FOR OFFICIAL USE

N5

National Qualifications 2024

Mark

X816/75/01 Computing Science

MONDAY, 20 MAY
1:00 PM – 2:30 PM

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 confectionery company requires a program to store information about boxed chocolates.

Complete the table below to state which types of variable should be used. **2**

Variable	Type of variable
chocolateName	
inStock	Boolean
numberOfChocolatesInBox	

2. Convert the denary number 105 into 8-bit binary. **1**

3. Explain why it may be necessary to return to the implementation stage of an iterative development process after the testing stage. **1**

4. A parking fine is £130. If this fine is paid within 14 days the fine is halved.

A design for a program to calculate the fine depending on when it is paid is shown below.

1. Set fine to 130
2. Get number of days since fine was issued
3. Calculate and store fine

Using a design technique of your choice, refine step 3 of the design. **3**

[Turn over

5. A competition was run to suggest names for a new bridge. The 20 most popular bridge names have been identified and stored.

(a) State the most suitable data structure used to store the bridge names. **1**

(b) State the predefined function that should be used to select any one of the 20 stored bridge names as the winner. **1**

6. Mateo is planning a cycling trip around Italy. The route he is planning is 1856.3 kilometers. This value would be stored in a computer system using 'floating-point representation' as shown below.

$$0.18563 \times 10^4$$

(a) Identify the mantissa and exponent in the above floating-point representation. **2**

Mantissa

Exponent

(b) During the trip Mateo uses his smartphone to track his route.

Describe how he could reduce the energy use of his device to ensure the battery lasts as long as possible. **1**

7. The program code below protects the rechargeable battery in an electric toothbrush.

```
…
Line 67  SET brushstop TO FALSE
Line 68  WHILE brushstop = FALSE DO
Line 69        SET battery TO <percentage of power left>
Line 70        SET temperature TO <temperature of battery>
Line 71        IF battery < 3 OR temperature > 45 THEN
Line 72             SET brushstop TO TRUE
Line 73        END IF
Line 74  END WHILE
Line 75  <switch toothbrush off>
…
```

(a) State the logical operator in this code. **1**

_____

(b) Describe the purpose of the Boolean variable in this code. **1**

_____

_____

8. State how many extended ASCII text characters can be stored using 80 bits. **1**

_____

[Turn over

9. A campsite booking system is being developed to calculate the cost of a stay at £35 per night, per person. The cost will be displayed to the user before they confirm the booking. The system will ask users for their name, number of people, arrival date and length of stay.

(a) Complete the analysis below. **2**

Input	
Process	
Output	Cost of stay

(b) The code below calculates the cost of the stay.

```
…
Line 7   RECEIVE name FROM (STRING) KEYBOARD
Line 8   RECEIVE numberOfPeople FROM (INTEGER) KEYBOARD
Line 9   RECEIVE arrival FROM (STRING) KEYBOARD
Line 10  RECEIVE nightsStaying FROM (INTEGER) KEYBOARD
Line 11  <calculate cost of stay>

Line 12  SEND "The cost of your stay is £" & cost TO DISPLAY
…
```

Using a programming language of your choice, write the code for Line 11. **3**

9. (continued)

(c) To pay a deposit, users will have to provide bank account details.

State how this information could be transferred securely to the booking system. **1**

(d) The number of guests who stayed at the campsite each night in 2023 is stored in the array `guests`.

`Index`	0	1	2	...	364
`Value`	271	240	153	...	87

The campsite want to know the total number of guests who stayed at the site in 2023.

Using a programming language of your choice, write the code to calculate this total. **4**

[Turn over

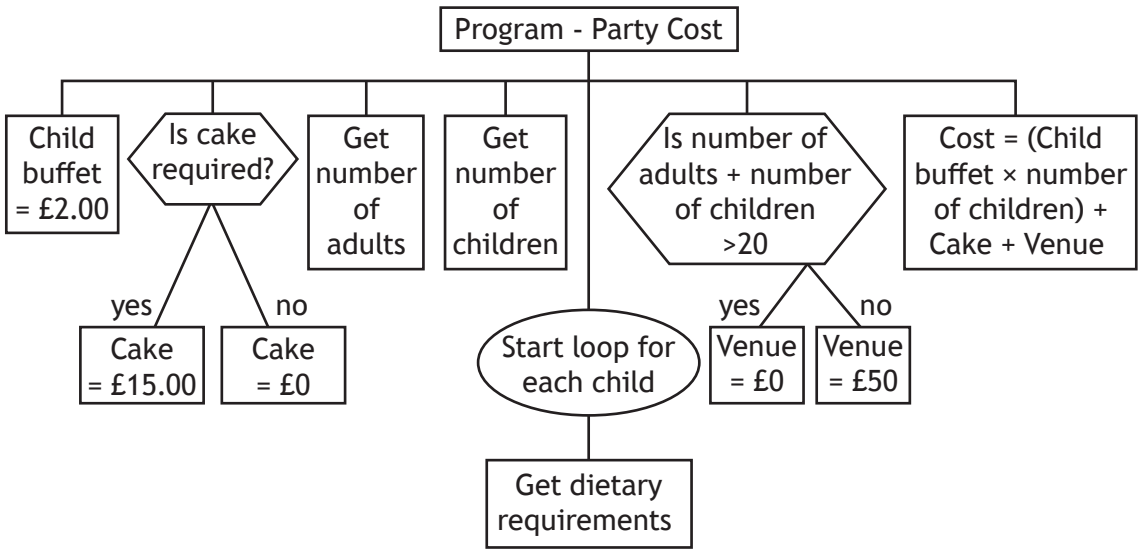
9. (continued)

(e) A map of the campsite is stored as a bit-mapped graphic.

Describe how this map is represented in a computer system's memory. **2**

10. An event company organises children's parties. They would like a program to help calculate the costs of parties.

Part of the structure diagram design is shown below.



(a) State another design technique that could be used to design this program. **1**

_____

(b) State the type of loop shown in the design above. **1**

_____

(c) The design is tested using the following inputs:

- 12 adults
- 16 children
- cake required - Yes.

(i) State the venue cost. **1**

_____

(ii) State the total cost of the party. **1**

_____

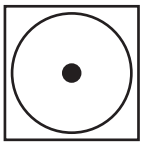
[Turn over

10. (continued)

(d) A personalised party sweatshirt costs £12, with each character of the personalised message costing an additional 25p.

(i) Using a design technique of your choice, design a program to store the user's message and output the total cost of the sweatshirt. **4**

(ii) The washing label on the sweatshirt has the following symbol.



Identify an object used to make this symbol and one of its attributes. **2**

Object _____

Attribute _____

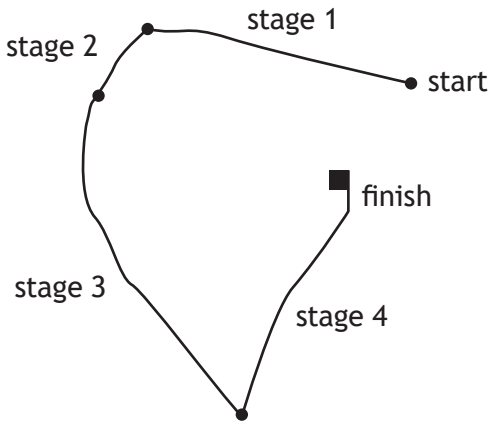
(e) Once the program is implemented, state which part of the processor will execute the following tasks. **2**

Task	Part of processor
Calculate cost	
Transfer the next instruction from memory	

11. Edge Races are developing a program to process information on races with multiple stages.

The first race has four stages as shown below.

Race one	
Stage	**Distance (km)**
1	19.9
2	6.5
3	35.2
4	20.0



The design for part of the program is shown below.

```
6.1     Loop 4 times
6.2         Get valid distance for stage
```

(a) The distance of a stage can range from 5 to 75 km.

(i) Using a design technique of your choice, refine step 6.2 to check the user enters a valid distance. **4**

11. (a) (continued)

(ii) Test data is used to ensure the distance entered is valid.

State the type of test in the table below. **2**

Type of test	Input	Expected results
	67.6	Program continues
	3.7	Program displays an error message

(b) The following lines of code are written to input the distance for each stage of 'Race one'.

```
...
Line 6    FOR stage FROM 0 TO 3 DO
Line 7       RECEIVE distance FROM KEYBOARD
...
```

Changes should be made to the code above to ensure that any number of stages could be processed.

Describe two changes that would be required. **2**

Change 1 _____

_____

Change 2 _____

_____

11. (continued)

(c) Edge Races classify races as 'beginner', 'intermediate' or 'advanced' based on the total distance of the race. The program displays the classification after calculating the total distance.

```
...
Line 25   <calculate the total distance for the race>
Line 26   IF totalDistance < 25 THEN
Line 27        SET race TO "beginner"
Line 28   END IF
Line 29   IF totalDistance >= 25 OR totalDistance <=100 THEN
Line 30        SET race TO "intermediate"
Line 31   END IF
Line 32   IF totalDistance > 100 THEN
Line 33        SET race TO "advanced"
Line 34   END IF
Line 35   SEND race TO DISPLAY
...
```

(i) When tested the code produced an unexpected result.

Identify the type of error in the code above. **1**

(ii) The code above is inefficient.

Using a programming language of your choice, re-write lines 26 to 34 to make this more efficient. **2**

(d) During execution the code is translated.

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

11. (continued)

(e) The average stage distance for each race is calculated and stored in the variable `avgDistance`.

(i) Using a programming language of your choice, write the code to store the average to 1 decimal place. **2**

(ii) The average stage distance should be displayed, as shown below for 'Race one'.

```
The average is 20.4 km
```

Using a programming language of your choice and the variable `avgDistance`, write the code to produce the output above. **2**

[END OF SECTION 1]

[Turn over for SECTION 2

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SECTION 2 — DATABASE DESIGN AND DEVELOPMENT — 25 marks

Attempt ALL questions

12. Riley wants to add a new contact on their mobile phone.

State the attribute type that would be used to store the data identified by the arrow above. **1**

13. Nathan cancels his ClipClop social media account.

Describe one implication for ClipClop under UK General Data Protection Regulation. **1**

14. Teams take part in a technology competition. Their details are stored in a table called `Team`. The sorted output below was produced by executing a query.

teamID	schoolID	teamName	noOfMembers	technology
T1	936	Pseudo Boom	3	Robot
T22	871	Brainy Bunch	4	E-Glasses
T56	658	Thinking Caps	2	Air drone
T24	658	B.H.B	2	VR headset
T67	402	Fuzz Logic	4	Health tracker
T29	214	Alpha 1.0	5	Artificial intelligence
T37	214	Successors	3	Land drone
T46	214	Brainy Bunch	4	VR headset
T99	197	Elec-tricks	2	Smart watch

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

```
SELECT teamID, schoolID, teamName, noOfMembers, technology

FROM Team

ORDER BY _____

_____
```

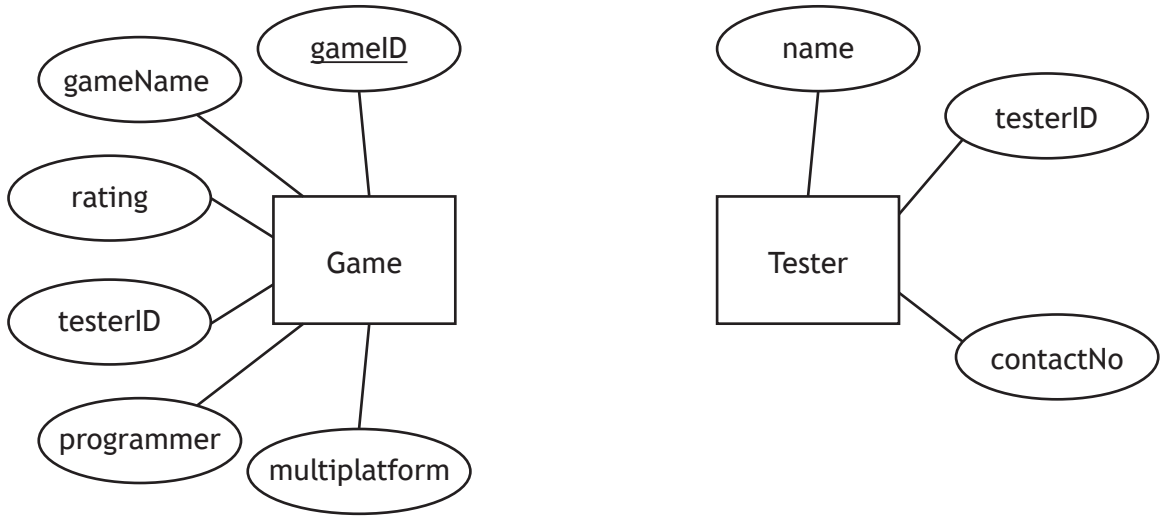
(b) Brainy Bunch from schoolID 214 has been disqualified from the competition. Write the SQL statement to remove them from the table. **2**

[Turn over

15. The Games Lab is a video game testing company that programmers can send games to for testing. Each game is allocated to a tester who works on several different games. Testers are based in three offices — Scotland, France and Australia — and only accept games rated 12A, 15 and 18.

(a) (i) Use the information provided to complete the entity-relationship diagram below by:

- identifying any additional key attributes
- drawing any missing attributes
- drawing the relationship between entities
- naming the relationship between the entities. **4**



(ii) State the validation to be applied to the `Rating` attribute. **1**

_____

15. (continued)

The `Game` table is implemented. Some of the data it currently stores is shown below.

Game					
gameID	**gameName**	**programmer**	**rating**	**testerID**	**multiplatform**
378B	World Away	CodeQueen	12A	EX2706	Yes
311H	Denta Deet	AbdurPSK	15	EX777	No
484D	Cupland	LindyLoo	12A	EX360	No
257P	Heat Wave	EMC2	15	EX277	Yes
183B	Water Rage	CodeQueen	15	EX987	Yes
021B	Bee-Hive	AcroGymGal	12A	EX120	Yes
782C	Combat45	AbdurPSK	12A	EX2706	No
...	...	...	...	...	...

The game 'Water Rage' has been reclassified as an 18 rating. The following SQL statement was implemented to make this change.

```
UPDATE Game
SET rating = "18"
WHERE programmer = "CodeQueen"
```

(b) Explain why the SQL statement above would give an unexpected result. **1**

(c) Rewrite the SQL statement to give the expected result. **1**

[Turn over

16. A database stores data on a local netball league. The `Club` table stores data of the clubs that play in the league. The `Player` table stores data on each player.

Sample data from each table is shown below.

Club				
clubID	**clubName**	**trainingVenue**	**contactNo**	**division**
A2706	Joint Forces	Glasgow	01415829631	3
B1803	Shooting Stars	Renfrewshire	01245668123	2
E0408	Team Titans	Glasgow	01415571239	1
P2507	Hot Shots	Lanarkshire	01245789456	1
H0311	Throwing Tigers	Glasgow	01418529637	2
…	…	…	…	…

Player					
playerID	**name**	**email**	**age**	**position**	**clubID**
358	Meenal	m.hussain8@blues.com	21	Goal keeper	E0408
562	Jacob	smithj_47@rt.co.uk	25	Goal shooter	A2706
981	Tara	taratara2@getmail.com	24	Centre	P2507
742	Ibrahim	ib0201@blues.com	36	Wing defence	E0408
801	Devin	smithdev1@getmail.com	30	Goal shooter	B1803
129	Amber	ambersun9@rt.co.uk	21	Wing attack	A2706
232	Xander	XanderXander8@rt.co.uk	38	Goal defence	E0408
475	Harris	mrharris_g@blues.com	36	Goal attack	E0408
603	Zohra	zohra_lan@getmail.com	32	Centre	B1803
…	…	…	…	…	…

(a) Explain the purpose of the foreign key `clubID` in the `Player` table. **1**

MARKS

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(b) Design a query that could be used to create a list of names and the division for Goal keepers that are over 30 years old. **4**

Field(s)	
Table(s)	
Search Criteria	

(c) (i) The netball league wants a list of players who meet at least one of the following criteria:

- train in Lanarkshire
- play for a team in division 2.

Complete the SQL query below. **4**

```
SELECT clubName, name, playerID

FROM _____

WHERE _____

_____

_____
```

(ii) Describe how this SQL query should be tested. **2**

_____

_____

(d) Explain why it is better to have referential integrity implemented before adding a new player to the netball database. **1**

_____

_____

[END OF SECTION 2]

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17. Digital Escapes is a company who provide online jigsaw challenges.

Each challenge has three web pages each containing a jigsaw puzzle. The user can move to the next web page by clicking a hyperlink.

Low-fidelity prototypes of a challenge are shown below.

Welcome to your challenge

Puzzle 1

Your finished jigsaw will look like this.

Puzzle 2

Puzzle 2

Your finished jigsaw will look like this.

Final Puzzle

Final Puzzle

Your finished jigsaw will look like this.

Complete the diagram below to show the structure of this challenge. **2**

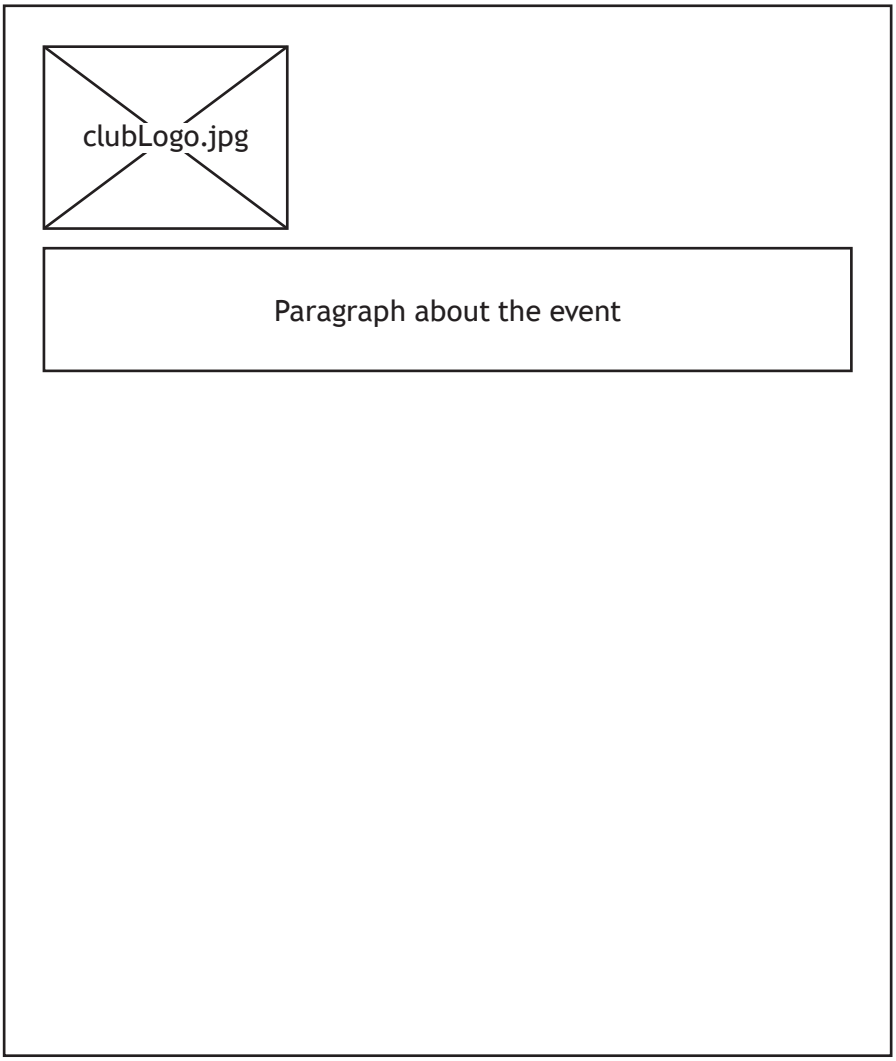
Puzzle 1

18. An athletics club would like a new web page to allow them to celebrate the success of their members from recent events.

They would like the web page to display the following content:

- a paragraph with information about the event
- an image of the club members at the event with a paragraph about the results under the image
- a hyperlink to the home page
- the club's logo at the top of the page.

Complete the wireframe below to design the web page. **3**



19. Gone Away travel is a holiday booking website.

Below is the home page for the website.

https://www.goneawaytravel.co.uk

Gone Away Travel

Naples

Copenhagen

Egypt

(a) Gone Away travel have added flags to the images on their home page. These contain a white background that must be removed.

State the reason why a PNG file format would be more suitable than a JPEG file format. **1**

_____

_____

[Turn over

19. (continued)

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(b) The following HTML and CSS is for a web page containing information about a trip to Naples.

style.css

```
body{
background-color:lightblue;
}

img{
height:200px;
width:250px;
}
h1{
font-family:Helvetica;
font-size:14px;
}
div{
background-color:white;
}
#city{
text-align:center;
font-size:20px;
}
p{
text-align:center;
font-size:12px;

}
```

naples.html

```
<!doctype HTML>
<html>
<head>
<title>Gone Away Travel - Naples</title>
<link rel="stylesheet" type="text/css" href="style.css">
</head>

<body>
<h1>Gone Away Travel</h1>
<h1 id="city">Naples</h1>
<p>Come visit the lovely Naples, the third largest city in
Italy. Home to the best pizza in the world. View our
pictures below to help make up your mind.</p>

<div>
<img src="Media/naples1.png">
<p class="description">Stunning view of the Naples bay</p>
</div>

<div>
<img src="Media/naples2.png">
<p class="description">One of the many food markets in
Naples</p>
</div>

</body>
</html>
```

19. (b) (continued)

(i) The description of each photograph is to be right aligned, use Arial font and be the same size as the other paragraphs on the page.

Write a single CSS rule that would only style the descriptions. **3**

```
_____ {

      _____

      _____

      }
```

(ii) The hyperlink below can be found on the Naples information page.

```
<a href="www.NaplesCity.co.uk">Official Naples city
guide</a>
```

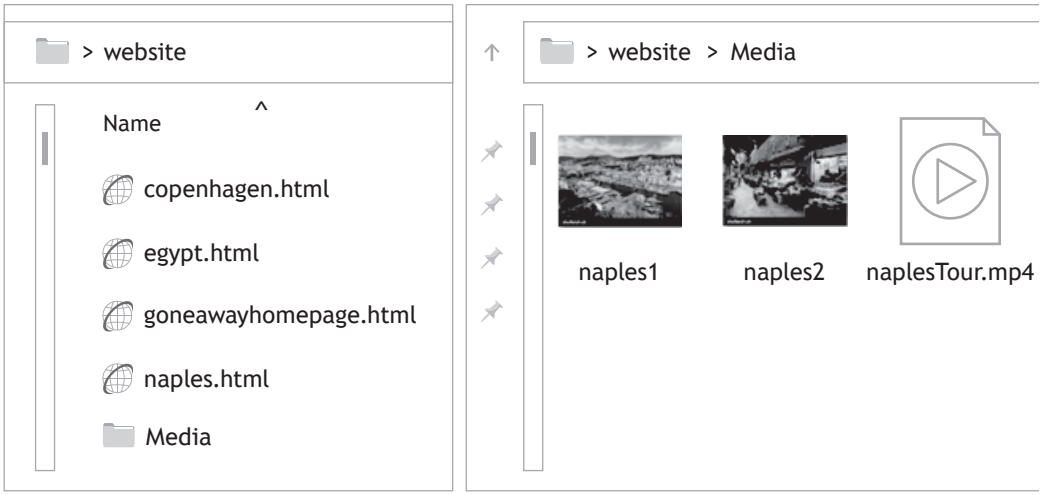
State the type of addressing used in the hyperlink. **1**

_____

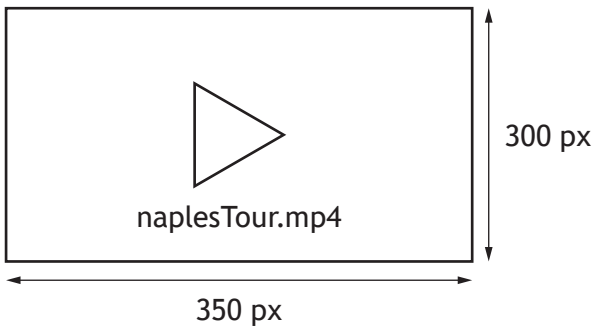
[Turn over

19. (continued)

(c) A video tour of Naples will be added to the web page. All media files for the website are stored in a folder called 'Media' as shown below.



Using this structure, complete the following code so that the video naplesTour.mp4 is displayed on the naples.html page with the following dimensions. **3**




```
<video  _____ controls>

<source src=_____
type = "video/mp4">

</video>
```

19. (continued)

(d) Gone Away Travel would like to improve their website based on user feedback. A sample of the feedback is shown below.

> 'It would be fun to listen to clips of useful local phrases for each holiday location.'
>
> 'I felt really bored while using your website. Booking a holiday should be fun.'
>
> 'I got stuck on the Naples page!'

Identify one functional requirement that should be added to the website based on the feedback above. **1**

_____

[Turn over

20. Blockland theme park is developing a new website for visitors.

The following code is used to create the home page.

```
<!doctype html>
<html>

<head>
    <title>Blockland Home Page</title>
<style>
    body{background-color:lightblue;font-family:arial;}
    img{height:150px; width:150px;}
    h1{font-family:helvetica; font-size:24pt; text-align:center;}
    .openSection{text-align:left;}
    div{background-color:white; font-size:12pt;}

</style>
</head>

<body>
<img src="blocklandLogo.jpg" alt="Blockland Logo">
<h1>Welcome to Blockland!</h1>

<div>
<h1 class="openSection">Ultimate Day Out</h1>
<p>With an amazing themed room to suit every Block Lover including
rapid race cars, terrifying tarantulas and spectacular space there
is something for the whole family.</p>
<a href="parkRides.html">Click here to view the rides in the
park</a>
</div>

…

<a href="parkShop.html">Click here to browse the shop</a>
</body>
</html>
```

(a) Describe how the 'Ultimate Day Out' heading, including any background colour, will be displayed in a browser. **4**

20. (continued)

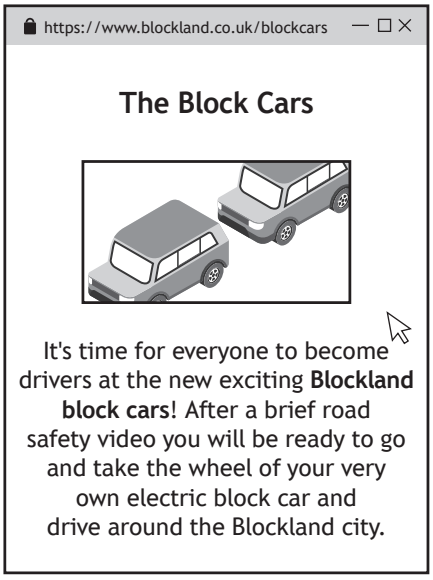
(b) The following code is to be added to the website.

```
…
<p>New Rides</p>
<ul>
<li><a href="blockCars.html">The Block Cars</a></li>
<li>The Mystical Forest</li>
<li>The Lizard</li>
</ul>
…
```

Draw how this code would look when viewed in a browser. **3**

[Turn over

(c) The page for a new ride called 'The Block Cars' is shown below. When the user moves the cursor over the image of the ride another image showing the opening date is revealed.



(i) State the language used to implement this feature. **1**

(ii) State the type of event that is used. **1**

(d) Blockland runs a competition that involves guests of the park submitting video footage they have taken of the rides. A member of staff suggests uploading the videos to the website.

State what Blockland should do to ensure they comply with the Copyright, Designs and Patents Act. **1**

(e) The website has been tested to ensure that all navigation works as expected and all the media on the website displays correctly.

Describe one other test that could be carried out on the website. **1**

[END OF SECTION 3]

[END OF QUESTION PAPER]

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ADDITIONAL SPACE FOR ANSWERS

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