FOR OFFICIAL USE

N5

National Qualifications 2025

Mark

X816/75/01 Computing Science

FRIDAY, 25 APRIL

9:00 AM – 10:30 AM

X8167501

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day Month Year

Scottish candidate number

Total marks — 80

SECTION 1 — Software design and development, and Computer systems — 55 marks

Attempt ALL questions.

Attempt EITHER Section 2 OR Section 3

SECTION 2 — Database design and development — 25 marks

SECTION 3 — Web design and development — 25 marks

You may use a calculator.

Show all workings.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.

SQA ©

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SECTION 1 — SOFTWARE DESIGN AND DEVELOPMENT, AND COMPUTER SYSTEMS — 55 marks

Attempt ALL questions

1. A leaderboard shows teams and their scores.

Position	Team	Score
1	Harry Putter	81
2	Par Tee	79
3	Sandy	77

(a) A computer system stores the scores as binary numbers.

Convert the denary number 79 to an 8-bit binary number. **1**

(b) A computer system stores the team names using extended ASCII code.

Calculate the number of bits required to store the team name:

Par Tee **1**

2. Describe a situation where an iterative approach is required during the software development process. **1**

3. Part of a program is shown below.

MARKS DO NOT WRITE IN THIS MARGIN

```
...
Line 34  RECEIVE xyz FROM (INTEGER) KEYBOARD
Line 35  SET abc TO xyz ^ 2
...
```

(a) State the value stored in `abc` when '3' is entered by the user at Line 34. **1**

(b) The programmer has not used internal commentary or white space in their code.

State one other way to improve the readability of this code. **1**

4. Identify the mantissa and exponent in the floating-point representation below.

0.127×10^2 **2**

Mantissa

Exponent

5. The photograph below is stored in a computer system as an array of pixels.

State the graphic representation used to store this photograph. **1**

[Turn over

6. The program below issues customers with a username.

```
...
Line 11  RECEIVE firstName FROM (STRING) KEYBOARD
Line 12  RECEIVE yearOfBirth FROM (STRING) KEYBOARD
Line 13  SET userName TO firstName & yearOfBirth
Line 14  SEND userName TO DISPLAY
```

Describe how the value assigned to the `userName` variable is created in Line 13. **1**

7. A program is required for passengers to book a ticket on a bus.

(a) Passengers must enter their destination and their age when making a booking, as some will qualify for free travel.

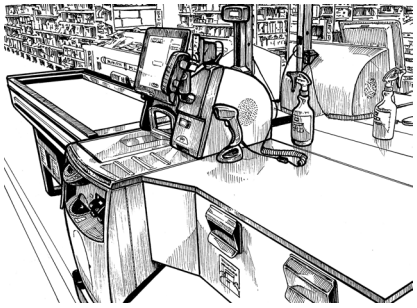
Complete the table below to state the most suitable data types that should be used. **2**

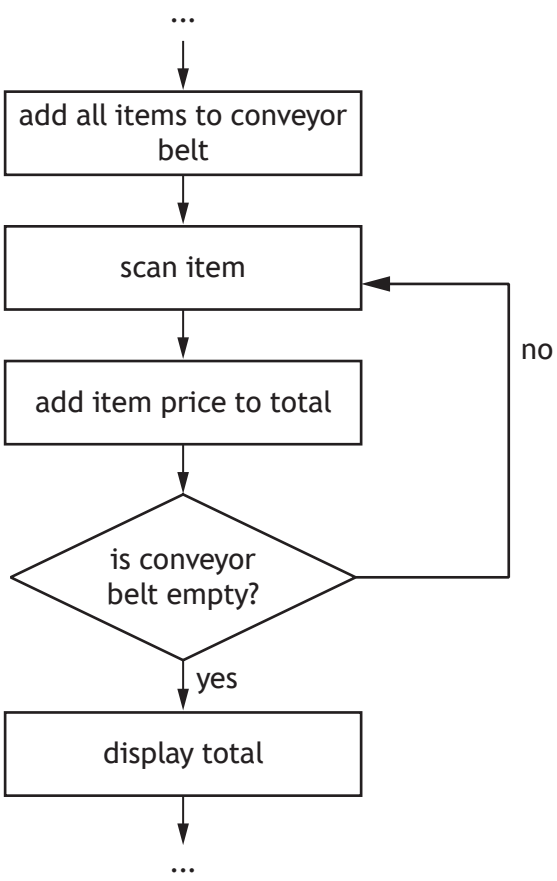
Variable name	Sample data	Data type
passengerAge	78	
destination	Ullapool	

(b) Write a line of code that will randomly allocate a seat number and store this in the variable `seatNum`. There are 50 seats available. **2**

8. A new supermarket self-service till is being designed for customers. Part of the program design is shown below.

MARKS DO NOT WRITE IN THIS MARGIN





(a) State the design technique shown above. **1**

(b) State which type of loop is used in this design. **1**

(c) State the most suitable data type for the variable that will be used in the 'is conveyor belt empty?' step. **1**

9. Luna Life is a company that creates animations.

(a) The company logo shown below is stored as a vector graphic.

Identify the object used to make this logo and one of its attributes. **2**

Object

Attribute

(b) Luna Life uses a program to calculate the cost of creating an animation. Part of the program is shown below.

```
SET basicCost TO timeInSeconds * animatorCharge
```

After the basic cost has been calculated, the following discounts can be applied to animations depending on their use:

- education — deduct £20 from cost
- charity — deduct £30 from cost.

Using a programming language of your choice, write the code to ask for the purpose of the animation, calculate any discount, and display the final cost in the variable `finalCost`. **4**

9. (continued)

(c) State the part of the processor used, during the calculation of the discount, to:

(i) perform the calculation **1**

(ii) temporarily store the values used in the calculation. **1**

(d) Luna Life has 100 computers in its office. During the working day, staff use standby mode when their computers are not in use.

Describe why staff use standby mode. **1**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

10. A program is being written that will allow gamers to add money to their account using gift cards.

The program asks the user to enter their username, their five-character password and the gift card number. The updated balance in the user's account is then displayed.

(a) Identify three processes that will be carried out by the program. **3**

Input(s)	Username, password, gift card number
Process(es)	
Output(s)	Display new balance

10. (continued)

(b) Using a programming language of your choice, write the input validation code to confirm that the password entered has five characters. **4**

(c) Test data will be used to ensure this input validation works correctly.

Complete the test table below. **2**

Type of test	Input	Expected result
	As4G5	Program will continue
Exceptional		Error message, ask to re-enter

[Turn over

11. A gym wants to encourage members to burn more calories than their monthly target.

It uses a program to calculate additional calories burned over a 12-month period.

...	April	May	June	...
...	6821.34	5129.89	4997.67	...

The design below shows how a member's average additional calories burned is calculated and displayed.

1. Store each month's additional calories burned
2. Calculate the average additional calories burned
3. Display the average additional calories burned

The data structure `calories` is used to store additional calories burned each month. The variable `avgCalories` is used to store the user's average additional calories burned.

(a) Using a design technique of your choice, refine step 2. **4**

MARKS

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(b) A member's average additional calories burned is displayed using the line of code below.

```
SEND avgCalories TO DISPLAY
```

This code displays the value below to a member.

5123.879

Using a programming language of your choice, rewrite this code to display the average additional calories to one decimal place. **2**

(c) If a member's average additional calories burned is over 6000 calories, and they have a personal trainer at the gym, they will be given a 15% discount on their next session.

The code to implement this is shown below.

```
...
Line 27  SET memberDiscount TO 0.00
Line 28  <repeat for every gym member>
Line 29        IF avgCalories < 6000 AND trainer = TRUE
Line 30              SEND "Congratulations on a 15% discount"
                     TO DISPLAY
Line 31              SET memberDiscount TO sessionCost * 0.15
Line 32        END IF
Line 33  <end repeat>
...
```

(i) Identify the logical operator in the above code. **1**

(ii) It was identified that a member who burned 6578.1 average additional calories and who has a personal trainer did not receive the 15% discount.

State the type of error in the program and how the error can be corrected. **2**

Type of error

Correction

11. (continued)

(d) After final testing, the program is run without requiring any further translation.

State the type of translator that has been used. **1**

(e) State the term used at the evaluation stage, to describe a program's capability to handle unexpected or incorrect data being entered without crashing. **1**

(f) A member has written an e-mail to the gym manager.

State what can be done to ensure that, if intercepted, the e-mail cannot be read by others. **1**

(g) The gym manager wants to set up tablet computers at the door to carry out a survey as people leave the gym.

The survey should ask if they are a member or a pay-as-you-go customer, and if they were attending the gym or a fitness class. The survey should also ask people to rate their visit, from 1 to 10, and have a space for any additional comments.

Design a user interface for this survey. **4**

12. In an archery game, players score points when they hit the target.

The points entered are whole numbers in the range 0 to 10.

The game has 10 rounds and each player shoots two arrows in each round.

The program below is written to record a player's score.

```
...
Line 24 SET totalScore TO 0.00
Line 25 SEND "round1" TO DISPLAY
Line 26 RECEIVE arrow1 FROM (REAL) KEYBOARD
Line 27 RECEIVE arrow2 FROM (REAL) KEYBOARD
Line 28 SET roundTotal1 TO arrow1 + arrow2
Line 29 SET totalScore TO totalScore + roundTotal1
...
Line 70 SEND "round10" TO DISPLAY
Line 71 RECEIVE arrow19 FROM (REAL) KEYBOARD
Line 72 RECEIVE arrow20 FROM (REAL) KEYBOARD
Line 73 SET roundTotal10 TO arrow19 + arrow20
Line 74 SET totalScore TO totalScore + roundTotal10
Line 75 < display all ten round totals >
Line 76 SEND "TotalScore: " & totalScore TO DISPLAY
```

(a) When this code is evaluated it is found to be inefficient.

Explain how to make this code more efficient. **3**

(b) A tester enquired why the total score was displayed as below:

Total score: 180.60

Explain the problem with the program that this output has highlighted. **1**

12. (continued)

(c) The code below is written to store the names of a maximum of 40 competitors in an archery competition.

```
...
Line 80   SET stop TO TRUE
Line 81   SET count TO 0
Line 82   WHILE NOT(stop) AND count <= 40 DO
Line 83      RECEIVE nextPerson FROM (STRING) KEYBOARD
Line 84      IF nextPerson = "NO" THEN
Line 85           SET stop TO FALSE
Line 86      ELSE
Line 87           <store name entered>
Line 88           SET count TO count + 1
Line 89      END IF
Line 90   END WHILE
Line 91   SEND "Total archers " & count TO DISPLAY
...
```

Describe why this code will not function as expected. **1**

[END OF SECTION 1]

[Turn over for SECTION 2

DO NOT WRITE ON THIS PAGE

SECTION 2 — DATABASE DESIGN AND DEVELOPMENT — 25 marks

Attempt ALL questions

13. A model collector keeps information about the items collected in a database. A query has been run and the output is shown below.

modelNumber	title	theme	pieceAmount	cost
1279	Space Base	Space	1422	125
7525	Colour Fun	Classic	1685	90
1457	Lady Liberty	Architect	1500	90
5271	Command Rover	Space	750	70
1280	Dino Compound	Adventure	612	60
6598	Creative Box	Classic	790	45
8182	Astronaut	Space	647	45
3688	Century Hawk	Star Battles	253	30
1094	Tomb Treasure	Adventure	161	20
2281	River Raft	Adventure	18	6

Complete the SQL statement used to produce this sorted output. **2**

```
SELECT modelNumber, title, theme, pieceAmount, cost

FROM Model

ORDER BY
```

14. A restaurant stores employee details in a database. Each employee is trained as either a chef, a server, a manager or a cleaner. Sample data from the database is shown below.

Employee					
empID	**empName**	**jobTitle**	**startDate**	**fullTime**	**contactNum**
117254	Alex Roberts	Manager	21/10/24	✓	07701675815
259631	Rayyan Patel	Chef	05/09/23	✓	07778589526
300193	Charlie King	Server	10/03/25		07789900991
220205	Sam Scott	Cleaner	13/02/25		07811606115
576482	Drew Moore	Cleaner	30/12/24		07705900169
365482	Carter Price	Server	23/01/25		07716168759
419372	Rowan Kelly	Chef	07/07/24	✓	07700148652
895714	Jun Baek	Server	30/04/25		07812612568
681354	Nikan Khan	Manager	06/08/23	✓	07780254369
...	...	...	...	...	...

(a) Complete the missing attribute and attribute type in the table below. **2**

Attribute	Attribute type
contactNum	
	Boolean

(b) Errors are made when data is entered for new employees.

State one attribute where restricted choice validation could be used to reduce errors. **1**

[Turn over

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15. A band booking company has a range of bands that can be booked for various events. It wants a database to store information on bands and their bookings.

A band can play more than one event. An event can only have one band.

When a band is being booked for an event the form below is completed.

Please use the form below to book your band of choice.

Event Name

Band

Ross Wonder

More Info
RW172 - Ross Wonder
Genre is rock.
Price is £1500
Has 2 members

Date

Venue

E-mail

Submit

When the band has been booked, the following e-mail is sent to the organiser.

Congratulations.

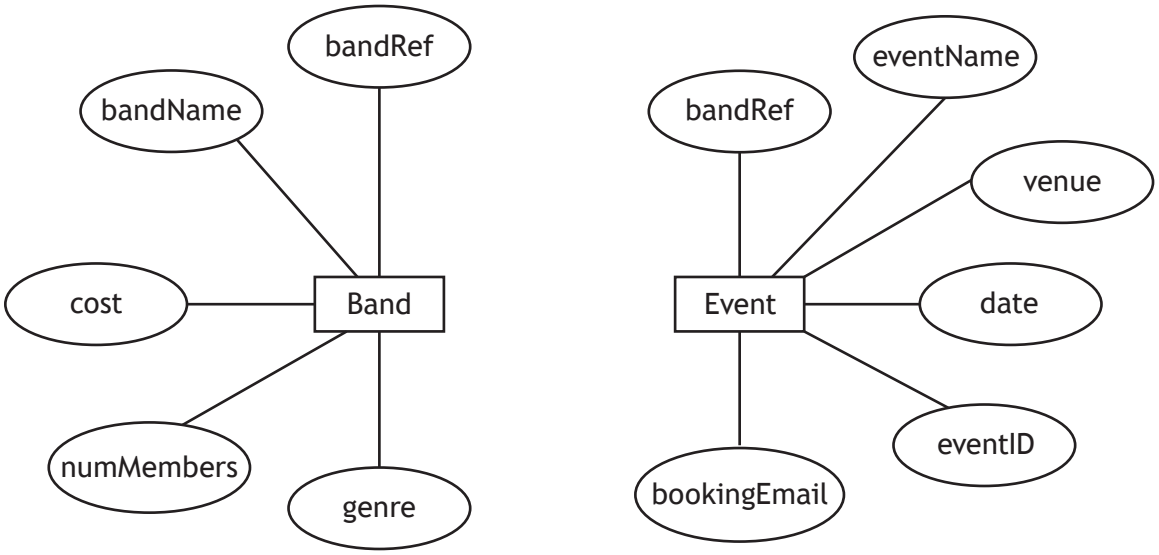
You are all booked. You have been given the exclusive event ID 1318.

Ross Wonder is looking forward to playing at your event.

15. (continued)

(a) Complete the entity relationship diagram by:

- identifying the key attributes
- drawing the relationship between the entities
- naming the relationship. **3**



[Turn over

15. (continued)

The database has been created. Sample data from each table is shown below.

Band				
bandRef	**bandName**	**cost**	**numMembers**	**genre**
RW172	Ross Wonder	1500	2	Rock
ML435	Of Men and Lions	1250	5	Country
BP908	Brightplay	2200	6	Rock
LP241	Les Pencils	1800	2	Pop
BB456	The Bright Brothers	1300	3	Electronic
ME243	Miceica	2000	4	Country
SI746	20 Seconds to Irvine	1100	5	Folk
...	...	...	...	...

Event					
eventID	**eventName**	**date**	**bandRef**	**venue**	**bookingEmail**
1215	Paterson Wedding	10/04/2026	ML435	Lakeside Lodge	steph@zmail.com
1318	Charity Ball	25/09/2025	RW172	The Old Poet	jgritchie@cmail.com
1154	Oscar's Luau	11/08/2025	ME243	The Old Poet	YFang131@mail.com
1089	Award Ceremony	05/12/2025	SI746	Driftwater	JThom@zmail.com
1706	Hogmanay Dance Off	31/12/2025	BB456	The Unicorn	handD@mail.com
2011	Afternoon Tea	26/03/2026	BP908	The Old Poet	andyCliff@cmail.com
...	...	...	...	...	...

15. (continued)

(b) Complete the SQL statement below that will display the name of any country band playing at 'The Old Poet' and the date of the event. **4**

```
SELECT
FROM
WHERE
```

(c) Customers' personal details have been stolen.

State one requirement of the UK General Data Protection Regulation (GDPR) that the company should have implemented to prevent this from happening. **1**

[Turn over

DO NOT WRITE IN THIS MARGIN

16. Caledonian Wheels organises a motorsport racing championship. A database is used to store data on racing teams and their individual drivers. The data stored in the database is shown below.

Team			
teamID	**teamName**	**titlesWon**	**location**
RR32	Rapid Racers	7	Italy
SS21	Swift Streaks	3	United Kingdom
TT16	Turbo Titans	2	Germany
VR12	Velocity Vipers	4	Italy
ER54	Elite Racers	1	United Kingdom
PV81	Prime Speed	5	Spain

Driver					
driverNum	**forename**	**surname**	**wins**	**points**	**teamID**
1	Shannon	Kelly	5	125	ER54
3	Ezri	Wuzik	2	50	PV81
4	Jackie	Price	2	50	RR32
11	Kai	West	4	100	SS21
14	Charlie	Wilkinson	1	25	TT16
18	Moss	Gray	0	0	VR12
22	Kris	Hunt	1	25	SS21
31	Meenal	Ibrahim	3	75	VR12
55	Ollie	Graham	6	150	TT16
63	Gerry	Fox	0	0	PV81
77	Jackie	West	1	25	ER54
81	Akari	Ogawa	0	0	RR32

16. (continued)

(a) Caledonian Wheels want to share details about all the UK based drivers who have had a successful year so far.

(i) Design a query to search the database for a driver's full name, driver number and team name who have won more than three races and drive for a United Kingdom based team. **4**

Field(s)	
Table(s)	
Search Criteria	

(ii) Describe how the SQL statement could be tested when the query is created. **1**

(b) The following SQL statement is implemented in the database.

```
SELECT teamID, teamName, titlesWon
FROM Team
WHERE (teamID = "PV81" OR location = "Italy") AND titlesWon >=5
```

Write the expected output from this SQL statement. **2**

16. (continued)

(c) Jackie West won her 2nd race of the season increasing her points to 50.

Write the SQL statement to update Jackie's details. **4**

(d) A new driver is to be added.

```
INSERT INTO Driver (driverNum, forename, surname, wins,
points, teamID)
VALUES (99, "Thomas", "Webb", 0, 0, "PC81")
```

When this SQL statement is run, an error message is displayed stating that the record cannot be added.

Explain why an error message is displayed. **1**

[END OF SECTION 2]

[Turn over for SECTION 3

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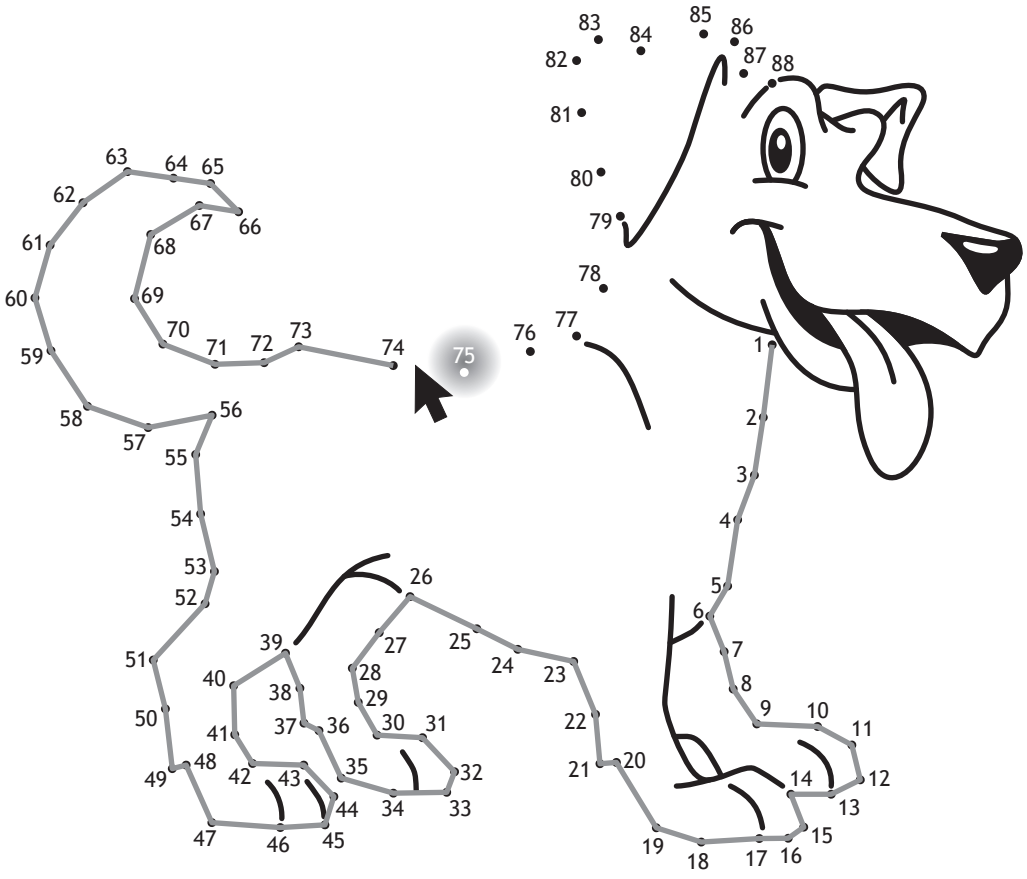
SECTION 3 — WEB DESIGN AND DEVELOPMENT — 25 marks

Attempt ALL questions

17. In a web-based join-the-dots game, when a user moves the cursor away from a number the next number in the sequence lights up.



Identify the JavaScript event used to implement this feature. **1**

18. Explain the difference between absolute and relative addressing. **2**

19. Visitors to a farm park gave the following feedback.

'My children would have liked to see pictures and videos of the farm before our visit'	'It would have been useful to know the opening time before we got there'	'It would be better if I could prebook an animal experience as there were no spaces left when I got there'
'I didn't know the price of tickets before I arrived'	'I wish I had known about the farm shop and the products it sells'	

The farm park decides to create a website that takes account of this feedback.

Use the information above to create two functional requirements for the website. **2**

Functional requirement 1 _____

Functional requirement 2 _____

[Turn over

20. A travel website about Italy has a home page containing a list of cities. The home page is shown below.

https://www.goneawaytravel.co.uk

Italian Cities

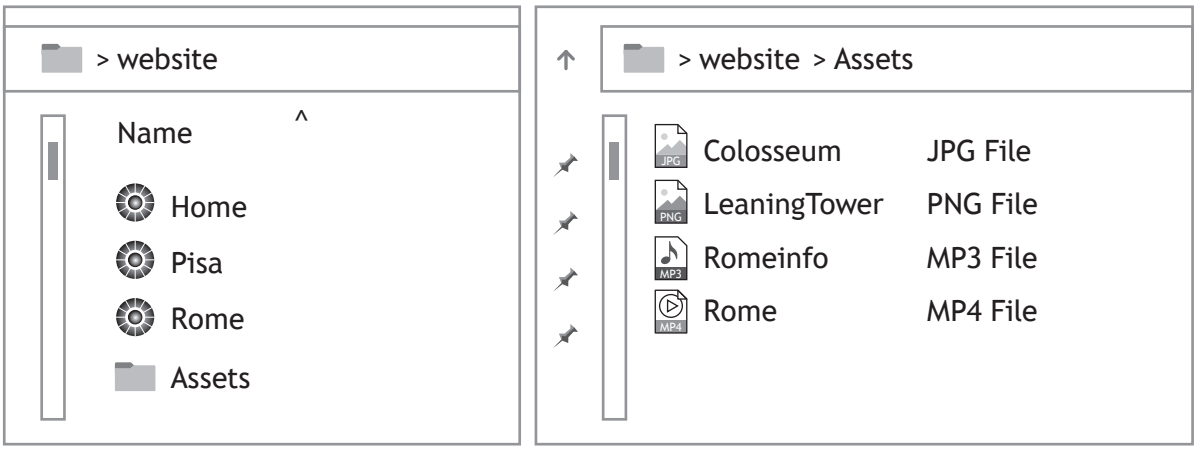
Visit these Italian cities

- Pisa
- Rome

(a) The image used on the home page is stored as a jpeg file.

State one reason why jpeg files are used to store images on a website instead of bitmap. **1**

(b) All web pages and media are stored in folders as shown below.



(i) A hyperlink to the `Pisa.html` page is to be added to the home page as shown below.

Visit these Italian cities
- Pisa
- Rome

Complete the code below that would implement this list. **3**

```
<p>Visit these Italian cities </p>
```

(ii) Complete the HTML code below to add the sound file to the `Rome.html` web page. **3**

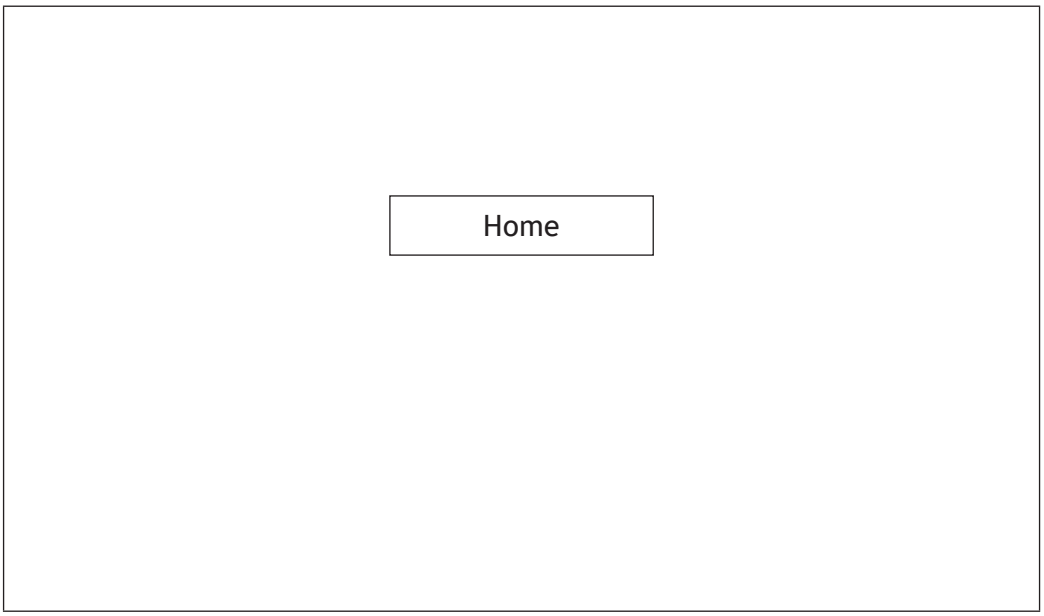
```
<                                  Controls>

<source src="                                  "
type="audio/mpeg">


<_/                                  >
```

21. Alpine Valley Ski Resort are designing a website to advertise their resort.

(a) The website will have a home page and three separate pages: 'Ski Shop', 'Kids Club' and 'Getting Here' that link back to the home page.

The 'Getting Here' page has an external link to the local bus service's website.

Draw the navigational structure for this website. **3**

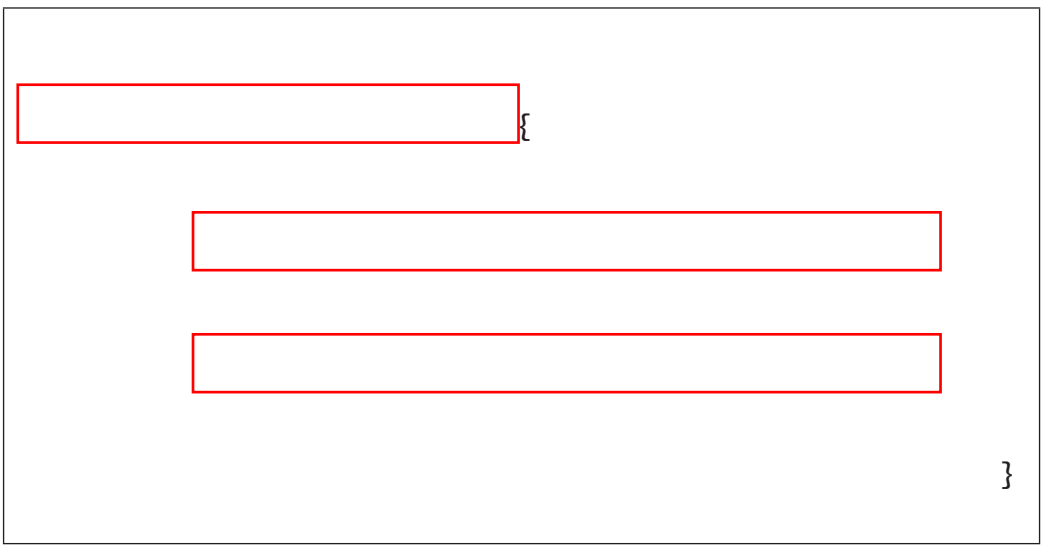


(b) The HTML for the home page heading is shown below.

```
<h1 id="SkiValley"> Alpine Valley Ski Resort</h1>
```

To make the heading stand out it should have a font size set to 40 pt and the colour set to 'aqua'.

Write the CSS code to style the heading. **3**



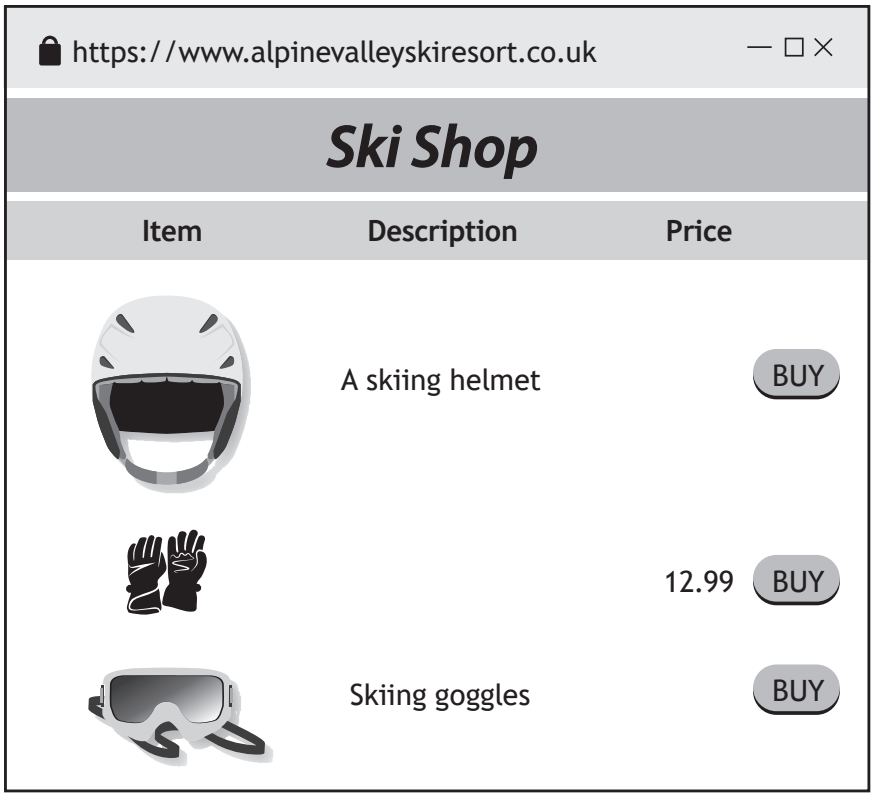
21. (continued)

(c) On testing an mp3 audio file implemented on the home page, the file took too long to load.

(i) Describe how the file size can be reduced without altering the length of the sound. **1**

(ii) Describe one other test that should be carried out on the website. **1**

(d) The 'Ski Shop' page is implemented on the website.



(i) State one reason why this web page is not fit for purpose. **1**

(ii) State what law the resort must comply with to use images of items from suppliers on their website. **1**

21. (continued)

(e) Some HTML and CSS code for the 'Kids Club' page is shown below.

HTML	CSS
<body> <h1 class="Kids"> Kids Club </h1> The first rule of kids club is to always listen to the instructor every single time … … </body>	body{background-color:red; color:white; font-size:14px;} p{color:green; font-family:Verdana } h1{font-size:28px} #instructor{color:blue; font-family:Calibri} .Kids {text-align:center}

Describe how the 'Kids Club' heading will look when displayed in a browser. **3**

[END OF SECTION 3]

[END OF QUESTION PAPER]

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