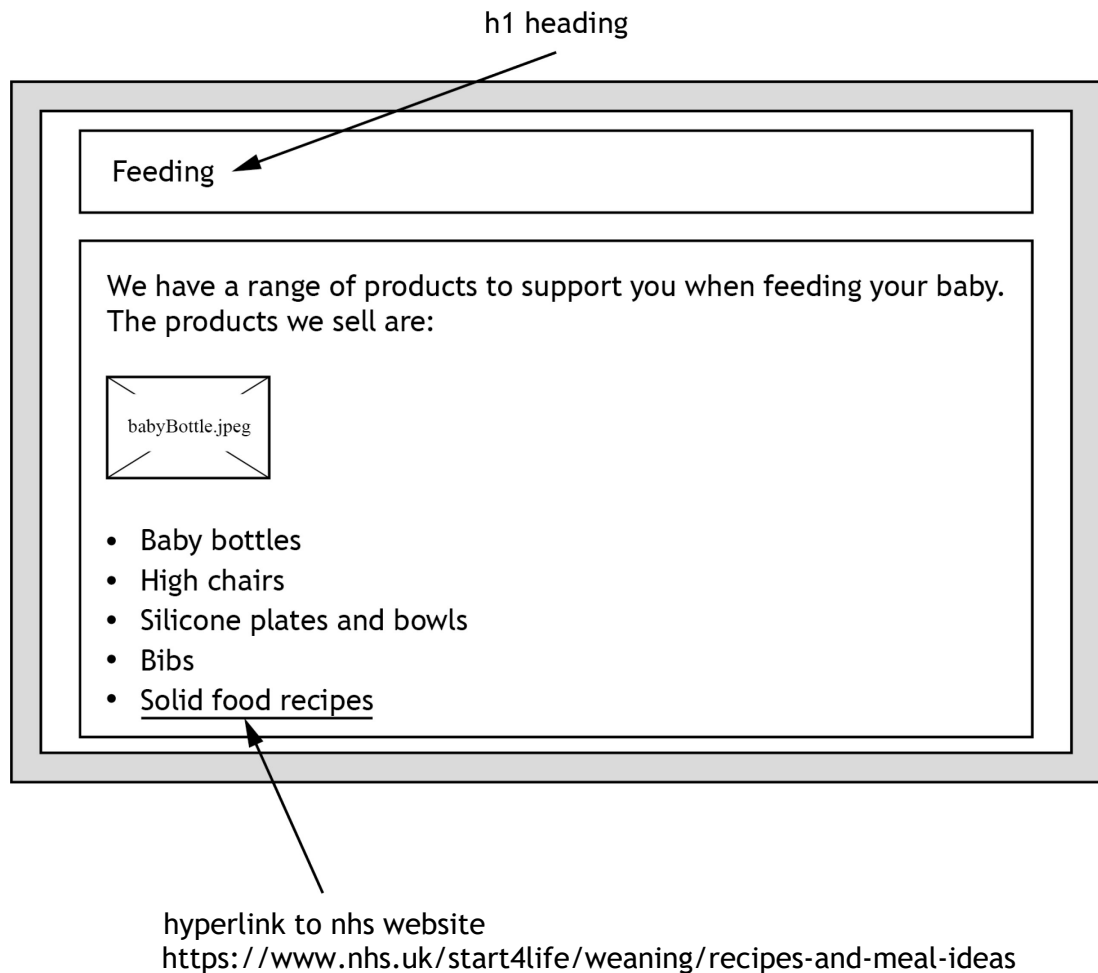
- ◆ Check your answers carefully, as you cannot return to part A after you hand it in.
- ◆ When you are ready, hand part A to your teacher or lecturer and collect part B.

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:

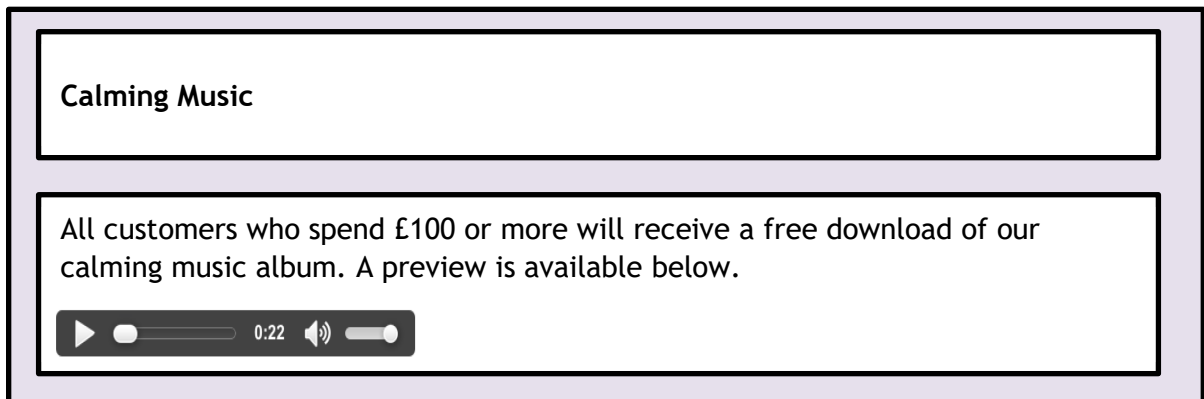
- ◆ The page background should be the colour palegreen (#98FB98):
 - the top section should have the background colour lightyellow (#FFFFE0)
 - all other sections should have a background colour lightblue (#ADD8E6)
- ◆ The size of company logo is 648px by 136px:
 - all other images are sized 320px by 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)

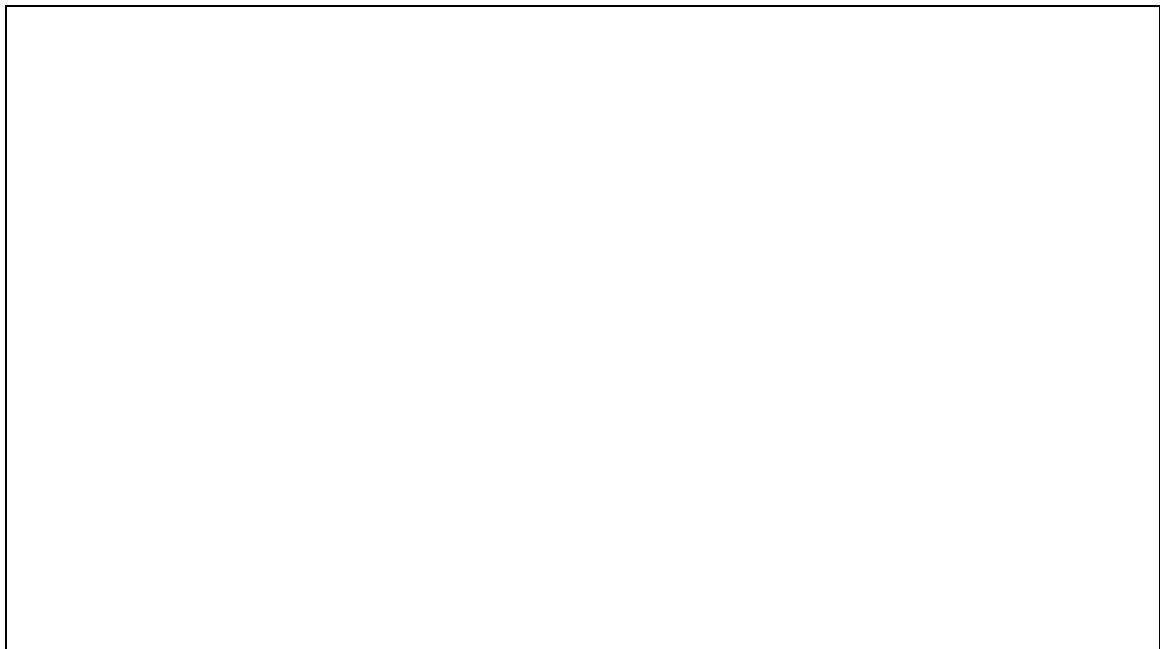
Candidate name_____ Candidate number_____

- 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_____