

X216/12/01

NATIONAL
QUALIFICATIONS
2013

TUESDAY, 7 MAY
9.00 AM – 11.30 AM

INFORMATION
SYSTEMS
HIGHER

Attempt **all** questions in Section I.

Attempt **all** questions in Section II.

Attempt **one** sub-section of Section III.

Part A Applied Multimedia
Part B Expert Systems
Part C The Internet

Page 12	Questions 16 to 17
Page 15	Questions 18 to 21
Page 18	Questions 22 to 25

For the sub-section chosen, attempt **all** questions.

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.



SECTION I

Attempt ALL questions in this section.

1. The Scottish Tennis Association stores details about players and clubs in a single table. Below is a record from this table.

Name	Paul Notman
Rating	6.2
Tennis club	Strathmore
Club secretary	Marta Barowska
Club address	67 Greenfield Street, Falkirk
Club telephone	01789 786532

- (a) Describe **one** data modification problem with this database design. 2
- (b) Describe how a primary key could be created in this situation. 2

2. A sports shop's database uses two tables. Samples of data are shown below.

Customer	Date	Item*
Susan Greig	23/03/2013	XT3
Frank Graham	14/04/2013	XTW SB7 T11
Arman Adimi	14/04/2013	XT3 SOX

Item	Description	Price
XT3	Running shoes	£79.99
XTW	Cross trainer	£59.99
T11	Tennis balls	£6.99

- (a) Data can be in UNF, 1NF, 2NF or 3NF. State the normal form of the shop's data giving a reason for your answer. 3
- (b) State the *cardinality* of the relationship between the two tables above. 1

SECTION I (continued)

2. (continued)

(c) A report is produced on the current stock list as shown below.

Item	Description	Price
XT3	Running shoes	£79.99
XTW	Cross trainer	£59.99
T11	Tennis balls	£6.99
No. of items: 3		

State **two** features of an RDBMS which could be used to calculate and display the number of items in this report.

2

3. State what is meant by the *domain* of an attribute.

2

4. State the most appropriate data type for the following descriptions:

(a) the position of a switch (on or off);

1

(b) photograph image (not embedded);

1

(c) the number of people at a meeting.

1

5. Describe what is meant by the term *data integrity*.

2

6. Businesses use a variety of *organisational information systems*.

(a) Describe what an *expert system* is.

2

(b) Describe the purpose of a *data processing system*.

2

7. Describe the use made of *Gantt charts* in project management. You may use a sketch of a Gantt chart as your answer.

3

8. State **two** features of *personal information management software*.

2

SECTION I (continued)

- | | | |
|-----|--|-------------|
| 9. | State two requirements of the Data Protection Act 1998. | 2 |
| 10. | Describe what is meant by the term <i>data warehouse</i> . | 2 |
| | | (30) |

[END OF SECTION I]

[Turn over for SECTION II on Page six

SECTION II

Attempt ALL questions in this section.

11. Student Accommodation at SouthScot University is in single rooms. Students may hire additional equipment for use in their rooms. When applying for accommodation students indicate what equipment they would like to hire. These requests are kept for one year only. A sample equipment request form is shown below.

SouthScot University Accommodation Services

Student Name: *Aneka Lukowiecka*

Student No: *10683*

Home Address: *27 Candle Street
Hallburn
ZX1 4NK*

Room No: *101*

Please enter the number of items you would like to hire.

Item	Hire Cost	Term 1	Term 2	Term 3
Toaster	£4	<i>1</i>	<i>1</i>	<i>1</i>
Kettle	£4	<i>1</i>	<i>1</i>	<i>1</i>
DVD Player	£5			
Printer	£10			<i>1</i>
21" Monitor	£10			<i>1</i>
19" Television	£8	<i>1</i>	<i>1</i>	
Lamp	£2	<i>1</i>	<i>2</i>	<i>2</i>
Electric Heater	£5	<i>1</i>	<i>2</i>	

SECTION II (continued)

11. (continued)

Each item of equipment has a unique stock number and details of equipment available for hire are kept on forms at the storeroom. An example of part of a hire list form is shown below.

Hire List (2012/13)					
Stock No	Item	Manufacturer	Test Date	Term	Student No
1019	Kettle	Hotmate	13/02/2013	1	10683
1019	Kettle	Hotmate	13/02/2013	2	10683
1065	Lamp	CBright	15/09/2012	2	10683
1079	Lamp	CBright	12/03/2010	2	10683
1066	Toaster	Hotmate	15/09/2012	2	10877
1095	DVD Player	Acme	30/06/2012	3	11121
1101	Kettle	Electro	30/04/2013	3	10683
1102	19" Television	Bush	22/04/2010	2	11233

Data from these forms can be represented in un-normalised form as:

Student No
 Student name
 Home address
 Room No
 Item
 Hire cost
 Stock No
 Manufacturer
 Test date
 Term

Using Student No as the primary key, transform this un-normalised data to third normal form.

You **must** show the intermediate stages of first normal and second normal form and identify all primary and foreign keys at each stage of normalisation.

17

[Turn over]

SECTION II (continued)

12. Carter's Carriage is a transport company which operates a fleet of vans carrying goods between 25 depots throughout the country. Every trip follows one of a number of set routes between an origin depot and a destination depot. Refuelling, if necessary on longer routes, is only permitted at a particular town on the route.

A relational database has been created to help the company. The structure of the data model is as follows:

Driver	Trip	Van	Route
<u>Driver number</u>	<u>Driver number*</u>	<u>Registration number</u>	<u>Route number</u>
Driver name	<u>Registration number*</u>	Capacity	Origin
Mobile number	<u>Date</u>	Date purchased	Destination
	Route number*		Refuel town

- (a) Draw an *entity relationship* diagram to represent this data model.

6

- (b) The data dictionary below represents the Trip entity.

State a suitable entry for each of the missing values A to D.

4

Attribute	Data Type	Validation	Unique	Key
Driver number	Integer	Lookup from Driver table	N	PK/FK
Registration number	A	Lookup from Van table	N	PK/FK
Date	Date		C	PK
Route number	Integer	B	N	D

- (c) It was suggested that the "Refuel town" could be used instead of "Route number" as a primary key in the Route table. If this change is made, state the effect on *entity integrity* in the Route table. Explain your answer.

3

SECTION II (continued)

13. A media studies teacher at ForthView High School managed to get hold of a recording of the BBC radio commentary from the 1966 World Cup Final between England and Germany. The media studies class listened to this recording one afternoon.
- (a) Categorise the information in the recording in terms of its *time* and *form*. 2
- (b) Comment on the quality of the information in the recording in terms of *timing*, *presentation* and *reliability*. Justify your answers. 6
14. Scottish Investments and Securities uses an IS driven business model. As part of this model, the company has developed five organisational information system management strategies.
- (a) *Network strategy* is one of these strategies. Name the other **four**. 4
- (b) Describe what would need to be considered when developing a network strategy. 6

[Turn over]

SECTION II (continued)

15. BestPals is a social networking website. Members can post comments and images on their own pages and on their friends' pages.



- (a) (i) State **four** features of a web page that BestPals could control to enforce a “house style”. 4
- (ii) Describe how BestPals could use web authoring software to implement a “house style”. 2

Members of BestPals can also send private messages to their friends.

- (b) Under three separate headings of *social*, *legal* and *ethical*, comment on the implications of using private messaging. 6

(60)

[END OF SECTION II]

SECTION III

Attempt ONE sub-section of Section III

Part A	Applied Multimedia	Page 12	Questions 16 to 17
Part B	Expert Systems	Page 15	Questions 18 to 21
Part C	The Internet	Page 18	Questions 22 to 25

For the sub-section chosen, attempt *all* questions.

SECTION III

Part A—Applied Multimedia

Attempt all questions.

16. Mr Thomas runs a lunchtime multimedia club for pupils at Bancroft Secondary School. The club has been approached by the local Owl Rescue Sanctuary and asked if it would consider designing and producing a website for them.

This website needs to be completed by the start of the next school term in October and should contain photographs, video, sound clips and factual information about the owls currently at the sanctuary. It is hoped that the website can then be used as an information resource for Primary School classes who will be visiting the sanctuary as part of their class project.



“Snowy”—the Sanctuary’s mascot

- (a) Mr Thomas has decided that pupils should form a web development team and that they should elect a *project manager*.

(i) State **two** skills that a project manager should have. 2

(ii) The project manager is ultimately responsible for drawing up a *contractual requirements specification*.

State **three** items found in a requirements specification and give an example of each from the information above. 6

(iii) A *multimedia designer* and a *multimedia programmer* are two other positions that need to be filled within the web development team.

Describe the role that **each** of them will take in the creation of this website. Your answer should include mention of any interaction with other team members. 6

- (b) The index page of the website will be displayed with photos of the four different types of owl at the sanctuary. The type of owl will be displayed under each photograph. The four types are: Pygmy, Barn, Snowy and Spotted.

If a type of owl is selected, a page should be displayed containing facts about each owl, as well as a photograph and small movie clip. The option should also be available for users to play a sound clip of the owl. At the end of each section the user should have the option of returning to the index page or quitting the application.

(i) Create an *outline storyboard* for the Pygmy Owl web page. Your diagram should clearly show all the information and navigation required. 5

(ii) State **three** additional pieces of information that should be included in a *detailed storyboard* for this web page. 3

SECTION III

Part A—Applied Multimedia (continued)

16. (continued)

The pupils who have taken on the roles of media specialists are responsible for any graphics, audio or video clips to be used in the website. They visited the sanctuary where they recorded a set of movie clips and took photographs of the owls.

- (c) The photographs are imported from the camera into photo editing software before being saved as JPEG files for use within the website.

Discuss the implications for the images on the index page of altering their *colour depth*, *resolution* and *degree of compression*.

6

- (d) Audio clips of the owls are to be included within the website. MP3 and MIDI are two audio file types.

Discuss the suitability of each audio file type for this purpose.

3

- (e) When a video clip of the owl is included within the web page it appears “jerky”.

Describe an alteration that could be made to fix this problem.

2

Any multimedia project should be carefully planned and then fully documented upon completion.

- (f) Two types of documentation were produced in the development of this website.

- (i) Storyboards are one component of the *project development documentation*. State **two** other components of this type of documentation.

2

- (ii) State **one** type of documentation produced other than project development documentation.

1

[Turn over]

SECTION III

Part A—Applied Multimedia (continued)

17. Tourists can find out information about a city they plan to visit from a variety of sources. Before they travel they could carry out research using the WWW. Interactive kiosks are a common sight in most city centres and they can, for example, provide visitors to a city with information on hotels and restaurants.

- (a) Using **two** appropriate comparison criteria, compare the WWW and kiosk as multimedia delivery media. 4
- (b) (i) Suggest the most likely type of user interface being used in the kiosk. Explain your answer. 2
- (ii) With reference to **two** criteria used to evaluate good user interface design, comment on the two restaurant information screens shown below. 4

ByreByre	ByreByre restaurant was opened in 2009 and is situated in the city centre.	Silver Salver	The Silver Salver is the most prestigious restaurant in the area. Set in a wonderful location overlooking the sea, this restaurant has fine dining mastered.
	The dining area is spacious with a part open kitchen so that diners can watch as food is prepared.		Food enthusiasts come from miles around to taste the exquisite fish dishes the restaurant is famous for.
T: 01345 667889 W: www.byrebyre.co.uk E: info@byrebyre.co.uk	Serving a choice of soup and sandwich, as well as the famous ByreByre Burger.	T: 01664 987654 W: www.salverrestaurant.com E: book@salver.com	
Lunch: 3 courses £12		Open: Wed–Sun only	

- (c) Information can be categorised in terms of its *use* under three headings. Control is one of these headings.
- (i) Name the other **two** headings for use. 2
- (ii) Choose **one** of the headings in part (i) and give an example based on the restaurant information screens above. 2


(50)

[END OF SECTION III—PART A]

SECTION III

Part B—Expert Systems

Attempt all questions.

18. State **four** facts about the Dendral expert system. 4
19. Many different types of thistles grow in different parts of the world. Thistles are one type of the many invasive weeds which can cause problems for gardeners.
- (a) Give **one** benefit and **one** drawback for gardeners that would particularly apply to an expert system on thistles. 4
- Here are notes on three types of thistle:
- Take care when handling the Bull Thistle because of the spines on the stem and the rough leaves. The lovely flower resembles a vase.
- The Musk Thistle has a large disc flower. The naked stem and smooth leaves cause no problems when gathering samples.
- The hairy leaves and spiny stems mean gloves are a good idea when handling the Scotch Thistle. The flower looks like a flattened globe.
- 
- (b) (i) Derive **three** attribute-value pairs for the Scotch Thistle. 2
- (ii) Create a factor table for the three types of thistle. 4
- (iii) Create three rules, **one** for each type of thistle. 5
- (iv) Derive a question that would be part of a user consultation. 2
- (c) Name the final stage of the development and describe how it would be carried out for an expert system on thistles. 4

[Turn over

SECTION III

Part B—Expert Systems (continued)

20. Scotbank provides business loans to companies and uses an expert system to help them make decisions about the loans. The result of a consultation with the expert system will be a “yes” or “no” to a loan request. The system has been in use for a number of years.

Three scores are awarded by the system during a consultation:

- “amount” (based on the amount of the loan)
- “business” (based on the annual sales and profit)
- “people” (based on the credit rating of each company director).

- (a) The system uses a rule which gives a “yes” when the “business” score is greater than the “amount” score and the “people” score is greater than 50.

(i) Represent this using *propositional logic*.

2

(ii) There are two problems with this rule.

- It is not always correct for every loan application.
- The scores obtained during a consultation are not always reliable.

Explain how the system could calculate a level of confidence in a “yes” using this rule.

4

- (b) A client is confused when a loan request is denied.

(i) Categorise the *level* of the information, “loan request is denied”, for

- the client
- Scotbank.

Justify the difference in level.

3

(ii) Explain how the expert system can be used to help this client understand the reason for the loan being denied.

2

- (c) State **two** ways that new employees at Scotbank could be given training before using the expert system with a client.

2

- (d) Executives of Scotbank become concerned at a large number of recent loans which were granted and then not repaid.

(i) Explain where the responsibility lies when loans are authorised based on “bad” advice from the expert system.

2

(ii) State a reason why this expert system might give “bad” advice.

2

SECTION III

Part B—Expert Systems (continued)

21. During a consultation, a rule is fired in a *forward chaining* expert system. Describe the processes that take place before the next rule can be fired. Your answer should include the correct sequence of events and correct terminology.

8

(50)

[END OF SECTION III—PART B]

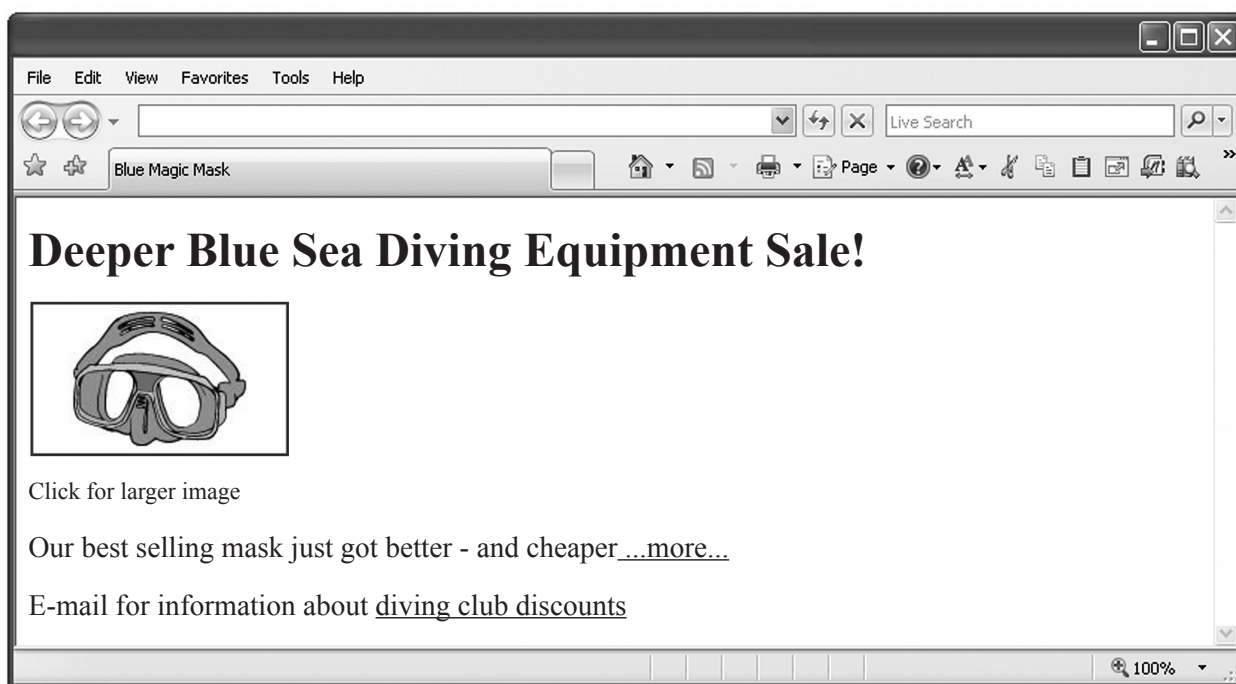
[Turn over

SECTION III

Part C—The Internet

Attempt all questions.

22. Deeper Blue Sea is a company selling diving equipment. Part of a page from the company's website is shown below.



Part of the HTML code used to produce this page is shown below.

- (a) State suitable entries for each of the missing values labelled A to D.

4

1. <head>
2. <title>Blue Magic Mask< A >
- 3.
- 4.
- 5.
6. < B >
7. < C >
8. <h1>Deeper Blue Sea Diving Equipment Sale!</h1>
9. <p> </p>
10. <p class="style1">Click for larger image </p>
11. <p>Our best selling mask just got better - and cheaper
...more... </p>
12. <p>E-mail for information about diving club discounts </p>

SECTION III

Part C—The Internet (continued)

22. (continued)

- (b) Write the *cascading style sheet* code for lines 3 to 5 which causes the text “Click for larger image” in line 10 to be displayed in 9 point. 4
- (c) Describe the effect of clicking on the following hyperlinks.
- (i) the image of the mask (line 9 in the code) 2
 - (ii) “... more...” (line 11 in the code) 2
 - (iii) diving club discounts (line 12 in the code) 2

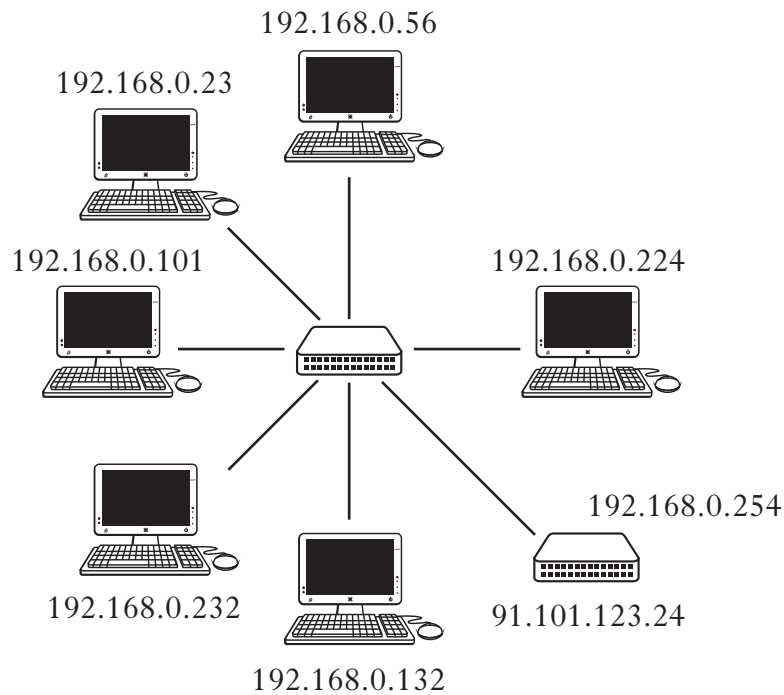
23. (a) State what is meant by a protocol. 2
- (b) Name **two** *Internet protocols* and state the purpose of each. 4
- (c) A team of Internet developers wishes to develop a new protocol. State which Internet organisation they should contact. 1

[Turn over]

SECTION III

Part C—The Internet (continued)

24. Total Action is a Scottish company which develops computer games and sells them online. The company employs 184 people and has 236 devices on a single network using the address range 192.168.0.0 to 192.168.0.255. A sample of a small part of the network is shown below.



A new computer is to be added to the network. The following information has to be entered in order to set up the computer for use on the network.

Network Set Up Screen	
IP Address:	192.168.0.237
Subnet Mask:	<input type="text"/>
Gateway Address:	<input type="text"/>

- (a) State the value to be entered for the

(i) *subnet mask*;

1

(ii) *gateway address*.

1

- (b) Describe the purpose of a gateway.

2

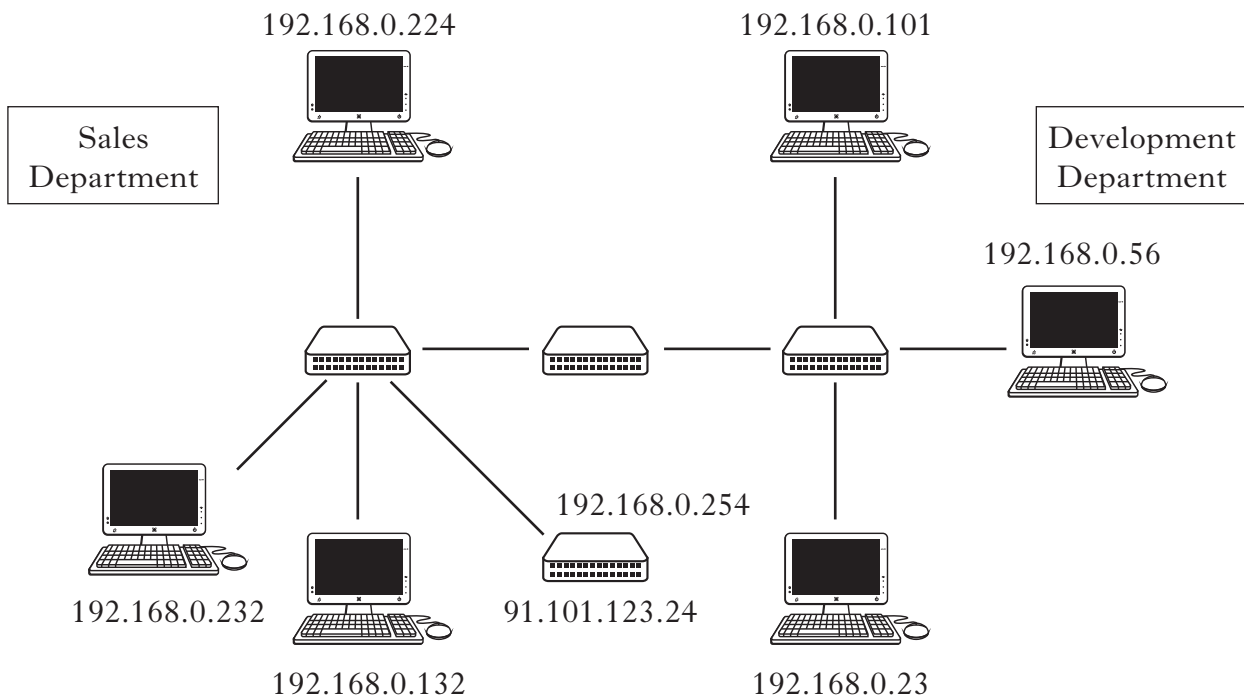
SECTION III

Part C—The Internet (continued)

Marks

24. (continued)

The IT department at Total Action has decided to subdivide the network into two equal subnets: one for the Sales department and one for the Development department, as shown below.



- (c) State the additional hardware that has been used to connect the two subnets. **1**
- (d) Copy and complete the table below indicating whether changes need to be made to the subnet mask and the gateway address for the named stations.

Station Address	Change required – Yes or No	
	Subnet Mask	Gateway Address
192.168.0.56		
192.168.0.232		

4

Total Action has just developed a game called “Zombeez” and is creating a new website for this game.

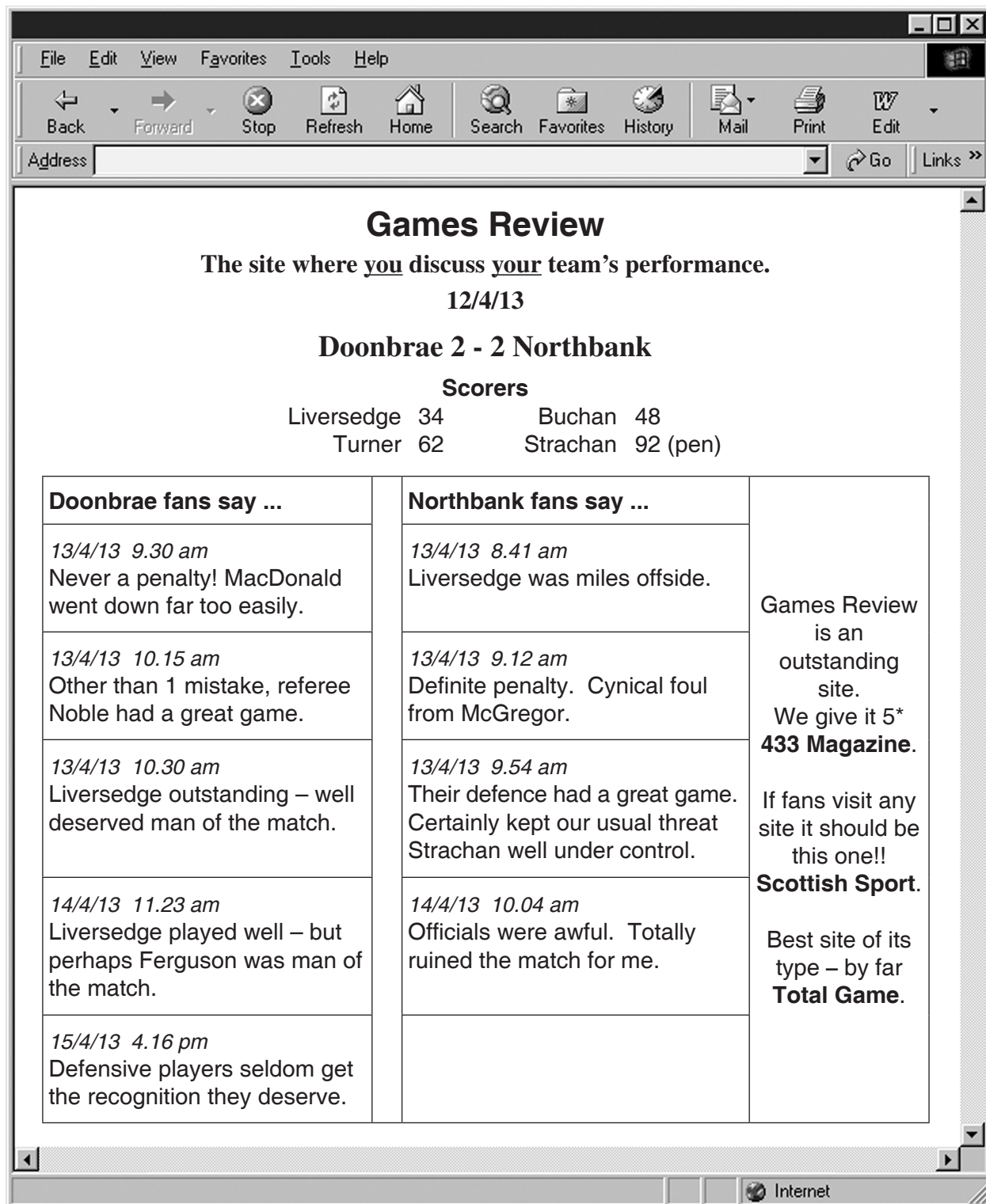
- (e) State which Internet organisation they should apply to for a *domain name* for this website. **1**
- (f) State a suitable domain name for this new website. **2**
- (g) A games designer gains unauthorised access to the new website from a computer in New York, USA. Describe how the UK police would deal with this international incident. **3**

SECTION III

Part C—The Internet (continued)

25. Games Review is a website on which fans may post their comments regarding their team's performance in recent matches. Access is by annual subscription of £10.

A sample page from the website is shown below.



SECTION III

Part C—The Internet (continued)

25. (continued)

- | | |
|---|-------------|
| (a) Evaluate this web resource in terms of <i>bias</i> and <i>credibility</i> . | 4 |
| (b) Explain the difference between the <i>cost</i> and <i>value</i> of information with reference to this web resource. | 2 |
| (c) Categorise the information in the fans' posts in terms of their <i>source</i> . | 2 |
| (d) Explain why it would be appropriate to use <i>php</i> to produce this website. | 4 |
| (e) In order to subscribe to this website, users have to complete an on-screen form. Describe two advantages of using client-side scripting for validating the form. | 2 |
| | (50) |

[END OF SECTION III—PART C]

[END OF QUESTION PAPER]

[BLANK PAGE]