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Computing Science

Duration — 2 hours

Fill in these boxes and read what is printed below.

Full name of centre                 Town

Forename(s)                        Surname               Number of seat

Date of birth                     Scottish candidate number

Day      Month      Year

Total marks — 90

SECTION 1 — 20 marks
Attempt ALL questions.

SECTION 2 — 70 marks
Attempt ALL questions.

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.
SECTION 1 – 20 marks

Attempt ALL questions

1. Artificial intelligence programs may consist of lists of facts and rules that are written in no set order.
   State the type of programming language that is being described.

2. Describe one activity that the passing of the Communications Act in 2003 made illegal.

3. The following HTML head section is written for a page in a cooking website.

   <head>
   <link rel="stylesheet" type="text/css" href="recipes.css"/>
   <title>Chicken Recipes</title>
   <meta name="keywords" content="Cooking">
   </head>

   (a) The above HTML shows that an external style sheet is being used to format the web page. State one advantage gained through using an external style sheet in preference to internal styles.

   (b) If a user entered “Chicken Recipes” into a search engine this page would not be included in the results. Suggest a solution to this problem.

4. The memory management function of the operating system ensures that data resident in memory is not overwritten by currently running programs. Describe one other role of the memory management function when opening an additional program.
5. A school pupil writes a small computer program to bombard a web server with requests for a particular web page. This has the effect of preventing other users from accessing the website.

(a) State the law the pupil has broken?  

(b) Explain why bombarding a web server may deny access to legitimate users. 

6. Describe how keylogging software poses a security threat to users who are unaware that the program is running on their computer. 

7. Explain the role of a trace table when testing a computer program.
8. The algorithm below is implemented using a procedural programming language.

Line 1. SET total TO 0
Line 2. SET noOfWeights TO 0
Line 3. SET weight TO 0
Line 4. SEND “How many weights do you wish to add up” TO DISPLAY
Line 5. RECEIVE noOfWeights FROM (INTEGER) KEYBOARD
Line 6. REPEAT noOfWeights TIMES
Line 7. SEND “Please enter a weight” TO DISPLAY
Line 8. RECEIVE weight FROM (REAL) KEYBOARD
Line 9. SET total TO total + weight
Line 10. END REPEAT
Line 11. SEND “Your total weight is” TO DISPLAY
Line 12. SEND total TO DISPLAY

(a) When prompted the user of the program enters the values 4, 3, 7.5, 1.5, 5.

Following this input, state what the output would be from line 12?

(b) State the data type that should be declared when initialising the weight variable.

9. Open-source programs are increasing in popularity.

State one advantage and one disadvantage of using open-source programs.
10. A design is drawn showing two subroutines which are called one after the other.

   ![Diagram: Store and output an integer, Set variable - number to the value 5, Output message "Your number was" & number]

(a) State the design methodology shown above.

(b) If the design was implemented, without parameter passing and using local variables, what would be the actual output?

11. Explain why increasing the amount of cache memory in a computer system improves processing performance.
1. Matthew is designing a program that will store and process information on the calorie content of different biscuits. He uses pseudocode to design how data will be entered into the program.

Line 1. FOR counter FROM 1 TO 10 DO
Line 2. <get a valid biscuit name>
Line 3. <get a valid calorie content for the biscuit>
Line 4. END FOR

(a) Explain why the above pseudocode indicates that two arrays will be required when the design is implemented.

(b) The calorie content of a biscuit may be an integer ranging from 0 to 200.

(i) Using pseudocode or a language with which you are familiar, write a refinement of Line 3.

(ii) Describe, using multiple examples of each type of input, how you would comprehensively test your refinement of line 3.
1. (continued)

(c) The following function has been used within the program. The pseudocode for this function is shown below.

Line 1. STRING FUNCTION analysis (biscuitCaloriesArray, biscuitNamesArray)
Line 2. Set maxCalories TO biscuitCaloriesArray[0]
Line 3. Set maxName TO biscuitNamesArray[0]
Line 4. FOR counter FROM 1 TO Length(biscuitCaloriesArray)
Line 5. IF biscuitCaloriesArray[counter] > maxCalories THEN
Line 6. SET maxCalories TO biscuitCaloriesArray[counter]
Line 7. SET maxName TO biscuitNamesArray[counter]
Line 8. END IF
Line 9. END FOR
Line 10. RETURN maxName
Line 11. END FUNCTION

(i) The two arrays used in lines 2 and 3 are passed as parameters into the function. State whether the parameters should be passed by value or by reference and explain your answer.

(ii) The two arrays hold the following 6 values:

<table>
<thead>
<tr>
<th>biscuitCaloriesArray</th>
<th>102, 23, 83, 149, 56, 82</th>
</tr>
</thead>
<tbody>
<tr>
<td>biscuitNamesArray</td>
<td>Kit Kat, Rich Tea, Chocolate Digestive, Boasters, Ginger Snaps, Hob Nob</td>
</tr>
</tbody>
</table>

State the output from the function when tested with the above values.

Total marks 10
2. In 1982, for his 12th birthday, Greg was given a Sinclair ZX Spectrum computer.

The specification of a ZX Spectrum home computer system is shown below.

- Zilog 8 bit processor (16 bit address bus)
- 3.5 Mhz clock
- 16Kb ROM
- 48Kb RAM
- 256x192pixel, 4 bit colour output to TV

(a) Like most computers from the 1980s, the ZX Spectrum had no internal backing storage.

(i) State where the operating system would have been stored?  

(ii) Describe one advantage of storing the operating system in this way.

Page eight
2. (continued)

(b) The ZX Spectrum had a total of 64 Kb of memory (16 Kb ROM + 48 Kb RAM). Using an appropriate calculation, prove that this was the maximum amount of memory that could have been installed in the computer. **Show your working.**

(c) Greg’s current computer has a clock speed of 3.5GHz, 1000 times faster than that of the ZX Spectrum. When Greg researches the difference between the raw processing power of his current PC and the Spectrum he finds that his PC is significantly more than 1000 times faster at processing data than the Spectrum.

With reference to differences in computer’s architecture (other than clock speed), state two reasons why this is the case. **2**

(d) While browsing the world wide web, Greg recently discovered and downloaded a ZX Spectrum emulator which allows him to play all his old games.

Discuss **two** possible hardware issues that the emulator program would have to compensate for when running old spectrum programs on much newer hardware. **2**
2. (continued)

(e) The ZX Spectrum stored program files on magnetic tape.

A 48Kb game took 5 minutes to load from tape. The sounds were saved in mono at a sampling depth of 1 bit. Calculate the sampling frequency of the sound files used by the Spectrum? **Show your working.**

Total marks 10
3. Rory is studying app development at college. As part of a project assignment he creates an app for the members of his local table tennis club. The app will allow its users to store match results, arrange matches with other users and discuss training techniques.

(a) He uses a graphics package to create a design for the home screen of his app.

(i) State the type of user Rory is designing the app for. Justify your answer.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Page eleven
3. (a) (continued)

(ii) Describe why the accuracy of the input device being used will be a factor in the design of the user interface.  

(iii) Describe one way the current interface design could be improved.  

(b) During the later stages of development, the table tennis app is Beta tested.

Describe one attribute of Beta testing.  

(c) Apps require storage for both program and data files.

(i) Explain why solid state storage is used in mobile devices.  

(ii) Briefly describe a current trend in storage systems.  

3. (continued)

(d) A later version of the completed app allows users to view current rankings for every user.

(i) Explain why the rankings must be stored remotely from the app.  

(ii) Describe how this feature could contribute to the growth of online communities.  

Total marks 9
4. A computer system collects data from a sensor attached to a wind turbine.

(a) An example reading from the sensor is 302.563 Watts. Each reading is stored in memory as a 32 bit value. Describe a method that could be used to store a single reading.

(b) State the one possible function of the interface required to connect the sensor to the computer.

(c) A sub-program is required to read the power being generated once a minute and then calculate the average power reading for each hour. The hourly average is to be stored in a text file. The pseudocode below shows a design for the sub-program.

Line 1. Set averagePower TO 0
Line 2. Set powerReading TO 0
Line 3. OPEN FILE “Turbine Readings”
Line 3. WHILE switch = On
Line 4. REPEAT 100 TIMES
Line 5. <wait 60 seconds>
Line 6. RECEIVE powerReading FROM (REAL) SENSOR
Line 7. SET averagePower TO averagePower - powerReading
Line 8. END REPEAT
Line 9. SET averagePower TO averagePower / 60
Line 10. RECEIVE averagePower FROM FILE “Turbine Readings”
Line 11. <check if switch is on or off>
Line 12. END WHILE
Line 13. CLOSE FILE “Turbine Readings”
4. (c) (continued)

The above pseudocode contains three logic errors. Describe each of these errors.

1. 

2. 

3. 

(d) The complete program is implemented using rapid application development techniques. Describe two advantages gained by developing the program using this methodology.

(e) The wind farm where the turbine is situated uses a security camera to monitor the site. The camera records compressed video using the following settings: 8 bit colour, 460×320 pixel, 2 fps, 50% compression ratio.

Calculate the storage requirements for 1 minute of video. Show your working.

Total marks 12
5. As a superhero, Catman must keep the manufacture of his crime fighting gadgets a secret.
   The gadgets are manufactured as follows.
   Each individual component is manufactured by a different company.
   A technician employed by Catman’s company is given 5 of the components to assemble into a sub unit. A sub unit is only a part of any complete gadget.
   Catman himself uses several sub units to assemble each finished gadget.
   A relational database with four tables is created to track the manufacture of the each sub unit.
   The tables and field names are shown below.

<table>
<thead>
<tr>
<th>Components</th>
<th>Manufacturers</th>
<th>Sub Unit</th>
<th>Technicians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component ID</td>
<td>Company ID</td>
<td>Sub Units Name</td>
<td>Forename</td>
</tr>
<tr>
<td>Component Name</td>
<td>Company Name</td>
<td>Employee Number</td>
<td>Surname</td>
</tr>
<tr>
<td>Component Price</td>
<td>Address</td>
<td>Component ID</td>
<td>Gender</td>
</tr>
<tr>
<td>Company ID*</td>
<td>Telephone Number</td>
<td>Component ID</td>
<td>Employee Number</td>
</tr>
<tr>
<td>Bank Account Number</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) State a one-to-one relationship that exists between the tables.  

(b) Explain why the “Sub Units Name” field may be unsuitable as a Primary Key for the Sub Unit Table.  

(c) Catman uses the following form to enter data for each new technician.

<table>
<thead>
<tr>
<th>Technician’s Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forename</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Employee Number</td>
</tr>
<tr>
<td>Address</td>
</tr>
<tr>
<td>Telephone Number</td>
</tr>
<tr>
<td>Surname</td>
</tr>
</tbody>
</table>
5. (c) (continued)

Currently each new data item is typed in by the user. Describe two ways to improve the usability of this form.

(d) Catman suspects that one of the female technicians has leaked information about one of the sub units. He creates a report detailing all the female technicians that have assembled the “battery pack for grapple hook” sub unit.

<table>
<thead>
<tr>
<th>Forename</th>
<th>Surname</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sylvia</td>
<td>Trench</td>
</tr>
<tr>
<td>Tatiana</td>
<td>Romanova</td>
</tr>
<tr>
<td>Jill</td>
<td>Masterton</td>
</tr>
<tr>
<td>Domino</td>
<td>Derval</td>
</tr>
<tr>
<td>Rosie</td>
<td>Carver</td>
</tr>
</tbody>
</table>

Describe how Catman could use the database software to produce the above list.
5. (continued)

(e) The employee photos are stored as png files.
State the **type** of compression used by png and gif files.  

Total marks 10
6. Signella manufacture toys for dogs. Their website contains dynamic web pages that display products from their catalogue.

(a) When the customer selects one of the filters shown on the left (for example price between £5 and £7.50) the Signella website uses server-side scripts to extract the required information from a database, create a new page and return the page to the user's browser.

(i) State **two** reasons why generating the web pages using server-side scripts benefits the user of the website.

(ii) Name a programming language used in server side scripting.

(b) As shown in the above image, Signella's website makes use of multi-level navigation. Explain how multi-level navigation can aid the accessibility of a website.
6. (continued)

(c) Signella’s database of products stores a photograph of each toy at a resolution of 1024×768 pixels.

   (i) The html tag below is used to display the images of the products on the website.

   <img src="ball3.bmp" alt="Bouncy Fetch Ball" width="150" height="100" >

   Using information given in the above tag, explain how Signella could optimise the download speed of their web pages.  

   (ii) Create a CSS rule that will display a blue border, 1 pixel wide around each the image. The rule should also include a command to create a 20 pixel wide blank area around the image.  

(d) To protect against data loss, Signella back up their database to a second hard disk drive installed within their web server.

   Explain why copying data to a second backing storage device within the same computer is not a suitable backup strategy.  

Total marks 10
7. Smart Applications Ltd are a software company who specialise in creating mobile phone applications for client companies. They have been contracted by Fitboss Gyms to create a mobile phone application that will track the distance its users walk during the course of a day.

(a) Smart Applications Ltd develop each new mobile phone app for three different mobile operating systems. Explain why multi-platform development may provide their client with a competitive economic advantage.

(b) State three hardware factors that should be considered when developing applications for mobile devices as opposed to desktop PCs.

(c) The distance walked by the user is to be recorded and uploaded to cloud storage every hour.

(i) Other than storing data, describe two services that may be provided from cloud storage providers.
7. (c) (continued)

(ii) State the type of cloud storage used by the application.

(d) Smart Applications Ltd are asked by their client to ensure that the data created and accessed by the app is secure. Describe how biometrics and encryption could be used in the app to secure the users data.

(e) State why applications have a carbon footprint.

Total marks 10

[END OF MODEL PAPER]
## Section 1

<table>
<thead>
<tr>
<th>Question</th>
<th>Expected Answer(s)</th>
<th>Max mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Declarative</td>
<td>1</td>
</tr>
</tbody>
</table>
| 2.       | One mark for any one of the following:  
- dishonestly obtaining electronic communications services  
- possession of equipment used to dishonestly obtain communications services  
- improper use of a public electronic communications network  
- an example of the above (for example - SIM card cloning, trolling) | 1        |
| 3. (a)   | The styles in an external style sheet can be applied to multiple pages. | 1        |
|          | (b) The words “Chicken” and “Recipes” (1 mark) should be added to the meta tag (1 mark). | 2        |
| 4.       | Memory management allocates sufficient memory address for the additional application. | 1        |
| 5. (a)   | Computer Misuse Act | 1        |
|          | (b) Bombardment may cause resource starvation. | 1        |
| 6.       | Keylogging software stores every character entered on a keyboard which may include usernames and passwords (1 mark). The captured data may be used by another user to gain access to protected information or websites (such as online banking) (1 mark). | 2        |
| 7.       | A trace table records how a variable changes value when code is executed (1 mark). This helps the programmer find where errors are occurring (1 mark). | 2        |
| 8. (a)   | 17 (loop 4 times then add $3 + 7.5 + 1.5 + 5$) | 1        |
|          | (b) real           | 1        |
| 9.       | **Advantages:**  
(1 mark for any one of the following)  
- it’s usually free  
- it can be adapted to your specific needs  
- it evolves in response to the needs of the community using the software  
**Disadvantages:**  
(1 mark for any one of the following)  
- user interface often poorer  
- might be less support available if problems  
- although free there may be hidden costs such as additional support  
- as anyone in the community may adapt the software it’s more open to abuse such as virus insertion | 2        |
| 10. (a)  | Structure Diagram | 1        |
|          | (b) your number was 0 (text - 1 mark, value - 1 mark). | 2        |

## Section 2

<table>
<thead>
<tr>
<th>Question</th>
<th>Expected Answer(s)</th>
<th>Max mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
<td>Cache memory can store an increased number of frequently used instructions reducing the number of times instructions are read from the slower main memory.</td>
<td>1</td>
</tr>
<tr>
<td>1. (a)</td>
<td>The pseudocode shows two inputs inside a loop which tells us that the two inputs must be stored multiple times before the values are then used elsewhere in the program.</td>
<td>1</td>
</tr>
</tbody>
</table>
|          | (b) (i) REPEAT  
RECEIVE calorieContent FROM (INTEGER) KEYBOARD (1 mark)  
IF calorieContent < 0 OR calorieContent > 200 SEND “Error message” TO DISPLAY (1 mark)  
UNTIL calorieContent>=0 AND calorieContent<=200 (1 mark)  
OR  
RECEIVE calorieContent FROM (INTEGER) KEYBOARD (1 mark for both RECEIVE lines)  
WHILE calorieContent<0 OR calorieContent>200 (1 mark)  
SEND “Error message” TO DISPLAY (1 mark)  
RECEIVE calorieContent FROM (INTEGER) KEYBOARD  
REPEAT | 3        |
|          | (ii) To comprehensively test a program, test data should include:  
Normal test data – 12, 199, 54 etc (1 mark for two examples between 0 and 200)  
Extreme test data – 0 and 200 (1 mark for both)  
Exceptional test data – 345, -42, etc (1 mark for two examples outside 0 and 200) | 3        |
|          | (c) (i) Passed by Value (1 mark). Data is passed in but is not altered (1 mark). | 2        |
|          | (ii) Boasters     | 1        |
| 2. (a)   | (i) The operating system would be stored in ROM. | 1        |
|          | (ii) The contents can’t be changed/deleted (1 mark).  
OR  
no loading required/accessed instantly (1 mark). | 1        |
<table>
<thead>
<tr>
<th>Question</th>
<th>Expected Answer(s)</th>
<th>Max mark</th>
</tr>
</thead>
</table>
| (b) | Maximum Installable Memory = \( \frac{2}{\text{address bus width}} \times \text{data bus width} \)  
Maximum Installable Memory = \( 2^{16} \times 1 \text{ byte} \) (1 mark)  
Maximum Installable Memory = 65,536 bytes  
Maximum Installable Memory = 64Kb (1 mark) | 2 |
| (c) | Any two from the following:  
- The newer PC will have wider buses allowing for greater throughput of data  
- The newer PC may have a multi-core processor  
- The newer PC may have cache memory  
- The newer PC’s processor will have an increased number of internal registers | 2 |
| (d) | Any two from the following:  
- The emulator will have to ensure that the games’ instructions are processed at the same speed of the original hardware  
- The emulator will have to compensate for the differences in the colour depth of the game’s graphics and a modern high-colour monitor when displaying the old game  
- The emulator will have to compensate for the differences in low resolution of the game’s graphics and a modern high-colour monitor when displaying the old game  
- The emulator will have to allow for the use of modern input devices (mouse) that did not exist when the older computer was in use | 2 |
| (e) | Use the formula for working out the size of a sound file, reorder the equation to calculate the sampling frequency.  
sampling frequency \( \times \) sampling depth \( \times \) channels \( \times \) length (secs) = size of file  
sampling frequency \( \times \) 1bit \( \times \) 1 * (560) secs = 48Kb (1 mark)  
sampling frequency = \( \frac{(48\times1024\times8 \text{ bits})}{(1\text{bit} \times 5\text{300secs})} \) (1 mark)  
sampling frequency = 393216 bits / 300bits per sec  
sampling frequency = 1310.72 Hz | 2 |
| 3. (a) | (i) The app is being designed for novice users as it has a simple, easy-to-use layout. | 1 |
| | (ii) | Any one from the following:  
- If an object is too small, the accuracy of the touchscreen may make it difficult to select the object  
- The accuracy of the touchscreen will determine the minimum size of screen objects | 1 |
| | (iii) | Any one from the following:  
- Proper names could be given to the menus instead of single letters  
- The icons on the menu screen could be increased in size  
- Contrasting colours could be used to make the objects stand out more | 1 |
| | (b) | Any one from the following:  
- Beta testing may be undertaken by persons outwith the programming team  
- Beta testing will involve use of a complete (but not bug-free) product  
- Beta testing will test how software runs on hardware other than the hardware the software was written on | 1 |
| | (c) | (i) Low power consumption preserves battery life or small physical size fits easily inside small portable devices. | 1 |
| | (ii) | Any two from:  
- Storage devices are reducing in size  
- More data can be stored in an increasingly smaller physical space  
- The cost per unit of storage is continually reducing  
- New storage devices may have reduced power requirements | 2 |
| | (d) | (i) Each user has their own rank. To share this with every other user, central storage is required. | 1 |
| | (ii) | Rory’s app would allow a means to learn more about table tennis players encouraging the growth of the online community. | 1 |
| 4. (a) | The number would be stored as two values, a mantissa and an exponent (1 mark) with a section of the 32 bits being allocated to each value (1 mark).  
Note 1 – If the answer given suggests that 2 *32 bits (double precision) is used, this should be accepted.  
Note 2 – this answer could also be written as an example. 24 of the 32 bits could be used to store the mantissa with the remaining 8 bits being allocated to the storage of the exponent. | 2 |
| | (b) | Any two from:  
- Voltage conversion  
- Analogue to Digital Conversion  
- Compensating for differences in data transfer rates  
- Data format conversion | 1 |
<table>
<thead>
<tr>
<th>Question</th>
<th>Expected Answer(s)</th>
<th>Max mark</th>
</tr>
</thead>
</table>
| (c)      | 1 mark for each correctly identified error below:  
Error 1 - Line 4, should read REPEAT 60 TIMES (1 repeat for each minute in the hour)  
Error 2 - Line 7, last part should add powerReading on to averagePower and not subtract it  
Error 3 - Line 10, the averagePower should be written to the file and not read from it                                                                                                                                 | 3        |
| (d)      | Any two from the following:  
- Development teams can respond quickly to changing customer requirements  
- Continual contact with customer ensures that the development team are not guessing the wishes of the client  
- Testing is completed as the project progresses so errors are found earlier  
- Projects are often more enjoyable as regular goals are reached  
- Software is produced faster giving economic benefits to client and developer                                                                                                                                 | 2        |
| (e)      | Use the formula below to calculate the uncompressed size of a video file.  
Uncompressed video file size = resolution * colour depth * frames per second * length of video (seconds)  
Uncompressed video file size = 460*320 * 8bits * 2fps * 60seconds (1 mark for first three values, 1 mark for time)  
Uncompressed video file size = 141,312,000bits  
Uncompressed video file size = 16.846Mb (1 mark)  
The file has been compressed by 50% so is therefore half the size of the original uncompressed file = 8.423Mb (1 mark).                                                                                                                                 | 4        |
| 5. (a)   | Any one from the following:  
- Components Table to Manufacturers Table (one component is manufactured by one manufacturer)                                                                                                                                 | 1        |
| 5. (b)   | A Primary Key should be a unique value. It may be possible the two sub units have the same name making this field unsuitable as a Primary Key field.                                                                                                                                 | 1        |
| (c)      | Any two from the following:  
- The Gender field should have a restricted choice (drop down menu or radio button) to speed up entry of data and reduce errors  
- The Employee Number field should be generated automatically instead of requiring the user to enter it  
- The Surname field should follow the Forename field as data is entered faster by a user when it is in a logical order  
- Length checks could be used to inform the user when they have entered invalid data, for example the telephone number                                                                                                                                 | 2        |
| (d)      | Create a query (1 mark) with the following fields:  
Sub Unit Table.Sub Units Name and criteria = “battery pack for grapple hook” (1 mark).  
Technicians Table.Forname (1 mark).  
Technicians Table.Surname (1 mark).  
Create a report using the Forname and Surname fields from the query (1 mark).                                                                                                                                 | 5        |
| (e)      | Lossless compression                                                                                                                                                                                                  | 1        |
| 6. (a)   | (i) Any two from the following:  
- Load times of web pages generated server side are generally faster  
- The interactivity of the website will be improved allowing the website to respond to the users actions (show related items etc)  
- The user does not require additional plugins or browser scripting technology to view the website                                                                                                                                 | 2        |
| (ii)     | Any one from the following list of programming languages:  
ASP, ANSI C scripts, ColdFusion Markup Language, Java, JavaScript (using Server-side JavaScript), PHP, SMX, Lasso, WebDNA, Progress® WebSpeed®.                                                                                                                                 | 1        |
| (b)      | Multi-level navigation reduces clutter on the page making links easier to find. (1 mark).  
Multi-level navigation reduces the need to navigate through multiple web pages to find the correct page (1 mark).                                                                                                                                 | 1        |
<table>
<thead>
<tr>
<th>Question</th>
<th>Expected Answer(s)</th>
<th>Max mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c) (i)</td>
<td>The original images should be edited to reduce the resolution to that used on the webpage (i.e. from 1024x768 to 150x100) (1 mark). The graphics are currently uncompressed bmp files. They should be converted to a file type that allows compression (1 mark). Revision note - both of these techniques reduce the amount of data being transferred which reduces the load times of each web page.</td>
<td>2</td>
</tr>
</tbody>
</table>
| (ii)     | `.imageformat {  
border-width : 1px; (1 mark)  
border-color : blue; (1 mark)  
padding : 20px (1 mark)  
}`                                                                                                                                         | 3        |
| (d)      | A second backup disk within the same computer system is vulnerable to the same risks that may damage the first disk (for example, virus infection, fire, high magnetic field etc).                                           | 1        |
| 7. (a)   | Programs available for multiple platforms will have increased sales.                                                                                                                                                | 1        |
| (b)      | * Any three from the following:  
  - Reduced processing capability of mobile devices  
  - Limited backing storage  
  - Limited memory  
  - Touchscreen input (as opposed to keyboard and mouse)  
  - Screen can be rotated between landscape and portrait                                                                                                   | 3        |
| (c) (i)  | * Any two from the following:  
  - Encryption of files  
  - Different payment methods  
  - Peer to peer network setup  
  - Public file hosting  
  - Choice of where data is located (which country)  
  - Cloud hosted Net Drive  
  - Automatic backup of data                                                                                                                                   | 2        |
| (ii)     | Public Cloud Storage                                                                                                                                                                                               | 1        |
| (d)      | Biometric such as Voice Recognition or Fingerprint Recognition could be used to ensure only the user accesses the data. Encryption could be used to make the data unreadable should it be accessed without permission.                                             | 2        |
| (e)      | The creation and use of an application requires a running computer that uses electricity. The production of electricity always has a carbon footprint.                                                                | 1        |