

X216/301

NATIONAL
QUALIFICATIONS
2011

MONDAY, 16 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
Page 16
Page 19

Questions 21 to 24
Questions 25 to 28
Questions 29 to 32

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. Kwik Kut is a salon which employs a number of stylists. Each stylist has a number of regular customers. Details of appointments are kept in a database created from data in un-normalised form. The sample below shows an entry in the database.

Stylist	Michelle
Appointment Date	23/06/11
Appointment Time	11.30
Customer Name	Claire Morrison
Customer Phone Number	01554 765643

Michelle has decided to leave the salon. Describe **one** problem that could be encountered when Michelle leaves and all her records are removed.

2

2. One table in a shop's database can be represented as:

ORDER (order number, item number, description, price, quantity).

Data can be in UNF, 1NF, 2NF or 3NF. State the normal form of this data giving a reason for your answer.

3

3. An invoice from an Electronics shop is shown below.

Supasonic Electronics Customer Invoice					
Customer No:	1324	Customer Name		John Andrews	
Customer Address	27 High Street, Abervalley				
Date	29/04/11				
Item Number	Number Ordered	Price (£)	Discount rate	Discount Price (£)	Total (£)
555666	14	9.99	10%	8.99	125.86
556789	5	32.85	15%	27.92	139.60
Overall Total					265.46

Identify **one** attribute that would not be included in the un-normalised form of this data, giving a reason for your answer.

2

SECTION I (continued)

4. State **two** data types that could be used to include a video clip in a database. 2
5. State the *cardinality* of each of the following relationships.
- (a) National team and Professional footballer 1
 - (b) Actor and Film 1
6. Define the term *compound key*. 2
7. Describe the purpose of a *data dictionary*. 2
8. State the type of *organisational information system* that helps managers make tactical decisions by modelling “what-if scenarios” and performing analysis on data. 1
9. Describe the purpose of a *Data Processing System*. 2
10. A sales person has to deliver a presentation to potential customers. State **two** factors that he should consider regarding presentational style. 2
11. State **two** features that you would expect to find in Project Management Software. 2
12. Draw a diagram of each of the following LAN topologies.
- (a) Ring 1
 - (b) Bus 1
13. One criteria for evaluating software is *portability*. Describe what is meant by “portability”. 2
14. A spreadsheet package has a *macro* facility. Describe what is meant by the term “macro”. 2

[Turn over]

SECTION I (continued)

15. Mr Kai finds a wallet in the corridor at work. There is no identification in the wallet but there is a card with the following information:

Username: JHans982

Password: 12345

Mr Kai decides to log on to a computer at work using these details in order to find out the owner of the wallet.

Comment on the ethics of Mr Kai using ICT for this purpose.

2

(30)

[END OF SECTION I]

[Turn over for SECTION II on *Page six*

SECTION II

Attempt ALL questions in this section.

- 16.** The usage of rooms at Buchan College is recorded in an accommodation timetable. An example for Room C17 is shown below.

Room: C17					
Type: General Classroom Capacity: 33					
Period	1	2	3	4	5
Start Time	9.00	10.00	11.10	1.25	2.30
Finish Time	9.55	10.55	12.00	2:20	3.25
Monday	M Jones 3N6	K Brown 2P2	R Skolmowski 6K5	M Jones 1N4	
Tuesday	M Jones 1N4	M Jones 3N6		K Brown 2P2	J Singh 2G1
Wednesday			D MacGregor 1N4	D MacGregor 4H3	D MacGregor 3N6
Thursday		M Jones 3N6			
Friday	K Brown 2P2	D MacGregor 3N2			

Class codes are recorded in a separate list, part of which is shown below.

Class	Class Size	Subject
3N6	18	Mathematics
4H3	22	RE
6K5	18	Social Education
3N2	20	Mathematics

SECTION II (continued)

16. (continued)

This data can be represented in un-normalised form as

Room
Type
Capacity
Period
Day
Start time
Finish time
Teacher
Class
Class size
Subject

Using Room as the primary key, transform this un-normalised data to third normal form.

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

17

[Turn over

SECTION II (continued)

17. A tool rental company keeps records of tools, rentals and customers in a relational database. The database contains the following tables.

SUPPLIER (Suppliername, Address1, Address2)

RENTAL (CustomerID*, ToolID*, Date, Insurance)

CUSTOMER(CustomerID, Forename, Surname, Address1, Address2, Telephoneno)

TOOL (ToolID, Type, Price, Suppliername*)

- (a) Draw an E-R diagram to represent the structure of this database. 6
- (b) It was suggested that instead of CustomerID, Telephoneno could be used as a primary key in the CUSTOMER table. Describe how this would affect the *entity integrity* of this table. 3
- (c) Part of the data dictionary is shown below.

Entity	Attribute	PK	FK	Required	Unique	Type	Validation
SUPPLIER	Suppliername	Yes	No	Yes	Yes	Text	
	Address1	No	No	Yes	No	Text	
	Address2	No	No	Yes	No	Text	
RENTAL	CustomerID	A	B	Yes	C	Text	D
	ToolID						
	Date						
	Insurance						

State a suitable entry for each of the missing values, **A**, **B**, **C** and **D**.

4

SECTION II (continued)

18. A multinational company holds confidential personal data about its customers.

(a) Explain the difference between *security* and *privacy* as applied to data held in a computerised information system. 2

(b) The company's security strategy requires employees to use passwords.

(i) With reference to password guidelines evaluate the suitability of **one** of the following passwords. 3

scotland tom110695 Hs%2

(ii) Apart from passwords, describe **two** data security measures that the company should introduce as part of a security strategy. 4

The company has just purchased a new word processing package for use in one department.

(c) State **five** criteria that the company would have used to help select the most appropriate software application. 5

19. The Computer Misuse Act is an example of current legislation that applies to information systems. This Act criminalises unauthorised access to, and modification of, computer files.

Name and describe the purpose of **three** other examples of current legislation that apply to information systems. 6

[Turn over

SECTION II (continued)

20. Bankhill Swimming Club offers a range of weekly swimming classes for children. At the end of every ten-week block, swimming teachers complete reports that are issued to all swimmers. An example of a report is shown below.

BSCF22a

Swimmer: Lewis James **Class:** Tadpoles **Lesson:** Thurs 4.15 pm

Tadpole Assessment Points	Skill Level
Float on back unaided	3
Pick up objects from bottom of pool	3
Submerge body and blow bubbles through mouth	2
Push off wall and glide on front	3
Kick on front with arms extended	1
Kick on back with arms extended	2
Demonstrate Front Crawl for 5 m	1

If a 1 or 2 is achieved then the swimmer needs more time to practise the skill. A 3 is a pass. Try to get along to the pool as often as possible to assist progression and water confidence.

Assessment Process	
1	Unable to perform skill
2	Most elements displayed; requires improvement
3	Performs skill to standard on a consistent basis

Qualified Swim Coach: *J Buchanan*

- (a) Explain the difference between *knowledge*, *information* and *data*. Give an example of each in this context.
- (b) The quality of the information in this report is *complete*, *relevant*, *concise* and *reliable*. Justify this statement with reference to each of these characteristics.

6

4

(60)

[END OF SECTION II]

SECTION III

Attempt ONE sub-section of Section III

Part A	Applied Multimedia	Page 12	Questions 21 to 24
Part B	Expert Systems	Page 16	Questions 25 to 28
Part C	The Internet	Page 19	Questions 29 to 32

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

SECTION III

Part A—Applied Multimedia

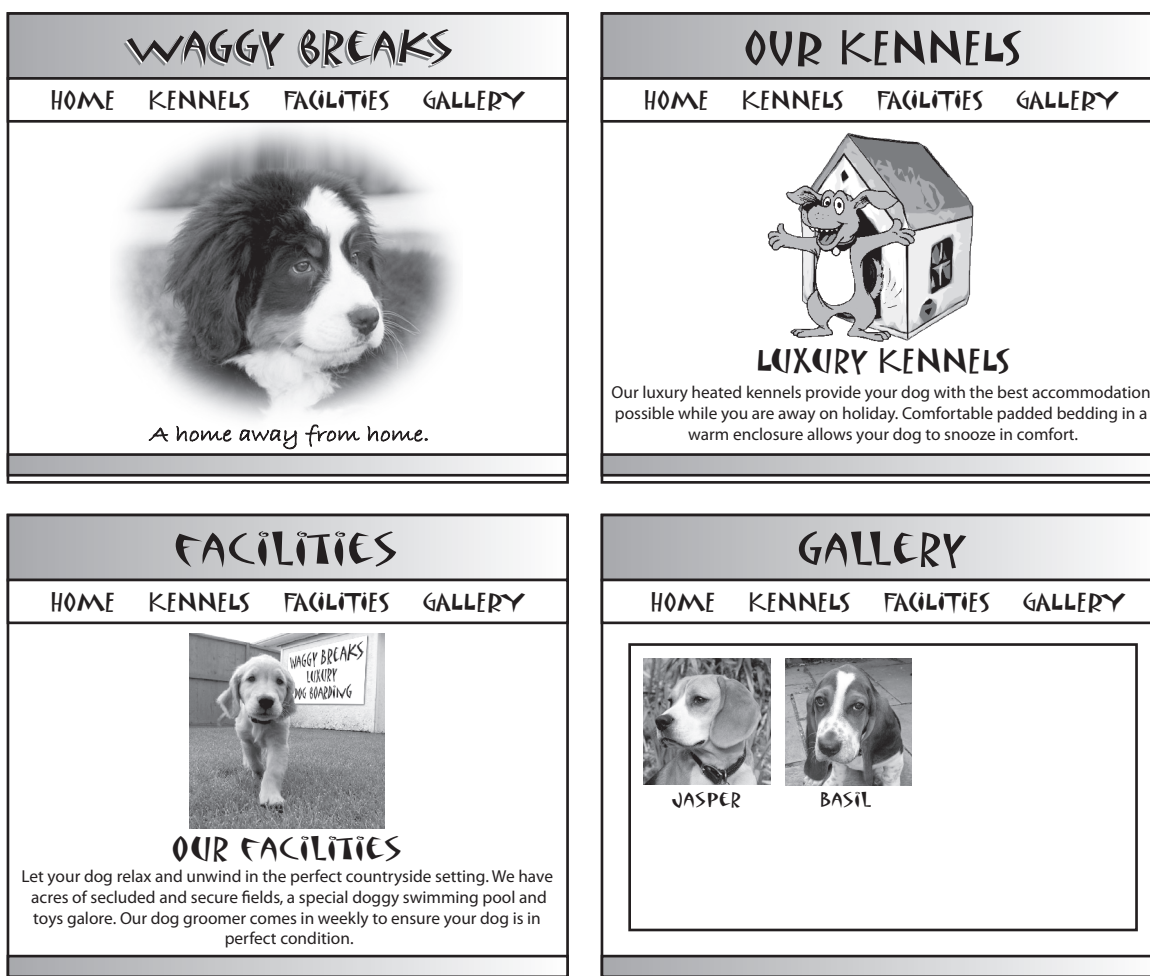
Attempt all questions.

21. Waggy Breaks is a small business set up to offer top quality dog boarding facilities while owners are away on holiday. The facility offers luxury heated kennels and acres of securely fenced fields for dog exercise. The business wishes to create a website advertising the facilities on offer.

Waggy Breaks approaches a multimedia developer to help with this project.

- (a) State **three** items found in a *requirements specification* and give an example of each from the paragraph of information above. 6
- (b) Explain why the requirements specification is important to both Waggy Breaks and the developer. 2

Four pages from the newly developed website are shown below.



- (c) (i) Draw a graphical representation of the navigational structure of the pages shown above. 3
- (ii) Name this type of navigational structure. 1

SECTION III

Part A—Applied Multimedia (continued)

21. (continued)

- (d) The photograph on the home page has been set to appear as a *progressive display*.

Describe **one** reason why the developer might have done this.

2

- (e) The developer has been given a number of photographs of customers' dogs. These photographs were given to Waggy Breaks by the dog owners who have also given their permission for them to be included in the website.



- (i) All photographs supplied are stored as JPEG files.

Give **one** reason for choosing JPEG as a file type rather than GIF in this case.

2

- (ii) State the personnel within the multimedia development team responsible for editing photographs ready to include in the website.

1

- (iii) *Object linking* is one advanced feature of web authoring software. Describe how this feature could help in the maintenance of a website.

2

- (f) It is important that Waggy Breaks considers copyright legislation in order to protect the content of their new website.

Describe how copyright applies to dog owners and to Waggy Breaks.

4

- (g) The completed website has been uploaded and the home page can be accessed using the following URL:

<http://www.waggybreaks.co.uk/home.htm>

State whether this is an absolute or relative URL and justify your choice.

2

22. The final stages in the development of any multimedia product are *testing*, *documentation* and *evaluation*.

- (a) Name and describe **two** types of testing that should be carried out on a multimedia product.

4

- (b) A development team produces two types of documentation. *User documentation* includes the hardware/software requirements and all user instructions for the customer.

- (i) State **one** other type of documentation produced by the development team.

1

- (ii) State **two** items contained in this type of documentation.

2

- (c) State **two** criteria that are used to critically evaluate a multimedia product.

2

[Turn over

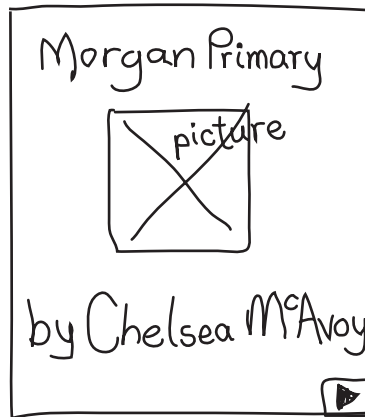
SECTION III

Part A—Applied Multimedia (continued)

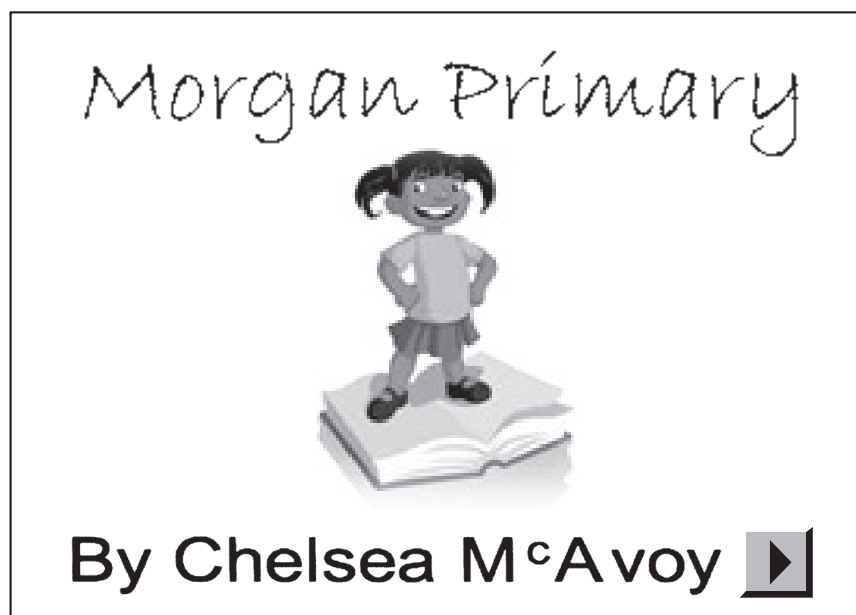
23. Primary 7 pupils at Morgan Primary School have been given a project task of creating a presentation about their time in primary school.

Pupils were asked to create a storyboard of their project for the teacher to check before they progress.

Chelsea has created a *detailed storyboard* for her first screen. This is shown below.



- (a) Identify **three** additional pieces of information that Chelsea should include in her detailed storyboard. 3
- (b) The completed title slide of Chelsea's presentation is shown below. Describe how the display of media elements in this slide could be improved by the use of:
- (i) kerning; 2
 - (ii) anti-aliasing. 2

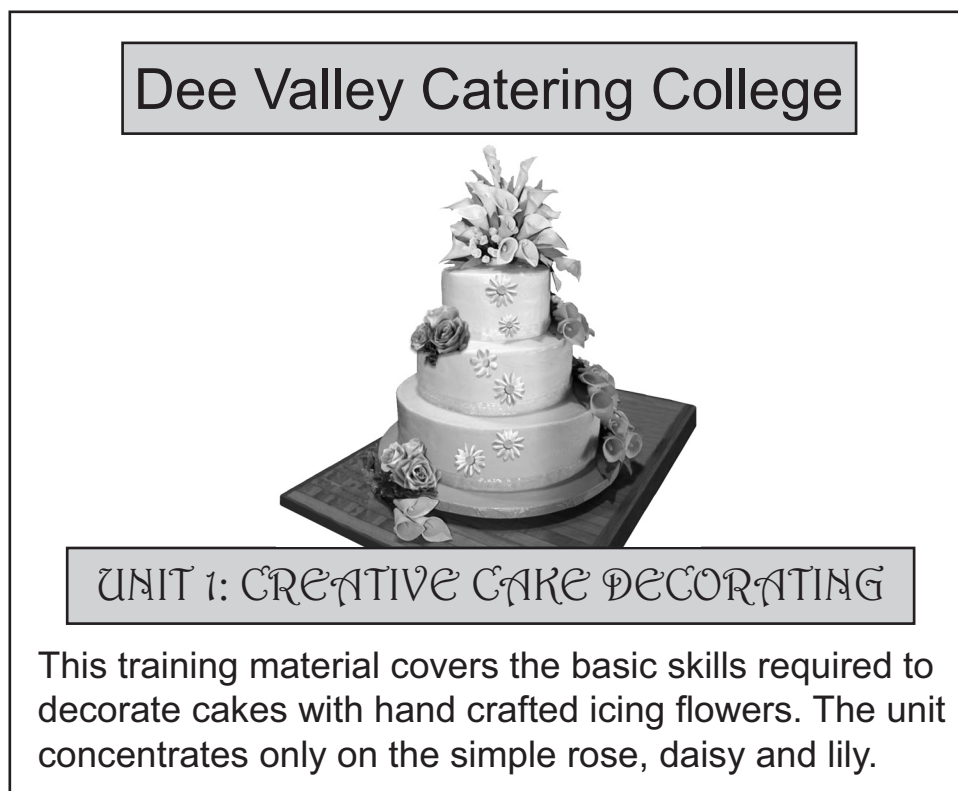


SECTION III

Part A—Applied Multimedia (continued)

24. Dee Valley Catering College offers a range of courses for interested students. The college is in the process of developing computer based training material (CBT) as part of a Creative Cake Decorating unit.

The first screen from this training material is shown below.



- (a) State the category of this information in terms of its *form*, *level* and *type*. 3
- (b) Describe how audio and video could be used to enhance the quality of this CBT material. 2
- (c) The text “Unit 1: Creative Cake Decorating” was created using a *non-standard font*.
Describe **one** possible solution to the problem of using non-standard fonts within a multimedia application. 2
- (d) State **two** reasons why a DVD could be a more appropriate storage medium than a CD for the college to use to distribute this material to its students. 2
- (50)

[END OF SECTION III—PART A]

SECTION III

Part B—Expert Systems

Attempt all questions.

25. Mark is employed by a mining company. He is given interesting rock samples and he classifies any precious or semi-precious gemstones. Some of his notes are shown below.

Specimen	Hardness	Specific gravity	Colour	Conclusion
A	7	2.85	Pink	Beryl
B	7	2.6	Green	Beryl
C	8	2.9	Red	Beryl
D	6	3.35	Blue-violet	Tanzanite
E	6	3.35	Blue-violet	Tanzanite
F	6	3.35	Blue-violet	Tanzanite
G	9	4.1	Pink	Ruby
H	9	3.9	Brown	Ruby
I	9	3.9	Red	Ruby

- (a) (i) Create a decision tree using **one** suitable attribute from “Hardness”, “Specific gravity” or “Colour” to represent whether a sample was Beryl, Tanzanite or Ruby. 4
- (ii) Derive the question that would be asked in a user consultation based on your decision tree in part (i). 2

Mark has similar notes classifying over one hundred different types of gemstone.

- (b) (i) Derive **three** attribute-value pairs for a Tanzanite sample. 2
- (ii) Create a rule for Tanzanite. 4
- (c) Describe a difficulty with representing the data for the Beryl or Ruby samples and suggest how to deal with this difficulty. 2
- (d) The above information is shown in a table. Classify this information according to its *level*, *form* and *type*. 3
- (e) Mark is an expert on gemstones but he has no experience in developing an expert system. Describe his role in the stages of development of an expert system to classify gemstones. 4

SECTION III

Part B—Expert Systems (continued)

26. A yacht uses an expert system to help with navigation. The user enters details of the destination.

The expert system:

- gets data from satellite positioning and onboard instruments
- advises a course
- calculates an estimated arrival time
- uses position data for other vessels from their satellite systems to avoid any collisions.

Updated local weather forecasts and tides are used directly as input by the expert system.

The Marine Expert	
Present direction	030°
Present speed	6.2 knots
Steer 15° to starboard	
Distance from destination	Bearing to destination
31.4 nautical miles	045°
Arrival time is 16:45	
Set new destination	View map
Explain course change	Man overboard

- (a) Describe the structure of the knowledge base for this expert system using examples from above. 4
- (b) Evaluate the expert system in terms of the quality of user interface. 2
- (c) The yacht is involved in a collision after the advice is faithfully followed. Explain the legal responsibility of the providers of the expert system in this case. 2
- (d) Other than a collision, give **two** reasons for any difference between estimated arrival time and actual arrival time. 2

[Turn over

SECTION III

Part B—Expert Systems (continued)

27. (a) Consider an expert system where letters A, B and C represent facts which may or may not be true.
- (i) Using propositional logic, represent the rule:
when A is true and not B then it follows that C is true. 2
- (ii) Using the following:
- The rule in part (i) has a certainty factor of 80%.
 - Fact A has a certainty factor of 60%.
 - “Not fact B” has a certainty factor of 75%.
- Calculate a certainty factor for C after firing the rule in part (i). 2
- (b) Use predicate logic to represent the following statements:
- (i) “Susan takes Higher English” 1
- (ii) “Alistair takes Higher Mathematics and Higher Information Systems”. 2
28. The development of expert systems dates back to the 1960s. They can be used to support decisions.
- (a) Compare an expert system with a decision support system. 4
- (b) State **two** characteristics of OPS5. 2
- (c) An expert system can use a *forward chaining* inference strategy. In a forward chaining system:
- (i) explain why *conflict resolution* is necessary; 2
- (ii) describe the purpose of the RETE algorithm; 2
- (iii) explain how the *refractoriness* conflict resolution strategy works. 2
- (50)**

[END OF SECTION III—PART B]

SECTION III

Part C—The Internet

Attempt all questions.

29. Supasonic Electronics is developing a website to sell audio-visual electronics online. Part of one of the pages being developed is shown below together with the HTML code used to produce it.

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

7



1. <html>
2. <head>
3. <title> **A** </title>
4. </head>
5. < **B** >
6. <h2 align=" **C
- 7. <table border=" **D
- 8. <tr>
- 9. <td></td>
- 10. <td>Samsonic XK112. £59.99 –
for this month only.</td>
- 11. </tr>
- 12. <tr>
- 13. <td></td>
- 14. <td>Kleersound 4 – £49 while stocks last </td>
- 15. </tr>
- 16. < **G** >
- 17. </body>
- 18. </html>****

- (b) Line 10 makes use of the tag. Explain how this differs from the <div> tag.

2

[Turn over

SECTION III

Part C—The Internet (continued)

29. (continued)

(c) Part of the HTML code for the homepage is as follows:

- 26. Supasonic Electronics
- 27. now selling direct to you

- 28. at incredible prices which will amaze everyone.
- 29. <p>Full money-back guarantee.</p>

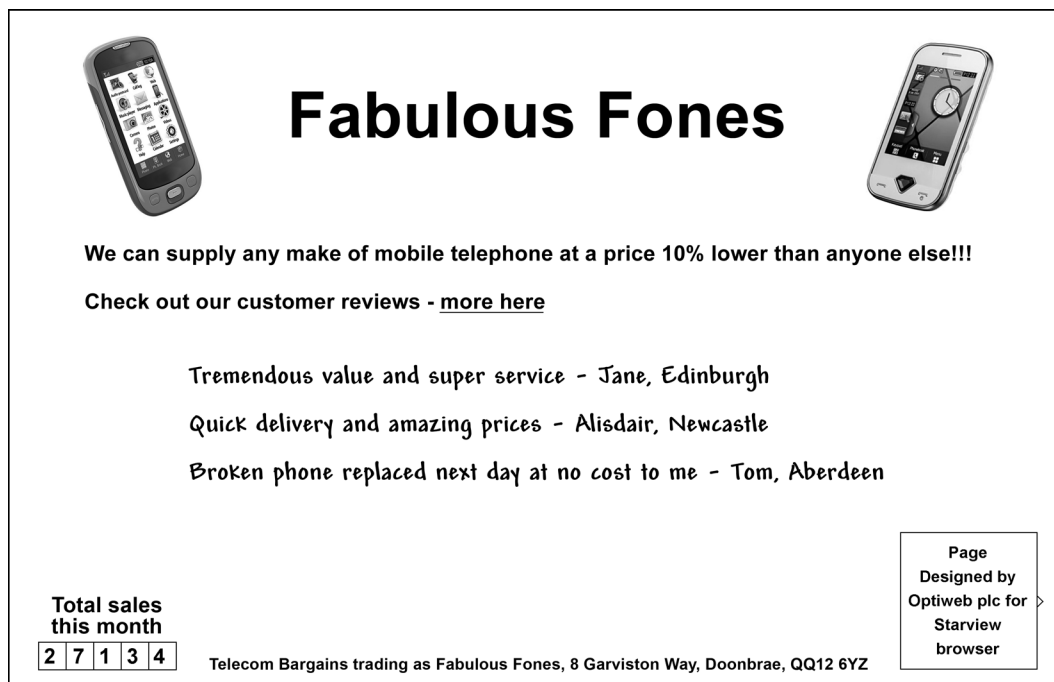
Sketch the output which would be produced by this code.

3

(d) Describe **one** way in which the role of the W3C is similar to that of the IETF and **one** way in which it is different from the IETF.

3

30. The screenshot below shows part of a website which has mobile phones for sale.



(a) Evaluate this web resource with reference to *bias* and *credibility*.

4

(b) The web page was created using a web authoring package.

- (i) The package used to create the page is advertised as having the capability to upload pages. Explain how this capability may save time in the development of a website.
- (ii) Other than the ability to upload web pages, give **one** advantage and **one** disadvantage of using the web authoring package compared to writing HTML code.

2

2

SECTION III

Part C—The Internet (continued)

30. (continued)

- (c) Give **one** reason why the web page in the screenshot on *Page twenty* could be described as a *dynamic* web page. 2
- (d) Categorise the information shown on the web page on *Page twenty* according to its *form*, *level* and *type*. 3
- (e) Companies such as Fabulous Fones make use of site usage tracking software to collect information.
- (i) State **two** types of information which might be collected by Fabulous Fones and describe how this information could be used to make changes to the website. 4
- (ii) Describe any privacy issues relating to the collection of information with site usage tracking software. 2

31. Robin works in Liverpool and Yasmin works in Singapore. From time to time they have to exchange information regarding company finances. To do this they make use of secure e-mail.



- (a) Describe the use made of public and private keys when Robin sends Yasmin a secure e-mail message. 4

[Turn over for Question 31(b) and Question 32 on *Page twenty-two*]

SECTION III

Part C—The Internet (continued)

31. (continued)

(b) Transmitting of e-mail across the Internet will make use of *packet switching* and *routing tables*.

(i) State **four** pieces of data which would be included in a data packet. 4

(ii) Describe **one** advantage in using packet switching for the transmission of data. 2

(iii) State **two** pieces of data stored in a routing table. 2

32. (a) State **two** reasons why there is a need for policing of the Internet. 2

(b) Describe **one** possible ethical implication of policing the Internet. 2

(50)

[END OF SECTION III—PART C]

[END OF QUESTION PAPER]

[BLANK PAGE]

[BLANK PAGE]