**Higher Computing Homework**

***Languages and Environments***

1. The following section of code represents some information about flights:

direct (glasgow, london)

direct (london, paris)

direct (paris, rome)

direct (paris, seville)

direct (rome, berlin)

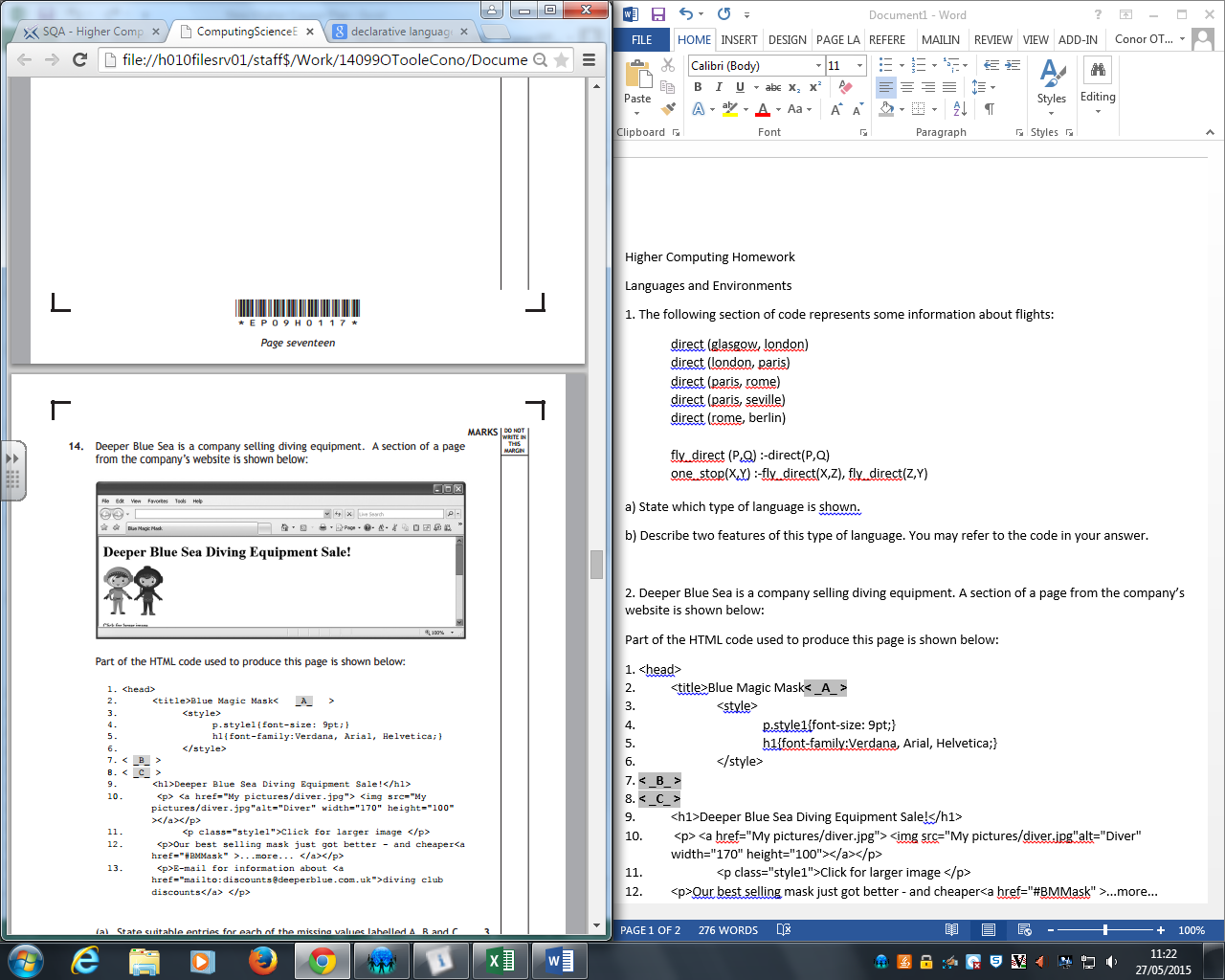
fly\_direct (P,Q) :-direct(P,Q)

one\_stop(X,Y) :-fly\_direct(X,Z), fly\_direct(Z,Y)

a) State which type of language is shown.

b) Describe two features of this type of language. You may refer to the code in your answer.

2. Deeper Blue Sea is a company selling diving equipment. A section of a page from the company’s website is shown below:



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

1. <head>

2. <title>Blue Magic Mask**< \_A\_ >**

3. <style>

4. p.style1{font-size: 9pt;}

5. h1{font-family:Verdana, Arial, Helvetica;}

6. </style>

7. **< \_B\_ >**

8. **< \_C\_ >**

9. <h1>Deeper Blue Sea Diving Equipment Sale!</h1>

10. <p> <a href="My pictures/diver.jpg"> <img src="My pictures/diver.jpg"alt="Diver" width="170" height="100"></a></p>

11. <p class="style1">Click for larger image </p>

12. <p>Our best selling mask just got better - and cheaper<a href="#BMMask" >...more... </a></p>

13. <p>E-mail for information about <a href="mailto:discounts@deeperblue.com.uk">diving club discounts</a> </p>

(a) State suitable entries for each of the missing values labelled A, B and C.

(b) The internal style sheet code in lines 3—6 affects the page layout. Explain the effect of the style sheet on:

(i) Line 9

(ii) Line 11

(c) Describe two benefits of using an external style sheet instead of an internal style sheet, as used by Deeper Blue Sea.

(d) The website is published on the internet. However, Deeper Blue Sea realises that search engines are not finding the website. Describe how the HTML code could be modified to help a search engine find the website.

3. (a) The managing director of Homeview wants to update his website and change the appearance of the text throughout all the web pages. He instructs his technical staff to make the following changes using cascading style sheets (CSS).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Text** | **Font** | **Size** | **Colour** | **Style** |
| Headings | Verdana | 20 | Black | Bold |
| Sub Headings | Tahoma | 16 | Red | Bold |
| Body Text | Arial | 12 | Blue | Regular |

Create a CSS rule that will implement the changes for the Sub Headings.

(b) To gain access to more detailed property information, users must complete a registration form to create a unique username and password.

Describe one example of input validation that could be applied to a username when it is first registered.

(c) When registering, the user must enter a valid e-mail address. This validation process is carried out by code written in a scripting language. In the language used, the syntax for an IF statement is:

if (expression)

{

command(s)

}

and the OR comparator is written using the symbol ||

The following code is used to validate the e-mail address:

if (atpos<2 || dotpos<atpos+2 || dotpos+2>=length)

{

alert(“Not a valid e-mail address”);

return false;

}

In the code above:

* the variable length stores the number of characters in the e-mail address
* the variable atpos stores the position of the @ character
* the variable dotpos stores the position of the last dot

For example, if the e-mail address is myname@sqa.com then *length = 14, atpos = 7* and *dotpos = 11*

Explain how the code above would process the validation of the e-mail address: my.name@net

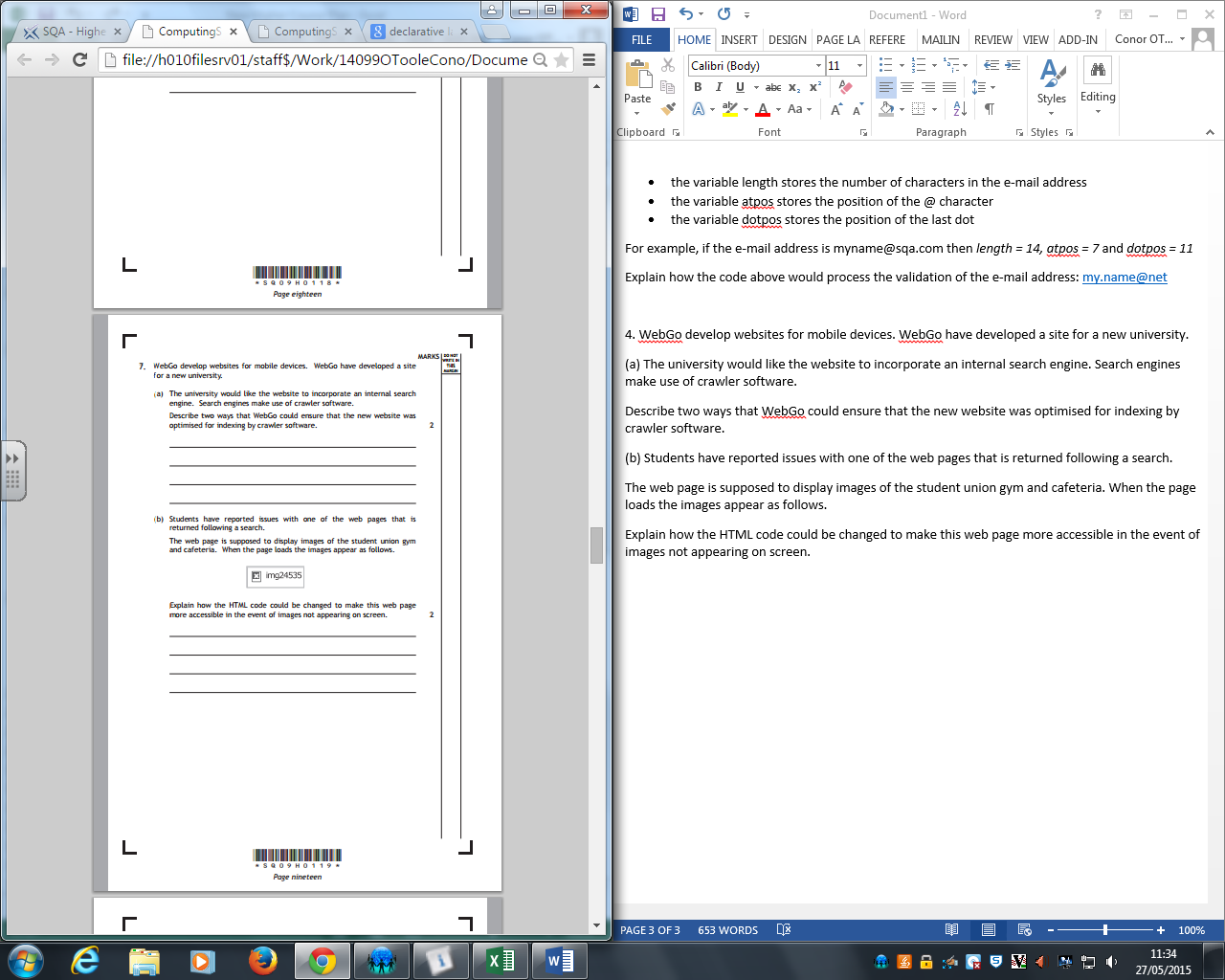
4. WebGo develop websites for mobile devices. WebGo have developed a site for a new university.

(a) The university would like the website to incorporate an internal search engine. Search engines make use of crawler software.

Describe two ways that WebGo could ensure that the new website was optimised for indexing by crawler software.

(b) Students have reported issues with one of the web pages that is returned following a search.

The web page is supposed to display images of the student union gym and cafeteria. When the page loads the images appear as follows.



Explain how the HTML code could be changed to make this web page more accessible in the event of images not appearing on screen.

5. WebScape is a web design company. It is developing a website that will be accessible on many devices including tablets, laptops and smartphones. The site is hosted on their web server.

(a) Describe how accessible design can be achieved using cascading style sheets (CSS).

(b) A typical page in the website is tested and requires optimisation.

<body>

<script src=”http://webscape.org.uk/js/jquery.js”></script>

<script src=”http://webscape.org.uk/js/jquery.once.js”></script>

<script src=”http://webscape.org.uk/js/drupal.js”></script>

<script <src=”http://webscape.org.uk/js/panels.js”></script>

<style>

.center\_div

{

border:1px solid gray;

margin-left:auto;

margin-right:auto;

width:90%;

background-color:#d0f0f6;

text-align:left;

padding:8px;

}

</style>

<img src=”boat1.gif” alt=”Big Boat”>

<img src=”logo.gif” alt=”logo”>

<img src=”boat2.gif” alt=”Big Boat2”>

<img src=”welcome.gif” alt=”Welcome Message”>

</body>

Explain how the code above could be altered to optimise load times.

6. A program has been written to find the position of the maximum value in a list, however the program stops responding. The algorithm responsible is shown below.

line

1 SET source TO [71,76,66,67,89,72]

2 SET position TO 1

3 FOR counter FROM 2 TO 6

4 IF source[counter]>source[position] THEN

5 SET counter TO position

6 END IF

7 END FOR

Describe how a feature of the software development environment could have been used to locate the area of code with the error.

7. One feature of a declarative language is the use of facts. These facts are shown in lines one to three below:

|  |  |
| --- | --- |
| Line 1  Line 2  Line 3  Line 4 | human(einstein)  human(pascal)  human(lovelace)  mortal(X):-human(X) |

State the feature being used in line 4 and explain a benefit of its use.

8. Joseph has been asked to develop a website for the Glasburgh Safari Park where visitors can go to see animals including pandas. Joseph often makes use of cascading style sheets which can be internal or external.

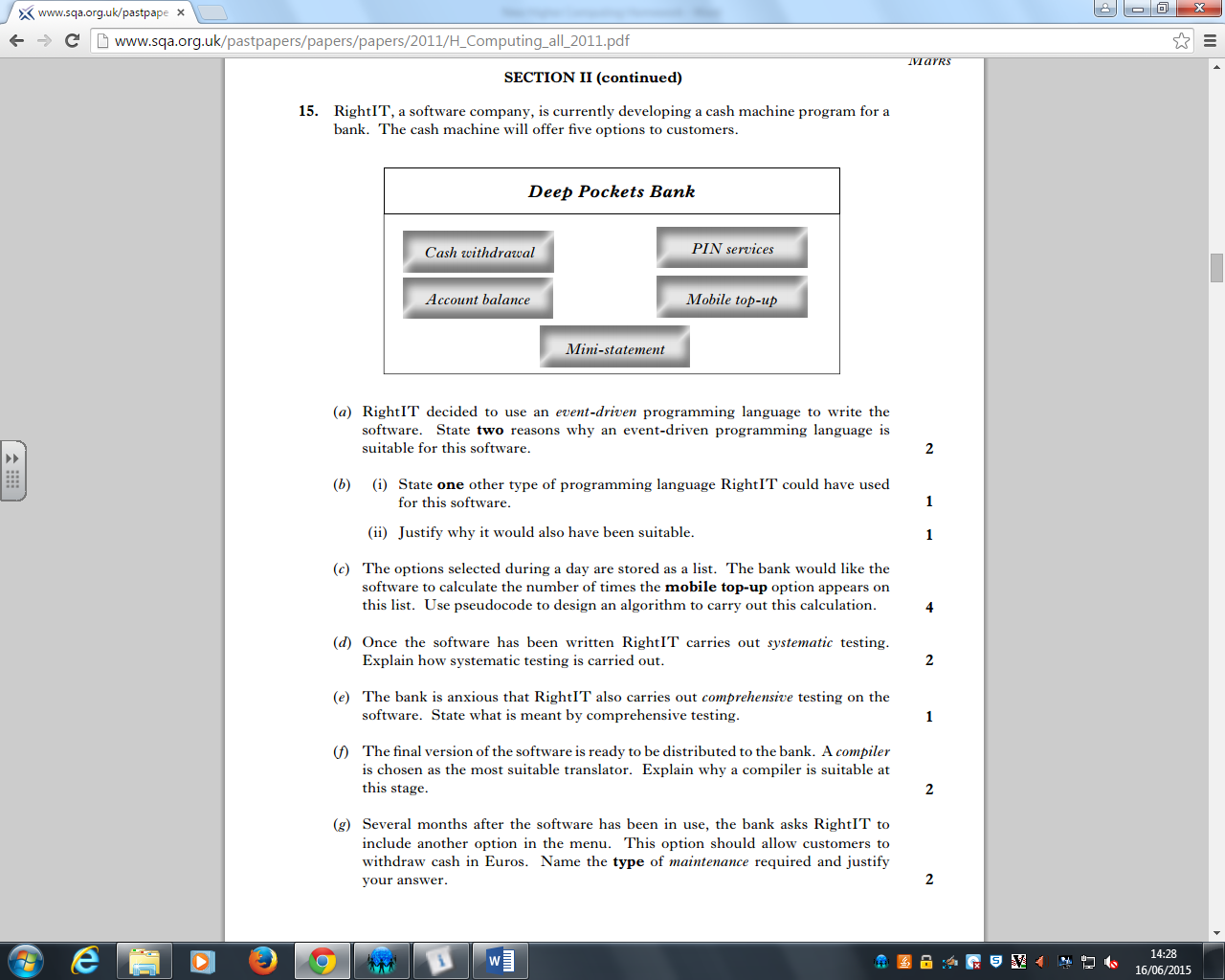
a) Joseph is using an external style sheet named “masterstyle”. Complete the HTML code that will successfully link to this stylesheet.

|  |
| --- |
| <link rel = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ type = “text/css” href = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_> |

b) Joseph includes a rule in the external style sheet to make all the large headings appear in Tahoma font, blue and centred wherever they appear on each page.

Write a CSS rule to manage these large headings.

9. RightIT, a software company, is currently developing a cash machine program for a bank. The cash machine will offer five options to customers.



a) (i) State one other type of programming language RightIT could have used for this software.

(ii) Justify why it would also have been suitable.

b) The options selected during a day are stored as a list. The bank would like the software to calculate the number of times the mobile top-up option appears on this list.

Use pseudocode to design an algorithm to carry out this calculation.

c) Once the software has been written RightIT carries out systematic testing.

Explain how systematic testing is carried out.

d) The bank is anxious that RightIT also carries out comprehensive testing on the software.

State what is meant by comprehensive testing.

e) The final version of the software is ready to be distributed to the bank. A compiler is chosen as the most suitable translator.

Explain why a compiler is suitable at this stage.

f) Several months after the software has been in use, the bank asks RightIT to include another option in the menu. This option should allow customers to withdraw cash in Euros.

Name the type of maintenance required and justify your answer.

***Computational Constructs***

1. When implementing code, a programmer can limit the scope of a variable. Explain what is meant by scope and how it can be limited.

2. A function used to perform an arithmetical operation is shown below:

FUNCTION combinations (INTEGER number) RETURNS INTEGER

SET factor TO 1

FOR counter FROM 1 TO number DO

SET factor TO counter \* factor

END FOR

RETURN factor

END FUNCTION

(a) State the formal parameter in the function.

(b) A program has two variables called items and permutations which contain the values 3 and 0 respectively, as shown below:



(i) Explain what is meant by an actual parameter, by referring to the following line of code used to call the function above:

SET permutations TO combinations(items)

(ii) State the values contained in items and permutations after execution of the line of code in part (i).

(iii) Explain your answer to part (ii).

3. Weather statistics are recorded for each day of the 30 days of November. An algorithm is used to count the number of dry days below freezing temperature as a subroutine. Describe how the subroutine could make this value available to other parts of the program.

4. An algorithm is implemented so that the EcoCaledonia website can validate a user’s data from its online application form. There are two subprograms at line two and three. The parameters for these subprograms are not shown.

|  |  |
| --- | --- |
| Line 1  Line 2  Line 3  Line 4 | REPEAT  Enter\_applicant\_data(…)  Validate\_form\_data(…)  UNTIL <form data is valid> |

Name a parameter that should be passed at line 2, state the type of parameter passing used and justify your answer.

5. A well written program should make use of parameter passing.

a) State the purpose of an in parameter.

b) State the purpose of an out parameter.

6. Describe one difference between an object-oriented language and a procedural language.

7. A travel agent uses a suite of software to help advertise holidays and make bookings. Part of the pseudocode that was written for the software is:

|  |
| --- |
| if cost per person is less than 500  set band to ‘cheap’  end if  if cost per person is greater than or equal to 500 AND cost per person is less than 2000  set band to ‘medium’  end if  if cost per person is greater than or equal to 2000  set band to ‘expensive’  end if |

a) When the above is implemented as a subroutine, state whether the variable “cost per person” would be passed by reference or value. Justify your answer.

Each holiday booking is assigned a unique reference code. The software which creates this code uses concatenation within a user-defined function.

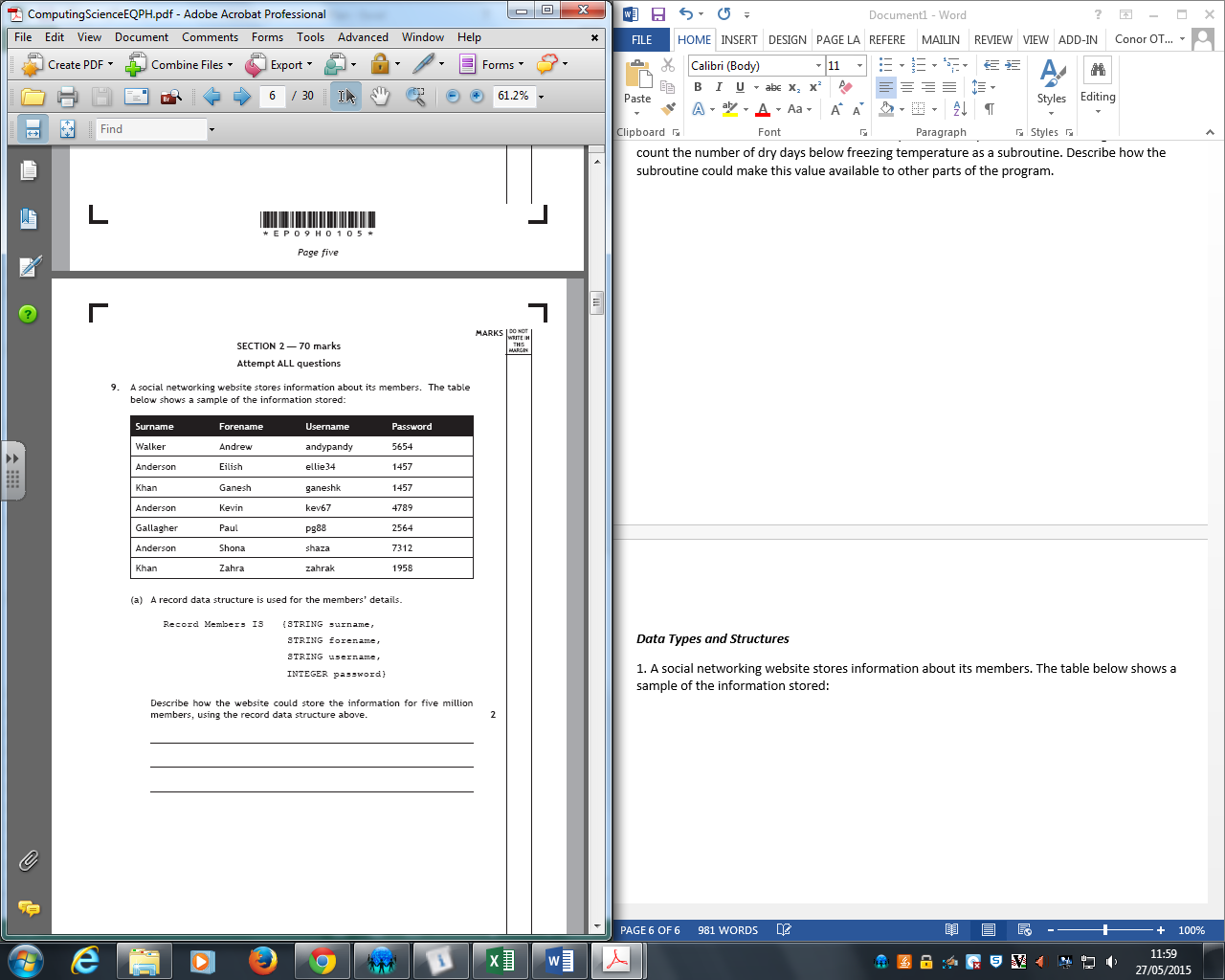
b) Explain the term function.

8. Explain one difference between a procedure and a function.

9. In the case of both a local variable and a global variable, explain what is meant by the term scope.

***Data Types and Structures***

1. A social networking website stores information about its members. The table below shows a sample of the information stored:



(a) A record data structure is used for the members’ details.

Record Members IS {STRING surname,

STRING forename,

STRING username,

INTEGER password}

Describe how the website could store the information for five million members, using the record data structure above.

2. Clare has just started programming and has created an algorithm to search the array cars which holds one hundred car registration numbers.

Clare wishes to search for a specific registration number each time she uses the program. Clare’s algorithm is shown below.

line

1 SET check TO 0

2 SET counter TO 1

3 RECEIVE registration FROM KEYBOARD

4 REPEAT

5 IF cars[counter] = registration THEN

6 SET check TO 1

7 END IF

8 SET counter TO counter + 1

9 UNTIL check = 1 OR counter = 101

Clare could have used a Boolean variable called “found” as part of this algorithm. She alters line 1 to read:

1 SET found TO false

With reference to the line numbers shown, state the other changes that Clare would need to make if she wished to use this Boolean variable.

3. A program has been written to find the position of the maximum value in a list, however the program stops responding. The algorithm responsible is shown below.

line

1 SET source TO [71,76,66,67,89,72]

2 SET position TO 1

3 FOR counter FROM 2 TO 6

4 IF source[counter]>source[position] THEN

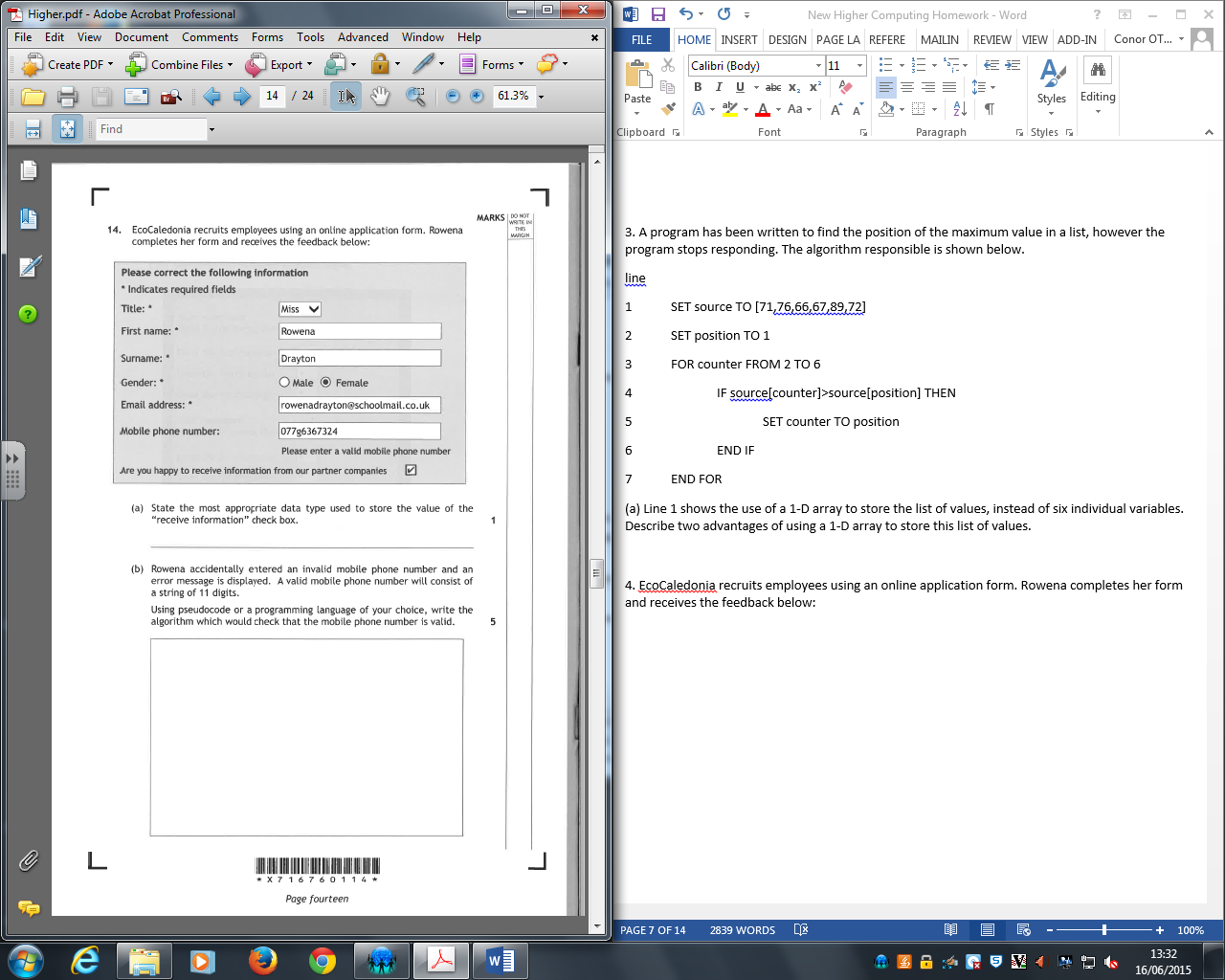
5 SET counter TO position

6 END IF

7 END FOR

(a) Line 1 shows the use of a 1-D array to store the list of values, instead of six individual variables. Describe two advantages of using a 1-D array to store this list of values.

4. EcoCaledonia recruits employees using an online application form. Rowena completes her form and receives the feedback below:



State the most appropriate data type used to store the value of the “receive information” check box.

5. Explain how the variable chosen in answer 4 could be used in a linear search algorithm.

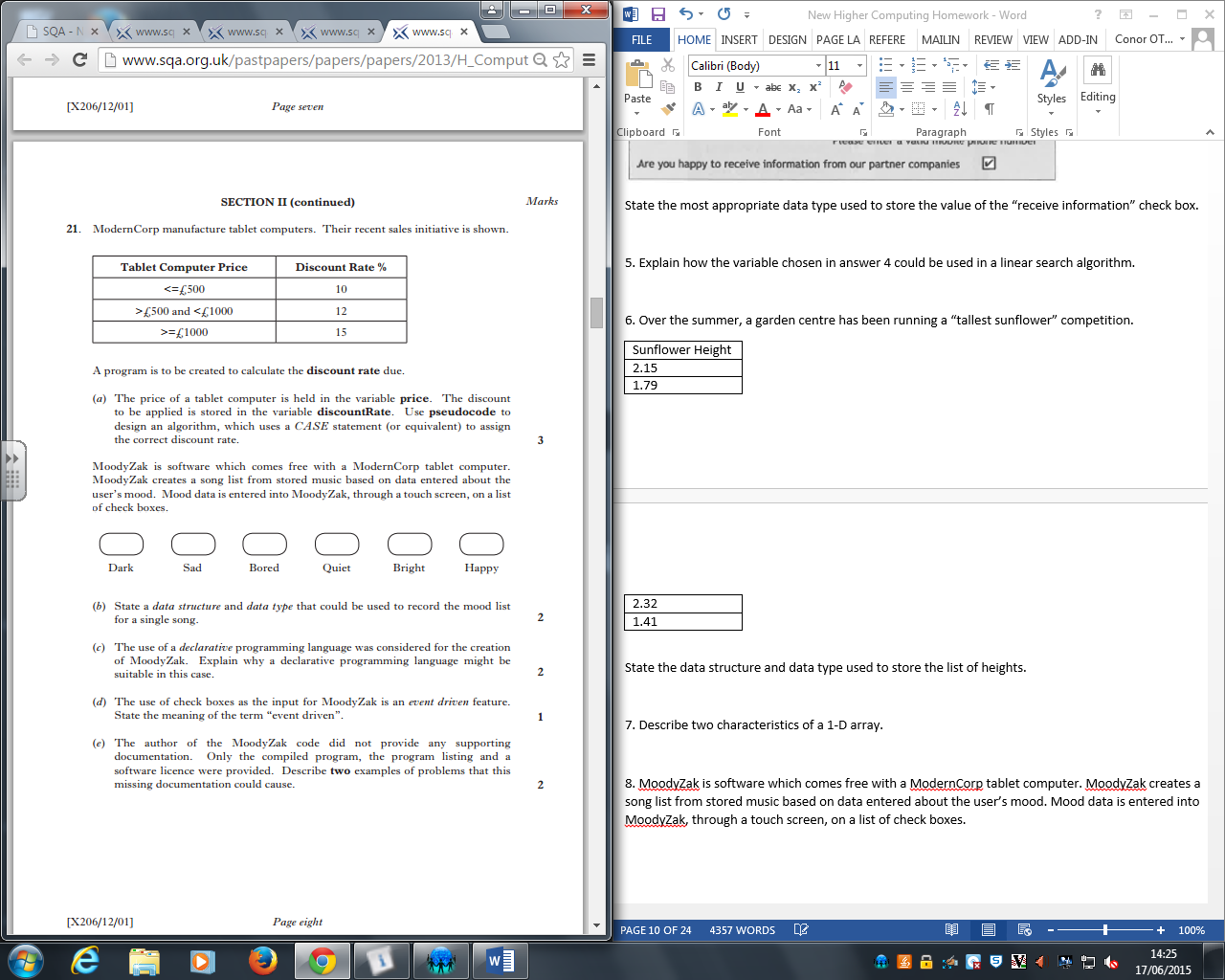
6. Over the summer, a garden centre has been running a “tallest sunflower” competition.

|  |
| --- |
| Sunflower Height |
| 2.15 |
| 1.79 |
| 2.32 |
| 1.41 |

State the data structure and data type used to store the list of heights.

7. Describe two characteristics of a 1-D array.

8. MoodyZak is software which comes free with a ModernCorp tablet computer. MoodyZak creates a song list from stored music based on data entered about the user’s mood. Mood data is entered into MoodyZak, through a touch screen, on a list of check boxes.



State a data structure and data type that could be used to record the mood list for a single song.

9. A program contains three variables, of the same type, with the following values:

|  |  |  |
| --- | --- | --- |
| variable1 | variable2 | variable3 |
| 8 | 4 | 84 |

The program is written in a new language called SQAM. It contains the line of code shown below. The symbol **&** represents a particular operation.

variable3 = variable1 **&** variable2

(a) The value 84 is assigned to variable3. State the single common operation carried out by the **&** symbol.

(b) State the data type that must have been used for all three of the variables.

10. Explain what is meant by the data type, real.

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

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

(b) photograph image (not embedded);

(c) the number of people at a meeting.

***Testing and Documenting Solutions***

1. A social networking website stores information about its members. The table below shows a sample of the information stored:

|  |  |  |  |
| --- | --- | --- | --- |
| **Surname** | **Forename** | **Username** | **Password** |
| Walker | Andrew | andypandy | 5654 |
| Anderson | Eilish | ellie34 | 1457 |
| Khan | Ganesh | ganeshk | 1457 |
| Anderson | Kevin | kev67 | 4789 |
| Gallagher | Paul | pg88 | 2564 |
| Anderson | Shona | shaza | 7312 |
| Khan | Zahra | zahrak | 1958 |

A test plan is to be constructed for the search algorithm. kev67 is an example of normal test data that will be used to test the search algorithm.

Describe two examples of other types of test data that should be used in this test plan.

2. A function used to perform an arithmetical operation is shown below:

FUNCTION combinations (INTEGER number) RETURNS INTEGER

SET factor TO 1

FOR counter FROM 1 TO number DO

SET factor TO counter \* factor

END FOR

RETURN factor

END FUNCTION

Initial testing of the function showed that it contained a logic error. This logic error was corrected.

(i) Use an example to explain how a logic error could occur by changing one line of code.

(ii) Describe one other type of error that may occur when coding.

3. (a) A company is developing a new software package. State when the company would use beta testing.

(b) State two reasons why the client should be involved in the testing.

4. A program has been written to find the position of the maximum value in a list, however the program stops responding. The algorithm responsible is shown below:

line

1 SET source TO [71,76,66,67,89,72]

2 SET position TO 1

3 FOR counter FROM 2 TO 6

4 IF source[counter]>source[position] THEN

5 SET counter TO position

6 END IF

7 END FOR

The program stopped responding because the loop did not terminate. This is an example of an execution error. Describe another type of error that can occur when a program runs.

5. Describe how usability testing could be carried out on a website.

6. Chris wants a program to process information about each of the pupils in his class.

a) When Chris tests the program, it outputs the wrong number of A passes.

State the name of this type of error.

Chris creates an algorithm that will search the array of average marks and return the smallest value present.

|  |  |
| --- | --- |
| Line 1  Line 2  Line 3  Line 4  Line 5  Line 6  Line 7 | SET list to [74.33, 57.67, 73.33, 87.33]  SET minimum TO list [0]  FOR counter FROM 1 to 3 DO  IF minimum > list[counter] THEN  SET minimum TO list[counter]  END IF  END FOR |

A trace table is used to record the change to a variable at the corresponding line number. Part of the trace table is shown below.

|  |  |  |  |
| --- | --- | --- | --- |
| Line | List | Minimum | Counter |
| 1 | 74.33, 57.67, 73.33, 87.33 |  |  |
| 2 |  | A |  |
| 3 |  |  | B |
| 5 |  | C |  |
| 3 | … | … | … |

b) State the values missing from the trace table below at A, B and C.

c) Explain how breakpoints could be used in conjunction with a trace table to locate errors in

code.

7. RightIT, a software company, is currently developing a cash machine program for a bank. The bank is anxious that RightIT also carries out comprehensive testing on the software.

State what is meant by comprehensive testing.

***Algorithm Specification***

1. Finest Fashions is an online fashion store. Customers can browse the company website, search for items of clothing and make online purchases.

The screen shot below shows one page from the Finest Fashions website:



(a) All images on the website have been stored as bitmaps of integers, corresponding to the colour of each pixel. Part of an algorithm used to compress the images is shown below:

1 SET pixelPrev TO “ “

2 SET runLength TO 0

3 SET counter to 0

4 REPEAT

5 RECEIVE pixelColour[counter] FROM (INTEGER)file1

6 IF pixelPrev ≠ pixelColour[counter] THEN

7 SEND pixelColour[counter] TO file2

8 SEND runLength TO file2

9 SET pixelPrev TO pixelColour[counter]

10 SET runLength TO 0

11 END IF

12 SET counter TO counter + 1

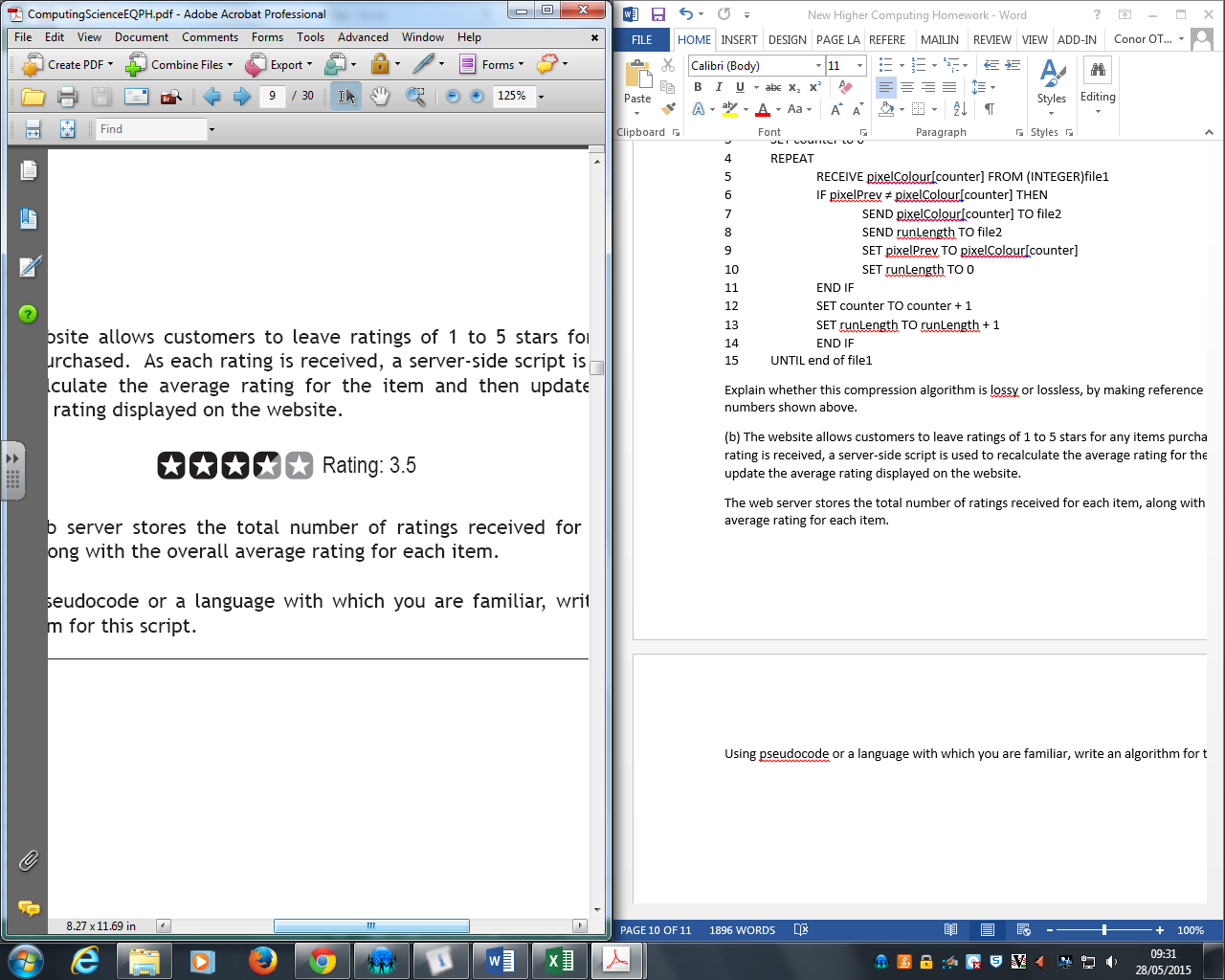
13 SET runLength TO runLength + 1

14 END IF

15 UNTIL end of file1

Explain whether this compression algorithm is lossy or lossless, by making reference to the line numbers shown above.

(b) The website allows customers to leave ratings of 1 to 5 stars for any items purchased. As each rating is received, a server-side script is used to recalculate the average rating for the item and then update the average rating displayed on the website.



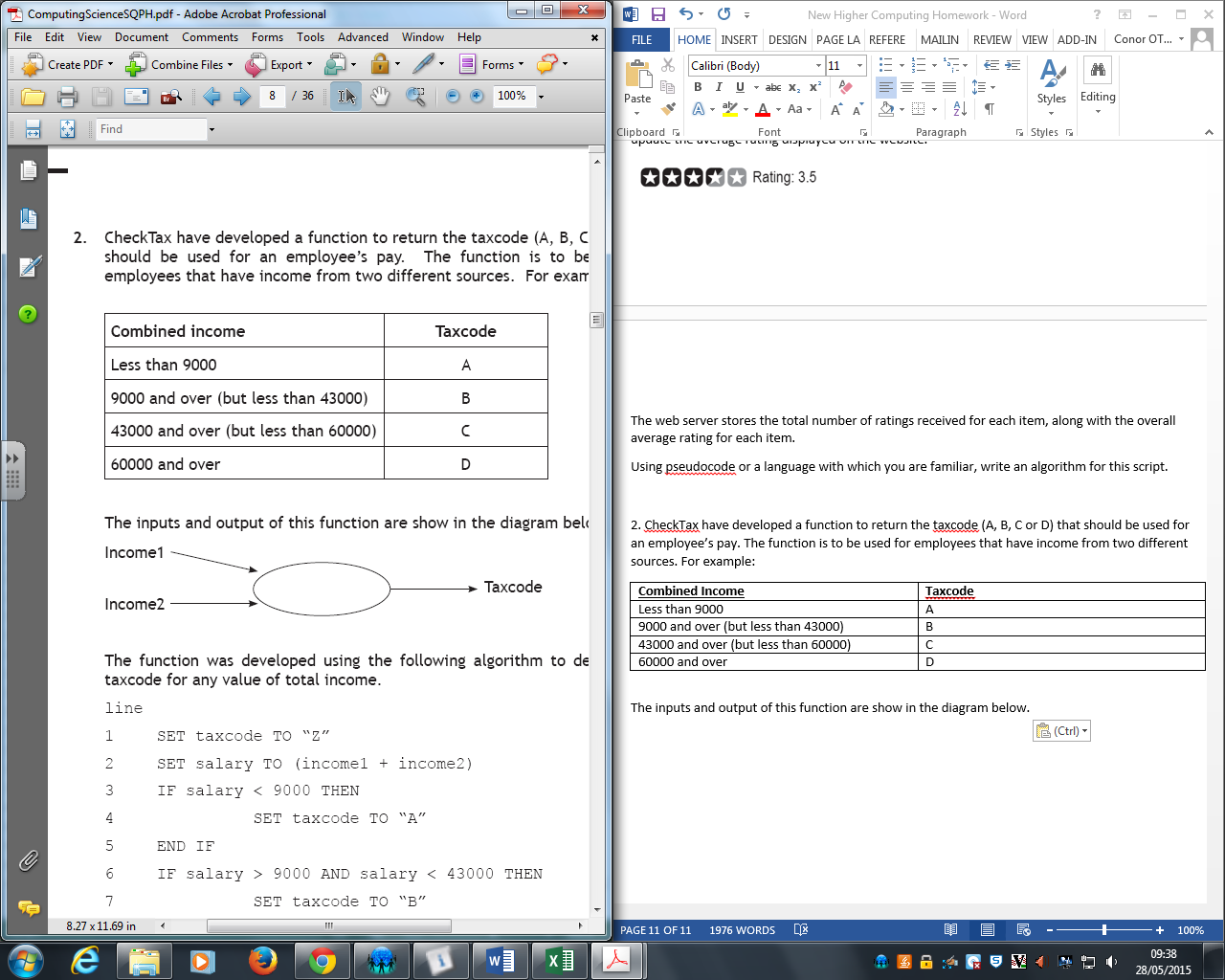
The web server stores the total number of ratings received for each item, along with the overall average rating for each item.

Using pseudocode or a language with which you are familiar, write an algorithm for this script.

2. CheckTax have developed a function to return the taxcode (A, B, C or D) that should be used for an employee’s pay. The function is to be used for employees that have income from two different sources. For example:

|  |  |
| --- | --- |
| **Combined Income** | **Taxcode** |
| Less than 9000 | A |
| 9000 and over (but less than 43000) | B |
| 43000 and over (but less than 60000) | C |
| 60000 and over | D |

The inputs and output of this function are show in the diagram below.



The function was developed using the following algorithm to determine a taxcode for any value of total income.

line

1 SET taxcode TO “Z”

2 SET salary TO (income1 + income2)

3 IF salary < 9000 THEN

4 SET taxcode TO “A”

5 END IF

6 IF salary > 9000 AND salary < 43000 THEN

7 SET taxcode TO “B”

8 END IF

9 IF salary > 43000 AND salary < 60000 THEN

10 SET taxcode TO “C”

11 END IF

12 IF salary > 60000 THEN

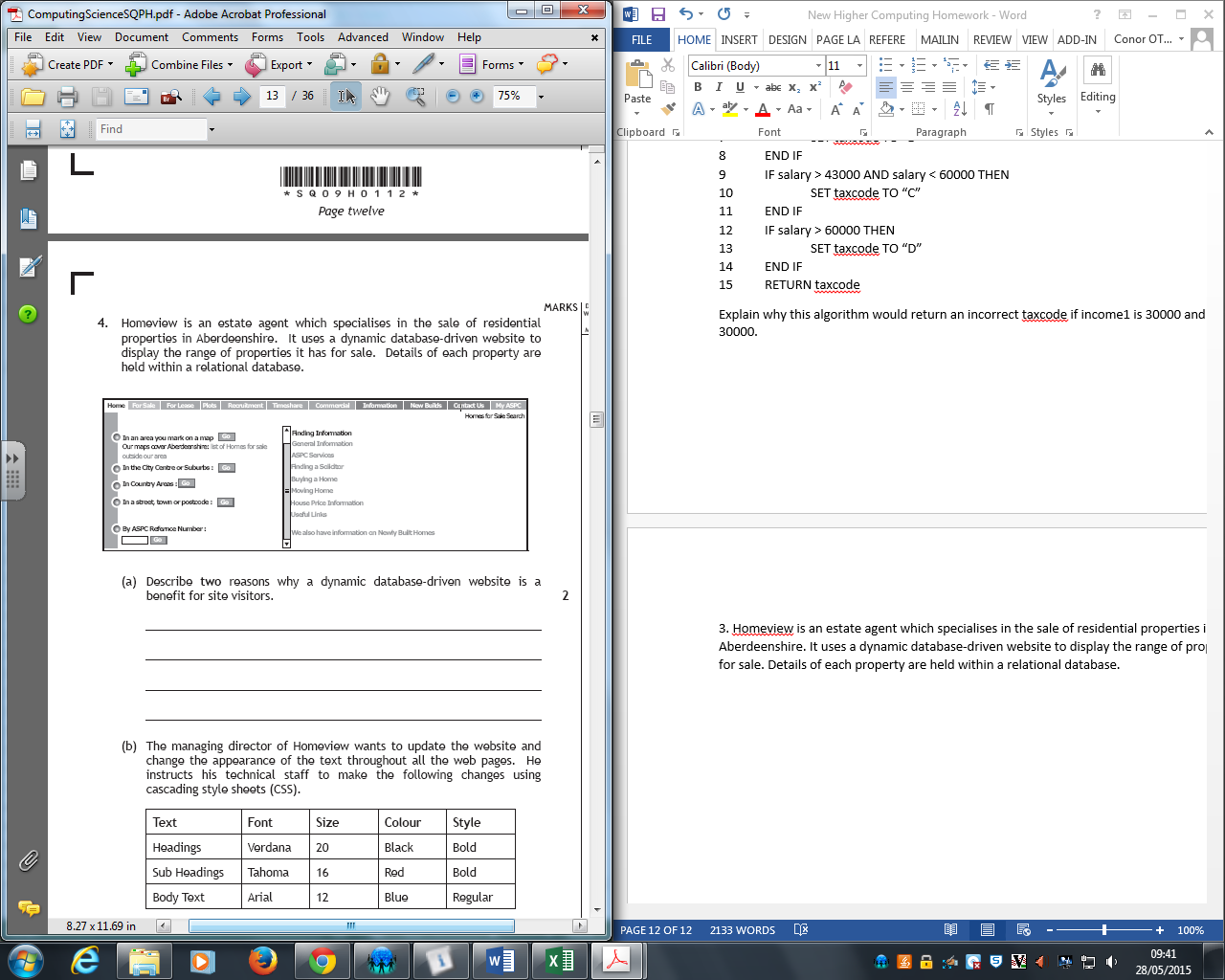
13 SET taxcode TO “D”

14 END IF

15 RETURN taxcode

Explain why this algorithm would return an incorrect taxcode if income1 is 30000 and income2 is 30000.

3. Homeview is an estate agent which specialises in the sale of residential properties in Aberdeenshire. It uses a dynamic database-driven website to display the range of properties it has for sale. Details of each property are held within a relational database.



To gain access to more detailed property information, users must complete a registration form to create a unique username and password.

Describe one example of input validation that could be applied to a username when it is first registered.

4. Craig has been asked to write an algorithm that will search for a target ID from a list of fifty receipts. Each receipt has a unique receipt ID. Part of the algorithm is shown below.

|  |  |
| --- | --- |
| Line 1  Line 2  Line 3  Line 4  Line 5  Line 6  Line 7  Line 8  Line 9 | SET found TO false  SET counter TO -1  RECEIVE target\_id FROM (INTEGER) BARCODEREADER  REPEAT  SET counter to counter + 1  IF receipt\_id[counter] = target\_id THEN  SET found TO true  END IF  UNTIL \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

Using pseudocode, or a language with which you are familiar, complete line 9 of the algorithm shown above.

5. EcoCaledonia recruits employees using an online application form. Rowena complete her form but accidentally enters an invalid mobile phone number which displays an error message. A valid mobile phone number will consist of a string of 11 digits.

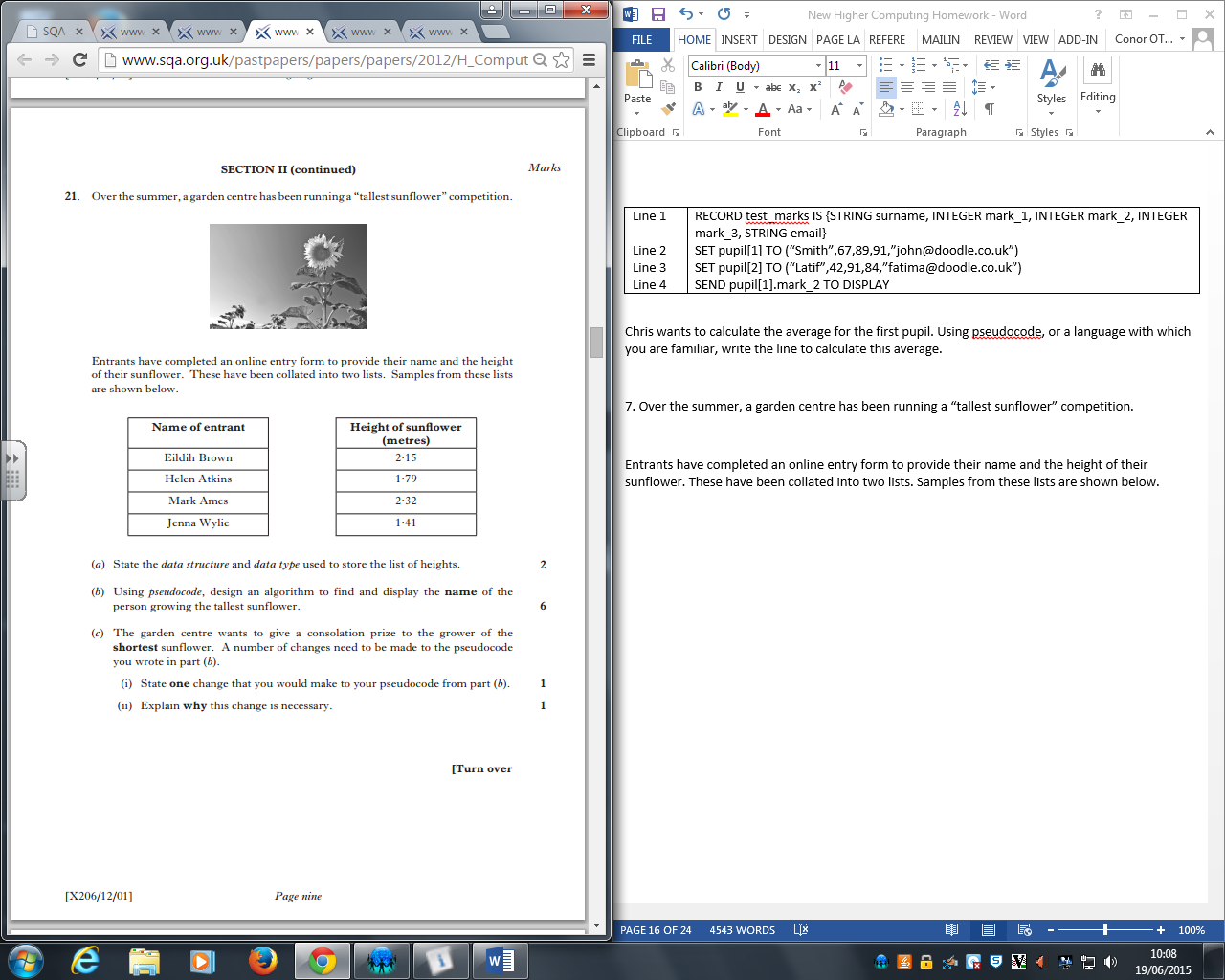
Using pseudocode or a programming language of your choice, write the algorithm which would check that the mobile phone number if valid.

6. Chris wants a program to process information about each of the pupils in his class.

|  |  |
| --- | --- |
| Line 1  Line 2  Line 3  Line 4 | RECORD test\_marks IS {STRING surname, INTEGER mark\_1, INTEGER mark\_2, INTEGER mark\_3, STRING email}  SET pupil[1] TO (“Smith”,67,89,91,”john@doodle.co.uk”)  SET pupil[2] TO (“Latif”,42,91,84,”fatima@doodle.co.uk”)  SEND pupil[1].mark\_2 TO DISPLAY |

Chris wants to calculate the average for the first pupil. Using pseudocode, or a language with which you are familiar, write the line to calculate this average.

7. Over the summer, a garden centre has been running a “tallest sunflower” competition.



Entrants have completed an online entry form to provide their name and the height of their sunflower. These have been collated into two lists. Samples from these lists are shown below.

|  |  |  |
| --- | --- | --- |
| **Name of Entrant** |  | **Height of Sunflower (Metres)** |
| Eildih Brown |  | 2.15 |
| Helen Atkins |  | 1.79 |
| Mark Ames |  | 2.32 |
| Jenna Wylie |  | 1.41 |

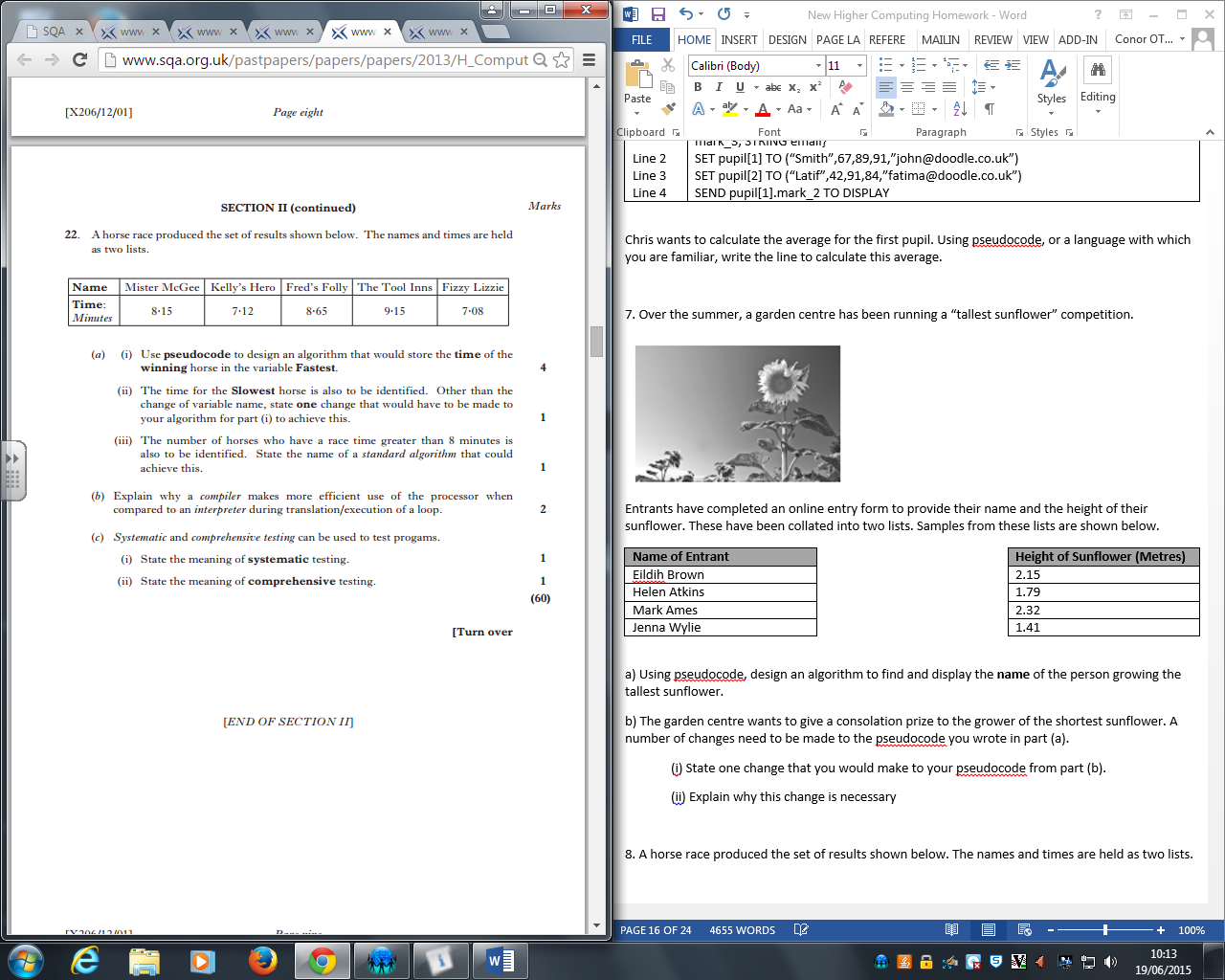
a) Using pseudocode, design an algorithm to find and display the **name** of the person growing the tallest sunflower.

b) The garden centre wants to give a consolation prize to the grower of the shortest sunflower. A number of changes need to be made to the pseudocode you wrote in part (a).

(i) State one change that you would make to your pseudocode from part (b).

(ii) Explain why this change is necessary

8. A horse race produced the set of results shown below. The names and times are held as two lists.

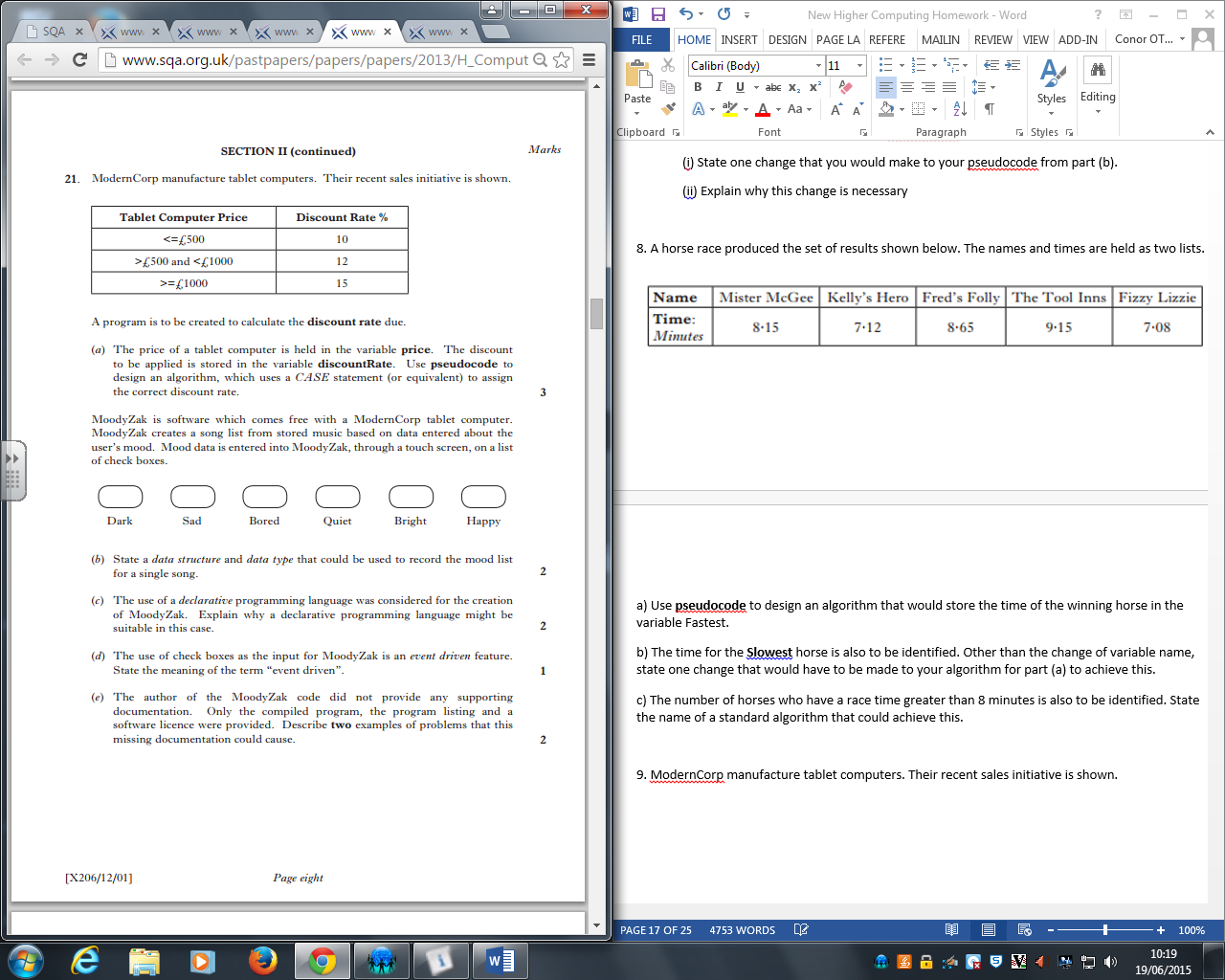


a) Use **pseudocode** to design an algorithm that would store the time of the winning horse in the variable Fastest.

b) The time for the **Slowest** horse is also to be identified. Other than the change of variable name, state one change that would have to be made to your algorithm for part (a) to achieve this.

c) The number of horses who have a race time greater than 8 minutes is also to be identified. State the name of a standard algorithm that could achieve this.

9. ModernCorp manufacture tablet computers. Their recent sales initiative is shown.



A program is to be created to calculate the discount rate due.

The price of a tablet computer is held in the variable price. The discount to be applied is stored in the variable discountRate. Use pseudocode to design an algorithm to assign the correct discount rate.

***Low-level Operations and Computer Architecture***

1. State the decimal value of the largest whole number that can be stored using 10-bits.

2. Describe two differences between main memory and cache memory.

3. Ali has created a poster using bitmapped graphic software. Describe how a colour bitmapped graphic is stored.

4. Finest Fashions decides to make its website available on mobile devices such as smartphones. As a result of this decision, maintenance must be carried out.

Explain one modification to the interface that will be necessary, due to the technical limitations of smartphone devices.

5. An app is being developed to view video clips of sporting events such as the 2014 Commonwealth Games and will run on a wide range of smartphones.

(a) Once in use, the Sports Selection screen will send the selected sport to the web server and suitable video clips will then be returned to the smartphone. The developers of the app are considering the use of distributed storage for the video clips.

(i) State one benefit of distributed storage for the app developers.

(ii) State one benefit of distributed storage for the users of the app.

(b) Many smartphones use the Vortex processor. In February 2014 an updated version of the Vortex processor was released. Read the following information about the new processor.

*“The 32-bit Vortex-A17 will replace the aging Vortex-A9. The scalable design can support up to four cores, running at speeds of 2GHz and beyond. It will provide up to 60% greater performance than a Vortex-A9 chip, but use 20% less power. The Vortex-A17 processor offers configurable caches, with sizes between 32 KB and 64 KB for instruction, and 32 KB for data.”*

(i) Explain how the use of cache can improve the user’s experience of the Commonwealth Games app.

(ii) It is expected that the next release of Vortex processors will introduce the 64-bit Vortex-A50.

Explain why the improvement from 32-bit cores to 64-bit cores will improve the performance of any smartphone, based on these ARM processors.

6. Jade is writing a program on her PC that is intended to run on her mobile phone.

Explain why an emulator is required in the programming environment.

7. A programming language uses 32 bits to represent real numbers such as the negative value —0·000000016.

Explain how the 32 bits could be allocated to store such numbers.

8. A section of code has been written to total the contents of an array of 100 values.

line

1 SET total TO 0

2 FOR index FROM 1 TO 100

3 SET total TO total + values[index]

4 END FOR

Explain the benefit of this code being present in cache memory.

9. Convert the decimal number -120 to binary using 8 bits.

10. Explain how cache memory can improve system performance.

11. Describe how quad-core processors can be used to improve load times for web apps containing client-side scripts or multimedia.

12. A local hair salon has a desktop computer, tablet computer and a printer. A digital camera is used to take a customer’s photograph and then the camera is connected to the desktop computer using an interface.

a) State two tasks undertaken by an interface when transferring these photographs to the desktop computer.

The hair salon also has some video clips stored on their computer that they use to train staff.

b) Calculate the uncompressed file size of one of these video clips which is 90 seconds long and was captured at 25 frames per second with a resolution of 260 by 200 pixels and 16777216 colours.

State your answer in appropriate units and show all working.

13. State the largest whole number that can be stored as a 10-bit positive integer.

14. a) Describe an example in which an image stored as a vector graphic could have a larger fi le size than if the same image was stored in a bitmapped format.

b) A bitmapped graphic has a bit-depth of 24 bits and a resolution of 300 dpi.

(i) State the number of colours that may be represented in this graphic.

(ii) State the effect that increasing the bit-depth will have on the file size of the graphic.

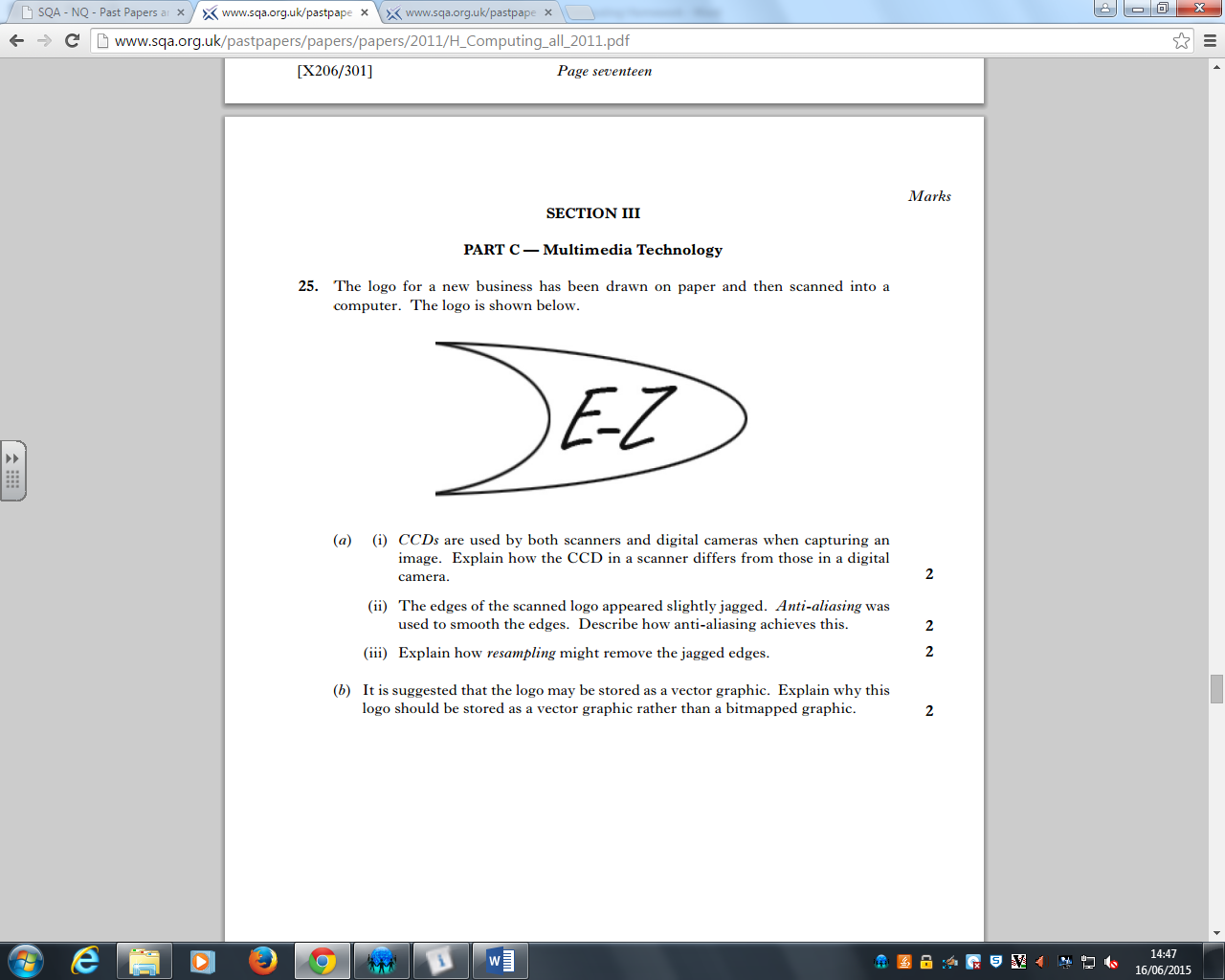
15. Describe the function of each of the following in a memory read operation:

• address bus

• data bus

• control lines

16. The logo for a new business has been drawn on paper and then scanned into a computer. The logo is shown below.



It is suggested that the logo may be stored as a vector graphic. Explain why this logo should be stored as a vector graphic rather than a bitmapped graphic.

17. Write the ten digit binary number 1001001001 as a positive integer.

18. Ali has created a poster using bitmapped graphic software. Describe how a bitmapped graphic is stored.

19. The table shows types of computer memory listed in descending order of speed of access, (fastest first). Identify the two missing types (1) and (3).

|  |  |
| --- | --- |
| (1) |  |
| (2) | Cache |
| (3) |  |
| (4) | Backing Store |

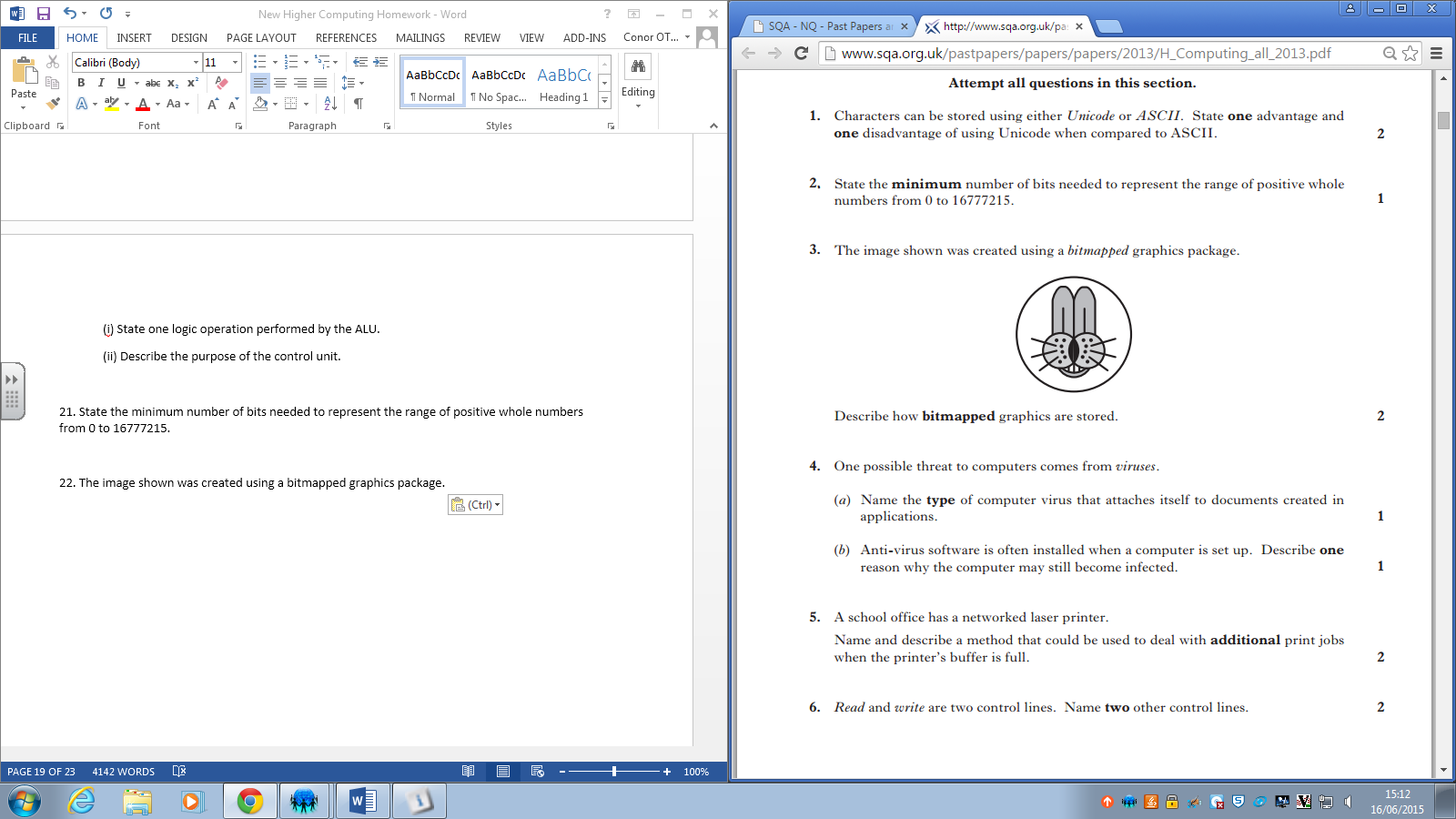
20. All processors contain an ALU and a control unit.

(i) State one logic operation performed by the ALU.

(ii) Describe the purpose of the control unit.

21. State the minimum number of bits needed to represent the range of positive whole numbers from 0 to 16777215.

22. The image shown was created using a bitmapped graphics package.



Describe how bitmapped graphics are stored.

23. Ms Masters is teaching her class about using vector file formats to store graphics. She tells the class “Vector graphic file formats are more storage efficient than bitmapped file formats”.

Describe the type of graphic Ms Masters might use to show that the statement above is true.

24. Characters can be stored using 16 bits Unicode or 8 bits in ASCII. State one advantage and one disadvantage of using Unicode when compared to ASCII.

***Design Notations***

1. Name one graphical design notation.

2. State two benefits to a programmer of a design written in pseudocode.

3. 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\*)

Draw an E-R diagram to represent the structure of this database.

4. The owners of holiday properties in the Laguna Lake apartment complex rent their apartments to holidaymakers throughout the year.

• Owners may own a number of apartments

• Holidaymakers may make several bookings in a year

A relational database has been set up to record these bookings. The entities and attributes are as follows:

OWNER (OwnerID, OwnerName, OwnerAddress1, OwnerAddress2)

BOOKING (CustomerID\*, ApartmentNo\*, Date, NumberOfNights)

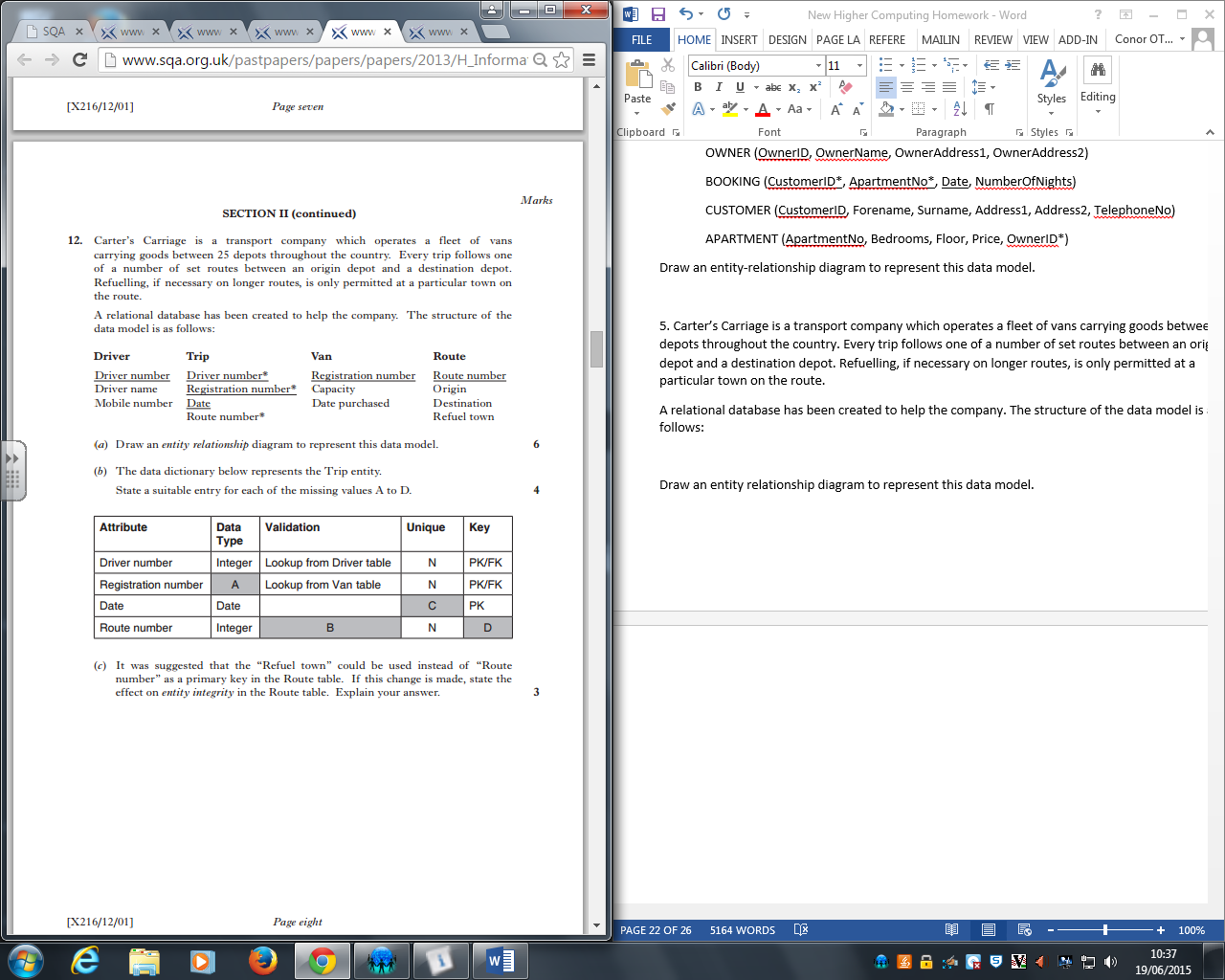
CUSTOMER (CustomerID, Forename, Surname, Address1, Address2, TelephoneNo)

APARTMENT (ApartmentNo, Bedrooms, Floor, Price, OwnerID\*)

Draw an entity-relationship diagram to represent this data model.

5. 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.

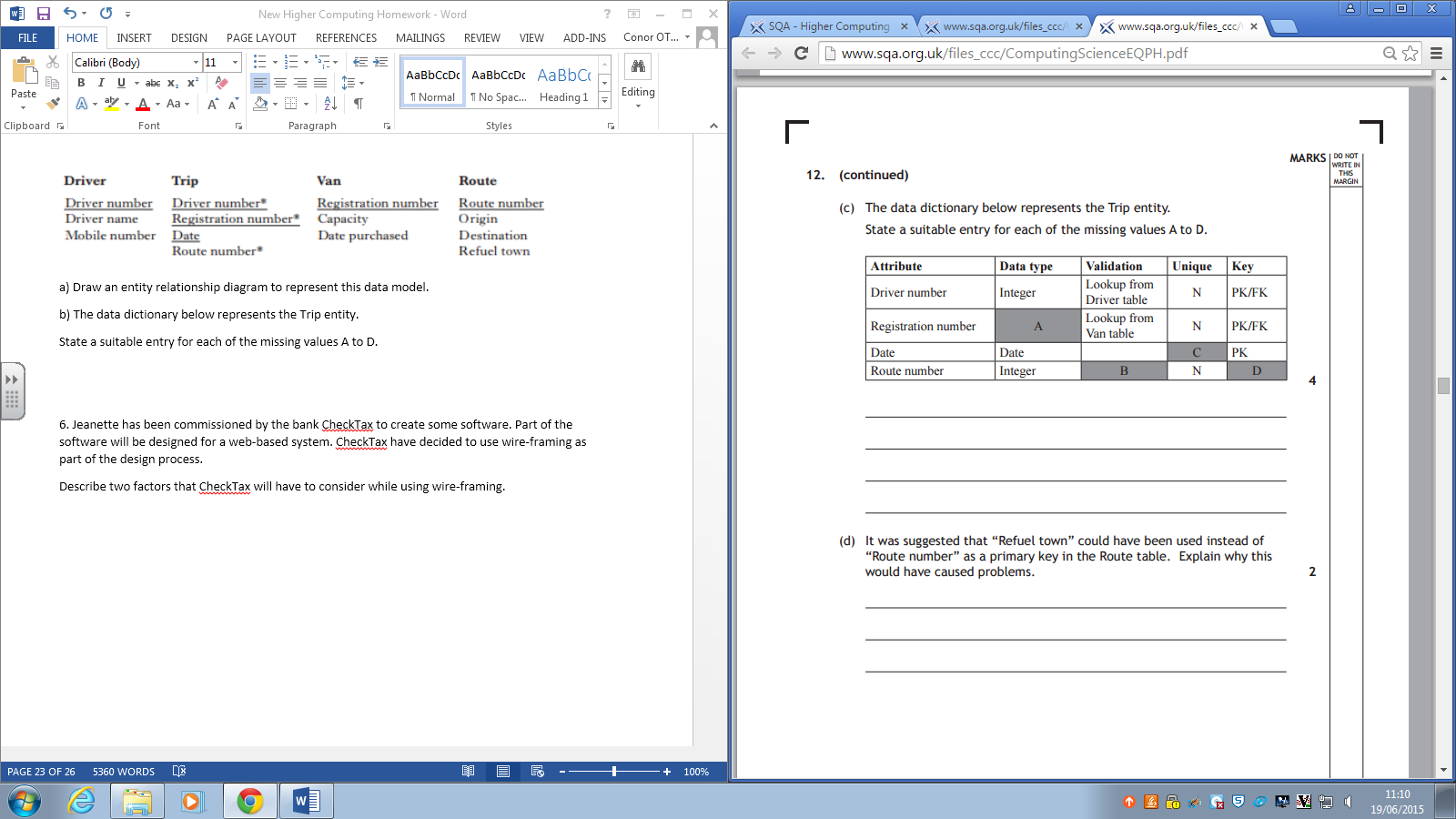
A relational database has been created to help the company. The structure of the data model is as follows:



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

b) The data dictionary below represents the Trip entity.

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

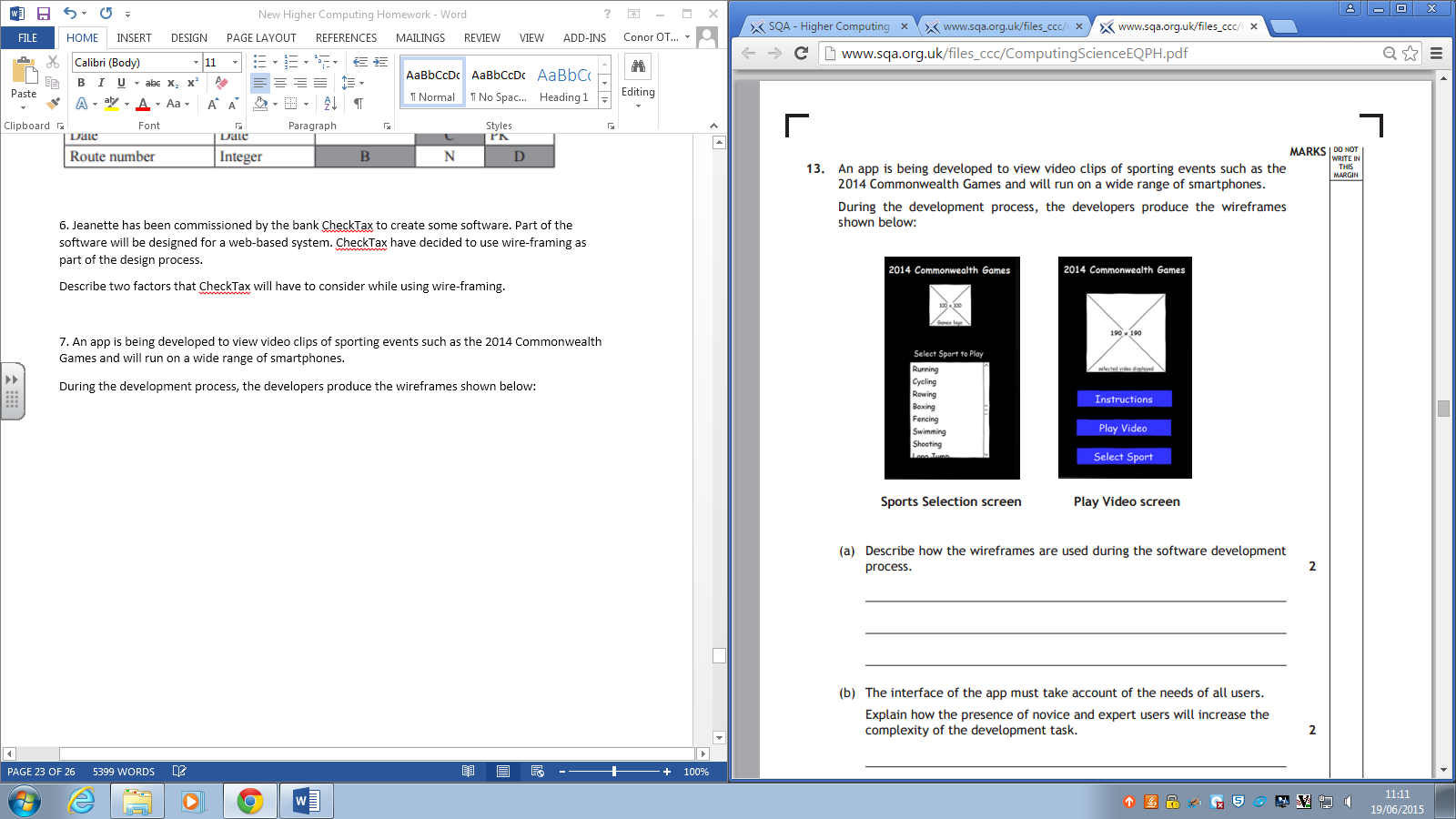


6. Jeanette has been commissioned by the bank CheckTax to create some software. Part of the software will be designed for a web-based system. CheckTax have decided to use wire-framing as part of the design process.

Describe two factors that CheckTax will have to consider while using wire-framing.

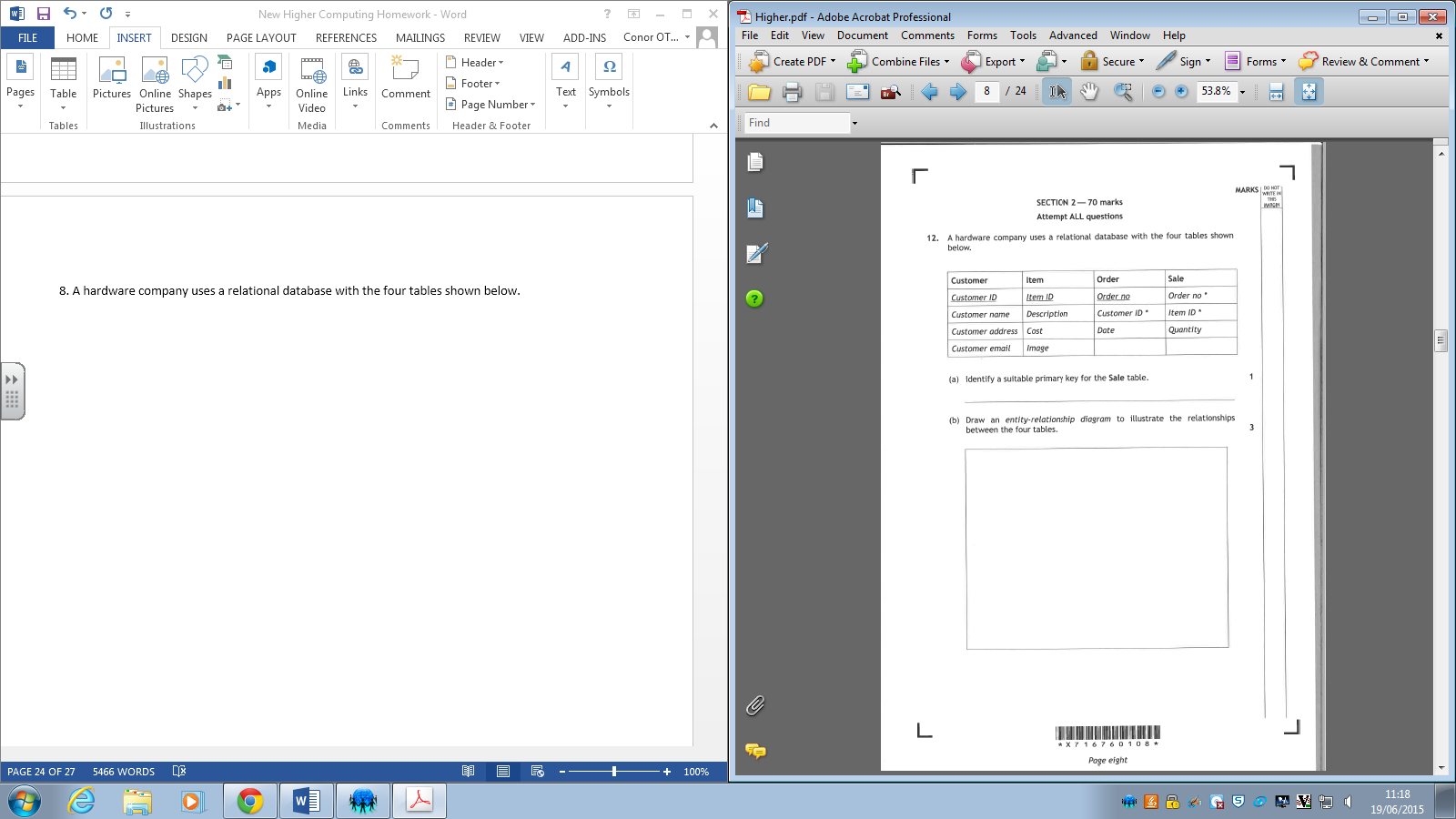
7. An app is being developed to view video clips of sporting events such as the 2014 Commonwealth Games and will run on a wide range of smartphones.

During the development process, the developers produce the wireframes shown below:



Describe how the wireframes are used during the software development process.

8. A hardware company uses a relational database with the four tables shown below.



Draw an entity-relationship diagram to illustrate the relationships between the four tables.

***Development Methodologies***

1. SN is a software development company. They have been invited to bid for the contract to develop software for a multinational supermarket chain.

a) Explain why using a rapid application development (RAD) methodology could be beneficial to SN when bidding for the contract.

b) Describe how Agile methodologies could be used in the effective production of the software.

2. Describe two benefits of prototyping when following a rapid application development methodology.

***Contemporary Developments***

1. DeskCom create mathematics software for schools. A systems analyst from DeskCom has been sent to visit an interested school.

DeskCom programmers will consider many factors when deciding which programming language to use to code the new software. Describe one factor they should consider when choosing a programming language.

2. Choose a contemporary development in intelligent systems.

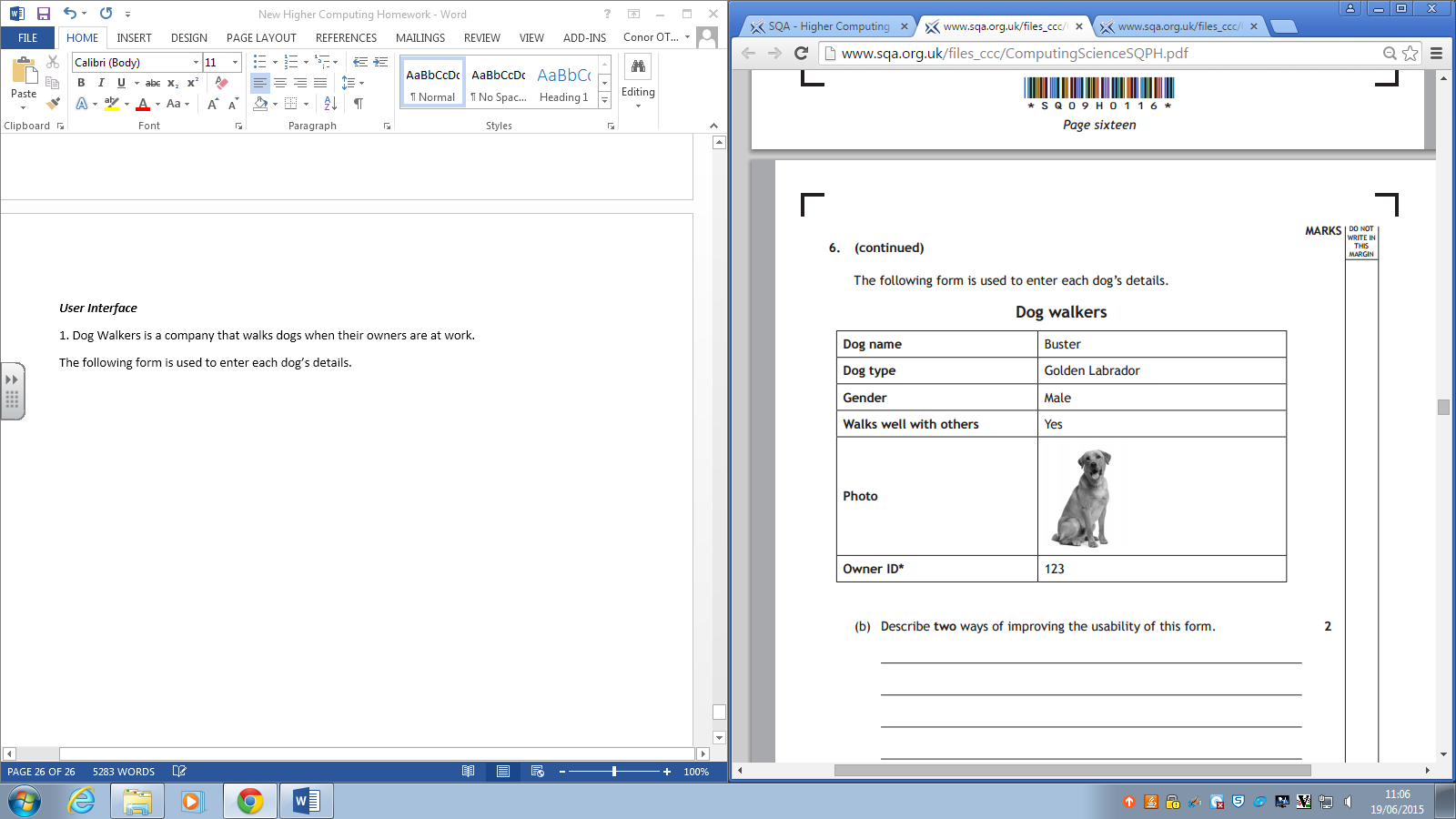
Briefly describe the main features of this development.

3. Explain how the trend towards increased processor performance impacts on the lifetime carbon footprint of a smartphone.

***User Interface***

1. Dog Walkers is a company that walks dogs when their owners are at work.

The following form is used to enter each dog’s details.



Describe two ways of improving the usability of this form.

2. Finest Fashions decides to make its website available on mobile devices such as smartphones. As a result of this decision, maintenance must be carried out.

Explain one modification to the interface that will be necessary, due to the technical limitations of smartphone devices.

3. Describe how usability testing could be carried out on a website.