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.

Your evidence, especially code, must be clear and legible. This is particularly important when you paste screenshots into a document. You can print code from the software environment or copy and paste this into other packages such as notepad or Word.

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 and 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 — software design and development

Evidence		Tick
1a	Completed task 1 sheet identifying the missing inputs	
1b	Completed task 1 sheet showing the expanded design for 'calculate average length of words in sentence'	
1c	Printout of your program code	
1d (i)	Printout evidence of the test run showing inputs and outputs	
1d (ii)	Completed task 1 sheet showing the completed test table	
1e	Completed task 1 sheet with evaluation	

Task 2 — database design and development

Evidence		Tick
2a	Completed task 2 sheet showing the analysis of inputs	
2b	Completed task 2 sheet showing the primary and foreign keys in the data dictionary	
2c	Printout or screenshot showing correct validation implemented for shirtNumber field	
2d (i)	Printout of SQL statement to change player's information	
	Printout of the updated 'Player' table	
2d(ii)	Printout of SQL statement to display a list of suitable players	
	Printout of the output from the SQL statement	
2e	Completed task 2 sheet explaining why the output is not correct	
2f (i)	Completed task 2 sheet identifying the value that produces an error	
2f (ii)	Completed task 2 sheet explaining why this error is expected	

Task 3 — web design and development

Evidence		Tick
3a	Completed task 3 sheet identifying two end-user requirements	
3b	Completed task 3 sheet showing a wireframe design for the 'First Aid' page	
3c 3d (i) 3d (ii)	Printout of HTML and CSS code: ♦ firstAid.html ♦ soundMixing.html ♦ home.html ♦ styles.css	
3e	Completed task sheet 3 discussing the results of testing the website	
3f	Completed task sheet 3 with evaluation of fitness for purpose	

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

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

Task 1: software design and development (part A)

The measurement of how easy a sentence is to read is called the reading age. One method of calculating this is to use the average length of the words in the sentence.

So the longer the average word length, the higher the reading age.

Program analysis

A program is required to calculate the approximate reading age (junior, teen or senior) of a single sentence with a maximum of 20 words. The user will enter each word of the sentence, one at a time. The program will then calculate the average word length and display an appropriate message.

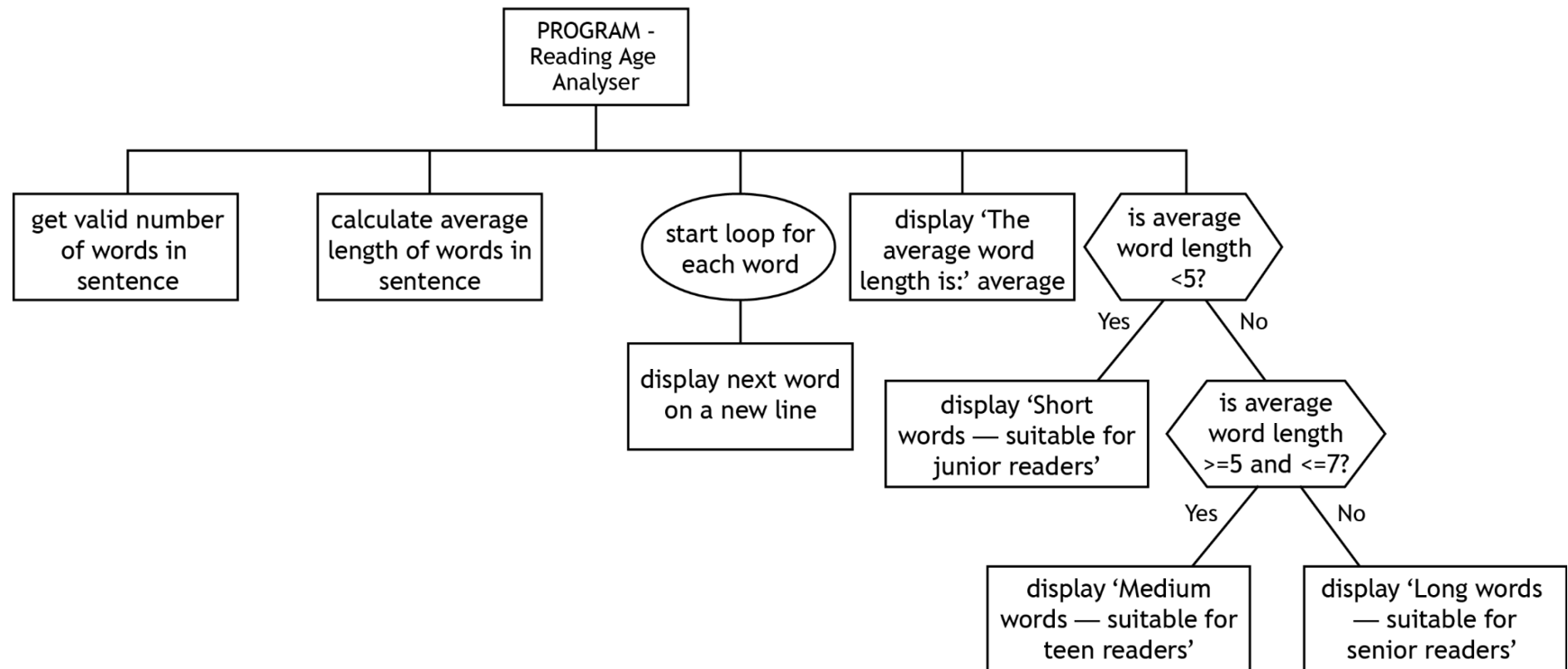1a   Complete the analysis below by identifying the missing inputs.

(2 marks)

Inputs

♦

♦

Processes
♦ calculate the average word length (total number of characters divided by number of words)
♦ decide which message to display

Outputs
♦ each word in the sentence displayed on a new line
♦ one appropriate message from:
  — Short words — suitable for junior readers
  — Medium words — suitable for teen readers
  — Long words — suitable for senior readers

♦ 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)
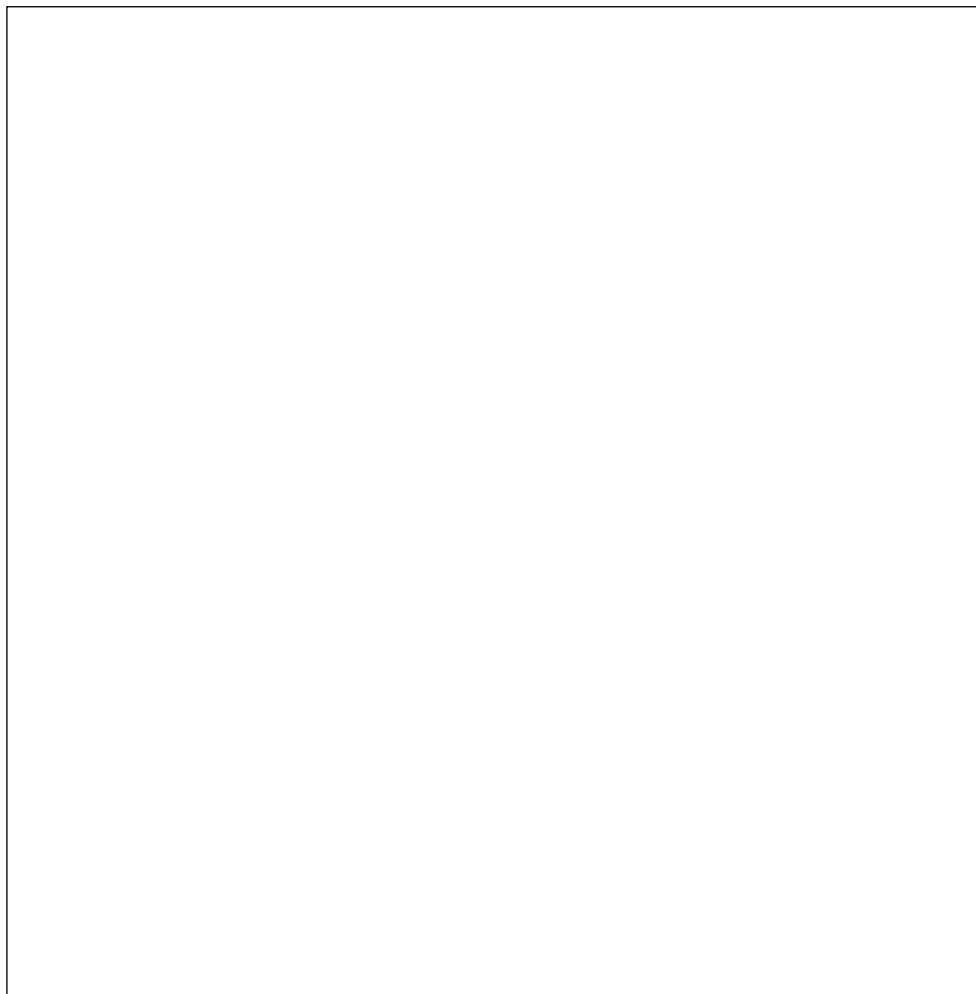
Program design (structure diagram)

```
                              PROGRAM -
                              Reading Age
                              Analyser

  ┌──────────────┐  ┌──────────────┐   ╭──────────╮  ┌──────────────┐   ╱ is average ╲
  │ get valid    │  │ calculate    │   │ start loop │  │ display 'The │   ╱ word length ╲
  │ number of    │  │ average      │   │ for each   │  │ average word │   ╲      <5?    ╱
  │ words in     │  │ length of    │   │ word       │  │ length is:'  │    ╲          ╱
  │ sentence     │  │ words in     │   ╰──────────╯  │ average      │
  └──────────────┘  │ sentence     │                 └──────────────┘   Yes        No
                    └──────────────┘
                                      ┌──────────────┐
                                      │ display next │
                                      │ word on a    │
                                      │ new line     │
                                      └──────────────┘
```

- start loop for each word → display next word on a new line
- is average word length <5? — Yes → display 'Short words — suitable for junior readers' ; No → is average word length >=5 and <=7?
  - Yes → display 'Medium words — suitable for teen readers'
  - No → display 'Long words — suitable for senior readers'

1b   The structure diagram contains the following process:

```
calculate average
length of words in
sentence
```

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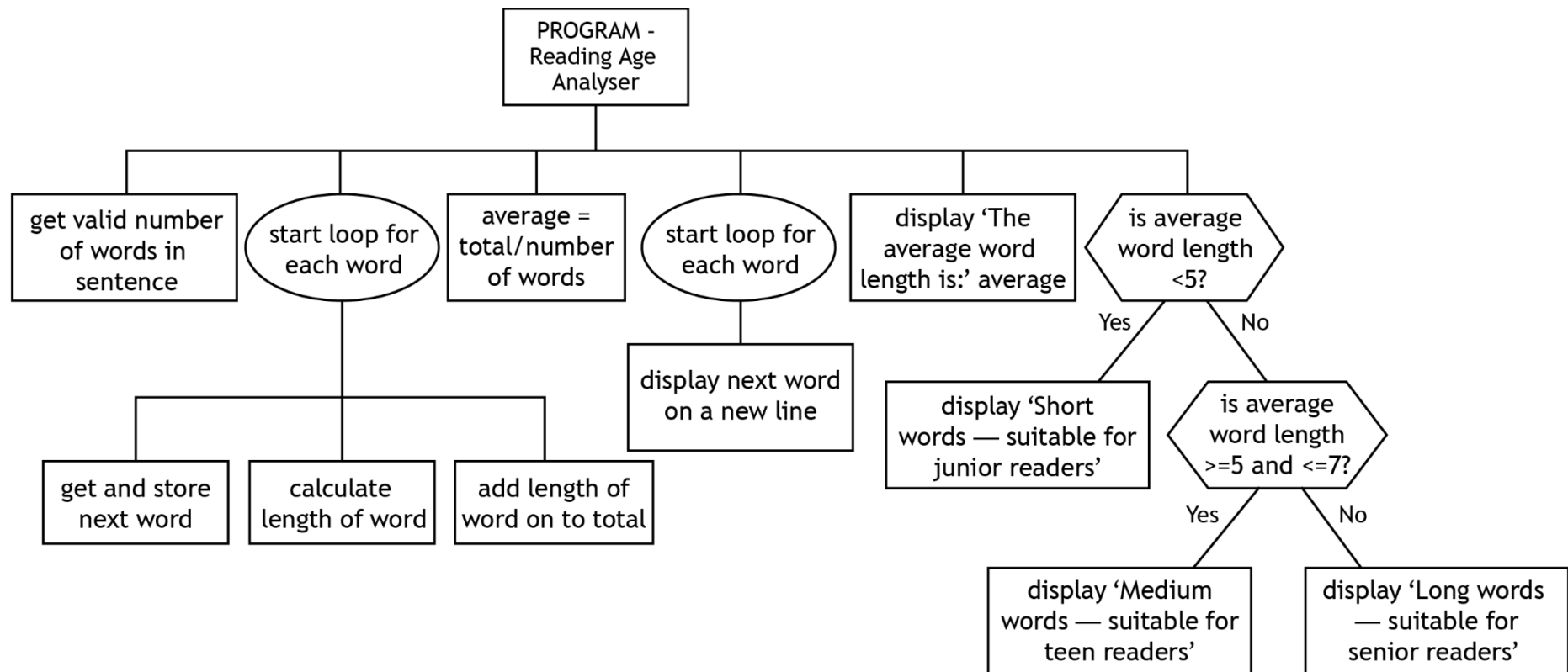flowchart, structure diagram or pseudocode design.

(3 marks)

- ♦ Check your answers carefully, as you cannot return to part 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 1: software design and development (part C)

Program design (completed structure diagram)

```
                          PROGRAM -
                         Reading Age
                          Analyser
    ┌──────────┬──────────┬──────────┬──────────┬──────────┬──────────┐
 get valid   start loop  average =  start loop  display     is average
 number      for each    total/     for each    'The        word length
 of words in word        number of  word        average     <5?
 sentence                words                  word
                                                length is:'  Yes / No
                                                average
             ┌─────┬─────┐           display              is average
          get and store calculate   next word            word length
          next word    length of    on a new line        >=5 and <=7?
                       word                                Yes / No
                       add length
                       of word on   display 'Short
                       to total     words — suitable for
                                    junior readers'

                                                display 'Medium   display 'Long words
                                                words — suitable   — suitable for
                                                for teen readers'  senior readers'
```

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

Ensure the program matches the completed structure diagram.

Print evidence of your program code.

(15 marks)

1d(i) You should test your program to ensure it produces the expected output.

Use the following data to check that the message 'Long words — suitable for senior readers' is displayed:

Number of words: 5
Words in sentence: distressed
                      tourists
                      wandering
                      around
                      aimlessly

Run your program to show that it produces the correct message.

Print evidence of the test run showing inputs and outputs.

(1 mark)

(ii) Additional test data is required to check that the other two messages are also displayed correctly.

Complete the test table below with data that could be used to produce the other two messages.

Test data	Expected results
Number of words: 4 Sentence:	'Short words — suitable for junior readers' is displayed.
Number of words: 3 Sentence:	'Medium words — suitable for teen readers' is displayed.

(2 marks)

Candidate name_____ Candidate number_____

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

Efficiency of your program code	(1 mark)

Readability of your program code	(1 mark)

Candidate name_____ Candidate number_____

Task 2: database design and development (part A)

The Scottish Amateur Women's Football Association keeps details of clubs and players who play in their leagues.

Each club plays matches in one of three football leagues. Each club's football pitch is identified by an address (street and postcode). The date each club was first formed is recorded. The Association's rules state that no club is allowed to have the same name as another.

Players are given a unique registration number. The Association records their forename, surname, date of birth and the club they play for. Players are required to supply a mobile phone number, so they can be contacted about match fixtures or cancellations. Each club is required to inform the Association of each player's shirt number and their preferred playing position (Striker, Midfielder, Defender or Goalkeeper).

Players cannot be registered unless they are a member of one of the Association's clubs.

2a   The Association wants to create a database to keep club and player details.

Complete the missing club and player details in the analysis of inputs table below:

(2 marks)

Club details:	Player details:
Street Postcode	Forename Surname

- ♦ 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, by identifying the primary and foreign keys in the relational database.

(2 mark)

Entity: Club

Attribute name	Key	Type	Size	Required	Validation
clubName		text	20	Y	length <= 20
street		text	40	Y	length <= 40
postcode		text	8	Y	length <= 8
formed		date		Y	
league		number		Y	Restricted choice: 1,2,3

Entity: Player

Attribute name	Key	Type	Size	Required	Validation
forename		text	20	Y	
surname		text	30	Y	
registration		number		Y	Range: >= 100000 and <= 999999
clubName		text	20	Y	Existing clubName from Club table
mobileNo		text	12	Y	length = 12
dateOfBirth		date		Y	
position		text	10	Y	Restricted choice: Striker, Midfielder, Defender, Goalkeeper
shirtNumber		number		Y	Range: >= 1 and <= 25

- 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: Club					
Attribute name	Key	Type	Size	Required	Validation
clubName	PK	text	20	Y	length <= 20
street		text	40	Y	length <= 40
postcode		text	8	Y	length <= 8
formed		date		Y	
league		number		Y	Restricted choice: 1,2,3

Entity: Player					
Attribute name	Key	Type	Size	Required	Validation
forename		text	20	Y	
surname		text	30	Y	
registration	PK	number		Y	Range: >= 100000 and <= 999999
clubName	FK	text	20	Y	Existing clubName from Club table
mobileNo		text	12	Y	length = 12
dateOfBirth		date		Y	
position		text	10	Y	Restricted choice: Striker, Midfielder, Defender, Goalkeeper
shirtNumber		number		Y	Range: >= 1 and <= 25

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

(1 mark)

Print evidence to show that you have added the validation to the database, to match the data dictionary requirements.

2d(i) Noreen Glass, registration number 814209, has moved teams from Aviemore Aces to Dundee North. She will play in the number 24 shirt at her new club.

Implement **one** SQL statement that will make the required changes to Noreen's information.

(3 marks)

Print evidence of the SQL statement and the 'Player' table, clearly showing the change you have implemented.

(ii) The Association would like to invite suitable players to a goalkeeper coaching day.

Implement an SQL statement that will only display a list of club names, players' full names and mobile phone numbers for all league 1 goalkeepers.

(4 marks)

Print evidence of the SQL statement and the output.

2e The Association's rules state that players who play in the 'Striker' position are given a shirt number between 10 and 15.

Test the following SQL statement, which is intended to identify strikers who do not have the correct shirt number:

```
SELECT forename, surname
FROM Player
WHERE shirtNumber <10
OR shirtNumber > 15;
```

Explain why the output is not correct.

(1 mark)

2f   The following SQL statement produces an error when executed.

```
INSERT INTO Player
VALUES (220745,"Unknown","Erin","Smith","07993 874657",
"31/05/1999","Striker",23);
```

(i) Identify the value in the SQL statement that produces an error.

(1 mark)

(ii) Explain why this error is expected if the database is fit for purpose.

(1 mark)

Candidate name_____ Candidate number_____

Task 3: web design and development

Montpel Youth Club would like to create a website to advertise their club.

The website should contain information about where and when the club meets. Pictures of each club leader should be displayed on the home page, along with a short paragraph detailing their experience of working with young adults.

Each night, leaders run an activity. Lists of the activities for the current and following weeks need to be kept up-to-date on the website. The club also wants to include some additional activity information. For example, for the first aid activity, the club would like a page showing what members learned at this activity.

Club members pay to attend some of the activities. Prices should be listed on the website.

3a   Identify **two** end-user requirements for this website.

End-user requirement 1
(1 mark)
End-user requirement 2
(1 mark)
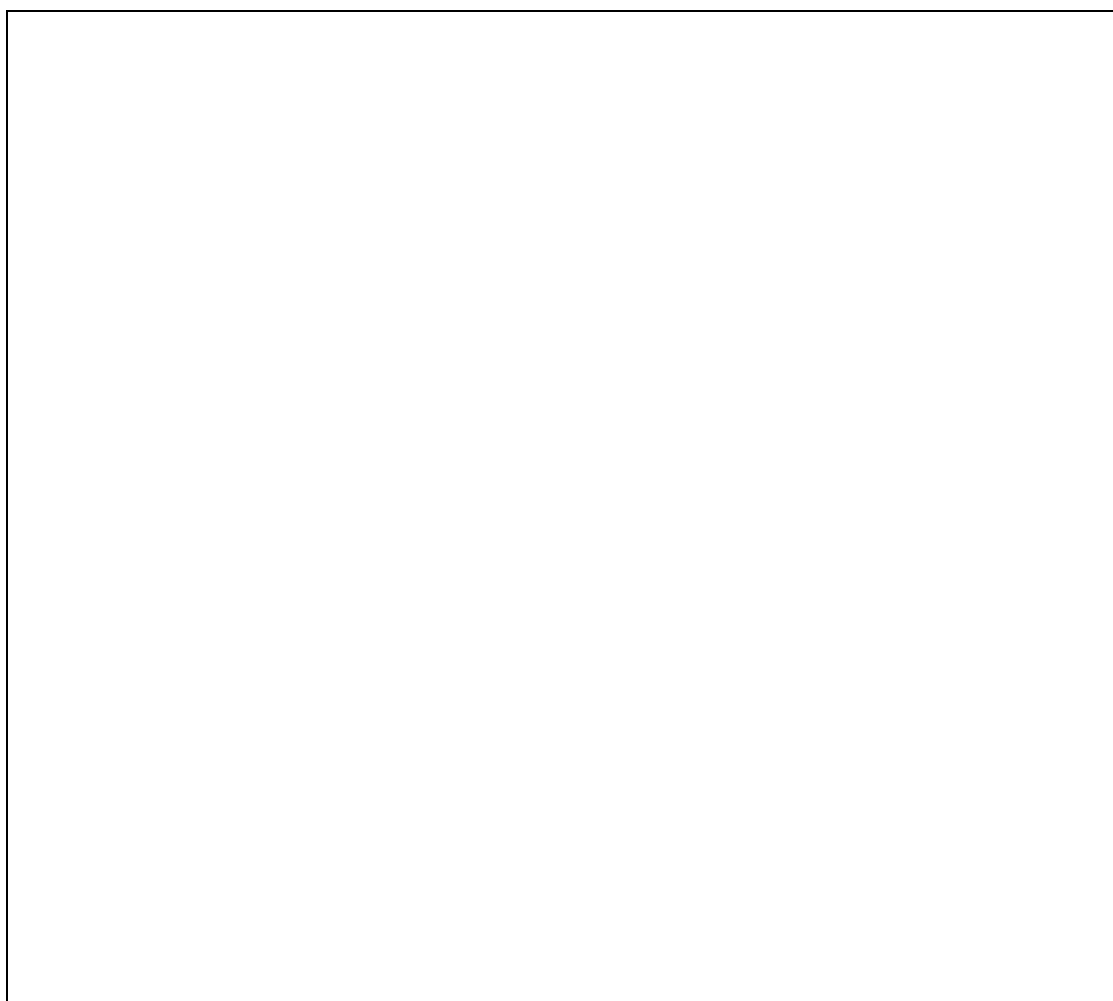
Candidate name_____ Candidate number_____

First aid is one of the activities run by the youth club. The 'First Aid' page will include content of what is covered at the activity, as follows:

- ♦ a link to a website which contains a video of how to make an arm sling
- ♦ a main heading 'How to make an arm sling'
- ♦ a numbered list detailing the steps required to put someone's arm into a sling
- ♦ a graphic called 'armsling.jpg'
- ♦ a paragraph of text introducing the numbered list

3b   Draw a wireframe design showing how you would position the above content on the page.

(2 marks)

Candidate name_____ Candidate number_____

Your teacher or lecturer will provide you with a copy of the unfinished website.

Open this and look carefully at:

- the home page
- the content of each page and the incomplete 'First Aid' page
- the hyperlinks within the website

3c   The 'First Aid' page currently has no content. Open the 'firstAid.html' file in order to edit it.

Implement your design using HTML. The file 'armsling.jpg' has been provided within the website files.

(4 marks)

The additional information required to complete the 'link to a website', 'paragraph of text' and 'numbered list' is listed below:

- video page link address

  https://www.sja.org.uk/get-advice/first-aid-advice/how-to/how-to-make-an-arm-sling/

- paragraph of text

  When someone hurts their arm or shoulder badly, it is important to hold the injury still using a sling. Instructions detailing how to put a sling on a patient are given below.

- numbered list

  1 Before applying a sling, check for cuts and make sure any bleeding has stopped.
  2 For forearm slings, use padding for the injured arm and tie the sling around the patient's neck on the uninjured side.
  3 For shoulder or collarbone slings, drape the long side of the bandage down from the shoulder on the uninjured side, bring it over your patient's arm and tie it behind their back.
  4 Make sure the sling keeps your patient's arm in place but is not so tight that it limits blood flow.
  5 If there is severe bleeding or if you suspect a dislocated joint or broken bone, see a doctor immediately.

3d(i) Sound mixing is another activity that the youth club has created a web page for.

The activity leader would like to add a sound mixing example to this page.

Open the soundMixing.html page in order to edit it.

Using the file 'mixExample.mp3', edit the 'Sound Mixing' page to add this sound.

(1 mark)

3d(ii) User feedback suggested changes to how the website looks.

Open the 'home.html' and 'styles.css' files in order to edit them.

Using external styles, make all the following changes:

♦ the background colour of the page should be "lightblue" (#ADD8E6)
♦ the middle 'Facilities' part of the page should be styled with the same colour as the page background
♦ the h2 headings should be reduced to size 14 and the font changed to Arial

(3 marks)

Print evidence of your code from these edited files:

♦ firstAid.html
♦ soundMixing.html
♦ home.html
♦ styles.css

3e   Test the website to ensure that all media displays correctly and that any hyperlinks work as expected.

Discuss the results of testing the website.

(1 mark)

3f   Initial analysis identified the following functional requirements for the website.

The website should display:

- where the club meets
- when the club meets
- photographs of each leader
- a paragraph about each leader
- a list of activities for this week
- a list of activities for next week
- additional information on activities, where required
- the cost of some activities

Use the above analysis to evaluate the finished website in terms of fitness for purpose.

(2 marks)

Candidate name_____ Candidate number_____